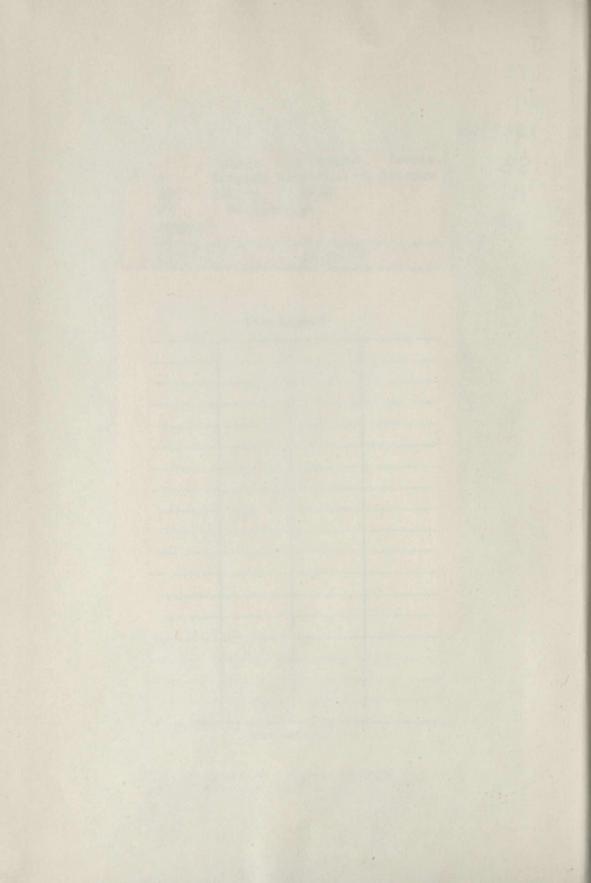
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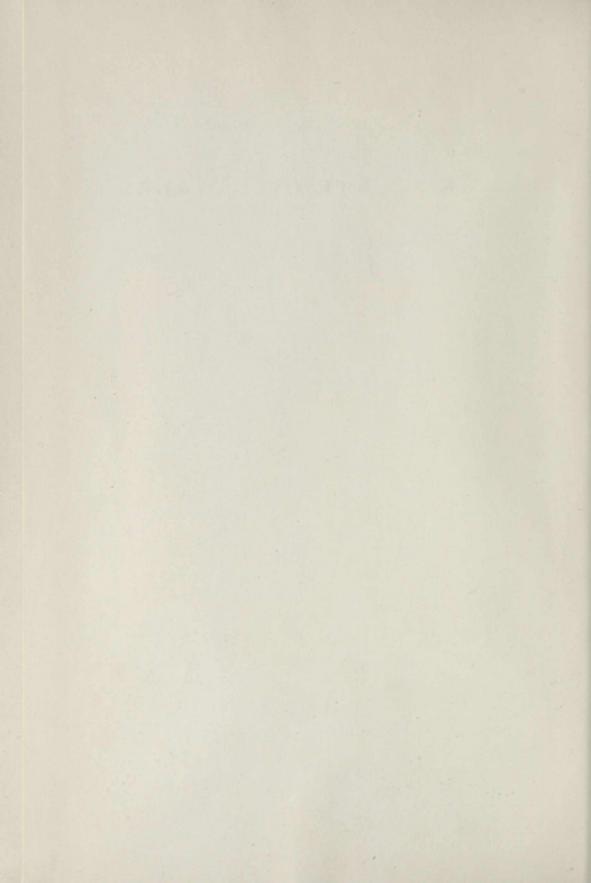
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First Session—Twenty-eighth Parliament 1968-69

THE SENATE OF CANADA

PROCEEDINGS
OF THE
SPECIAL COMMITTEE
ON

SCIENCE POLICY

The Honourable MAURICE LAMONTAGNE, P.C., Chairman The Honourable DONALD CAMERON, Vice-Chairman

No. 28

WEDNESDAY, FEBRUARY 12th, 1969

WITNESSES:

Department of Manpower and Immigration: Dr. W. R. Dymond, Assistant Deputy Minister, Program Development; Dr. Duncan R. Campbell, Acting Director, Planning and Evaluation Branch; Harry H. Morritt, Assistant Director, Manpower Information and Analysis Branch; and K. V. Pankhurst, Chief, Manpower Requirements Section.

APPENDIX:

29.—Brief submitted by the Department of Manpower and Immigration.

MEMBERS OF THE SPECIAL COMMITTEE

First Session-T NO cycleben Parliament

SCIENCE POLICY

The Honourable Maurice Lamontagne, *Chairman*The Honourable Donald Cameron, *Vice-Chairman*

The Honourable Senators:

Nichol Aird Grosart Belisle Haig O'Leary (Carleton) Phillips (Prince) Blois Hays Robichaud Kinnear Bourget Lamontagne Sullivan Cameron Thompson Carter Lang Desruisseaux Leonard Yuzyk McGrand Giguère

> Patrick J. Savoie, Clerk of the Committee.

ORDERS OF REFERENCE

Extract from the Minutes of the Proceedings of the Senate, Tuesday September 17th, 1968:

"The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That a Special Committee of the Senate be appointed to consider and report on the science policy of the Federal Government with the object of appraising its priorities, its budget and its efficiency in the light of the experience of other industrialized countries and of the requirements of the new scientific age and, without restricting the generality of the foregoing, to inquire into and report upon the following:

- (a) recent trends in research and development expenditures in Canada as compared with those in other industrialized countries;
 - (b) research and development activities carried out by the Federal Government in the fields of physical, life and human sciences;
 - (c) federal assistance to research and development activities carried out by individuals, universities, industry and other groups in the three scientific fields mentioned above; and
 - (d) the broad principles, the long-term financial requirements and the structural organization of a dynamic and efficient science policy for Canada.

That the Committee have power to engage the services of such counsel, staff and technical advisers as may be necessary for the purpose of the inquiry;

That the Committee have power to send for persons, papers and records, to examine witnesses, to report from time to time, to print such papers and evidence from day to day as may be ordered by the Committee, to sit during sittings and adjournments of the Senate, and to adjourn from place to place;

That the papers and evidence received and taken on the subject in the preceding session be referred to the Committee; and

That the Committee be composed of the Honourable Senators Aird, Argue, Bélisle, Bourget, Cameron, Desruisseaux, Grosart, Hays, Kinnear, Lamontagne, Lang, Leonard, MacKenzie, O'Leary (Carleton), Phillips (Prince), Sullivan, Thompson and Yuzyk.

After debate, and—
The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Thursday, September 19th, 1968:

"With leave of the Senate,

The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That the name of the Honourable Senator Robichaud be substituted for that of the Honourable Senator Argue on the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Wednesday, February 5th, 1969:

With leave of the Senate,

The Honourable Senator McDonald moved, seconded by the Honourable Senator Macdonald (Cape Breton):

That the names of the Honourable Senators Blois, Carter, Giguère, Haig, McGrand and Nichol be added to the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.

ROBERT FORTIER,
Clerk of the Senate.

MINUTES OF PROCEEDINGS

Wednesday, February 12th, 1969

Pursuant to adjournment and notice the Special Committee on Science Policy met this day at 10.00 a.m.

Present: The Honourable Senators Lamontagne (Chairman), Bourget, Cameron, Carter, Grosart, Haig, Kinnear, McGrand, Robichaud, Sullivan, Thompson and Yuzyk-12.

In attendance:

Philip J. Pocock, Director of Research (Physical Science).

The following witnesses were heard:

DEPARTMENT OF MANPOWER AND IMMIGRATION

Dr. W. R. Dymond, Assistant Deputy Minister, Program Development; K. V. Pankhurst, Chief, Manpower Requirements Section; Dr. Duncan R. Campbell, Acting Director, Planning and Evaluation Branch; and Harry H. Morritt, Assistant Director, Manpower Information and Analysis Branch.

In attendance:

Robert Lachapelle, Acting Director of the Research Branch.

(A curriculum vitae of each witness follows these Minutes.)

The following is printed as Appendix No. 29.

-Brief submitted by the Department of Manpower and Immigration.

At 1.00 p.m. the Committee adjourned to the call of the Chairman.

ATTEST:

Patrick J. Savoie, Clerk of the Committee. Defines that the Mintest of the Physical Control to the Control of the Control of

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Dr. W. R. Dymond, Assistant Deputy Minister Program Development, Manhank And K. V. Parkhurs, Cheef, Mangawar Requirements Section.

Tr. Duncan R. Campbell, Acting Director, Flaming and Evaluation Branch and Harry H. Morritt, Assistant Director, Manpower Information and Analysis Branch.

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Robert Lacinpelle, Acimy Linector of the Research Del

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But submitted by the Department of Mannower and Immigration.

At 1.00 p.m. the Committee adjourned to the call of the Chairman

ATTEST

Patrick J. Savole, Gerk of the Committee.

CURRICULUM VITAE

DYMOND W. R., William Richard Dymond was born in Toronto, and received his secondary school education at Upper Canada College, Toronto. Dr. Dymond holds a Master of Arts degree in Economics from the University of Toronto and a Doctor of Philosophy degree, also in Economics, from Cornell University. His graduate thesis was in the field of studies of labour-management committees and the way in which they operated in the United States and Canada. He entered the service of the Department of Labour in the Economics and Research Branch in 1951, having previously been professor of economics at the University of Massachusetts. Shortly after his entry into the service, he was appointed Chief of the Manpower Division of the Economics and Research Branch; on January 1, 1957 he became Director of the Branch; and on September 18, 1961 was appointed Assistant Deputy Minister of the Department. Dr. Dymond has been a sessional lecturer in labour economics at Carleton University, Ottawa. He has also lectured in this subject at McGill University, Montreal, and was a staff member of a management seminar held at the University of Southern California in the summer of 1958. Dr. Dymond has represented Canada at meetings of the International Conference of Labour Statisticians and has delivered papers at sessions of the American Economic Association, the American Statistician Association, and the Canadian Political Science Association. He was a member of a special Interdepartmental Committee on Unemployment Statistics and has represented the Department of Labour in many discussions with governmental and non-governmental agencies interested in labour relations and manpower. In 1965 he was elected Chairman of the Manpower and Social Affairs Committee of the Organization for Economic Co-operation and Development in Paris, and he has since been re-elected to that position. In addition, he has served as an expert for many O.E.C.D. Manpower activities, including the 1961 "Examination of Manpower Policy and Programs in the United States." He was one of the authors of the report "Skilled and Professional Manpower in Canada, 1945-1965", which was prepared for the Royal Commission on Canada's Economic Prospects. As of January 1, 1966, Dr. Dymond has been the Assistant Deputy Minister in charge of the Program Development Service of the Department of Manpower and Immigration.

PANKHURST K.V., On graduating from the London School of Economics in 1952 he was elected to a Dean Research Scholarship in the University of Leeds for research into the economics and history of the wool textile industry. He taught economics in three universities in the United Kingdom, was economist to an industrial development council and research economist at the National Institute of Economics and Social Research in London. In 1961 he became Director of Economic and Social Research in the University of Wales, Aberystwyth. He came to Canada in 1964 to start a Research Division for the Unemployment Insurance Commission, and joined the Department of Labour in 1965 as a senior economist. Since the inception of the Department of Manpower and Immigration in 1966 he has directed programmes of research concerned with Canada's future manpower requirements and with highly qualified manpower, including the design and direction of a major survey of scientific and engineering manpower. He has written and

published numerous works concerned with such subjects as short-term forecasting, international trade, regional analysis and policy, fixed investment, migration, long-term projections and manpower.

CAMPBELL DUNCAN R., Born Montreal April 30, 1935; Canadian citizen; married; two children. Education: B.A. University of Toronto, Honours Political Science and Economics 1958; Ph.D., Cornell University, Economics 1966. Academic Honours, Awards, etc.: R.J. Little Scholarship, Toronto, 1954. Ford Foundation Doctoral Dissertation Fellowship, 1961. Cornell Senior Fellowship, 1961 (declined). Phi Beta Kappa, Cornell Chapter, 1961. Phi Kappa Phi, Cornell Chapter, 1961. Thesis: Thesis: The Impact of Seller Concentration on Market Performance: A comparative study of the Canadian and American petroleum refining and marketing industries. Publications: (1) "Public Policy Problems of the Domestic Crude Oil Industry, Comment"; American Economic Review, March 1967; (2) "Manpower Implications of Prospective Technological Change in the Eastern Canadian Pulpwood Logging Industry" (with E.B. Power), Queen's Printer, 1966; (3) Various articles in trade publications. Employment: 1958-1960, Teaching Assistant-Department of Economics, Cornell University; 1960-1961, Head Teaching Assistant-Department of Economics, Cornell University; Summer 1961, Lecturer, summer school, Cornell University; 1961-1962, Ford Foundation Fellowship; 1962-1963, Lecturer, Department of Economics, Yale University; 1963-1966, Research Economist-Department of Labour, Ottawa; 1966, Economist, Planning and Evaluation Branch, Department of Manpower and Immigration; 1967, Acting Director, Planning and Evaluation Branch, Department Manpower and Immigration.

MORRITT HARRY H., Born in Vancouver, B.C. in 1923, attended primary and secondary schools in that city and graduated from U.B.C. in 1945 with a B. Comm. Degree. Attended Cornell University in 1954-55 and received an M.A. in economics from that University in 1959. Presently the Assistant Director of the Manpower Information and Analysis Branch of the Department of Manpower and Immigration. Included among responsibilities is that of directing staff engaged in the maintenance of an inventory of Professional, Scientific and Technical Manpower in Canada and conducting surveys and preparing reports based on this inventory. An additional responsibility is for the direction of a Professional and Technical Occupations Section which has responsibility for the preparation of Career Outlook reports for graduates of universities and community colleges and various other reports which are distributed to Canadians studying in other countries in connection with "Operation Retrieval". Previously worked as a senior economist in the Pay Research Bureau of the Public Service Staff Relations Board, and prior to that as an administrator in the Industrial Relations Branch of the Department of Labour and as an economist with the Economics and Research Branch of that same department.

THE SENATE

SPECIAL COMMITTEE ON SCIENCE POLICY

EVIDENCE

Ottawa, Wednesday, February 12, 1969.

The Special Committee on Science Policy met this day at 10.00 a.m.

Senator Maurice Lamontagne (Chairman) in the Chair.

The Chairman: Honourable senators, this morning we will hear from the representatives of the Department of Manpower and Immigration. Heading the delegation of representatives from that department is Dr. W. R. Dymond, Assistant Deputy Minister, who is in charge more specifically of program development.

Dr. Dymond is accompanied by Dr. D. R. Campbell, Acting Director, Planning and Evaluation Branch; Mr. Robert Lachapelle, Acting Director of the Research Branch. Mr. Harry Morritt, Assistant Director, Manpower Information and Analysis Branch, and Mr. K. V. Pankhurst, member of the Department of Manpower and Immigration.

As is usual, I would ask the head of the delegation to make an opening statement.

Dr. W. R. Dymond, Assistant Deputy Minister, Program Development, Department of Manpower and Immigration: Thank you, Mr. Chairman. I will try to make my opening statement reasonably brief. Honourable senators, I thought it would be useful to position the work on research and development in the Department of Manpower and Immigration within the context of manpower and immigration policy in Canada and in the work and objectives of the department generally.

Within the past decade, particularly, Canada, as well as other highly industrialized countries, has come to recognize how important it is to manage manpower resources effectively in the achievement of economic and social objectives. This recognition, I think, arose as we entered the so-called age of automation and we became aware of the speed and intensity of technological change and the problems it creates for people in adapting to new job requirements.

Those concerned with economic policy came to realize that in this kind of economy the human

factor in production is relatively more important in economic growth than is capital or the application of technology.

With this realization came a mounting concern for the strengthening of programs aimed at improving the qualifications and utilization of our human resources. The concept emerged of an "active manpower policy." An active manpower policy is basically concerned with helping people to respond effectively to economic and technological change.

Its purpose is to create the opportunities and conditions which allow people to obtain and hold jobs for which they are best suited and which, in turn, make them most productive.

Immigration is also a responsibility of our department and it has played an important role in the development of Canada's manpower resources and in the growth of its population. Immigration is now an integral part of our manpower policy and is a significant program element which helps materially, in meeting the needs of our economy for skilled, technical and educated manpower.

The flow of immigration has varied from year to year as the needs of the Canadian economy have varied and as economic conditions in the principal source countries have changed. In the years since 1946, approximately 2,800,000 immigrants have come to Canada and the children of post war immigrants have made up a large and important part of our population.

Canada maintains 46 immigration offices in 29 countries of the world and we encourage immigration on a completely non-discriminatory, universal basis, provided those desiring to enter meet minimum educational standards and can find a place in our labour market. We also provide for the reunion of the relatives of those who have immigrated to Canada. Our policy is based on the recognition that immigration is an important source of population growth, and that an expanding population is a source of economic growth. Immigration also has significant non-economic values which add to the social and cultural diversity of Canadian society.

As to the main kinds of programs that we have in the department, training is by far the most important one in terms of money and human resources. The new Adult Training Program was introduced in 1967 and is financed on a 100 per cent basis by the federal Government, which purchases training for adult members of the Labour force from public training institutions, from private industry, and on some occasions from private schools. By far the bulk of the training is purchased from public training institutions through the provinces.

The training is directed not only to the unemployed, although they make up a substantial proportion of those trained, but to the employed and those requiring training to secure more productive jobs than they now have. We purchase specific occupational training of up to a year's duration, and beyond in some circumstances, and also provide general educational upgrading to enable workers with limited education to develop the more specialized skills required by our modern economy.

This present fiscal year we will have trained over 200,000 persons under this new program, and for the coming fiscal year it is estimated that we will have in training some three-quarters of one per cent of those in the labour force.

A major innovation introduced as part of this program is the provision of training allowances to all of those who are three years in the labour force or who are one year out of school and have dependents to support. In an economy of rapid technological change it is not possible to remove persons from production or to train unemployed who will take jobs if they become available, unless adequate income support is provided for them.

Another major function of the department is the public employment service, whose offices are now called Canada Manpower Centres, to symbolize the new concept of the local employment office as the institution through which all our manpower programs are implemented. These centres find jobs for workers, counsel them and help to meet the manpower needs of employers.

A basic function of the Canada Manpower Centres is to improve the speed of response of workers to technological and economic changes. It is in the centres that we make people aware of the opportunities and of the availability of training, mobility and other programs which can help them take better advantage of these opportunities. Our manpower centres have a two-way relationship to the labour market. They cannot give good advice to a worker unless they know what employers want. Employers will tell them what they want only if they know from experience that our manpower centres are skilful in meeting the employers' needs.

Another basic program is our Manpower Mobility

whom we cannot find a job in his local labour market. It applies also to under-employed workers who work less than 30 hours a week and wish full-time employment, and to workers who are not utilizing their most highly productive and qualified skills. Under the program a worker can be moved on an exploratory grant to a labour market where there may be work for him to enable him to look for such work and to accustom him to the new community. Once the worker has found a job in another community, or our manpower centres have found a job for him, all travelling expenses for him and his dependents are paid, plus a relocation grant of up to \$1,000, based on the number of his dependents. In addition, the program will pay \$500 to facilitate the sale of his existing home or the purchase of a new home.

I might direct your attention next to page 4 of the brief, because that indicates the organizational structure of the department and will enable you to position the Program Development Service in the department. The Program Development Service is the service responsible for research and development and the current manpower information functions of the Department. If you look over to the extreme left of the chart under "Director General of Operations", you will see a line of authority from the Deputy Minister through the Director General of Operations to Regional Directors in each of the five regions of Canada. These regions embrace with in Canada both immigration and manpower functions under the same Regional Director, so that in Canada there is complete organizational integration between the two sides of the department's work.

Next is the Assistant Deputy Minister (Manpower), who is responsible for the administration and developing guidelines for the manpower programs of the department. Next is the Assistant Deputy Minister (Immigration), who is responsible for the administration of the overseas, in a line sense, functions of immigration, and within Canada for functional guidelines of the immigration aspects within Canada. In the middle are the usual service functions of the department in connection with personnel, information, financial and administrative services, and a special staff training and development task force.

My own responsibilities are indicated on the far left side of the chart. There are three major branches of the Program Development Service: a Research Branch, a Manpower Information and Analysis Branch, which has a very considerable field component at the regional and district level of our operations to provide local current manpower information, and a Planning and Evaluation Branch, which is concerned with program development, the development of new programs or changes in our existing programs and evaluation of our existing programs. Within the brief Program, which applies to any unemployed worker for there is a fuller description of each of these functions. I think I might draw your attention to the fact that, so far as I am aware, the organization of the department in respect of research and development and program evaluation is somewhat unique in the sense that we have put at a senior—a level equal to and equivalent to people responsible for operational and administrative functions at the Assistant Deputy Minister level—a responsibility for research and development, so that it will assume an equal kind of weight and impact on the department's decision-making and its operations as the more traditional kinds of managerial and operational functions have. This is a growing trend, and in the federal Government organization I think we were probably one of the first departments to develop it in this sense.

Perhaps I might now briefly direct your attention to pages 8 and 9 of the brief. There, under paragraph 16, we have tried to outline in general terms the objectives of the Program Development Service, which are:

- (i) analyzing the public need for policies and programs and determining the degree of need for new programs or program changes;
- (ii) initiating and co-ordinating long-term program planning and conducting program analysis of the courses of action available to reach the departmental goals;
- (iii) evaluating the impact, costs and benefits of existing departmental activities and sub-activities and recommending changes therein;
- (iv) analyzing those recommendations concerning departmental policies and programs which emanate from the Canada Manpower and Immigration Advisory Council and Boards and domestic and international organizations;
- (v) providing detailed, prompt, specialized and accurate labour market information analyses and research as a basis for departmental decisions on the purchase of training courses, the admission of immigrants, referral and mobility, and providing needed analyses to organizations and individuals to assist their decision making;
- (vi) providing co-ordination with other federal departments and provincial governments in the above areas.

That completes my introductory remarks, Mr. Chairman.

The Chairman: Thank you, Dr. Dymond. Senator Thompson will initiate the discussion.

Senator Thompson: Dr. Dymond, I wonder if at the start you could give us a little bit more of the background, and tell us why on page 4 you partitioned your work. If I could quote from page 1, which is chiefly concerned with scientific activities into the three separate components, why have you done it in

this area of research, Manpower Information and Analysis, Planning and Evaluation Branch?

Dr. Dymond: The Research Branch basically is concerned with the longer term and more fundamental research activities in the field of manpower and immigration which would in a long run sense stand behind future changes in policy in this area or of the development of information that will be of guidance in day-to-day decision making in a long-run sense as distinct from the short term. If I could skip over now to the Planning and Evaluation Branch, the background research would enable any changes in programs and policies to be thought through and developed in a wider context than just an immediate day-to-day context.

Senator Thompson: In regard to the planning and the evaluation . . .

Dr. Dymond: The planning and the evaluation function is our evaluation of programs. That is to take our existing programs and to determine the degree to which they are effectively meeting their public objectives. One of the major tools we use in that branch for determination of whether they are meeting their public objectives effectively is benefit cost analysis and other kinds of analyses such as what happens to the clients of the programs as they go through them and that sort of thing.

A second responsibility of that branch is formulating changes in programs and all of this of course is done very much of a consultative atmosphere with the operational departments. You do not do that in a vacuum, but they sometimes head up a task force and in other ways direct the work on program changes or the development of new programs. Thirdly, they are responsible for the over all, at the departmental level, long-term planning system and the program forecast and review system that is used to make decisions on the allocation of resources. That is used to transmit our resource needs to the Treasury Board. Those are the areas that that branch is responsible for.

The Chairman: In other words, the Research Branch would be mainly interested in general research. I would say applied research or mission oriented research at a fairly high level and, for general purposes, the Planning and Evaluation Branch evaluates and advises immediately the policy makers within the department.

Dr. Dymond: Yes, that is right. Although the Research Branch will sometimes get involved in pretty immediate kinds of policy changes as well. Now, the Manpower Information and Analysis Branch is focused on the generation of current information on labour supply and demand. The regional and local levels of the branch have a field organization to serve the needs of our regional and local offices and at headquarters to

serve the needs for short term and current information on the state of the labour market.

Senator Thompson: Your Research Department, you say, would do long term research? Would you, for example, be doing work on the impact of technology on the worker? We had the Department of Labour last week. One of the questions that was raised was what is the program planning or the analysis of leisure time? I quoted some things that West Germany was doing about approaches towards shifts and preference for a longer holiday being of more benefit to the worker than just having a shorter work week. Do you do this kind of thing?

Dr. Dymond: Well, our focus of interest is different from that of the Department of Labour. We have a section in the Research Branch. It is not very adequately staffed at the moment, but it is devoted to the impact of technological change on manpower requirements, on the changing allocation of manpower, on what happens to the needs for manpower and on what knowledge people need to know within enterprises and within occupations. I might cite one study that Dr. Campbell undertook some time ago when he was in this branch, regarding the manpower requirements of the eastern logging industry as affected by technological change. There we have been having some pretty dramatic kinds of changes in these big harvesters and the new equipment going into that industry. The focus of concern of our research in this area is on the impact of change on the manpower requirement side and on what skills and knowledge workers need to have as a result of changing technology. That information hopefully in the future will have an impact on our overall forecasting of manpower needs and other studies that we are undertaking at the present time.

Senator Thompson: As far as your sort of sitting back and thinking of future implications—I have just taken technology as one—you say first that you are understaffed and secondly, you quote the logging industry which is an immediate problem. I imagine you are referring to this technology in the logging industry today. Have you got people who are sitting back and taking a long term look and doing research with respect to years from now?

Dr. Dymond: Yes, we certainly have studies going on of the future manpower requirements and supplies up to 1975 and year by year as to how requirements are going to evolve. We have research to get a longer run view of the impact of technology on manpower requirements and the whole adjustment process of manpower to changing technological requirements.

Senator Thompson: How many men are in this department?

Dr. Dymond: In the technological change . . .

Senator Thompson: In the Research Branch.

Dr. Dymond: In the Research Branch there are around 88 altogether at the present time, which is quite a bit under the establishment.

Senator Thompson: You bring up the Department of Labour, which is cut off from you. I sense that there could be the possibility of some gap between the two of you, perhaps I could enlarge on that. For example, I am thinking of regional development. You have emphasized the need for manpower utilization. Employment services and immigration are obviously related to regional development. So is the Department of Industry, and so are a whole variety of departments. It is all very well to be training a group of men somewhere in the Maritimes, but I can see a conflict between the Unemployment Insurance Commission, which is paying people because they are unemployed, while your manpower mobilization may be suggesting it might be helpful if you moved to some other place. In your brief the only mention of integrating various departments is that you have an informal discussion. Do you think this is adequate and do you not need a more formal mechanism so that you are not even, within your own department, working at cross purposes?

Dr. Dymond: I assume you are talking about research.

Senator Thompson: Yes. You mentioned the research as very closely related to services.

Dr. Dymond: Yes.

The Chairman: We were told, for instance, that the Department of Labour did not know what you are doing in terms of research, and I know that you were formerly with the Department of Labour. We were told this and also that you did not know what was going on in the field of research in the Department of Labour, except through very accidental and very informal communication.

It seems to some of us that there are areas of possible duplication but we are not too worried by duplication in the field of social and economic research, because there is so little being done, but there might be a possibility of important gaps. For instance, they say in the Department of Labour that they would like to do research on the impact of technology. You say that you are doing some of this, but not very much. Yet we are going through a period of most rapid technological change, where that change will have all kinds of influences on the labour market and on the way of living of the worker.

Dr. Dymond: I think the area of technology we are focussed on for the moment is an area which, in my view, has both industrial relations or labourmanagement relations dimensions and manpower dimensions, very clearly. At the point where we get active in doing the kind of research I think we should be doing in this area and we are not doing very much of at the moment, because of recruitment problems, we would certainly corroborate with and set up some joint discussions with the Labour Department in that particular area, because it certainly is one area in which clearly changes within industry have manpower and industrial relations dimensions that are very closely interlocked. There is no question about it. For that reason, it would be very specialized research that would focus on one aspect of it to the exclusion of the other. In that sense, there is room for jointly developed programs in that particular area.

Senator Thompson: Assuming you had doubt, what is your mechanism for the Department of Labour entering, when you wish to co-operate with them, and knowing they want to co-operate with you?

Dr. Dymond: I think the traditional mechanism is the setting up of an interdepartmental committee, to guide the research in that area. In fact, in this particular field, other departments such as Regional Development, and the industry part of Trade and Commerce, are also concerned with technological change. If one wants to broaden the horizons, the Science Council has some interest in this field.

Senator Thompson: But there is no interdepartmental committee existing at the moment so that you could be planning together?

Dr. Dymond: Not at the moment in this field. I was going on to say the labour and management also as organized groups have an interest in this field.

The Chairman: And the Economic Council.

Senator Thompson: Could I ask you do you think there should be an interdepartmental committee so that you could get that better co-operation?

Dr. Dymond: Yes, I think this would be helpful. I think it is a relevant comment to make that our problem at the moment in this area of research gaps is perhaps that we are too inward looking, if I may express it that way.

We see so many things that need to be researched from the point of view of the evolution and constant adaptation of our own policy and programs in the department. There are so many gaps right in what is our direct field of responsibility. We have not been very outward looking in looking for gaps in a somewhat larger context of the kind we are discussing now in relation to technological change.

In that sense, I suppose there is a gap here in the larger and longer term sense. We have not felt very pre-occupied with that kind of gap in the department, because of the realization of so much research which needs doing on our own doorstep, so to speak.

Senator Thompson: Within your department could there be conflicting policies? I would appreciate if you would comment on that. I am thinking of your manpower mobility program.

Just to get the picture of this in mind, what is the research that led to the initiation of this program, how is it initiated, and how is its effectiveness monitored? Is this program meant to be strictly a stimulus to interprovincial mobility, and how does this mesh with regional development programs and with the Unemployment Insurance operations? It may be that these three activities will work at cross purposes? I raise that as a question.

Dr. Dymond: I might give a little history and then turn part of the question over to Dr. Campbell, because he was responsible for some of the work leading to adaptations in the current programs.

The program got started originally in the period of the Department of Labour, the original and early version of the program. It was imported into the Department of Manpower with the Government reorganization in 1966. So the early research and other work leading to the design of the program occurred within the Department of Labour.

There was a certain amount of research going on in the mobility field but not a great deal, I think, and to be quite candid and honest, I would have to say that the original version, the early first version of the program was not particularly a product of a very elaborate or deep research.

The purpose of the program really is not particularly to pick up one part of your question, to move people interprovincially. In fact a great bulk of the movement occurs within provinces and within regions. The largest part of the movement occurs, as a matter of fact, within Ontario in terms of numbers moved.

Senator Thompson: Could I just interrupt? Why is it not interprovincial?

Dr. Dymond: There is some movement interprovincially, but I think it is a wise policy to move people no further than they need to move to get a satisfactory and stable job. So the movement tends to be from outlying areas in provinces into centers, or between centers that are declining to some extent and centers that are growing. Senator Thompson: You do not think this would help in national unity if we were all moved around the country, that we would get to know each other?

Senator Haig: Are you not moving miners from the Atlantic coast to places out west?

The Chairman: And British Columbia. They moved on their own, That I know.

Senator Cameron: If I might interrupt Senator Thompson, I think there is a very general feeling that people do not know the rationale behind the separation of the Department of Labour and the Department of Manpower. This may have all kinds of justification but I am sure the general public, and many members of Parliament, do not know the reason why these two were divided up.

The Chairman: I am sure Dr. Dymond was not responsible for that.

Senator Cameron: No, no, I know that. I am satisfied that is true and I do not want to embarrass my friend Dr. Dymond. I could be embarrassing.

What does the Department of Labour do? What I would like to have seen was this chart which Dr. Dymond has prepared, showing the way his department is organized—and it is very good—put alongside a chart of the Department of Labour.

The Chairman: You have it in the other brief.

Senator Cameron: I would like to see them side by side, because I feel that there can possibly be duplication in the way it is set up now.

Senator Thompson: The gaps that occur.

Dr. Dymond: If I might comment on the duplication point—I will not, I think, comment on the reason for the Government reorganization act. From what I know of what the Department of Labour is doing, I do not see much real area of duplication of research and development activity, except possibilities in the one field we were discussing earlier, of studies of technological change because of the nature of the phenomenon.

In the Department of Labour, as I understand it, the research would be oriented to questions of wages, working conditions, labour standards, industrial relations, labour management relations, the kinds of changes there should be in the Industrial Relations Act, and these kinds of questions.

The Chairman: These are the functions of the department, but we were told that their research program, although it has not been implemented yet, was much more ambitious in general than this. Per-

haps it would not be desirable that there should be such an extension of their research functions which would really go beyond the new specific functions of the Department of Labour, but certainly we were given to understand that their research programs might very well go beyond that.

Dr. Dymond: As I say, our policy is basically to do research within the framework of the department's objectives, policies and programs, and not to stray outside those boundaries except where there was participation in joint research activities, because they cover a wider frame of reference than the department's. But we find, quite frankly, as I hope comes through the brief, that we are really performing not really adequately enough in researching the areas that are part of the department's direct responsibilities.

Senator Thompson: I do not want to embarrass you by quoting the Gordon Commission; I do not know if you were connected with it. My colleague Senator Haig has told me that 1,500 Maritimers are moving out to Alberta, to the coal mines there. Turning to another aspect, I would presume that fishermen have seasonal employment and are compensated by the unemployment insurance offices. This would mean there would be encouragement for them to stay within their regions. On the other hand, you have a Manpower Mobility Program. To my mind there could be a conflict in this. Can you explain how this is not so, or do you yourself see any danger in it?

Dr. Dymond: I do not see any basic conflict, frankly. We are moving people to the closest employment opportunity, those people whom we have to move because there is no apparent prospect of their employment in the local area in which they find themselves. If we see a prospect developing in the reasonable future we will not move them, because there is no point in tearing up roots, which is a difficult process for individuals and their families, unless we see no prospect in that area. Therefore, our mobility work has to be, and I think is, pretty closely co-ordinated with work on regional development and industrial development in local areas and in regions. In other words, the intention of the mobility program is supportive of the regional development process rather than detracting it; it is where the regional development process and the process of bringing jobs to workers cannot work that our program comes to bear, first of all in the main to move people within provinces, and then, of course, between provinces if that cannot take care of the problem.

It might be useful to ask Dr. Campbell to quote a statistic or two on the size of this program, because it is relatively small compared with the total movement of workers on a free and unassisted basis within Canada. In other words, our program is really to pick up people who are unable to move on their own. By far the majority of the movement, the vast bulk of it, occurs in a free sense, of people moving around the country to different or new or better employment opportunities rather than through our program, which is designed to support that element of mobility that would not occur without our kind of financial help.

Senator Thompson: Do you know what the Department of Industry is doing in the regional plan?

Dr. Dymond: Yes.

The Chairman: They are not doing very much now. These functions have been transferred to the new Department of Regional Development.

Senator Thompson: That is quite right. How do you relate to the Department of Regional Development?

Dr. Dymond: For example, when there is a FRED plan . . .

Senator Thompson: A what?

Dr. Dymond: A FRED plan. The fund for regional development. There is a plan for the northeast, New Brunswick, the inter-lake area of Manitoba and one being developed for Prince Edward Island. In those plans there is provision for the application of manpower training programs, mobility programs and councelling programs to tell people about opportunities. Where there is a plan of regional development in a depressed area, the mobility program becomes a part of the plan of moving people, either within the area or to other centres where there is more growth. In other words, it is highly integrated into the structure of a plan where one exists.

The Chairman: I do not want any comment from you perhaps at this stage, but in that sense most of these regional plans involve either greater mobility of labour or at least training or re-training of manpower in those areas. These plans are under the responsibility of the Department of Regional Development, the total plan, but the substance of the tools at the Government's disposal comes from your department?

Dr. Dymond: That is right.

The Chairman: So it is a little bit confusing for us.

Senator Grosart: Referring to the question of definitions which Senator Cameron raised, I notice on page 3, paragraph 10, there is the statement: The department is also involved in the ILO.

That is the International Labour Organization...

through our Department of Labour in matters related to manpower.

Could the witness explain that? This department is involved through the Department of Labour in matters of manpower. Is there a statutory definition of "labour" and "manpower"?

Dr. Dymond: There is a statutory definition of the responsibilities of the Department of Manpower and Immigration in the Government Reorganization Act, and there is a statutory definition in the old Department of Labour Act. Other than that I know of no statutory definitions. The reason this is phrased in this way is that the Department of Labour is the department that represents Canada at the ILO, the International Labour Organization, in all matters that affect...

Senator Grosart: Including manpower?

Dr. Dymond: Including manpower, because the ILO is an all-embracing organization that covers labour—management relationship matters, manpower matter, health and welfare matters, anything affecting the welfare of workers, their economic welfare as well as their social welfare. We participate in ILO committee meetings, work and research through the Department of Labour. In other words, they coordinate the activities of any government department, ours of the Department of Health and Welfare, in ILO affairs. I must say they are very open and co-operative in any dealings we have with ILO.

Senator Cameron: Mr. Chairman, I still cannot get it out of my mind why it should not be the Department of Labour, Manpower and Immigration. This is a very big and complicated department, I know, but it seems to me...

The Chairman: You want to go back prior to 1966?

Senator Cameron: I am just wondering. I want to know the rationale behind it. As I said earlier, there may be very good and valid reasons for this, but I am not convinced.

The Chairman: You could go on and add the Department of Regional Development.

Senator Caneron: Exactly. The Department of Labour as presently constituted is concerned with the administration of labour matters and yours is concerned with the longer range social implications of manpower program. Mind you, I like the idea of a manpower program. It has an inclusive sound or feel

to me, but to have these two related departments slow growth areas it was moved to the new Departcompletely separated... ment of Regional Development. Its work is pretty

The Chairman: The Department of Labour now is really restricted to the field of industrial relations and the very directly related field of labour standards and conditions.

Senator Cameron: It is administrative really.

The Chairman: And this is quite separate in terms of policy responsibility. This is quite different from what the Department of Manpower and Immigration is trying to do. The area of duplication in terms of policy at least is much more wide and I believe much wider when we come to relate the Department of Manpower and Immigration to that of regional development. The area there is much wider it seems to me than with the Department of Labour.

Senator Grosart: We will have to summon you as a witness, Mr. Chairman.

The Chairman: No, but I think we are getting a little bit off the field at this moment because we are not really dealing with research at this point. We are dealing with Government organization.

Senator Thompson: Mr. Chairman, I think with research, our concern is the overlapping between different departments. Could I move to another area? On page 34 I was interested in the actual and estimated research funds by scientific discipline. Again, with respect, I consider economists to be particularly in it and looking at human beings, that you look on them from the terms of the economic production that they can develop and so on. I noticed that under economics it has gone up tenfold. I would have thought that one of the most sensitive areas that should be developed in your manpower would be under psychology and perhaps sociology. Surely it is the psychology of the people behind the desk who assess a man and suggest that he move to another area or be fitted for another job. There were several terms about the direction and the importance of this. Why is it that economics have gone up tenfold and psychology down? I don't know how much psychology has gone down-I am not a mathematician-but surely this table at the bottom of page 34 indicates it has gone down an awful lot.

Dr. Dymond: One should observe, Mr. Chairman, that this table, particularly for 1967-68, is almost impossible to interpret in terms of trends, because in 1967-68 this function comprised the Pilot Projects Branch which was concerned with the development of training and other measures to lift up disadvantaged people and put them into a position where they could thake advantage of economic opportunities. Because that branch was operating in the

slow growth areas it was moved to the new Department of Regional Development. Its work is pretty highly integrated with their concerns and they did, in fact, as you can see from this table, utilize a lot of sociological and pshchological work in developing that program. When you get to 1968-69 and 1969-70 that branch is no longer in this table so the trends are not very helpful here.

Now, as to the reason why we use so many economists, our works in the economic field, the functions and responsibilities of the department, as I indicated to some extent in my opening statement, are economic in character. In other words, our objectives are to stimulate economic growth and to better utilize the labour force and make it more productive, as well as to bring in immigrants to meet the needs of our economy. These are all economic matters and economic problems. That is not to say, however, that they do not have social and psychological dimensions. Of course they do, as you are suggesting in your comments, but the main dimensions, at least in our view, are economic and much of the work in this field of manpower has been done by economists. If one looks at the literature you will see that much of the pioneering work in this country was done by the Economic Council of Canada and some of the basic studies, prescriptions and analyses and proposals they made led to the setting up of the department.

I would not want to say that these are the right proportions. We are having a study following immigrants in order to see what happens to them after they arrive in this country and we are utilizing sociologists and some psychological skills on that study, because it has these dimensions to it. In the major analysis of our programs, and the diagnosis of the problems we face in Canada, for example, one very important kind of problem is the whole question of the trade-off between price and unemployment. We think our programs have a major contribution to make, and this is part of the reason for substantial Government expenditures in the area of our programs, in making a better trade-off between price and unemployment, by working on the structural side of the adjustment in the labour market. This is an economic kind of problem and the people that are making contributions to understanding and the development and analysis of this problem are economists. I am only citing one kind of example. I do not want to hold a brief for this being the right kind of proportion of our efforts as between disciplines in the future.

Senator Thompson: I am thinking, Dr. Dymond, of a study in the United States regarding their employment service a number of years ago. There was considerable public concern regarding the employment services, the question being raised why there are private industries with professional staff, and others going to private enterprise organizations. I am thinking of what an opportunity there is to examine the kind of counselling that should be set up. There may be people in your conselling offices that have a tendency to be sergeant majors, but have not had the training. I think this should be one of the emphasis that you should be doing, which is in psychology and sociology.

Dr. Dymond: You are certainly quite right in the counselling level of training. These people are taking courses and programs that are very heavily sociologically and psychologically oriented. We have not been doing much research in that area on the counselling process. There is quite a body of knowledge and literature in that field. But you are quite right, at that level. We do not employ the skills of the economist in counselling out on the job, we employ the skills of people who understand people and their problems and how to give valid advice about them.

Senator Thompson: I am thinking of a study to see how effectively this is being done, as guidelines for those people. I would suggest this to you.

Dr. Dymond: That would employ these kinds of skills, certainly.

Senator Thompson: Could I ask one last question, as I know others wish to take part? This is in the whole range of immigration. I am thinking of Corbett's book and of Mackenzie King's phrase, "absorptive capacity". What he meant by that I am not sure or by "keeping the fundamental character of the Canadian nation". What does "brain drain" mean, and whether actually by bringing immigrants in are we really just satisfying the needs of the United States?

I have many questions but I will just ask you that. Do you think it is a substantial statement to say that the flow of immigrants coming in are moving to the United States after taking training and adaptation in Canada?

Dr. Dymond: No, I do not think that that is a substantial kind of problem.

Senator Thompson: How do you know, Dr. Dymond?

Dr. Dymond: I am going to ask some of the other people to respond in more detail; but in general one statistic that impresses itself on my mind is that the second most important source, after the United Kingdom, of professional and technical manpower for this country is the United States. Therefore, while we have a net deficit position vis-a-vis the flow between Canada and the United States of professional and technical manpower, the gap in this

deficit position is narrowing all the time, if one looks just at those two countries.

If one looks at our total intake of professional and technical and other kinds of manpower, as compared to the immigration outflow to the United States and other countries, we have a very heavy positive balance, of course, of very substantial magnitude.

If there is any criticism to be made of Canadian policy, I would think it would be the countries of western Europe and the United Kingdom which would make that criticism, for our impact on their "brain drains", that would constitute a substantive kind of criticism of Canadian policy, from their point of view, not from the Canadian manpower point of view. I might ask Mr. Pankhurst to say a word, as he has done a lot of research on this area.

Mr. K. V. Pankhurst, Chief, Manpower Requirements Section, Department of Manpower and Immigration: I think the main point about the "brain drain" is that it is something of a fallacy. Should we consider its magnitude, there seems to be an impression that we have a very heavy loss to the United States. It is an impression which has been created because the statistics that we have of the movement between Canada and the United States are incomplete, in that they do not show the figures of returning Canadian residents who have been to the United States. Very large numbers of them go there for their higher education. As a result, the impression has been created that perhaps seven-eighths of the people who leave Canada for the United States remain there, whereas the calculation which I have done suggested that the proportion which remains in the United States may be half or possibly even less than that, and that at least half return.

I think the important thing about this movement is that the people are going to the United States to get their education and so in fact the Canadian economy is benefiting to quite a large extent from the investment in education which our southern neighbours are providing for us, and so generating a part of our manpower resources.

Senator Thompson: Have you read the Medical Research Council statement?

The Chairman: Fifty per cent seems to be a fairly high rate just the same, if you say that 50 per cent do not come back.

Mr. Pankhurst: I put that as a maximum. It may be much less than that.

Senator Bourget: Have you any figures on the movement of these technical people?

Mr. Pankhurst: We do not have very good figures on that, because a Canadian resident who goes to the

United States does not become recorded in the statistics of people returning to this country-so we can only make a few guesses about it.

Senator Yusyk: The situation has improved since the 1930s, pre-war, because I gather that the brain drain was considerable before the war, and that the position has improved since then.

The Chairman: It has improved since Vietnam, too.

Dr. Dymond: It has been improving quite rapidly in the last two or three years, again I think partly because of the tightening up of the United States immigration regulations, which occurred a year or so ago. This means that no one can get into that country unless he has a pretty firm kind of job that is not competitive with the American labour market. So our deficit position has improved very markedly in the last few years.

Senator Thompson: I always used to feel that immigration was a very scientific process. In reading through the three case histories that you have, I find that you are now doing a job vacancy survey, which you never had in Canada. I find that was an extraordinary omission over the years. I was led to believe there was a very systematic approach in adapting the immigration—to use this term again—the economic absorptive factor in manpower capacity. This might give us an answer to the question?

In regard to the professional and technical manpower survey which you mention at page 53, it seems to me that is also vital. We in this committee have listened, for example, to Dr. Gray telling us that Canada faces a glut of scientists unless the system changes. On the other hand, we have heard that we do not have enough scientists. On your remark about not being too concerned about the flow of professional people to the United States, the Medical Research Council, in their report, appeared to be desperately concerned about the number of doctors, not only immigrants but native born doctors, who have gone to the United States. Following a question which was raised by my colleague Senator Bourget, I feel that in some way it is essential to try to get these figures. I appreciate your difficulty with the fact that once a person comes as a Canadian resident, he does not have to report. Is there any way we could change our law to make this effective for research purposes?

Dr. Dymond: I think, it would create quite a burden. The thing we are deeply concerned about is to retrieve Canadians who are studying in the United States and other countries, and we have mounted, in co-operation with the Association of Universities and Colleges of Canada, quite an extensive activity known as "operation retrieval." This involves teams

which tell Canadians who are studying in the United States and in Europe the opportunities for them in the Canadian labour market. They try to make a link-up—and this is pretty extensive—with employers in the Canadian labour market. Thus, they are exposed to our labour market as much, hopefully, as they are to the labour market in which they are studying.

I do not want to leave the impression that we are airily unconcerned about this problem. We are very much concerned with it. If we are talking about the loss of people, whether it be immigrants or native Canadians, to the United States, fundamentally this is pretty much a question of the extent to which we have challenging and economically attractive opportunities in this country for people with scientific, managerial and other kinds of relatively scarce skills. It is that side of the policy, I would say, that should be worked on the make this country as attractive and challenging as possible for Canadians, whether they have come to Canada from abroad or are native Canadians.

Senator Grosart: Has there been any qualitative research done in this field as opposed to quantitative research, which is the mere counting of heads? We are often told-and Professor A. R. M. Lower has said it on many occasions—that we lose the best and get the worst.

Dr. Dymond: Perhaps I might ask Mr. Pankhurst if he knows of research on the qualitative as distinct from the quantitative side.

Mr. Pankhurst: There is the longitudinal study.

Dr. Dymond: Mr. Pankhurst mentions that we will, I think, be getting an insight into this question through what we call a longitudinal study, which is following a representative sample of immigrants for three years to find out what happens to them. That will tell us something about the quality of the people who come, the activities they engage in and what kind of contribution they make to our economy. Certainly as a matter of impression, I must say, I think we are doing pretty well on the qualitative side of the immigration movement in recent years. Our statistics reveal very substantial increases in the proportion of skilled, technical, professional and managerial as compared to the early post-war years when there was a very heavy inflow of people with modest skills and modest educational levels. Our present selection system puts quite a heavy weight on education as one of the factors of eligibility for admission to Canada. As you probably know, we are criticized to some degree for that kind of scheme by countries who feel population pressures and so on outside this country.

Senator Grosart: Has any research been done on built-in restrictions of professional associations in Canada in the immigration field?

Dr. Dymond: Yes. We are engaging in quite a substantial project in the Research Branch on that question right now. We are looking at all of the trades and professions to see whether, and to what extent, there are restrictions of the kind you mention that inhibit acceptance of the qualifications, provided they are valid of course, of immigrants in the professional area. We have had quite a bit of liaison, and I think fruitful discussions, with the medical associations, the engineers and the agricultural profession on these kinds of questions. I have been active in these discussions and I personally detect a good deal of flexibility and responsiveness to the problem. I am not suggesting it is ideal yet by any means, but I think progress is being made.

For example, we have an offer to any professional organization, and this presents a very difficult problem considering the variety of countries from which we bring immigrants, and our extension of immigration throughout the world through the universalist policy—to study the educational equivalents of their professions in other countries so that they can make valid judgments about the equivalent foreign education and experience in Canadian terms. I think there is some response to this offer, and a good deal of smoothing of the immigration procedures to make them more efficient, to make assessment of qualifications by engineering organizations in the provinces a quicker and more efficient kind of procedure.

Senator Grosart: My question really related to research. I am asking whether anything has been done. Is there a paper or anything...

Dr. Dymond: No, there is not.

Senator Grosart: Just let me finish. Is there a paper that outlines these inhibitions, in say unions, the medical profession or the legal profession? We as a committee are concerned with these inhibitions and we want to know. Is there any information available? Has somebody had the courage to sit down and say, "Here is an inhibition in apprenticeship rules and union regulations. Here are the inhibitions against doctors in the medical profession. Here are the inhibitions in the legal profession and other professions"? Surely this information should be available, although I do not say in a critical way. What are the inhibitions?

Dr. Dymond: As I said, we are making a study. As this study progresses we issue briefs, for the use of our officiers overseas and potential immigrants overseas, called Entrance Requirements for various professions and occupations. I can make these available to the committee. They outline in some detail the

requirements the immigrant must meet to gain acceptance in the profession or trade. This can certainly be made available. We are making a good deal of progress in the preparation of this material for use in the immigration program, and it outlines the kind of requirements you are talking about.

Senator Grosart: In view of the fact the inhibitions I am referring to are not part of our national immigration policy as such, have you made any critical comment to any of these organizations on the validity or otherwise of these non-statutory inhibitions that are keeping people out of the country, or discouraging people from coming?

Dr. Dymond: No, I would not say we have as the federal Government made any critical comments, because this is something that is firmly within provincial jurisdiction, namely legislation concerning trade qualifications and that sort of thing. It has not been a matter of federal policy to be critical of something within the provincial jurisdiction. It think it is well known, however, through speeches of the Minister of Manpower and Immigration, that we would like to see an objective and liberal approach taken to the question of trade and professional qualifications.

Senator Thompson: Following on Senator Grosart's question, we know that the medical associations in the United States have, through a national body, set up a means of evaluating the standards of undergraduate work in medical school throughout the world. We know that in Canada the different provincial bodies, with the smallest of staffs, and so on, reject the standards set by the American association and say, "Look, we will establish our own standards". These are the sort of facts it would seem to me, without being critical or otherwise, should be expressed in this committee and to the public, knowing there is a desperate need for doctors.

When an immigrant comes in-let us say he is a electrician-he faces a very frustrating experience. I don't think that Canadians generally realize what happens. The immigrant electrician will apply to join a union and be told that he is ineligible to join until he has Canadian experience, whereas he cannot get Canadian experience before he joins the union. He finds himself in a vicious circle of frustration. I think in some ways we are not being frank to the public with the facts. You tell the immigrant in the overseas office that he is needed, but it does not get through to him the enormous frustration he is going to face in Canada. I suspect we are wasting an enormous creative energy, talent and skill because of these barriers and I feel it is up to the department to get facts and put them up against other situations in the States, other countries and send this to editorial pages across the country. It is up to the Canadian people to judge how they feel about it.

Dr. Dymond: I should say in relation to the doctors, it is my understanding from discussions with them that they are divided, depending on what professional organization you are talking about. Some of the organizations prepared to use the U.S. test of equivalence.

Senator Thompson: Could you mention any province that is actually doing that?

Dr. Dymond: I think the Province of Quebec has a French version based on this examination and, in fact, we conduct examinations overseas for the medical profession in Quebec. Other medical associations are expressing some interest in this proposal. The research I mentioned is going to try to dig into this question you are raising. Undoubtedly, this is a very crucial and important question.

Senator Grosart: Is there not a step that goes beyond the mere comparisons of equivalence? Is there not a responsibility on the Department of Manpower to go beyond this and say, "Are these standards valid?" We know what it takes to get a job as a longshoreman in Canada, the skills and the qualifications.

Dr. Dymond: I think the problem, senator, is the one I mentioned.

Senator Grosart: Provincial partly, but not altogether provincial.

Dr. Dymond: It is in so far as there is legislation in this field and it is provincial legislation. I think we have a responsibility (a) to tell the immigrant the facts and we certainly try to do that and (b) to undertake research, as I indicated on the nature of this problem. From the research might flow some policies and steps toward a more active posture in this regard, but I think I would have to say it is delicate because of this question of provincial jurisdiction in this field,

Senator Thompson: Do you think you have the responsibility to tell the Canadian public the facts?

Dr. Dymond: Well, I think any good research done by Government or any place else should be put on the table and be a matter of public record. That is my belief, unless it is going to be against the public interest of course, for some reason or other.

Senator Yuzyk: Could I ask a question about research in general. We are dealing with immigration right now. I have been looking at this supplement, particularly at page 3, By Research Branch (Immigration and Foreign Manpower Section) and I note that there are certain projects here, most of them not completed. There are only actually two comple-

ted. We realize of course that Canada puts a lot of stress on immigration. When I look at this list I am not very impressed with the research that is being done on immigration. Perhaps this is not the whole of the research that is being done or contemplated. Certainly a great portion of our population are immigrants and it is of great importance to us to know, for instance, not only immigration, but the adaptation and the integration that takes place and we do not have very many studies in this field at all.

I am glad to note that there are some good beginnings here, the results are still in the future and I would think that this would lead me to believe that either your department does not pay enough attention to research or else you are not given the money to carry out the research that you would like to do. Now, you can correct me if I am wrong. Could you give us a general explanation of the research aspect of the department, say of manpower in this case.

Dr. Dymond: On the immigration side, senator, this may look sort of innocent, a longitudinal study on immigrants: economic and social integration of a representative cohort of immigrants during their first years in Canada. This is actually a very large and major study that will cost hundreds of thousands of dollars. In other words, it embraces a sample of 10,000 immigrants that come in every year.

Senator Yuzyk: I am glad you explained that. You would not gather it from this brief statement.

Dr. Dymond: I was going to say the brief statement is not very enlightening.

Senator Grosart: Excuse me, what page are we on?

Dr. Dymond: Page 3 of appendix C. We will follow those immigrants at six-month intervals with interviews, both mail and personal interviews over a period of three years.

Senator Yuzyk: This started in 1967?

Dr. Dymond: Yes, there was a lot of development work behind this in 1967. It actually started January 1 of this year, that is actually picking up samples of immigrants. From it will flow a great deal of information, knowledge and studies. It will be comprehensive so we will know every group and every occupation and every area of Canada and what happens to the immigrants. In other words, instead of a lot of partial studies which have been done in the past, such as a particular group in Toronto, Montreal or Calgary or what have you, most of them ethnically based studies, this will be completely comprehensive. As I said, it looks very innocent here in four lines, but it is a major study of immigration

into Canada from which will come our basic knowledge in the future of what happens to immigrants. We will then feed that knowledge back into the development of immigration policy and into our selection procedures, into our counselling and so on. In other words, it will be the major way in which we will be able to keep track of what is happening to immigrants in this country with a view to improving our performance in selection and counselling, and, once they get to Canada, the adjustment side.

Senator Yuzyk: This work would be done not only in Ottawa, but various centres in Canada?

Dr. Dymond: Throughout the whole country, but the work will be co-ordinated in Ottawa and the data analysed and developed in Ottawa and then fed out into our whole system, both overseas and in this country. We hope to have some rather major studies that will be published and flow from this basic longitudinal study, as we are calling it.

Senator Thompson: Are you saying that at this point we de not have a study? For example, when there was a decision that immigrants had to have a skill did the Government know there would be economic benefit to Canada by admitting a hundred unskilled young Italians, say, and training them at public expense here. If the Government did know this, then it is saying that only the skilled will be admitted, and the unskilled will be excluded. Has it been based on having looked at it economically to arrive at a decision on not bringing unskilled people in?

Dr. Dymond: There were a number of studies relating to the requirements of the Canadian economy for manpower. There were a number of studies of unemployment. For example, quite a study was done by the Senate itself some years ago under Dr. Deutsch or with the assistance of Dr. Deutsch, on unemployment, the kind of people who were unemployed and the kind of people who become unemployed, where they come from. That kind of information was relevant to the development of the policy.

As one looked at the future, obviously more and more education was going to be required by the average member of the labour force, regardless almost of what occupation he was in, in order to cope with technological change. I think these kinds of studies were relevant for the shape of the new immigration policy that was introduced.

We do have individual studies by individual scholars of particular groups and their adjustment problems, of which there are quire a few, incidentally. They are not recorded here. What we are trying to accomplish through this longitudinal study is a

comprehensive all-embracing look at what happens to immigrants.

Senator Thompson: If 50 Italian families in Toronto—or any other group—said to me, "We would like our young people to be coming in," could I say that the Research Branch of the Department of Manpower and Immigration had done a study on this, to substantiate that if they did not have skills the cost of retraining them to fit into the Canadian market would not be justified, because over the long haul it would not he repaid? Is it on that basis we are not letting unskilled people come in?

Dr. Dymond: I would not quite say that was the basis. I think it was that we face more economical alternatives, through having the capacity to import and bring in people who have the skills already or, in many cases, retraining with modest expenditures people already in Canada, rather than people who have very low levels of education.

Senator Thompson: I appreciate this. I am assuming that each year consideration is given to the extent by which our population should be increased by immigration in order to benefit Canada. You probably are unable to get your quota of skilled people from Europe or the other countries you are trying to get them from. Have you therefore considered whether bringing unskilled people in would be detrimental economically?

Dr. Dymond: I think we are going to have firmer views when we see what happens under the new selective system. Quite a number of unskilled people come in as a result of the right of Canadians to sponsor, both in regard to nominated relatives and to straight dependants. We will be following this up to see what happens to them in our labour market. I would not want to make the case that we are uninterested in them. It is a matter of the relative proportion, basically.

Senator Thompson: Do you know if they have been a burden on the Canadian taxpayer or have you been able to do any study on the sponsoring of unskilled?

Dr. Dymond: The sponsor takes on an obligation to support the dependants, so in theory they should not become a burden on the taxpayer—although they become a burden on someone if they cannot get adequate employment in the labour market.

Senator Bourget: Have you got statistics on the unskilled labour that is coming in?

Dr. Dymond: We have statistics by occupation of immigration, quite detailed statistics.

Senator Bourget: Have these been published?

Dr. Dymond: Yes.

Senator Bourget: Through your own department or through the Dominion Bureau of Statistics?

Dr. Dymond: Through our own department.

Senator Thompson: I do not think the Canadian public is aware of the economic contribution which an immigrant makes to Canada. You can hear this from various private groups, but surely in order to get a receptivity from the point of view of the public there should be studies by you to show the economic contribution made by immigrants. Australia, I understand, goes in more for retraining of immigrants. I am not sure of the retraining area.

If the Canadian Government were to bring immigrants over and retrain them, there might be an outcry by sections of the public unless it were pointed out that this would really be of economic benefit, that the cost of retraining immigrants, on a long-term—and probably on a short term—would really be paid off. I am asking about this, as I think this is an area where you should be effective.

Dr. Dymond: I might ask Dr. Campbell to respond to that. We have quite a comprehensive study of retraining, what its costs and what its benefits are and the extent to which we are retraining immigrants. As we are training many immigrants in skills and in language and in basic educational upgrading, we will be able, I think to sort out immigrants in this analysis, this kind of a benefit cost model of our adult training program. Is that right, Dr. Campbell?

Dr. Duncan R. Campbell, Acting Director, Planning and Evaluation Branch, Department of Manpower and Immigration: That is correct. We will be able to sort them out, although I do not know that that really would provide the answer to the question you are asking. The preliminary indication we have—and that is all it is—is that we are getting back a good benefit cost-ratio for training immigrants—although what we are doing mostly is providing them with either French or English, when that is needed to utilize their skills.

As Dr. Dymond has pointed out, we have a fairly rich skill mix amongst the immigrants and it has made very good economic sense, quite aside from all the social values, to provide those people with training in French or English to enable them to make their contribution as rapidly as possible in the occupation for which we brought them to Canada.

Senator Thompson: I remember a Member of Parliament, Dr. Maloney, who came from a very large immigrant riding. He did research on his own and found that after three or five years an immigrant had

made a down payment on a house, and had acquired a car, a refrigerator, and other appliances.

I think it would be helpful if the department were to provide this type of fact as it applied right across the country.

Dr. Campbell: This sort of material will be coming out of the longitudinal study that Dr. Dymond mentioned.

Senator Yusyk: For our own information I think it would be very beneficial if we had an outline, say, of this longitudinal study. I would also include this study of the analysis of the social and economic adjustment of immigrants. We want a detailed outline to give us some idea of how to attack the whole problem, what has been achieved so far, the results that have been achieved and what we can expect in the future.

Dr. Dymond: We would be very glad to provide that or any other details of any of these studies that are briefly listed here. In reply to the questions on the economics of immigration, I think it is not too strong to say, as economists, that we do not have a firm kind of detailed analytical or theoretical view of the role immigration plays in the process of economic development and in the process of growth, in relation to the business cycle and so on in this country. When we examine the literature of economics we find remarkably little guidance on this essential and crucial question for Canada, so we are launching a study of the economics of immigration—if I can put it that way—in a fairly basic way.

We have contracted with a professor to start a study at Simon Fraser University. We also in time hope to build for our guidance a benefit-cost model of the immigration program, to see what the benefits and costs are for various kinds of immigrants and the various parts of the immigration program, with also something about the timing of the economic impacts of immigration, about which we know very little.

I think we are probably geared to a kind of shortrun context when thinking of immigration. Many people say it is inappropriate that we should have a longer run view, so we will certainly try to do a good deal of research and analytical thinking to establish these kinds of perameters for our immigration program in the future. There has not been a lot of writing about immigration in this way. It has been rather historical in character and not very analytical or theoretical in content, to provide a guide for policy.

Senator Bourget: Would not the Canada Manpower and Immigration Advisory Council give you some guidance on that? Dr. Dymond: We hope so. We hope both the council and the advisory board on research would contribute, and we would hope to put the results of such studies before them for their conclusions and advice.

Senator Bourget: Has this council been established now?

Dr. Dymond: It is in the process of being set up.

Senator Bourget: It has not been set up?

Dr. Dymond: It has not been set up yet.

Senator Bourget: Are funds holding you back at all from carrying on some of these researches?

Dr. Dymond: No, I would not say funds are holding us back. It is lack of people that are holding us back, our inability to recruit adequate professionals who can conduct research in this area, not the total size of the budget.

Senator Bourget: You mention in the brief that one of the hindrances to carrying out the project was the fact that the scientists were not offered high salaries. You mention that somewhere. I do not know exactly where.

Senator Thompson: On page 1 at the bottom.

Senator Bourget: What kind of salaries are you offering to economists and scientists, and how do they compare with salaries paid to economists in other departments?

Dr. Dymond: I think the comparison with economists in other departments is reasonably favourable. I do not see a problem there. I think the Government does a pretty good job of making sure the balance is maintained.

The Chairman: No departmental disparities.

Dr. Dymond: I might not be that blunt. I do not have detailed knowledge of all the disparities. At the moment the top professional salary range is from \$17,408 to \$18,646. To get that kind of salary in our sort of organization you would have to do a considerable amount of administrative work because it is at our section head level; you could not get that kind of salary to do research and nothing else. I think this is partly the problem we are alluding to in the brief.

Senator Bourget: The inadequate salary level offered.

Dr. Dymond: Today to get people to do sophisticated research requires typically a PhD degree with three, four or five years experience. Our reading at the moment is that we are not very competitive. We have been out in the market trying to get people and we have not been very successful. I think part of the suggestion here is to find ways and means of recruiting people and paying them salaries competitive with what they could get in universities, which in our kind of research is probably the principal competitor, and industry to a lesser extent. That might require the creation of some positions that do not have too much administrative responsibility but would have primarily a research kind of a responsibility at a reasonably senior level. I think it is possible to have a situation where some people are primarily interested, equipped and effective in administration to be paid about the same amount as people engaged on their own without too much direction on a pretty sophisticated, difficult and complex research project. In a hierarchical structure, of course, of the kind you typically find in government, this is difficult to manage.

Senator Bourget: Are you doing your recruiting yourself or is it done for you by the Public Service Commission?

Dr. Dymond: It is done through the Public Service Commission, who hold competitions, advertise and so on. We have been fairly active in making our own contacts with people. The officers of the Program Development Service at branch head level go out and talk to people, interest them in our work and so on. It is basically a joint activity.

Senator Yuzyk: Do you seek the co-operation of professors or scholars at universities, in co-operation with certain departments? For instance, I would imagine some of these can be farmed out to certain universities who would try to specialize in that field, and you could get some of this work done through programs for Ph.D. degrees and the like.

Dr. Dymond: We have a number of projects out on contract to university professors. We use that method fairly extensively, as well in some cases, if they are big projects which require survey capabilities, consulting firms. I would say that mainly our contracts are with university professors. We have, of course, a grant program uunder which we give grants to people who are capable of doing research. Again it is mostly to university professors that we make grants on subjects of concern to the department. It is referred to in the brief in this area. We are finding that due to staff shortages we are having difficulty getting as much contract research done as we should like. I would not say this applies to grants, but contract research requires a lot of internal management to outline the project, discuss it and monitor it from

the department's point of view. All of this requires scarce and talented staff time so that your ability to get the research done, extramurally in part, is related to your capacities internally. Certainly, we have no posture at the moment of trying to do research internally that could be done externally. Our job is really to get as much research and development work done as we possibly can because of the big gap between our need in this respect and our capacity to produce.

Senator Grosart: Could I ask if any research is being done in the immigration sense in such matters as relative discrimination between various types of origins of immigration. On the entrepreneur factor, the degree of impact of entrepreneur into the economy from immigrants, the capital inflow which is incidental to some kinds of immigration and the effect on imports and exports, the relationship say in criminology. Are you doing that kind of study or is anybody doing it?

Dr. Dymond: As I said, this so-called longitudinal study will provide some data in this respect. We do separate in our statistics entrepreneurs from other occupations. I think the department has collected in the past some data and I know they have on the resources of immigrants, for example, those who bring capital with them. There have been in the past, and I think we are still collecting them, some case study materials on cases of successful entrepreneurship from immigrants and the kind of contributions they have made to the economy. On the question of discrimination I do not think we have overtly and substantively looked at that question from a research point of view. I think some of the private studies have come up with a number of views because they have been pitched at particular ethnic groups. That has been a focus of interest and concern.

The Chairman: In general, would it be true to say there was very little research being done in the former Department of Immigration and Citizenship?

Dr. Dymond: Yes.

The Chairman: This is probably one of the explanations of all of these questions. Your research effort really started, for all practical purposes, in 1966.

Dr. Dymond: Yes, I think that is correct. I think in terms of people and money our present research would be multiplied by a factor of many times as compared to before 1966.

The Chairman: That is why we have some unknowns now.

Senator Grosart: You did not say anything about the criminology aspect. I am not bringing this up in a critical way. I am one who believes that when someone gets into trouble with the law it is a question of adjustment.

The Chairman: Would not that be a responsibility of the Department of Justice or the Department of the Solicitor General doing research on criminology in Canada rather than...

Senator Grosart: That is what I am asking the witness, Mr. Chairman. I would like to have your answers, but I would also like to have . . .

The Chairman: Do not start to be difficult again.

Senator Grosart: I would also like to have the witness's answer because I did mention this and I just want to know.

Dr. Dymond: I did not ignore it deliberately. I do not think we have any data on that question.

Senator Cameron: If I might respond to that. No, we have not been doing any studies on that and do not have any data. There was a study some time ago by the Dominion Bureau of Statistics, the results of which I assume are still valid. There is no reason to assume any changes in the low rate of criminality amongst immigrants.

Senator Haig: What about the health position? This is still an important factor, am I not correct?

Senator Cameron: It is a very important factor in his admission. The immigrants, in addition to their suitability and the need for their skills, are screened both with regard to health and criminality overseas, which is of course a lot of what keeps the criminality rate low amongst immigrants.

Senator Haig: Where is the health study made, the health of the immigrants discussed? Is it made at the port of departure?

Dr. Dymond: He is checked before he is granted a visa to come to Canada. A medical examination is made and a health history. Certain health problems are in the non-admissible classes, as is much criminality in the non-admissible classes. One would expect that if we are administering the act at all effectively we should have a much lower rate of criminality among immigrants than among the population generally.

Senator Grosart: I raised the question only because I see it as a form of maladjustment. I am not for one moment suggesting that any particular source or origin of immigrant is more prone to criminality than any others.

Senator Thompson: I would like to follow on Senator Grosart's question. I am looking at an abstract from the New York *Times*, September 1, 1968, in which it says there is an acute problem in getting employment in Canada. In this article your deputy minister is referring to the hiring of Indians. He gives this explanation:

"a reluctance on the part of certain individuals whom they have employed to adjust to a new work environment." . . .

What he was referring to was what employers and federal job counselors have described as a tendency for Indians to be more concerned with status than job content and to adopt an aloof attitude toward co-workers.

Would that statement be based on any research?

Dr. Dymond: Not in the sense of this detailed study that we have been discussing this morning. I think we have a lot of information, of course through our local offices or counsellors, our placement people on difficulties of placement and retention of employment of immigrants, because they come back again and again to our offices if they have trouble in the labour market. Of course, we carry immigrants on welfare payments from our department until they get their first job so there are differential experience among various groups from various countries on the extent to which we have had to carry them on welfare until they get their first job. Obviously, some groups are going to fit into the Canadian labour market more quickly than others. It is just a matter of some of the things mentioned there. The difference between our culture and other cultures creates a differential adaptation

Senator Thompson: What they are saying in this article, in essence, is that Asians face a difficult situation with respect to professional and technical opportunities for jobs. This is suggesting that there is some form of discrimination across Canada. I notice that we are raising the numbers coming in. It would seem to me it is an area where a study should be made to remedy that.

Dr. Dymond: I do not think I would say that it is necessarily discrimination, personally. I think for many Asian countries, particularly India and Pakistan—not the Phillipines and certainly not Japan—there is a really difficult problem of equivalence. In other words, the educational system in India, for example, while on the surface—we are doing some work on this right now—may appear to be comparable, a BA degree from an Indian university equals a BA degree from a Canadian university. It really does not, either in terms of the length of time it takes to

get one, which is several years shorter in many many fields or in the content and quality of what is taught. Much of the apparent difficulty of some Asians—I do not think it is true of all, by any means—in the Canadian labour market appears to centre on this question of equivalence between Canadian education and theirs. As a matter of fact, we are doing some work right now to try to get this problem sorted out, part of it in co-operation with the Association of Universities and Colleges of Canada.

Senator Thompson: Again I have some examples involving Indians who have trained and received their qualifications in Britain. Again what I am suggesting is that it is most appropriate to have research to get the facts of this and other groups.

Dr. Campbell: If I might respond to that, although it is not mentioned in our brief, because we have not formally undertaken it, I have recently had discussions with a group of professors at Michigan State who for some years have been researching the question of prejudice particularly in so far as it is related to colour, and these discussions are intended to lead towards a study of that question in Canada. The area of discrimination is one we have been concerned about. These other factors are important. It is always very difficult to say where the breaking line really falls, whether in an individual instance it is discrimination or whether it is based on a more substantive view of the person's likely performance. We feel a very definite need to deal with this question, and I am hopeful that these discussions will lead to a fairly significant study in Canada of the problems that these people are facing.

Senator Cameron: There is a specific group I am interested in. You are aware that Canada owes a tremendous amount to the immigrants who came here after the war so far as the arts are concerned. Our whole cultural development has been enlarged tremendously as a result of their coming.

The Department of Manpower and Immigration initiated that small experiment last year with manpower training or grants to train people who may be unemployed and who may want to upgrade themselves and their qualifications in some field of the arts in Canada. This covered people, who, for example, want to write for radio, playwriting, or people who want to be professional ballet dancers or who want to go on the stage or who want to go into the theatre. Have you done any work in trying to determine what the market is in Canada for people like this? In other words, we know there are a number of Canadians, some young and some fairly mature, who could benefit from and would like to take advantage of this training, but before extending a program of that kind to any great length, has anybody tried to establish how many people we can employ each year in this country, say, as radio scriptwriters, short-story writers or people who would like to act for television, in ballet or in drama or whatever it might be?

Dr. Dymond: I think that as part of our forward projection and forecasting work on manpower requirements we would pick up a part of that although this kind of forward forecasting, because of the factors of technological change and unpredictability of some elements of social demand, which is the area you are discussing primarily, is a very difficult kind of thing to come to grips with in any sort of detail such as the demand for entertainers and musicians as compared to people working in, say, the television field generally. Mr. Pankhurst, have you any observations to make on that?

Senator Grosart: It is very hard to say how long rock and roll is going to last.

The Chairman: There is a cycle.

Mr. Pankhurst: I don't think we conceive it as any part of our program at the moment to try to produce projections in the kind of detail that the senator is asking about. There is a very large demand for projections of the future manpower of the Canadian economy and of the way that it might be distributed between different kinds of industries and occupations, and, at the moment, at the beginning of our program, we regard it as primarily our responsibility to try to do this sort of thing in a sufficiently general way to be able to set the context for examining the broad policy implications of it or providing a context in which other people can make their own projections and to advise them of methods of doing that sort of work.

Senator Cameron: Mr. Chairman, I saw much the same sort of results of this kind of experiment last year. It was a pilot project. I thought it was very successful. A lot of people are beginning to inquire if this is going to be incorporated as a part of the manpower training policy. I see no reason why it should not, but before we can say, "Oh, yes, we will pay your fees to go to summer school or to the drama department of the university", we should know how many people this country can absorb in that field. There is no use training people and then having them stand around not being able to get a job.

Senator Thompson: Does that not apply to the whole of the manpower training program? I have heard of people being trained to become welders when welders were not needed.

Dr. Dymond: The senator has hit an area where it

talking about taste, essentially, and taste is an interacting process, as I would see it. You put before people certain things. For example, if they want to have more ballet, they must have some experience in order to really know if they want it, in the first place. You get a kind of circular or interacting process of demand built up, of which the supply in part creates its own demand, to get the kind of supply that seems to catch the public fancy or taste. I think the senator has hit on a difficult area for forecasting.

The Chairman: But to come back to a subject which is perhaps more directly related to our inquiry here, you made a survey of the professional, scientific and technical manpower in 1967. In the main brief you describe that survey from page 53 on. You say that this survey was based on 31 per cent of the number of holders of university degrees reported in the 1961 census. You then proceed to give tables of the distribution of this manpower between professions and disciplines and so on. Do you not think that most of these results are quite meaningless because they are based only on 31 per cent?

Dr. Dymond: That was merely intended to suggest that we are only covering a part of the highly qualified manpower field or the professional field. We are not pretending to cover the arts or lawyers or doctors or very many other professions. This is only covering scientists and a few fields of social science, economics, sociology and engineering. It is only a partial coverage that we are conveying by the 31 per cent of the total professional manpower spectrum.

The Chairman: All the professions listed in your tables are completely covered, however.

Dr. Dymond: In principle, yes. That is right.

Senator Cameron: I might interject that, having looked at two or three of them, I thought it was a pretty awful questionnaire.

Senator Thompson: Do you agree that there would be a glut of scientists, as we heard, or do you think there is a shortage of scientists?

Dr. Dymond: I might ask Mr. Pankhurst to answer yes or no to that question.

Mr. Pankhurst: In general, if we are talking about all the scientists and engineers, we have made some very preliminary projections of future needs, as part of a study we have in progress at the moment to make some projections for 1975. This is something we are doing with some urgency, so the techniques are rather rudimentary. However, we have provisionally estimated that the professional group as a whole-which was 7 per cent of the labour force in is much more difficult to forecast because you are 1951 and 10 per cent in 1961-will grow to 16 per

cent in 1975, which will show the nature of the expansion of the demand for this kind of manpower arising from the growth of our economy and the expansion of the science-based industries which are using this manpower.

As far as the engineers and scientists who are covered by the survey are concerned, we do not at the moment find much evidence of any underemployment—that is, in the normal sense in which people are out of work; nor do we find much evidence of under-utilization, to the extent there are people not in the labour force. For example, of the people covered by our survey, 97 per cent were either in employment or were occupied as students in preparing themselves for employment, and only 3 per cent were outside the labour force—housewives or retired people.

Senator Bourget: How have you got this information, through questionnaires or different organizations? Let us take engineers for a moment, did you get in touch with the Corporation of Professional Engineers?

Mr. Pankhurst: The survey was conducted by means of the questionnaire, which a committee member referred to a few minutes ago, being sent directly to individuals, but it was done with the co-operation and collaboration of all the pertinent professional associations—for example, the Canadian Council of Professional Engineers and the Chemical Institute of Canada.

Senator Bourget: Our own Association of Engineers do the same kind of work. They send a questionnaire out every year about our salary, what we are doing, in what field we are. I was wondering whether, once again, there is no justification for this.

The Chairman: I do not think this is the only area where there is possible duplication. It seems to me there are a lot of agencies within the federal Government which are involved in trying to measure or make surveys on professional manpower in Canada. We have been told, for instance, that NRC has been conducting surveys in this field. The Public Service Commission is conducting, for its own purposes, surveys in this field. The Science Secretariat has been making surveys on manpower supply and demand. Then there is the Science Council. Of course, your department and also the Dominion Bureau of Statistics are interested in this.

Dr. Dymond: I do not think they are making any surveys.

The Chairman: The census.

Dr. Dymond: Yes, the census.

The Chairman: But it seems to me at some stage, especially since you lack good people in your own area and this is your specific field of responsibility, there should at least be more co-ordination in the field around your operation than seems to be existing at the moment.

Dr. Dymond: I think I would say I would not disagree with that remark. This survey has a very long history, in the sense that it grew out of the Wartime Bureau of Technical Personnel and has been conducted periodically, and it has expanded its coverage somewhat over the years since then. This is the latest version of the survey.

I might say that I think we are somewhat at a crossroads in respect of this survey in that we have to decide whether to extend it to further fields of professional and highly qualified manpower or not, and how frequently to conduct it. To really find out, in the sense you are talking about now, what are the interests of various groups that are concerned with policy and the data. We have to decide whether it should extended, for example, to supporting groups to scientists, engineers, and other professionals-because the problem of utilizing highly qualified manpower embraces the support that they have and the problem of whether we have adequate and proper ratios of supporting personnel to professional personnel. There is a whole range of questions about the future of data collection in this field.

There is the question of bothering this element of the population with a variety of questionnaires from a variety of sources. People get more and more impatient with filling them in. This was expressed by Senator Cameron, I think. In the department we would appreciate any kind of guidance we can get on work in this area.

The Chairman: Have you been interested also in forecasting our future requirements in this field?

Dr. Dymond: Yes, I think Mr. Pankhurst has been expressing some very preliminary forecasts we have been making as part of a larger forecast of the total requirements for manpower. I think we have a feeling that in the field of science and engineering and social science you really have to use a common methodology, and have it within a co-ordinated context; that you really have to do some detailed work, field by field, in co-operation with the people in the field, or with associations and professional bodies which know the field pretty intimately.

In other words, we have the feeling that we do not have the resources at the moment to do that detailed work. We can provide some co-ordination and support, and a context in which this work can be done. There needs to be detailed study field by field.

The Chairman: But at the moment there is no co-ordination in that field?

Dr. Dymond: No. I should not say there is no co-ordination because we do have a committee of associations and other people interested that has advised us on the conduct of that survey . . .

The Chairman: But that was for the purpose of advising you?

Dr. Dymond: Yes.

Senator Kinnear: Mr. Chairman, I should like to ask a question in respect of manpower at the other end of the scale from the highly skilled. A look at page 7 of the brief reminded me of the Adult Occupational Training Act, and I notice that you are able to provide 50 per cent of the cost of research in respect of occupational training. My question is: What research are you doing aside from this which you mentioned for the young dropouts that are not coming into the labour force, for the drifters and for what I call the escapists from reality, and also the welfare cases that remain on welfare year in and year out? Have you done any research on how you can bring these people into the manpower scheme? What percentage do you consider are in the lower scales?

Dr. Dymond: I think we have some research going on in respect of that, and I will ask Mr. Lachapelle to talk about the kinds of groups you are speaking about in the labour force—the people who are less competitive in respect to our labour force needs.

Senator Kinnear: Yes, but they are people who must be taken care of in some measure. I imagine Senator Thompson was asking questions along this line. How can you have them become useful and productive citizens. I know that a great many injustices are done to that class of persons, but they have to be taken care of in some way, and they have to try to find out the research work already done, or what you can do for people in these categories. I have mentioned. Also, I would like to know what can be done for the students in the summer. I know that this year is expected to be, like the last two, a very poor year for students to obtain work.

It is awfully glamorous to talk about the arts and the deep range of skills in the country, but we must also take care of the other end of the scale.

Dr. Dymond: I certainly agree, and much of the departmental programs are designed and focussed on the people with lower qualifications, the lower skills in the labour force, the people who need the most help in getting employment, who need retraining to get employment, who need access to our joint federal-provincial rehabilitation program to get employment.

We are doing some planning and have been doing some research in this area. We are planning, for example, a very detailed survey at the moment of the people who are registered for long periods in our Canada Manpower Centres, many of whom are in the kind of groups you are talking about, to find out just who these people are, to get a sense of what their problems are and what kinds of needs for programs they have. Dr. Campbell, could you enlarge a little on some of our work in this area?

Dr. Campbell: Yes, I would be glad to do so. In general, both our training and our mobility programs seem to be heading into groups that are very closely related to the groups you are talking about. A recent study that we did showed that about half the people getting into the training program in fact come from the poverty groups. One of the main vehicles that we have had so far for helping with the problems of drop-outs, people with low motivation, low skills and so on, has been the rehabilitation program. There we have a number of research projects, many of the action variety. For instance, we have a project which is being carried out by the Jewish Vocational Center in Toronto and which is concerned with conditioning techniques in regard to youth with low motivation, to get them to respond to society in a way that is more beneficial to them.

In regard to the summer job situation this is one that we have been very concerned about. For quite a number of years the department—and, before it, the National Employment Service—has conducted campaigns to find jobs for students. Last year, it became quite apparent that the normal sort of campaign simply would not be sufficient. What we did last summer was to increase greatly our advertising budget, to mount a special campaign. We hired well over a hundred students in our offices to help to organize and find employment for summer students. We will be doing the same thing this summer, on a much more intensive basis. We are also, I should say, looking into other ways of getting at this.

Senator Thompson: What about your "new start" programs?

Dr. Campbell: That is now with the department for regional development. Dr. Dymond is probably the person who can best describe that.

Dr. Dymond: That was focused on the disadvantaged in selected development areas, or designated areas, one in Prince Edward Island, one in Alberta, one in Saskatchewan and one in Nova Scotia. I think there is one going ahead in New Brunswick, and others are in the process of development. There are experimental pilot projects really designed to get at what can be done for the very disadvantaged people by way of all kinds of training programs. Much of it we feel needs to be focused on the family unit. You cannot bring the male breadwinner up to participate

more fully in the economy in our society unless you bring his wife up and other members of the family. It is basically an experimental project to turn up information about programs.

I might mention one other research program here. In co-operation with the provinces we are developing an extensive program of research on training, and many of the questions surrounding our Adult Occupational Training Act and related questions on training, guided by a committee of our deputy minister and the provincial deputy ministers of education and labour. This work will focus on a number of areas of research that they think are important and of high priority for the formulation of policy with respect to adult training.

One of the areas they have assigned considerable priority to is to look at the people not now being trained. Who are these people that we are not picking up, who are obviously candidates in some sense for employment in our economy? This concerns particularly the younger groups. There has been a lot of talk about the people we do not pay allowances to because they are not out of school long enough. What is happening to these people? Who are they? Hopefully from this research will evolve some method of dealing with people who are falling through the grates, so to speak, of our training programs particularly. I think that research will begin to impinge heavily on the kinds of questions you are raising.

Senator Kinnear: About what percentage would you think is in this group or these groups?

Dr. Dymond: We did some work on the disadvantaged group generally, people who are not competitive in a variety of senses. I do not have those figures in front of me. Perhaps Dr. Campbell can speak to this. It is principally the work of Joe Klein.

Dr. Campbell: It is a tremendously difficult area. We have had a number of studies within the department that are not listed here, because they were fairly brief. They concern the number of people who have severe employment handicaps, whether they are social or psychological, or a severe lack of education, discipline, whatever it may be. People have an enormous range of problems of this kind, such as mental retardation and so on. The number of people in the group who at one time or another experience severe difficulties is very difficult to estimate. We have different estimates, and you can get a figure anywhere between about 200,000 and 600,000 quite readily. It depends very much on how you define the group and what you presume to know their problems to be.

Not all these people, of course, have these problems in perpetuity—which is a blessing. The fact is that many of them, either through getting into a training program or, very frequently in the past—and

I imagine at the moment—through their own efforts, have managed to overcome their handicaps in considerable degree, so we do not necessarily have at any one moment of time 600,000 people who are in desperate need. However, over the course of a number of years you get very large volumes.

The Chairman: How do you think the research work should be divided between you, the Department of Regional Development and the Department of Health and Welfare? Surely the Department of Health and Welfare has an interest in this field too.

Senator Kinnear: It would with the disabled, of course.

Dr. Campbell: I think all three of those departments have a major interest and concern in it. Certainly the projects that have been carried on, as I mentioned, have been fairly small ad hoc projects intended to acquaint us with the general dimensions of the problem.

The Chairman: And, we know that the Department of National Health and Welfare is not doing very much in that field and probably we have not heard yet from the Department of Regional Development.

Dr. Campbell: Certainly, if we were contemplating a single major project what we would do would be to get together with those other departments and form a committee or working group to oversee the project as a whole. That is the sort of arrangement, I might say, that we have been using with increasing frequency. At the moment, for instance, we have a project that is being carried on by a number of university professors in British Columbia for us, on the problems of Indian mobility. This is a major problem in Canada. It is quite apparent that our mobility program is just not reaching as many Indians as we and the Department of Indian Affairs would like it to. Although, because of our interest in our program we are providing the financing for that project, we, at a very early stage, in the development of the project formed a committee with the Department of Indian Affairs. The committee oversees the project to make sure it is not useful just to us, but to Indian Affairs as well. That sort of arrangement is a very fruitful way of getting a research done, when you have more than one department with a substantial interest in it.

Senator Thompson: Are not many of these projects interrelated? I was looking at a film about people handicapped because of mental retardation, and they were receiving training through, I think, one of your projects with a province. I had the feeling that perhaps expectations are being raised in the minds of these students. This was expressed by some of them. Unfortunately, because of advanced changes in technology they will never realize this. It gives a serious question as to why we do not examine this further. There is ARDA and so many departments. I

would feel it is most essential to devote and examine these closely, but to be doing it on a co-operative basis there should be some departmental structure.

Dr. Campbell: That is very true. The problem has not arisen in all forceful terms. I think basically Dr. Dymond outlined the reasons earlier. There is considerable scarcity of research resources. We have not been competitive in the market for the upper skill ranges, financially.

The Chairman: Before you go on, who is responsible for this, the Treasury Board or the Public Service Commission?

Dr. Dymond: If I might tackle this one, Mr. Chairman, the problem relates to the classification of positions, which establishes the pay range. The pay range and the classification of positions is the responsibility of the Treasury Board. The Board bargains with the Public Service union that represents professionals in determining rates of pay. These days the Public Service Commission is primarily the recruitment agency of the Government.

Dr. Campbell: I think just on that specific point the sort of problem we are faced with is well illustrated by some of our recent experiences in our current recruiting campaign. A person with a brand new PhD and no experience at all, an individual writing his thesis can today become an assistant professor in a Canadian university at a salary, depending on the individual and the university, anywhere between \$11,000 and \$14,000 for a nine-month year. Now, while we do not have yet—

The Chairman: Plus a few research projects.

Dr. Campbell: Exactly. In the United States with a nine to ten-month academic year a survey showed that people in economics generally added 30 per cent to their academic salaries through contracts and research grants and things of that sort. Presumably that figure is higher in Canada because the academic year is somewhat shorter. If you take \$12,000 and add 30 to 40 per cent to that you have gotten up to the rate we are in fact able to pay for experienced people who are carrying out a fair amount of administrative work as well. This simply makes it very difficult.

Senator Thompson: Well, I would like to go on record as saying that it seems to me to be a short-sighted policy on the part of Treasury that millions of dollars should be spent on projects in Manpower and Immigration while at the same time a large number of questions exist to which you could provide answers but you cannot because of limitations of professional staff.

The Chairman: The witnesses will be coming before us again.

Senator Carter: I have two unrelated questions. The first is a very simple one and follows on what Senator Kinnear was asking earlier concerning summer students. I think the question Senator Kinnear had in mind was with regard to the prospects for summer employment for students this year. Are they any better than they were last year?

Dr. Dymond: They are about the same, or perhaps a little worse than last year. There will be a few more people in the market but not too many more job opportunities as far as we can see.

Senator Carter: Then my second question has to do with the handicapped groups we were talking about earlier. I would like to know where responsibility lies for this. Maybe it is a provincial matter. But very often we have a group of people who are physically handicapped and who have no value on the ordinary labour market or in industry. At the same time you find in this group people who have tremendous talent; you find children who have a tremendous talent for painting and carving and all sorts of manual skills. Now unless they are discovered and receive proper training they can never be fully developed. Does your department take any responsibility for this? Do you find them and hand them over or point out to the provincial authorities, if it is their responsibility, that this is the situation? What happens in respect of groups like that?

Dr. Dymond: Well, there is the Vocational Rehabilitation Act, a federal act that provides for 50-50 cost-sharing and covers the rehabilitation of physically and otherwise handicapped individuals. Under this act payment is made for the process of vocational rehabilitation and medical rehabilitation, if it is required and cannot be covered by other schemes, and we refer people and the provinces refer people to this rehabilitation process. There are co-ordinators of rehabilitation in many provinces and there is machinery for identifying and placing people in the rehabilitation process under this federal-provincial 50-50 cost-sharing arrangement.

Senator Carter: Do you have any machinery for discovering these people in the first place? Do you carry out research to ascertain how many there are?

Dr. Dymond: We were discussing this earlier, and it is very difficult to estimate the number. It would not be fair to say that we do not have any solid figures at the moment. So far as machinery is concerned, when our offices uncover people who have physical and other social handicaps who could be assisted by the federal-provincial rehabilitation process under the act, they will refer people to these rehabilitation

processes. Now, I would not want to claim that this is by any means complete or 100 per cent effective or anything like that. I think we are not necessarily doing an effective job on this front in Canada today, but there is a machinery and a mechanism. Part of the problem is that it requires a very skilled set of people to really diagnose the handicaps that people have. It requires quite often psychiatric skills, medical skills, social work skills and other skills, and it is to bring all of these kinds of skills to bear on an individual who has a whole complex of problems of a medical, psychiatric, social and economic character-that is the difficult thing to do from a diagnostic point of view. It is equally difficult to them to prescribe the appropriate course of rehabilitation and to bring together the various programs that will really do a job for the person.

Senator Thompson: How many social workers do you have in your employment staffs in the man-power offices?

Dr. Dymond: My impression is not too many. When we need these kinds of services, we tend to refer to agencies.

Senator Thompson: Do you have any involved as managers of offices or even as workers in offices?

Dr. Dymond: I think some of our counsellors have backgrounds in social work, but we are not hiring them as social workers.

The Chairman: I note from page 3 of your appendix that you make annual reports on the economic and employment outlook. Are you the only people involved in this kind of forecast?

Dr. Dymond: No. To my knowledge the main economic departments are all doing various kinds of economic forecasting. The Department of Finance does; the bank does, trade and commerce does. Our forecast, of course, is pitched primarily at employment, unemployment and the labour force in an economic context. In other words, the focus of our forecast is different from that of their forecasts.

The Chairman: Would it be done completely independently?

Dr. Dymond: No. While we do some independent work, we rely heavily on the work done in finance and trade and commerce and the bank in this area. Not that we accept it 100 per cent, but we do some very careful cross-checking with them and vice versa. So far as they are concerned, what they build into their forecasts on the employment, labour force, and immigration will tend to be the views that we come

up with, judged by their own independent assessment, of course.

The Chairman: Is this done through informal consultations or through a more systematic organization?

Dr. Dymond: Basically, it is done through informal consultations, although from time to time, usually under the chairmanship of an officer in finance, there will be an exchange of information on the economic outlook. But it is not in my experience a regular thing. It tends to be as often as finance wishes to check with other departments on the outlook

The Chairman: On page 9 of the main brief there is a statement related to the Research Branch, where you say that the Research Branch carries out fundamental analyses of the functioning of the economy and the labour market, provided long- and shortrange forecasts of manpower needs, and conducts research on departmental manpower and immigration programs. I suppose that this is a very general statement and does not mean that you intend to do research in all aspects of the functioning of the economy.

Dr. Dymond: No. We would not go any more deeply into the functioning of the economy than was necessary to understand the allocation process for manpower, the operation of the labour market, and so on. We tend to rely pretty heavily for that background on the work of other departments, the Economic Council and independent scholars. We would only go into it as required in relation to our fundamental emphasis on manpower, employment and the labour force.

The Chairman: So far as your actual program of research is concerned, in its relation to forecasts, you have not gone beyond 1975 yet.

Dr. Dymond: No. We have a project now, using pretty primitive methods, forecasting manpower requirements to 1975, projected largely for Canada and the regions for approximately 200 occupational classes.

Mr. Pankhurst: There are about 250 occupational classes in about 12 industrial divisions.

Dr. Dymond: I might say that we are giving some thought to the development of an econometric model for manpower forecasting, in consultation with the Economic Councils, DBS and other agencies. In other words, we would like to have a model we could constantly adapt as we have changing knowledge of the economic outlook and changing input relationships for manpower rather than con-

stantly redoing the job by projection methods. So, we are giving thought to some developmental work.

Senator Thompson: Are there any provinces doing a similar study?

Mr. Pankhurst: No.

Senator Thompson: They rely on you?

Dr. Dymond: I think Ontario did a study.

Mr. Pankhurst: They are not doing an econometric model; they are making some projections for the province.

Senator Thompson: When it gets down to the high school counsellor level, does he get this projection to advise young people about what sort of jobs to go into?

Dr. Dymond: He will, when we get it done. We have a study from 1965 to 1970. The Meltz-Penz study is being used in the meantime, and will be used fairly extensively.

The Chairman: 1970 is pretty short term now.

Dr. Dymond: Yes, that is why we call this other project the crash project, to get some information out by July, up to 1975.

Senator Bourget: Am I right in saying that the most important program you have developed and, possibly, the most costly, has been the adult occupational training program? Has this program been in operation long enough to find out exactly what are the beneficial results you get from it?

Dr. Dymond: I will turn that question over to Dr. Campbell, because he has been, in his branch, developing the benefit-cost model on this program, and we are going to feed some early statistical data into it.

Dr. Campbell: We have had developed, about a year ago, a benefit-cost model on that program. That model does not measure the benefits; it does measure the costs, and forecasts benefits. The only way to be truly precise about exactly what the benefits are is to follow the people up, get a precise reading, and feed it into the model. The preliminary results are highly favourable, on a forecast basis. We have had an extensive test of a questionnaire for a follow-up study and, depending on printing and associated problems, we hope to have a follow-up study going in the next two or three months which will provide the concrete data to see how big the benefits are. Preliminary indications are very good, but we will not know for certain until we have the tests.

Senator Bourget: What is the cost of that program per year?

Dr. Campbell: The budget, from my recollection—but I would want to check it—is about \$190 million.

Senator Bourget: And it is shared 50 per cent by the provinces?

Dr. Campbell: No, it is 100 per cent federal.

Dr. Dymond: That is the allowances cost and operating cost.

Senator Yuzyk: Have you a study of the placement of Bachelor of Arts graduates in universities, that is, their absorption into the labour force? I am asking this question because many of them have just a general arts degree and are not specifically qualified for specific jobs. Is there any study under way to gauge their absorption into the labour force?

Dr. Dymond: I might ask Mr. Pankhurst about that. There is some information from the highly qualified survey, but that would not catch the general arts people, would it?

Mr. Pankhurst: No.

Mr. Harry H. Morritt, Assistant Director, Manpower Information and Analysis Branch, Department of Manpower and Immigration: We have a survey of requirements for new graduates which will be carried out in March of this year, and this will give some indication of what our requirements are for this year for graduates in arts as well as in other fields.

Senator Yuzyk: But there is no study in respect of B. A. graduates and what happens to them after they leave?

Dr. Dymond: There is no study as to what happens to them after they graduate, but we would have some impressionistic information from the manpower centers on the university campuses—from their success in placing them. We get a reading from that kind of data, but there has been no detailed follow-through study.

Senator Yuzyk: Do you not think that your department should undertake some study in this area? This is a current problem every year.

Dr. Dymond: I would think it is certainly worth looking into because the labour market for university graduates may get more difficult in the future. I just do not have any very firm ideas on it, but we are approaching something of a peak in the inflow of university graduates into the labour force. It will peak in about 1973, I think, after which it will level

off to a much more gradual slope of increase after 1973. The rate of inflow will peak in about 1973, so that the next two or three years will be the more difficult years from an absorption point of view.

Senator Yuzyk: I have another question. Since the chairman has been associated with the Department of Citizenship in the past, or at least part of his department...

The Chairman: It is not there any more, though.

Senator Yuzyk: That is right. Is there any cooperation, or do you conduct any projects, with the Department of Citizenship?

Dr. Dymond: Yes, there has been consultation on this longitudinal study with the Department of Citizenship because they have an interest in the citizenship and social-cultural aspect of immigration. I think there is a project listed in the brief that studies the citizenship court records to get some information on the progress of immigrants. That has been worked out in some consultation with Citizenship. I think on the question of adjustment processes for immigrants-we have been giving some thought to the whole question of what is the nonimmigrant's view of the immigrant-the view of the native Canadian or the immigrant who has been here for some time. We have not launched a study on this yet, but we have given it some consideration. If we go ahead with that kind of study then we would certainly do it in consultation and co-operation with Citizenship.

The Chairman: I do not think there is any duplication in research in this field, because we are told that the Citizenship branch of the Department of the Secretary of State does not do any research.

Senator Yuzyk: Perhaps it should be doing some.

Senator Thompson: Do you use a computer? I have a newspaper article here that is entitled "Computer Service Aim is to Match Jobless to Openings quickly". Has the classification of jobs across the nation ever been programmed on a computer so as to be able to fit people to the jobs?

Dr. Dymond: Right now we have a project—I do not think you could dignify it with the name "computer," but we are engaged in matching the vacancies against the clients, and we are doing it with mechanical equipment.

Dr. Campbell: We have been trying it primarily in the Prairie region with mechanical equipment, and we are now looking at the possibilities of actually having a computer-based match.

The Chairman: It has already been done in several areas of the United States.

Dr. Dymond: We are doing some mechanical matching and we are giving some attention to this.

The Chairman: It is already one o'clock and we will have to adjourn, although I am sure we could go on investigating the various areas of interesting research that you could do. We know that you are just at the beginning of this new venture in the Department of Immigration and Manpower, and we certainly hope that you have all the co-operation you need from various agencies, including the Treasury Board, in order to conduct your major operation with success. Thank you very much indeed.

The committee adjourned.

APPENDIX 29 to an of live many and no owl tran sub tade sension Thompson: Do you use a computer than

SENATE OF CANADA

SPECIAL COMMITTEE ON SCIENCE POLICY

BRIEF

BY THE

DEPARTMENT OF MANPOWER AND IMMIGRATION

INTRODUCTION

The Department of Manpower and Immigration was formed on October 1, 1966. The new department was made up of the Immigration Branch of the former Department of Citizenship and Immigration, the manpower elements of the Department of Labour including the National Employment Service, and elements of the research and administrative support for manpower operations. The objective of the Department of Manpower and Immigration is to promote the effective allocation of manpower resources and the development of the labour force and its characteristics compatible with the maximum sustainable rate of economic growth of the Canadian economy.

The role of scientific activity within this Department is supportive of manpower policy development and operations. That is, the fundamental objectives of scientific research activity in the Department of Manpower and Immigration are to ensure that Departmental policies and programs are developed, planned and altered as necessary, to make the maximum contribution to the attainment of the Departmental goals, and that relevant data is collected and analyzed to support the Departmental operations.

Since the Department of Manpower and Immigration was not formed until October 1st, 1966, there will not be a great deal of completed research projects to report in this Brief. A considerable amount of the resources intended for research have necessarily been involved in organizing and planning the establishment of scientific activity in the Department.

A hindrance to the effective development of this activity has been the difficulties experienced in hiring and holding the highly qualified professional staff needed. It has been the Department's experience that the salary levels for senior research positions are not sufficiently attractive to permit the Department to hire, and hold, a sufficient number of researchers of the calibre required for the Department's planned research activities.

This Brief has been prepared in accordance with Part II of "Guide for Submissions of Briefs and Participation in Hearings" developed by the Special Committee on Science Policy of the Senate of Canada.

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1. Organization

- a) Organizational block diagram of agency showing main units
 such as divisions and sections. Indicate those units
 conducting or funding scientific activities.
- 1. See Diagram 1(a). Conducting and funding of scientific activities is concentrated in the Program Development Service and its branches. Two other units in the Department have an indirect interest in research. Research on manpower adjustment within industry is paid for by the Manpower Division through the Manpower Consultative Service. The Staff Training and Development Task Force conducts a certain amount of action-oriented research on problems connected with the training and development of personnel, but it has no specific budget for this purpose.
 - b) Block diagram, when appropriate or necessary, indicating

 Parliamentary reporting channel(s), formal connections to
 other Federal agencies, advisory committees, etc.
 - 2. Diagram 1(b) shows the relationship of the Department of Manpower and Immigration to the Immigration Appeal Board, and to the Canada Manpower and Immigration Council and its related Advisory Boards.
 - 3. The Immigration Appeal Board was established by the Immigration Appeal Board Act (1966-67, Ch. 90). The members of the Board are appointed by the Governor in Council and have a retirement age of 70. The function of the Board is to hear appeals both from the Minister, and from persons ordered deported and sponsors of would-be immigrants.

- 4. Establishment of the Canada Manpower and Immigration Council, its four Advisory Boards and, as required by the Minister on the advice of the Council, a system of Regional and Local Manpower Committees, was authorized by the Canada Manpower and Immigration Council Act (1967, Ch. 13). Members of the Council are to be appointed by the Governor in Council for a term of not more than three years but are eligible for re-appointment. The function of the Council is to advise the Minister on manpower and immigration matters.
- 5. Members of the four Advisory Boards are to be appointed by the Minister for not more than three years but are also eligible for re-appointment. The function of each Board is to consider and report to the Council on any matter within the Minister's responsibilities in relation to the specific field of interest of the particular Board.
- 6. The Regional and Local Manpower Committees may be appointed by the Minister, as required, on the advice of the Council, and will have the function of advising the Department in the person of the appropriate Regional Director or Area Manager in carrying out the functions of its manpower service.
 - c) Block diagram indicating the organization of units

 (e.g. divisions, sections, task forces, etc.) responsible for scientific activities.
- 7. See diagram 1(c).
 - d) Description of formal agreements regarding scientific

 activities between agency (or one of its units) with

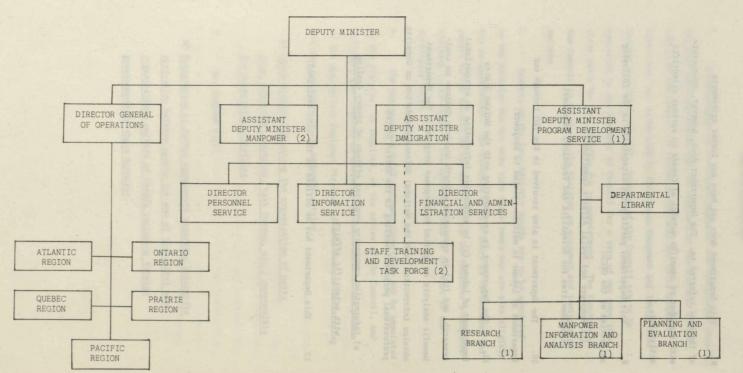
 organizations outside of Canada including foreign

 governments or their agencies.

- 8. This Department does not have any formal agreements of the kind referred to. The Department does, however, co-operate with a number of agencies outside of Canada in various scientific activities.
- 9. This Department participates extensively in the following activities of the OECD:
 - (i) Manpower and Social Affairs Committee
 - (ii) Committee for Scientific and Technical Personnel.
- 10. The Department is also involved in the ILO through our Department of Labour in matters related to manpower.
- 11. The Department is co-operating with the United States

 Department of Labour (i) by exchanging information on occupational research, and (ii) in sponsoring a North American Seminar on costbenefit analysis as applied to manpower programs. The Department obtains information from the National Science Foundation on Canadian professional personnel working in the United States.
- e) Information concerning overseas offices of agency dealing with scientific affairs.
- 12. This Department has no offices of the kind described.

DIAGRAM I (a): ORGANIZATION OF THE DEPARTMENT OF MANPOWER AND IMMIGRATION



- (1) Units concerned chiefly with scientific activities.
- (2) Units for which scientific activities occur as a secondary interest.

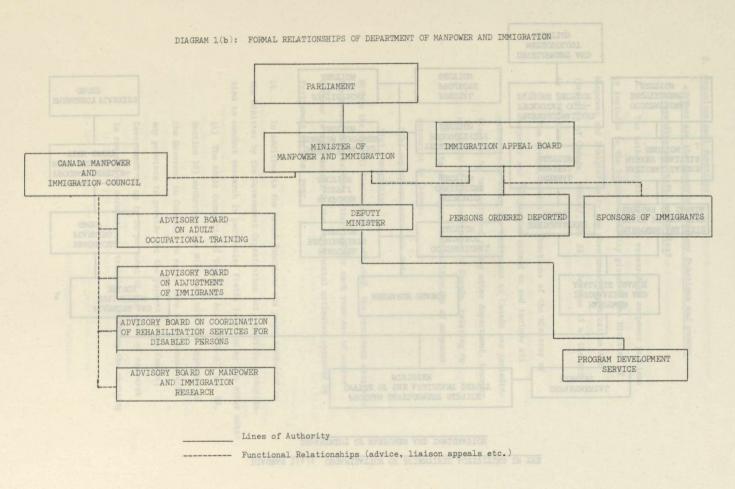
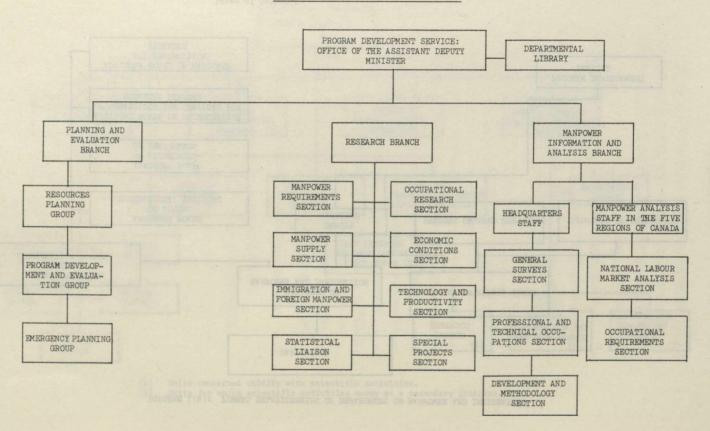


DIAGRAM 1(c): ORGANIZATION OF SCIENTIFIC ACTIVITIES IN THE

DEPARTMENT OF MANPOWER AND IMMIGRATION



2. Organizational functions

- a) What are the agency's statutory functions and powers regarding scientific activities?
- 13. The authority to carry on research on manpower problems is included in the blanket authority given to the Minister of Manpower and Immigration by the Government Organization Act (Statutes of Canada, 1966-67, Ch. 25). Section 13 of the Act is as follows:

"The duties, powers and functions of the Minister of
Manpower and Immigration extend to and include all
matters over which the Parliament of Canada has jurisdiction not by law assigned to any other department, branch
or agency of the Government of Canada, relating to

- "(a) the development and utilization of manpower resources in Canada;
 - "(b) employment services; and
 - "(c) immigration."

Within the overall limits thus established, the resources available for research activities authorized for each year are of course defined in more detail in the departmental estimates approved by Parliament for that year.

- 14. In addition to the broad functions and power conferred on
 the Minister by the Government Organization Act, specific authorization to conduct research in particular fields is given by two other acts:
 - (i) The Adult Occupational Training Act, (1966-67, Ch. 94, Section 10) authorizes the Minister, with the approval of the Governor in Council, to enter into an agreement with any province to provide for the payment by the Federal Government of up to 50 per cent of the costs of research in respect of occupational training, including the changing

manpower needs of the economy and the relation of these to training; and up to 50 per cent of the costs of projects for the development of occupational training courses.

- (ii) The Vocational Rehabilitation of Disabled Persons
 Act (1960-61, Ch. 26, Section 6) authorizes the Minister
 to undertake research in respect of vocational rehabilitation for disabled persons; and to co-operate with any
 province in such research where he deems it appropriate;
 and to publish information relating to such research.
- b) What organizational policies have evolved (e.g. regarding
 the implementation of (a)) that could be considered to define
 your agency's "policy regarding science" or "science policy"?
- 15. The general science policy of the Department of Manpower and Immigration is that research is not directed primarily to the advancement of pure science. Its fundamental objectives are to ensure that departmental policies and programs are developed, planned and altered as necessary, to make the maximum contribution to the attainment of the departmental goals, and to provide information and analyses vital to the effective operation of discretionary programs.
- 16. The Program Development Service of the Department pursues these objectives by:
 - (i) analyzing the public need for policies and programs and determining the degree of need for new programs or program changes;
 - (ii) initiating and co-ordinating long-term program
 planning and conducting program analysis of the courses
 of action available to reach the departmental goals;
 (iii) evaluating the impact, costs and benefits of
 existing departmental activities and sub-activities and
 recommending changes therein;

- (iv) analyzing those recommendations concerning

 departmental policies and programs which emanate from

 the Canada Manpower and Immigration Advisory Council

 and Boards and domestic and international organizations;
- (v) providing detailed, prompt, specialized and accurate labour market information, analyses and research as a basis for departmental decisions on the purchase of training courses, the admission of immigrants, referral and mobility, and providing needed analyses to organizations and individuals to assist their decision making;

 (vi) providing co-ordination with other federal departments and provincial governments in the above areas.
- 17. These functions are performed by the Program Development
 Service through three branches as follows:
 - (i) The Planning and Evaluation Branch assists in the development of departmental policies and programs, undertakes long-range planning, and evaluates the impact, costs and benefits of operating programs and potential alternatives.
 - (ii) The Research Branch carries out fundamental analyses of the functioning of the economy and the labour market, provides long- and short-range forecasts of manpower needs, and conducts research on departmental manpower and immigration programs. It also is producing a Canadian Classification and Dictionary of Occupations in co-operation with DBS for statistical and operating use of all government and other agencies in Canada.
 - (iii) The Manpower Information and Analysis Branch provides
 the information on, and analyses of, current and short-term
 future manpower and labour market conditions for use by
 the Department and outside agencies and individuals.

- Urgent needs for research on many problems arise from the requirement for more adequate information in order to develop the Department's policies for action on such important matters as adult occupational training, manpower mobility, immigration, rehabilitation, etc. In order to utilize the available resources of scientific manpower as fully as possible to meet these urgent needs, it has been found advisable to rely to a great extent on the encouragement of extramural research, by government financial assistance through research grants and the contracting-out of specific projects.
- The research authorized by the Adult Occupational Training Act is carried on, in accordance with the provisions of the Act, under agreements which have been signed with all ten provinces; the costs of research projects being shared equally between the province and the Federal Government.
 - c) Taking (a) and (b) into account, briefly describe the organization's functions and responsibilities in relation to:
 - i) other Federal agencies

 - ii) industry
 iii) educational institutions
 - iv) international representation and the monitoring of scientific activities outside of Canada
 - v) other

and describe the process whereby these are achieved or honoured, citing cases-in-point if appropriate or necessary.

i) Other Federal Agencies

Other Federal agencies such as Industry, Trade and Commerce, Bank of Canada and Finance, are able to benefit by the results of the research of the Department of Manpower and Immigration. These results include, for example, current data on manpower demand and supply in the national, regional and local labour markets; information on the demand for, and supplies of, professional and highly-qualified personnel; projections of the labour force, of

manpower requirements, and of the demand for highly-qualified personnel; current statistics on immigration; studies of problems in the adjustment of immigrants to life in Canada, and of conditions abroad affecting the movement of immigrants to Canada; and the Canadian Classification and Dictionary of Occupations which is being prepared. The principal results of such research are available, or will be available, in printed reports, either periodical or special.

- 21. Examples of more specific research services performed in large part for the use of another agency are: Assistance in the designation and delimitation of boundaries of areas to be assisted by the Area Development Agency; and evaluation of programs of relocation of Indians administered by the Department partly on behalf of the Department of Indian Affairs and Northern Development.
- 22. Services by other agencies to the Department of Manpower and Immigration include the provision of a variety of statistical data by the Dominion Bureau of Statistics, with which frequent liaison is maintained. An important current example of such cooperation is in the planning and discussion of the Canadian Classification and Dictionary of Occupations. The Department also has a formal contract with the Dominion Bureau of Statistics in regard to the newly-developed Survey of Job Vacancies, which is financed by the Department and conducted by the Bureau, according to plans prepared jointly.
- 23. Certain other Federal agencies have particularly important interests in common with the Department of Manpower and Immigration.

 These include the Department of Labour, the Department of Forestry and Rural Development, the Indian Affairs Branch, and the Citizenship Branch of the Secretary of State Department. The obvious danger of duplication of research is avoided chiefly by informal discussion

and correspondence between this Department and the others. In cases where joint interests are substantial, the research is frequently guided by an ad hoc committee and funds are jointly provided. A further check is provided by the overall Treasury Board surveillance.

(ii) Industry

24. Industry can benefit from the published results of research carried on in the Department. On the other hand, information is frequently obtained from employers in the course of research in various fields. The most important current example of the latter relationship is the gathering from industry of large numbers of job descriptions by the Occupational Research Section of the Research Branch, for use in the preparation of the forthcoming Canadian Glassification and Dictionary of Occupations.

(iii) Educational Institutions

- 25. Educational institutions, including universities, secondary schools and institutions for technical and vocational training, can benefit from the results of research on manpower, including forecasts of future manpower requirements, especially requirements for professional and other highly-qualified manpower. Descriptive monographs which are prepared on a large number of skilled and professional occupations, are used in schools to assist vocational guidance; the Canadian Classification and Dictionary of Occupations will probably become an important reference work for this purpose.
- 26. Departmental personnel who are planning research projects frequently consult professors and other members of the staff of educational institutions, to the benefit of both parties. This, of course, is usually an informal relationship between individual research workers, rather than a formal relationship between the institutions which employ them.

Arrangements for the performance of extramural research may take the form of grants by the Department, or of contracts given by the Department to educational institutions for research to be undertaken by professors or students. On occasion, formal arrangements are made between the Department and the research workers concerned. In these cases, the educational institution itself may not be formally involved, except in granting leave of absence to the research worker if necessary.

(iv) International Representation

28. International relationships have been covered in Section 1(d).

(v) Other

- 29. Other relationships include certain relationships with provincial governments and with organizations representing various special groups.
- 30. The most important formal relationships with the provincial governments, in connection with research, are the agreements signed with all ten provinces under the terms of the Adult Occupational Training Act of 1967 (Section 10). By these agreements, the Federal Government will pay 50 per cent of the costs incurred by the province for research projects such as are described in the Act, i.e., (a) research in respect of occupational training including research in respect of the changing needs of the economy for trained workers, and (b) projects for the development of occupational training courses and materials for such courses. Such research projects must have the prior approval of the Minister of Manpower and Immigration, to whom the province must submit a detailed description of the project beforehand. A ceiling of \$500,000 per year is placed on the money to be paid out by the Federal Government under these agreements.

- 31. There are less formal relationships with various provincial agencies by some sections in connection with research in various fields. The Occupational Research Section, for example, makes contacts with provincial departments of education, of economic development, etc., both to obtain research data and to impart the results of research. The field staff of the Manpower Information and Analysis Branch maintain regular liaison with provincial agencies concerned with manpower problems.
- 32. Organizations representing special groups in the population have formal or semi-formal relationships with the Department in several ways.
- The Minister, in selecting members for the four Advisory
 Boards established under the Canada Manpower and Immigration
 Council Act, 1967, to advise the Canada Manpower and Immigration
 Council, is instructed to consult such representative organizations
 as he deems appropriate in each case. One of the boards involved
 is the Advisory Board on Manpower and Immigration Research.
- 34. Organizations representing disadvantaged groups are frequently consulted about the planning of research connected with such groups. Disadvantaged groups include, for example, the blind, the deaf, the retarded, the mentally ill, and other groups suffering from handicaps; adults with low educational levels; and Indians and Eskimos.
- 35. Professional associations representing, e.g. engineers, physical scientists, sociologists, economists, etc., are called on for assistance in maintaining as complete as possible a register of personnel employed in such professions in Canada. A survey of such personnel is carried out periodically by the Manpower Information and Analysis Branch, to provide statistical data for research on highly-qualified personnel.

- d) Describe the process whereby your operational effectiveness, duties and goals are reviewed and revised.
- These objectives are pursued through the Department's Program Planning and Review Process. This is an annual procedure through which the Department's programs of future activities are reviewed and revised and on this basis the estimates for the coming fiscal year are prepared. This procedure has been developed as a result of the effort by the Department to apply the Glasco Commission's recommendation of Program Budgeting, and a related effort to apply cost-benefit analysis to the planning of its programs, in both of which efforts the Department of Manpower and Immigration has taken a leading role.
- 37. The operation of the Program Planning and Review Process may be illustrated by the procedures scheduled to be followed in preparing the programs and estimates for the 1970-71 fiscal year.

 These procedures have the following stages:
 - (i) Views as to the main unresolved issues facing the
 Department are collected from the staff, and are refined
 into major "issues", on which our program analysts
 prepare papers.
 - (ii) The Planning and Evaluation Branch of the Program

 Development Service, which is responsible for the

 Program Planning and Review, prepares a presentation to
 the Senior Management Committee on the resource implications of decisions on the "Issues", together with the
 resource implications of alternatives.
 - (iii) The Senior Management Committee (which includes the Deputy Minister and the other senior officials of the Department) meets in January, 1969, to review the alternative resource allocations and to recommend to the Minister those allocations and resource levels which seem realistic and likely to produce the greatest economic benefit.

- (iv) On the basis of these decisions, the annual

 Program Review document, embodying forecasts of

 programs and expenditures for the next five years,

 is prepared and submitted to the Treasury Board in May.

 (v) The Treasury Board provides the Department with

 targets for its estimates based on the Program Review.

 (vi) Based on these estimates, detailed one-year

 operational plans are prepared for the fiscal year 1970-71.
- 38. By following this procedure, the Department is annually reviewing its program of activities for the ensuing five years, and within this longer-run schedule prepares detailed operational plans for the next year, representing the best use of the available resources.
- 39. It must be noted that the research programs of the Department are subjected to the same process of annual review as the Department's operational programs. The Program Development Service is responsible for reviewing its own programs as well as those of other parts of the Department.
- 40. This does not mean that research programs are reviewed only once a year. Between the annual program reviews, each research program is subject, by the nature of research, to constant consideration, discussion, and amendment within the limits of the resources allocated to it.
 - e) Describe any outside studies commissioned (during the last five years) to suggest improvements of agency's operating procedures.
- 41. Since the Department of Manpower and Immigration was established in 1966, the following outside studies, each of which has some relation to research, have been commissioned and completed.

- (i) Operations Research Incorporated in 1967 made a cost-benefit study of the Occupational Training of Adults Program. This study was not directed at the improvement of research operations in the Department, but was nevertheless of great interest to research workers in the Department because it introduced them to methods of cost-benefit analysis, which can be applied in other fields in the future. This study was financed jointly by the Department and the Treasury Board.

 (ii) More recently, a study of an information system for
- (ii) More recently, a study of an information system for the Department has been carried out by a task force staffed by the Department and by Operations Research Industries. The objective of this study was to develop a system to produce all the information required by the Department for its operations and the program planning and budgeting process. In this case, also, the value of the study to research was a by-product rather than the chief purpose of the study.
 - (iii) Professor N. Meltz of the University of Toronto carried out a study in 1967 of the requirements for labour market information of the Department and of other users; and of the extent to which such requirements are satisfied, or could be satisfied, by the Department's own operations. The final report of the study presented a program, including some research projects, through which the Department might improve its provision of labour market information.
 - f) Comment on the relationship between the agency's responsibilities and powers, and its activities and programmes.

- 42. As has been stated above, research in the Department of Manpower and Immigration is directed at the improvement of the operational programs of the Department. While some government departments may encourage researchers in their general fields of interest, this Department carries on research intramurally, or grants money for extramural research projects, primarily to directly help the Department meet its program objectives.
 - g) What have been, what are currently, and what do you foresee
 as being the major hindrances to the effective performance
 of your functions, the honouring of your responsibilities
 and powers?
- 43. The chief hindrance, both current and foreseeable, is shortage of qualified staff to perform the research functions required. A substantial number of the research positions established in the Department have remained vacant, because of such conditions as the inadequate salary levels offered and a general shortage of adequately qualified personnel in certain fields, such as cost-benefit analysis.
- 44. The other major hindrance to effective scientific activity is the necessity to conform to procedures of budgeting, financial and personnel control primarily adapted to a large operating organization.
 - h) What major changes in organization functions are forecast as probable or desirable during the next five years?
- 45. The Department is still in an early stage of its development; changes are expected as the needs for various functions become increasingly clarified. However, it is difficult to forecast the nature of these changes except in very broad terms. One change which is just now taking place is the development of a training Research Branch to carry out the major research effort needed to make the Occupational Training of Adults Program most effective.

3. Personnel Policies

- a) What steps are taken to identify and hire those members of university graduating classes who will be the most effective researchers for your organization?
- 46. Personnel are recruited through the normal system of competitions of the Public Service Commission. Because of the shortage of adequately qualified research workers, and because of the unusually large number of vacant positions to be filled in the Department of Manpower and Immigration, every effort has been made by the Department to assist the recruitment process, by such methods as the preparation of material for inclusion in information booklets for circulation to students, and the assignment of research personnel from the Department to serve as members of recruitment teams sent by the Public Service Commission to interview job applicants in various parts of Canada and in other countries. Individuals suitable for recruitment are also discovered through informal contacts with university professors and other persons engaged in research in the manpower field or in related fields, in other government agencies or in private employment.
- 47. It should be added that recruiting efforts are not confined to the members of university graduating classes. On the contrary, the shortage of more experienced, more highly qualified research workers is a more serious problem than the need to recruit recent graduates from universities.
- b) Have any unique criteria been developed (or any research initiated to develop criteria) to help identify those who will be creative and effective researchers?
- 48. No unique criteria have been developed. However, when considering members of a university graduating class for research positions, we always examine carefully their research activities at

university. Most, if not all, of these people have completed at least one graduate degree and can produce their theses and publications as evidence of research ability. These results are discussed with them and with the faculty members under whom the research was carried out.

- c) What steps are taken to identify those members of the staff with high potentiality as research administrators?
- 49. Potential for research administration can be identified in staff members through the regular management and supervision of research projects.
- 50. Potential for research administration, identified through this process can be tested by assigning the employee as team leader on a short-term research project.
 - d) What distinctions are made between administrators of research and researchers as such; for example, regarding promotion, salaries, etc.?
 - The main distinction between administrators of research and researchers is the higher classification levels for the former group. Research administrators are usually paid the salaries of the top level of their occupational group or of one of the levels of the Executive Category, while a researcher's level is limited by the level of the research administrator managing his unit. This often makes it very difficult to hire highly-qualified research personnel, since to be able to offer them a reasonable salary, the manager must also assign them administrative functions which reduces their time for and effectiveness in research. Also, the promotion

of a researcher while based primarily on the effectiveness and quality of his research methods up to a certain medium range level, is limited beyond that, despite his work, by the extent of the administrative burden he takes on. The promotion of a research administrator usually is based on a significant increase in his administrative responsibilities (i.e., an enlarged area of research and a staff increase on transfer to a more responsible position).

- e) What is the policy regarding intramural and extramural

 education for staff members conducting or administering
 research?
- 52. The policy which governs extramural education for research staff is defined by Treasury Board regulations as follows:
 - (i) Educational leave without pay for a period not in excess of three years may be granted to an employee by a deputy head under Section 57 of the Public Service Terms and Conditions of Employment Regulations.
 - (ii) Reimbursement of 50% of tuition fees for successfully completed evening or correspondence courses related to the employee's work was permitted by Treasury Board Minute T.B. 620135, March 6, 1964.
 - (iii) Attendance at courses or conferences to familiarize an employee with changes or trends in his field of work, and payment of tuition or registration fees, and travelling, living and other necessary expenses, within certain strict limits of time, expense, etc., is permitted under T.B. 524534, amended by T.B. 635548 and T.B. 642580. Beyond the limits thus stated, the granting of leave and payment of expenses for an employee sent on a training course requires Treasury Board approval (T.B. 546465, June 17, 1959).

education programs in the research and development areas of the Department. However, some sections provide intramural training for their personnel in specific types of work. The Occupational Research Section of the Research Branch holds seminars to train its personnel in occupational classifications and related techniques. The Manpower Requirements Section of the Research Branch gives on-the-job training in statistical techniques to its staff as required. The Manpower Information and Analysis Branch has an extensive training program for its regional analyst staff.

4. Distribution of Activities

- 54. The expenditure of funds on research in the different regions of Canada is governed by three factors. First, the Manpower Information and Analysis Branch has professional staff in each of the five regions of the Department's operations to collect and analyze on a regional and local basis data on the current labour market. Secondly, the Department carries out, or supports, some studies on regional or local problems related to the labour market. Thirdly, extramural research, even when its purpose is not regional, is often carried out outside of Ottawa; the governing factor being where the research talent is available.
- a) The regional pattern of agency's spending (intramural and extramural) on scientific activities (e.g. by province).
- 55. In 1968-69, it is estimated that the field portion of the Manpower Information and Analysis Branch budget will be apportioned between the five regions approximately as follows:

Atlantic 13%

Quebec - 31%

Ontario 27%

17%

Prairie

Pacific 12%

56. Extramural research, including grants and contracts, this year will likely be distributed between the five regions approximately as follows:

> Atlantic 4%

30% Quebec

Ontario 63%

Prairie 2%

Pacific - 1%

b) The regions, if any, particularly suited for certain scientific activities.

- 57. The distribution of funds for the Manpower Information and Analysis Branch field data collection is determined by the size of the labour market involved.
- 58. The distribution of extramural research funds is largely determined by the availability of research talent. Thus, Ontario and Quebec receive much more of these funds since there are considerably more universities, research institutions, and other facilities for social science research in those two regions.
- c) Activities carried out, on an annual basis during the last five years, to assist in the investigation of regional problems or phenomena.
- 59. The Manpower Information and Analysis Branch continually collects and analyzes current data related to the local and regional labour market, i.e. occupational shortages and surpluses. The Research Branch has undertaken studies of manpower mobility, mostly through contracts or grants.
 - d) The role of your agency in contributing to regional development.
- 60. In a research sense, this Department is not heavily involved in contributing to regional development. Of course, the operating programs do have a significant effect on regional development, and hence the research which supports them has an effect.
 - e) In your experience, the cost and benefits of regional

 distribution of your scientific activities and the necessary

 conditions for this distribution to contribute to regional

 development.
- 61. There have been no evaluations which would contribute to answering this question.

5. Personnel associated with scientific activities

62. The following fourteen tables give the information requested for the Program Development Service of the Department of Manpower and Immigration, and when available, for the four branches which at present make up this service. These four Branches are:

Planning and Evaluation

Research

Manpower Information and Analysis

Administration

Except for figures applying to earlier years, the statistics are all for the date of October 1, 1968. Since the Department of Manpower and Immigration began to operate only at the beginning of 1966, there are no statistics for earlier years.

Table 5(a). Current personnel establishment and people on strength by category of personnel: Program Development Service, Department of Manpower and Immigration, October 1, 1968

	Number o	of positions	on establishmen	it by branch		Number of persons on strength by branch							
Category of Personnel	Planning and Evaluation	Research	Manpower Information & Analysis	Adminis- tration	Total four Branches	Planning and Evaluation	Research	Manpower Information & Analysis	Adminis- tration	Total four Branches			
Senior Officers and Senior Economists	1	2	1	1	5		2	1	1	4			
Administrative Services	3	3	9	2	17	2	3	7	2	14			
Administrative Support (Clerical & Secretarial)	12	27	37	5	81	5	12	35	4	56			
Program Administration	5	55(a)	5	1	66	4	50	3	B.T.	57			
Economists	8	34	66	-	108	4	15	53	The state of	72			
Statisticians	1	2	22	-	25	1	2	14		17			
Sociologists		4	1	-	5	1	2	1	-	3			
Unclassified	3	5	24	2	34(b)	4 4 4 7		A 100 M	By Shap	1.6			

Note: Categories of personnel by occupation are those in force at the date of October 1, 1968. There were no guest workers, staff-on-loan, or post-doctorate fellows in these branches.

- (a) Most of the Program Administrators in the Research Branch are occupational analysts on the Canadian Classification and Dictionary of Occupations project.
- (b) Unclassified by the Bureau of Classification Revision Division of the Treasury Board.

Table 5(b). No	umber of above	professional	staff
devoting most of the	eir time to res	earch adminis	strative duties
Planning and Evalua	tion Branch		1 .
Research Branch			6
Manpower Informatio	n and Analysis	Branch	13 .
Administration			1

Table 5(c)(i). Country of birth of professional personnel

(Number of persons by branch and highest university degree)

Country of birth	Planning and Evaluation			Research			Manpower Information and Analysis			Administration			Total four Branches		
	B.A.	M.A.	Ph.D.	B.A.	M.A.	Ph.D.	B.A.	M.A.	Ph.D.	B.A.	M.A.	Ph.D.	B.A.	M.A.	Ph.D.
Canada United Kingdom	4	1		14 3	7	3	24 2	7 2	-	1		1	43	15 2	4
Austria Bolivia		17				1		1	-			35		1	1
China Czechoslovokia			800	1 1	5	1	1.5				and Section 1		1		1 1
Egypt France						1	1		1.		The state of	63	1		1 1
Germany India	1		- 6		1			1			1002733		1	2	
Nepal Netherlands		3 - 1	3	1	14			1			03/01	Director .	1	1	1
Poland USSR	PARTICIO PE I LIUD	al by pro	hyprian a	C Thata	1	1	ne of se	aber 1,	1960. 3	Pro Rend	na cons	vigner.	Same Fe-	1	1
West Indies Yugoslavia	a Proper	A American	tratura la Biotione	1	And bra	act are	1	al smally	112 OF 10		-	B	1 2		-

(Number of persons by Branch and highest university degree)

Country in which secondary education taken	Planni	ng and Ev	valuation	Research			Manpower Information and Analysis			A	Administr	ation	Total four Branches		
	B.A.	M.A.	Ph.D.	B.A.	M.A.	Ph.D.	B.A.	M.A.	Ph.D.	B.A.	M.A.	Ph.D.	B.A.	M.A.	Ph.D
Canada United Kingdom	4 1	1		17 2	7	4	24	7 2		1	1	1	46 6	15 2	5
Austria Belgium	1 3			1 1	3	1							1		1
Bolivia China	-5	4		13	10	1	8	1		1 1			51	1	1
Czechoslovokia Egypt	Plannih; n.s.	did has	lugtion	1	search W A	1	4 sug	malysis w. A.	1	2 V)	dinistra 'A'a l	lar D	Total fou	Farancy	1
France Hong Kong				1	hermon	1	1						1		1
India Italy	1				1		1	2					1 1	3	
Pakistan Poland	1	able 5(c) (MT) C	orngel pu	мутер д	ghest wa	AGENTER	degree to	gen på 1	rafassian	al parso	nel -	13 1	1	
West Indies Yugoslavia				1			1						1 1		

Note: Total persons with B.A. in this table exceed the total in the preceding table, because a few of these persons took secondary education in more than one country.

Total persons with & A. in this table exceed the total in the preceding table, because a rew of these persons took secondary education

Table 5(c)(iii). Country in which highest university degree taken by professional personnel

(Number of persons by Branch and highest university degree)

Country in which highest degree taken Planning and Evaluation B.A. M.A. Ph.D.	Planning and Evaluation			Research			Manpower Information and Analysis			Administration			Total four Branches		
	Ph.D.	B.A.	M.A.	Ph.D.	B.A.	M.A.	Ph.D.	B.A.	M.A.	Ph.D.	B.A.	M.A.	Ph.D.		
Canada United Kingdom	5	1		18 3	6	1	27	7 4		1			51 5	14 5	1
United States Denmark				1	1	4 1	34	1				1	1	2	5 1
France Switzerland	8.4	яч	Pb.fr.	D. 16	1	1 1	8.4	1 N.A.	1	8.A.	MA	Ph. p.	R.Y.	1	1 2

lunto siglifal. Council in which secondary endeation taken by professional personner

Table 5(c)(iv). Number of working years since graduation and number of years employed in present organization

(Nimbon	-5	mamaana	har	Dwanah	and	highart	university	dograph

Planning and Evaluation		Research		Manpower Information and Analysis		Administration		Total four Branches							
	B.A.	M.A.	Ph.D.	B.A.	M.A.	Ph.D.	B.A.	M.A.	Ph.D.	B.A.	M.A.	Ph.D.	B.A.	M.A.	Ph.D.
Number of working years since graduation:	20	- A. B	Selferor Sel	7		100	And	out to	SIR	1 1	Total (Second		-		
0 to 4	3	-	TOTAL TOTAL	11	3	2	15	8	1	1	1	-	30	11	3
5 to 9	-	-	T to	2	1	3	3	2	No.	-	200	-	5	3	3
10 to 19	3	1	0.00	4	3	2	6	1	-	-		1	13	5	3
20 and over	-	-	Second Second	5	2	1	4	1	Office of the last	true !		-	9	3	1
Number of years employed in present organization:	1363		e g(e) be	mes obs	1862 20 E		(d): Selection	Table of the	markion and	anguaring p	9.6 5(c) (Vi)) 2 20a 78/67 arX	1.5	To Record	Tornactor (and	types of a
under one	-	-		1	1	2	12	6	1	-	-	-	13	7	3
one and under two	1	-	-	4	3	2	10	5	8 8	8-	59 5	-6	15	8	2
two and over	5	1	-	17	5	4	6	1		1	-	1	29	7	5

Table 5(c)(v). Average age of professional personnel

	B.A.	M.A.	Ph.D.
Planning and Evaluation Branch	31	37	-
Research Branch	36	38	40
Manpower Information and Analysis Branch	32	31	29
Administration Branch	25		47

Table 5(c)(vi). Percentage of professional personnel able to operate effectively in Canada's two official languages

	B.A.	M.A.	Ph.D.
Planning and Evaluation Branch	Ni1	Ni1	Ni1
Research Branch	30%	50%	50%
Manpower Information and Analysis Branch	21%	58%	100%
Administration Branch	Ni1	The state of	Nil

Table 5(d). Total number of professional staff in each degree category, Program Development Service, 1966 to 1968

	B.A.	M.A.	Ph.D.
1966	26	7	5
1967	41	13	7
1968	57	22	10

Table 5(e). Percentage of turnover of professional staff, Program Development Service, 1966 and 1967

	B.A.	M.A.	Ph.D.
1966	12%	14%	20%
1967	12%	15%	28%

Note: Percentage of turnover =

Number of separations in year

Total professional staff

Table 5(f). Percentage of current professional staff who, since graduation, have been in various types of employment

(Percentage of personnel by Branch)

Employment	Planning and Evaluation	Research	Manpower Information & Analysis	Adminis- tration	Total four branches
weller velue	8	%	%	%	%
By industry	Nil	53.8	26.8	Ni1	36.3
On staff of universities	Ni1	17.9	14.6	50	15.9
By provincial depts. or agencies	13.3	12.8	9.6	Ni1	11.3
By other federal agencies	85.7	46.1	36.5	100	45.4

Table 5(g). Number of staff in each degree category on educational leave:

One M.A. in Manpower Information and Analysis Branch

One B.A. in Administration

Table 5(h). Number of university students given summer employment in the field of scientific activities in the Program Development Service for the years 1966 to 1968

1966 6 1967 30 1968 14

6. Expenditures Associated with Scientific Activities

a) The following tables give the total funds spent by the

Department of Manpower and Immigration, broken down in

the following categories:

Table 6 - a - Functions

Table 6 - b - Scientific discipline

63. The data given refers only to the fiscal years beginning 1966-67, which is the year the Department was formed. Drastic changes in proportions between functions and between scientific disciplines can be accounted for between 1966-67 and 1967-68 by the formation and expansion of new research capacities and between 1967-68 and 1968-69 by the removal of the Pilot Projects Branch which was transferred to the Department of Forestry and Rural Development.

Table 6 - a

Department of Manpower and Immigration

Actual and Estimated Research Funds by Function

\$,000's		
1966-67	1967-68	1968-69
849	6,287	4,633
	577	1,514
849	6,864	6,147
	1966-67 849 	1966-67 1967-68 849 6,287 577

Department of Manpower and Immigration

Actual and Estimated Research Funds by Scientific Discipline

\$,000's 1966-67 1967-68 1968-69 Demography 149 1,075 460 Economics 545 2,420 5,167 Psychology 1,529 41 1,840 479 155 Sociology Total 849 6,864 6,147

- application to national economic manpower policy and operations.

 Some of the results are secondarily useful in fields such as regional development, social policy, and educational techniques and policies. It would be extremely difficult, however, to assign dollar values to the proportion of the research which is useful in this secondary sense.
- b) Table 6 c gives the actual and estimated operating and capital funds for the units described in 1 (c) for the fiscal years 1966-67 to 1969-70.

Table 6 - c

Department of Manpower and Immigration

Actual and Estimated Operating and Capital Funds of Units Primarily Concerned with Research

	\$,000's			
	1966-67	1967-68	1968-69	
Program Development Service Administration	der an exp	173	396	
Pilot Projects Branch	STAR STAR	3,727	indolo, in	
Planning and Evaluation Branch	Sin Briv	253	381	
Research Branch	747	1,209	2,241	
Manpower Information and Analysis Branch	anexpedia	1,155	3,029	
Manpower Consultative Service	87	46	100	
Manpower Grants	15	301	REITS TOR	
Total Description of the local Control of the local	849	6,864	6,147	

6 - c In 1967-68, the Department spent \$7,415 in furthering professional education at university for departmental staff. In 1968-69, the expenditure will be about \$4,000 for this purpose.

7. Research Policies

- a) Units Concerned with Intramural Research Activities
 - (1) Process Whereby Various Types of Programs and
 Projects are Selected, Initiated and Monitored.
- of 5. In general, as with all departmental activities, this process is handled through the program review and estimates procedure as described in Section 2 d). Possible research projects related to departmental programs, policies or issues are outlined and their resource implications described. Priorities between projects are then established within the resource limitations. Decisions are made on the best methods of carrying out the research (intramurally or under contract) and a detailed operational plan for each project is prepared. This program of research is annually reviewed, and also is subject to adjustment should departmental priorities shift. Research progress is evaluated against the operational plan and appropriate adjustment in financial and manpower resource allocation is made.
- The Planning and Evaluation Branch is primarily involved in evaluation or analysis of operating programs in terms of their effectiveness in meeting their objectives and development of new programs. Therefore, the initiation of virtually all projects is internal to the department, the principal parts of the department that play a role being the Deputy Minister's office, the senior management of the operating divisions and the Assistant Deputy Minister of Program Development.
- 67. In the Manpower Information and Analysis Branch the program activities are primarily responses to the department's need for analysed data for operational purposes. New projects would be in response to an informational need, involving the development of the techniques of collection and analysis of the required information, and then the actual carrying out of this collection and analysis.
- 68. In the Research Branch each section deals with different aspects of manpower economics and, therefore, the source of new issues for research involves not only the Department but also other federal

agencies and other bodies.

(2) Establishment of Priorities

69. The process of establishing research priorities in this department has already been partially described in the section above. Briefly, research priorities reflect the operating priorities of the department, departmental policy regarding possible future activity, and the state of knowledge in these areas. Research needs are ranked and compared to resources available. With this information the priorities are set.

(3) Network Methods.

70. Some research projects of the department do make use of either the critical path network or Program Evaluation and Review Technique (PERT). Two outstanding examples in the department of this are the Pilot Projects Branch which used PERT techniques to lay out the process of establishing itself, and the Canadian Classification and Dictionary of Occupations project of the Occupational Research Section of the Research Branch which is using PERT techniques in an attempt to complete this very complex project on schedule.

(4) Contracting Out Projects in Support of Intramural Programs

71. In all the research areas of the department described earlier in this paper the use of contracts to support the intramural research programs is fairly common. In particular, the Pilot Projects Branch made extensive use of educational consultants in developing new techniques of training. Most electronic data processing support for research projects in the department is contracted out as well as other sub-projects which require highly specialised skills for a short period of time.

(5) Policies Regarding the Funding of Extramural Research Programs.

72. In general, the departmental policy in funding extramural research programs, aside from those dealt with under Section 7 b) on units exclusively concerned with extramural research activities, are

that the research contracted for, whether this is in the universities or industry, is seen as an integral part of the intramural research programs of the department. That is to say, funds expended by units which are primarily concerned with intramural research are used solely to further that research, not to support other programs which are not directly related.

(6) Shifting Resources

73. The process by which the decision is made to shifting resources from one research program to another is part of that process described earlier as the program planning and program review process. That is to say, in the regular review and evaluation of research in the department, if it is discovered that a research program is no longer needed as urgently as another and there is a need to shift resources, this is done as a part of the priority setting and implementation procedure. In general, the department maintains sufficient flexibility in its research plans to take account of unexpected needs in the course of a fiscal year without having to carry out any drastic shifting of resources. Over longer periods of time the planning procedure permits sufficient foreknowledge of such shifting to avoid any real difficulties.

(7) Transfer of Research Results

The distribution of research results outside the department is handled in a variety of ways. Material which it is felt is of urgent interest to other federal agencies, or provincial departments, is made available for their restricted use directly upon it being available to this department. Other research results which the department feels would be of interest to the general public are presented in the form of a research monograph which is published by the Queen's Printer and available from them. The department also maintains a mailing list of those persons who are most likely to be concerned with the research results in our area and these people receive such publications as soon as they are available.

b) Units Exclusively Concerned with Extramural Activities

75. The Department has three programs to support extramural research activities. These are the Manpower and Immigration Research Grant Program, the Vocational Rehabilitation Research Grant Program, and the Federal-Provincial Manpower Training Research Program. The set of questions will be answered individually for each program.

MANPOWER AND IMMIGRATION RESEARCH GRANT PROGRAM

- (1) Describe Process Whereby Various Types of Programs and
 Projects Are Accepted For Funding and Relationship
 Various Factors have on the Acceptance Process.
- 76. Projects submitted under the Manpower and Immigration Research Grant Program are given a preliminary screening by a departmental committee to determine their relevance to departmental research needs. Those which are determined to be sufficiently relevant are then appraised by consultants both within and outside the Department for technical soundness. Any comments or suggestions for changes made by the consultants with which the Department agrees are forwarded to the researcher for possible inclusion in his final research project proposal.
 - (i) Previous record of achievement of unit or individual requesting funds

 The previous record of achievement of the researcher requesting funds is taken into account where the Department is familiar with the individual's work.

 When the Department is not familiar with the researcher, references are requested from persons competent to judge, on the basis of past performance, his ability to carry out the project proposed.
 - (ii) Nature of proposed project

If a project does not fall within the priority areas of research needed by the Department it has little chance of success. A few projects may be accepted each year which are less directly related to priority areas, but very definitely within the terms of reference or of interest to the department. In general, the department provides support for projects with fairly direct applicability to operations or policy formation, although basic research is not excluded.

(iii) Policies of granting agency

The policies of the department are fairly flexible as regards this program except on the matter of the need of the project to fall within a priority area; for example, there is no policy which states that an individual must be at a university to receive a research grant although, in general, only researchers who have at least completed their comprehensive examination for their Ph.D receive support.

(2) Establishment of Priorities

77. The priorities are established by consultation among the senior managers of the department and ratified by the Deputy Minister.

These are updated on a regular basis. As projects are received they are given priority ratings in accordance with these pre-established departmental research priorities.

(3) Monitoring of Projects and Evaluation of Results

78. Most projects are monitored through semi-annual or annual progress reports which are examined by researchers in the department and comments and suggestions passed to the researcher undertaking the project. The final report is similarly evaluated and the results examined for possible operational or policy implications. Both the results of research and the evaluations and implications of these results are passed to the appropriate managers throughout the department.

(4) Priority Implementation and Allocation of Resources to Programs and Projects

79. See paragraph 77.

(5) Network Methods

80. Network methods such as CPN or PERT are not used to plan and monitor grant programs or projects.

(6) Shifting Resources

- 81. The department has not found occasion to shift resources from one research project to be carried out under grant to another. However, changing circumstances could require that a grant not be renewed. Since it is made clear that the renewal of a grant is not automatic, but is conditional upon the priority of the research and the value and validity of the results, the department has not encountered any difficulties in shifting resources from one priority area to another.
- (7) Transfer of Research Results
- 82. See paragraph 78 above. Also provision is made for the researcher to publish the results of his study.
- (8) Percentage of Funds Available Actually Expended

 83. This program did not begin operating until the fiscal year

 1967-68 therefore there is nothing to report.
- (9) Percentage of Funds Requested Actually Granted

 84. The same comment applies here as in paragraph 83.

VOCATIONAL REHABILITATION RESEARCH GRANT PROGRAM

85. All the comments made under the Manpower and Immigration Research Grant Program apply equally to this program.

MANPOWER TRAINING RESEARCH PROGRAM

- 86. This program is one of shared cost research with the provincial governments under agreements provided for by the Adult Occupational Training Act.
 - (1) Describe Process Whereby Various Types of Programs and

 Projects are Accepted For Funding and Relationship Various
 Factors have on the Acceptance Process.
- 87. Under the terms of the agreement under which the program

operates in each province, research proposals are submitted to the federal government by the provincial government. In many provinces these projects come from outside the provincial department and are therefore subject to screening and approval by a provincial committee before being forwarded to the Department of Manpower and Immigration. The approval procedure in the Department of Manpower and Immigration is similar to that used for the other two grant programs; that is, the project proposal is subjected to an intensive technical appraisal before it is approved.

- (i) Previous record of achievement of unit or individual requesting funds

 The previous record of achievement is again taken into account or if the record is not known references are requested.
 - (ii) Nature of proposed project

 A project, to be approved under this program, musc fall within the terms of reference outlined in the agreement under which the program operates.
 - (iii) Policies of granting agency

 The comments would be the same as for the previous programs.
 - (2) Establishment of Priorities
- 88. Priorities are established between projects on the basis of consultation with the provinces concerning the areas where research is most needed in relation to manpower training.
- (3) Monitoring of Projects and Evaluation of Results

 89. The comments here are the same as for the previous programs.
 - (4) Priority Implementation and Allocation of Resources
 to Programs and Projects
- 90. See paragraph 88 above.
 - (5) Network Methods
- 91. Network methods are not used at the present time to plan or monitor grant projects.

(6) Shifting Resources

- another in this program would be based on the same considerations as with the other two programs. Major shifts between types of projects in terms of priorities or shifts of financial resources away from the present major areas of concern would likely be based on consultations with the provincial departments concerned. As the situation has not yet arisen there are no current difficulties to report.
 - (7) Transfer of Research Results
 See paragraph 89 above.

93

- (8) Percentage of Funds Available Actually Expended
- 94. The Department of Manpower and Immigration became responsible for this program in fiscal year 1966-67. In that year there was no firm budget for shared-cost research; i.e., funds for shared-cost research were drawn from the total budget for shared-cost training, as needed.
 - (9) Percentage of Funds Requested Actually Granted
- 95. In fiscal year 1966-67, the department approved projects representing 83 per cent of the total funds requested. Claims against these approvals in that year, however, totalled less than 10 per cent of the total approved since most of the research projects were of a long-term nature, spread over several fiscal years, with the major expenditures being made in later phases.

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8. Research Output

- a) Patents arising from research activities
- 96. No patents have arisen from the research activities of this Department.
 - b) Books or journal articles arising from research activities.
- 97. For a list of these, see Appendix A.
- 98. Since the Department of Manpower and Immigration came into existence only in 1966, many of its research activities have not yet reached the stage at which results can be published. As an example, one might mention the project to produce a Canadian Classification and Dictionary of Occupations, which will be an important reference work when it is completed. Work has also been undertaken on method of projecting manpower requirements and supplies, in the long run, and a longitudinal study of immigrant adjustment has been started. These works will not be completed for several years.
 - c) Reports issued from agency and units
- 99. Reports prepared in this Department are of two kinds:
 periodical reports issued at regular intervals, and special reports
 dealing with particular topics. In addition, every extramural research
 project financed by the Department, through a grant or a contract, must
 produce a report. These, however, are not always published by the
 Department; in many cases, the author may publish the report as an
 article in a learned journal, or otherwise.
- 100. For a list of reports, see Appendix B.
- d) Conferences or other means used to transfer information regarding the results of a project or programme to extramural groups.
- 101. Many members of the staff of the Program Development Service sometimes attend conferences of learned societies, such as the Canadian Economic Association, the American Economic Association, or the Canadian Council for Research on Education. At such conferences ideas and information about research in progress or completed are exchanged. However, a conference is rarely the principal medium for publishing the results of a specific piece of research done in the Department. Extramural

research projects financed by the Department are perhaps more often the subject of papers read by the authors at meetings of learned societies.

102. Discussions relating to research done, in progress, or being planned, are often held at specialised conferences organised by government and private agencies interested in a particular field of work.

Examples of such conferences recently attended by representatives of the Department of Manpower and Immigration are:

- (i) Sixth Federal-Provincial Conference on Labour Statistics,

 Esterel, Quebec, 9th May, 1967, at which the Director

 of the Manpower Information and Analysis Branch gave a

 paper on "Operational Uses of Job Vacancy Information."
- (ii) Joint Meeting on Corporative Aid to Higher Education, attended by representatives of the Association of Universities and Colleges of Canada, and of other organisations interested in higher education, including this Department, at Montebello, Quebec, 5th February, 1968 at which the Director of the Manpower Information and Analysis Branch gave a talk on the forecasting of requirements for professional manpower.
 - (iii) Seminar on Indian Family Relocation Projects, attended by representatives of the Department of Indian Affairs and Northern Development and of the Department of Manpower and Immigration, at Ottawa, 10th to 12th September, 1968 for the exchange of information. The Program Development Service carries on or finances research to evaluate the results of the relocation projects, with a view to planning future relocation projects.
- 103. Planned for the coming year is a North American Seminar on costbenefit analysis applied to manpower programs, sponsored jointly by the Canadian Department of Manpower and Immigration and the United States Department of Labour.
 - e) The means for the transfer of scientific and technological data obtained from countries outside Canada, to extramural groups

- 104. Publications of the OECD on manpower matters are distributed by the Department of Manpower and Immigration.
 - f) Individuals who had the opportunity to train themselves in specialised fields whilst employed with you and subsequently left and made important contributions to their field.
- The Occupational Research Section of the Research Branch gives training to its staff in types of work (chiefly occupational analysis, definition and classification) in which training is not readily obtained elsewhere. Persons employed for the summer, such as students or guidance personnel from schools, find this training valuable in their subsequent work. Other staff members who leave the Section are often able to use their training in other positions for example, in personnel work in industry, in educational institutions, or in other federal or provincial government departments.
- 106. While Occupational Research appears to afford the most striking example of this phenomenon, because of the special character of the work, the same type of benefit no doubt will accrue to a greater or less extent to persons employed in research in other fields in the Department.
 - g) Research teams that have arisen in this period and who have unique and valued abilities in important fields.
- 107. Work on the Canadian Classification and Dictionary of Occupations has developed a research staff with unique experience in occupational analysis and classification.
- 108. Similarly, the team of regional economists and analysts being developed in the Manpower Information and Analysis Branch is unique and is filling a previously unsatisfied data collection and analysis need.
- The longitudinal study of immigrants, which involves following the experience of a sample group of immigrants through several years, while they are adjusting to life in Canada, will be launched on 1st January, 1969 by the Immigration and Foreign Manpower section of the Research Branch.

 A research team has been developed, including one economist and one sociologist, who have already acquired valuable skill in the course of

developing the methodology for the study.

- 110. A highly qualified team of economists and statisticians is developing in the benefit/cost area of the Planning and Evaluation

 Branch's work. Also, the work of the Manpower Requirements Section of the Research Branch in long and middle range projections is producing a significant team of researchers developing new methods and acquiring scarce skills in this area.
- h) Unique or valuable research tools, facilities, or processes added or developed during the above period.
- 111. The most important research tools which have been developed in the Department include the following:
- (i) Benefit/cost analysis, which is still in an early stage of development, is being applied by the Planning and Evaluation Branch in the evaluation of Departmental programs. This represents one of the first attempts to apply benefit/cost analysis to manpower programs, and therefore a great deal of conceptual ground is being broken. The results of this Branch's analytic work will have impact for other agencies and for the governments of other countries.
 - (ii) The methodology of the Job Vacancy Survey which was recently established, and which is being administered by the Dominion Bureau of Statistics, was worked out in consultation between the Bureau and this Department.

 Such a survey has not yet been established in any other country.
 - (iii) An econometric model for calculating projections of
 manpower requirements is being designed in the Manpower
 - (iv) A periodical survey of highly qualified manpower (for obtaining current statistics on the requirements for, and supplies of, such manpower, the prevailing rates

- of remuneration, etc.) was designed in the Manpower
 Requirements Section of the Research Branch, and is
 being administered by the Manpower Information and
 Analysis Branch.
- (v) Methods for analysing, describing, defining and classifying occupations have been developed in the Occupational Research Section of the Research Branch.

 These methods have been developed chiefly for the work on the Canadian Classification and Dictionary of Occupations, which will also itself be a valuable research tool when it is finished.
 - (vi) Research on immigrants, especially in preparation for the longitudinal study referred to above (in subsection g)), has required the development by the Immigration and Foreign Manpower Section of such research tools as questionnaires for immigrants, methods for tracing non-respondents to surveys, ways of maintaining contact with respondents. No methods previously existing were exactly suitable to this problem.
 - (vii) The techniques of collecting, analysing and estimating current and short-term future labour requirements and supplies on a detailed occupational and geographical basis are being developed and applied by the Manpower Information and Analysis Branch.
- Details concerning the impact of your scientific activities and research output on the advancement of scientific knowledge and Canadian economic development.
- 112. Since research in this Department is directed toward serving the needs of the Department's operational programs, the chief impact of the research is through its effects on those programs, including such programs as the occupational training of adults, the selection and admission of

immigrants, the relocation of workers, etc. The operational programs of other government agencies will also be affected in some cases. Thus, in many ways, the research activities of this Department should aid Canadian economic growth and productivity.

- At the same time, the scientific activities of other organisations both governmental and private, will be benefited by the research tools which are being developed (which have been mentioned in the immediately preceding subsection). As an outstanding example, the Canadian Classification and Dictionary of Occupations which is being developed, will be of use to the Dominion Bureau of Statistics, to several other agencies of the Federal Government and to many other organisations. The studies being made of the demands for and supplies of highly-qualified personnel, both currently and in the future, will be of obvious use to, among others, educational institutions.
- The research units of the Department of Manpower and Immigration are also the primary source, within Canada, of certain categories of information which are important to the Canadian economy and the Canadian population in general. Examples are: current data on manpower demand and supply, especially in regional and local markets; and current data on immigration into Canada.

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- j) Any other measures or indications of research output
- 115. No comment.

9. Projects

a) List of titles of projects

116. Since the Department has only existed since October 1966, there are not a great many projects to repor*. Those which were begun in 1966 or 1967 are listed in Appendix C.

b) Case histories of most significant projects

117. Very little research which was started since this

Department was formed has been finished at this point. However,
below are reports on five which have been either completed, or are
well under way, and which are quite important.

(1) Development of Job Vacancy Survey

118. Data on the demand for manpower have, for a long time, been deficient in comparison with the abundant data on manpower supplies. When the Department of Manpower and Immigration was established and given the responsibility for improving the utilization of Canada's manpower resources, it was felt that a Job Vacancy Survey must be established as soon as possible, in order to fill this serious gap in our knowledge of labour market conditions. Studies and research concerning job vacancy data in Canada, the United States and other countries clearly indicated their operational usefulness in several major areas: job placement and counselling activities of the Canada Manpower Centres; training, mobility and immigration planning at regional and national levels; and manpower planning in industry. The results would certainly identify labour shortages in certain occupations, industries and areas and, in conjunction with data on the skills of available workers, would help in determining needs for remedial action through mobility and retraining programs and through adjustment in immigration flows.

- 119. Consequently, one of the first steps of this Department was to embark on the development of a systematic collection of comprehensive job vacancy data, in co-operation with the Bureau of Statistics. These efforts have now reached the stage when the first results of what will be a nation-wide survey extending to all sectors of the economy will be available for testing, evaluation and use by the Department by the middle of 1969.
- 120. The purpose of the Job Vacancy Survey is to obtain periodic estimates of the size, occupational, geographical and other characteristics of the unsatisfied demand for labour. It is a sample survey carried out by means of questionnaires mailed to hiring authorities, and followed up by personal interviews. It is a comprehensive survey, in the sense that it covers firms and organizations of all sizes and in virtually all fields of economic activity.
- 121. While the survey is being carried out for the Department by the Dominion Bureau of Statistics under contract, its planning and development was a co-operative effort by both agencies. The first stage, in the summer of 1966, involved a pilot survey of employers in a few representative communities, by means of a mailed questionnaire. This resulted in the redesigning of the questionnaire, the sharpening of the concept of a "job vacancy", and the undertaking, as the second stage of the development, of a comprehensive program of interviews of the larger employers to locate the appropriate job vacancy reporting units within these larger firms.
- 122. The third stage of development was entered in September 1968 with the launching by the Dominion Bureau of Statistics of a mail and interview survey to gather the desired job vacancy data.
- 123. It is expected that the Job Vacancy Survey will reach its full planned coverage of employers in 1970, and will then embrace about one-half million reporting units, and will extend to all sectors of the Canadian economy except agriculture.

- (2) Development of the Occupational Training for Adults Program
- 124. One of the most important development projects during the first year of the Department's existence was the planning of a new program of Occupational Training for Adults, to replace the Technical and Vocational Training Program previously carried out under the Department of Labour through agreements with the provincial governments.
- 125. The object of the new program was to assist in the attainment of the Department's goals of better utilization of Canada's manpower resources and the improvement of their quality.
- 126. To discover how occupational training in Canada might be improved, several of the principal officials of the newly-established Program Development Service, during 1966, made intensive surveys of the operation of existing Technical and Vocational Training Programs and studies of the international literature on the subject. Special surveys were made through questionnaires circulated among representative samples of trainees and of unemployed persons.
- 127. The study influenced the character of the Adult Occupational Training Act (1966-67, Chapter 94) which came into force on May 8, 1967. This Act empowered the Department of Manpower and Immigration to establish a new system of Occupational Training for Adults, which would be implemented through agreements to purchase training with provincial governments. Under the new program, the Federal Government ceased to extend financial support to vocational secondary schools, which form part of the normal system of secondary education of the province. The new program was intended entirely to assist the occupational training of adults, with a view to their employment.

- (3) Professional, Scientific and Technical Manpower Survey 1967
- In order to obtain current data on Canada's highly qualified manpower, the Research Branch and the Manpower Information and Analysis Branch jointly conducted a Survey of Professional, Scientific and Technical Manpower in 1967. The survey included persons employed in the fields of architecture, engineering, physical science, life science and social science. The data were gathered by means of a questionnaire which was designed with the co-operation and assistance of representatives from scientific and professional associations, educational institutions and government departments. It was mailed to 91,000 individuals whose names and addresses were obtained from the Scientific and Technical Personnel Register previously maintained by the Department of Labour, and a variety of other sources including directories of professional associations, educational institutions and government departments. The original mailing list included about 87,000 Canadian residents, equal to about 31 per cent of the number of holders of university degrees reported in the 1961 Census of the Canadian labour force.
- 129. The survey was conducted during the first three months of 1967. A response rate of 74 per cent was obtained, and a follow-up of a sample of the non-respondents was conducted by the staff of the Canada Manpower Centres. This procedure provided the basis for making estimates for the total survey population. The survey data are thus of the nature of estimates; they include data reported by the respondents together with estimates of the initial non-respondents based on data obtained in the follow-up.
- number of factors, including those of employment field, level of education, age, sex, industry group, work function, birth place, and annual earning rates. The four tables of data attached as an appendix indicate the type of information collected.

Table 1

Estimates of Highly Qualified Manpower residing in Canada by region of residence, and labour force status

	Emp1	oyed				
Region	Employee	Self- Employed	Student	Other(1)	Total(2)	
	CARA 2013	N	umber	AN ADDRESS OF STREET	- Shorted	
Atlantic	3,779	246	227	149	4,401	
Quebec	14,895	1,850	710	552	18,007	
Ontario	29,451	2,709	1,814	927	34,901	
Prairie	9,764	1,351	623	269	12,007	
British Columbia	6,218	806	487	361	7,872	
Yukon & N.W.T.	114	-(3)	balli-s ras	fi .esment	125	
Total (4)	64,227	6,968	3,865	2,265	77,325(5)	

- (1) Includes housewives, retired and other.
- (2) Includes those who did not state their labour force status.
 (3) A dash indicates zero or less than 100.
- (4) Includes those who did not state their region of residence.(5) This total includes 74,465 males and 2,860 females.

Table 2

Estimates of Highly Qualified Manpower employed and residing in Canada, by field of principal employment and level of education

Field of Principal Employment	Professional Certification	BachPass or first Prof. Deg.	Bach Honours	Masters	Doctorate	Total (1)
	inte off ad Lat	N	lumber	server ada	No. on Compa	70
Architecture	299	1,530	186	170	_(2)	2,199
Engineering	1,663	23,218	4,603	3,189	643	33.404
Phys. Science	327	3,116	1,635	1,691	2,475	9,267
Life Science	-(2)	4,352	895	1,179	1,249	7,779
Social Science	279	2,567	670	2,133	481	6,157
Other Fields	103	2,742	1,502	1,157	528	6,048
Not Stated	220	2,721	568	570	237	4,363
Total	2,977	40,246	10,059	10,089	5,617	69,222(3

- (1) Includes those who did not state their level of education.
- (2) Less than 100.
- (3) Includes those who gave no information on level of education or field of employment.

Table 3

Estimates of H.Q.M. employed and residing in Canda by field of principal employment and region of employment

Field of	ann to hand					
Principal Employment	Atlantic	Quebec	Ontario	Prairie	British Columbia	Total(1)
	vide revide		Numl	ber	ilder, publi	
Architecture	-(2)	561	983	297	281	2,199
Engineering	1,866	8,631	15,021	4,594	3,204	33,401
Phys. Science	463	2,011	4,429	1,576	670	9,167
Life Science	548	1,558	2,690	1,845	1,124	7,777
Social Science	307	1,125	3,083	1,010	621	6,156
Other Fields	397	1,068	3,207	737	632	6,047
Not Stated	289	1,091	1,932	756	394	4,465
Total	6,926	16,045	31,345	10,815	6,926	69,212

(1) Includes Yukon and N.W.T.

(2) Less than 100.

Note: The total of 69,212 reported in this table is slightly less than the total reported in Table 2 (69,222) due to the estimating procedure.

Table 4

Estimates of H.Q.M. employed and residing in Canada, Mean Annual Rate of Earnings in 1967, by field of principal employment and employment status

Field of Principal Employment	Employee		Self-Employed	
	No. Reporting	Mean Earnings	No. Reporting	Mean Earnings
ategration of or	erwitemal herl	\$	10 May 10 / 4	\$
Architecture	863	10,859	-(1)	v1) -
Engineering	28,908	12,148	2,285	17,249
Phys. Science	8,248	11,991	655	15,573
Life Science	6,306	10,714	515	12,918
Social Science	5,315	12,132	367	18,672
Other Fields	5,483	10,454	387	14,911
Not Stated	2,834	11,665	282	17,412
Total	57,957	11,765	4,537	16,411

(1) Less than 100.

- (4) Projection of Canada's Manpower Requirements to 1970
- 131. This project was originally undertaken in the Department of Labour shortly before the formation of the Department of Manpower and Immigration, in an effort to estimate some of the possible manpower implications of the projections of Canada's potential output to 1970, prepared by the Economic Council of Canada for its First Annual Review, published near the end of 1964. Another obvious purpose of the projections of manpower requirements was to assist the planning of manpower policies and programs by the Department responsible.
- 132. These projections were prepared through a co-operative effort by Professor Noah M. Meltz of Scarborough College, Toronto, working on contract and economists who were at first members of the Department of Labour, and later members of the Department of Manpower and Immigration.

 The work began in 1965 and a report was printed in 1968.
- 133. The data used in the study included the projections of potential output prepared by the Economic Council and labour force data from the Dominion Bureau of Statistics, including data both from the Census and from the Labour Force Survey. From this material projections were computed of
 - (i) the industry structure of manpower requirements in 1970;
 - (ii) the occupation structure of manpower requirements in 1970;
 - (iii) the required education structure of the labour force in 1970; and
 - (iv) the required education structure of entrants to the labour force between 1961 and 1970.
- 134. Such a projection must be a mathematical exercise based on a number of assumptions, and it is realistic only to the extent that the assumptions are realistic. These projections of manpower requirements, nevertheless, show approximately what the principal trends will be under the conditions assumed, and are consequently useful. Moreover, this has been a pioneer study, for which suitable new techniques were developed, and experience gained which will be useful in the future.

- (5) A Canadian Classification and Dictionary of Occupations
- 135. The very rapid development of the Canadian economy in the last two decades and the numerous occupational changes have accentuated a long-felt need for a single, multipurpose classification of occupations, based on a country-wide program of job analysis.
- Although each economy makes similar responses to technological change its occupational structure is modified largely in accordance with its own policies, developments and goals. It is essential to establish a system suited to national requirements. As a result, the concept of a standardized occupational code has come to be recognized as being essential for effective manpower planning, manpower operations, and career development.
- developed in Canada, the country in the past resorted to the use of a number of different systems. The Dominion Bureau of Statistics developed its classification, specifically for Census purposes, but the classes lacked definitions. The National Employment Service, in the absence of a code suited to its needs, adopted the United States Dictionary of Occupational Titles, and the Immigration Branch made use of the International Standard Classification of Occupations.
 - 138. The data compiled in one system could not be compared satisfactorily, for analytical purposes, with data compiled in the other two systems, nor could the data be used for planning or the integration of operational activities.
 - and lacks some that are; it does not meet the requirements of the Dominion Bureau of Statistics for Census purposes; it is not multipurpose in concept; it is specialized to a greater degree than is useful in Canada; and it is not available in the French language.

 Some of the D.O.T. definitions, prepared a number of years ago in the United States, are no longer valid in Canada today.

- 140. While the use of several classifications was a handicap at a time when the rate of change in the occupational structure was comparatively slow, the current pace accentuates the need for a standard classification, providing for uniformity of data on occupations as performed in Canada.
- 141. Therefore, the Department of Manpower and Immigration and the Dominion Bureau of Statistics are now jointly engaged in the development of the Canadian Classification and Dictionary of Occupations (CCDO).
- 142. The main purpose of the CCDO will be to provide for Canada a multipurpose instrument for use-in manpower research, the formulation of policies and support of programs, for statistical survey purposes, census taking, and for operational activities such as rehabilitation of the handicapped, selective immigration, and mobility of workers within the country. It will facilitate analysis of manpower economics, job market forces, and employment conditions; it will enable better counselling and placement services; it will provide essential data for the planning of educational and training programs; it will have many uses for personnel and manpower operations in business and industry.
- 143. The Canadian Classification and Dictionary will be based on the principle of "work performed", but to ensure clarity, account will be taken of supplementary factors such as materials, products, services, education and training, physical demands, tools, equipment, and working environment.
- 144. Group categories as well as the individual occupations will be defined in accordance with data based on job and occupational analysis and/or vertification, validation and consultation with experts in each field. All occupations will be classified according to the nature of their work regardless of the kind of establishment in which they are found.
- 145. There is an emphasis in the Classification on the transferability of skills from industry to industry and product to product an approach that is useful in a time of rapid occupational change.

- 146. For statistical purposes the Classification will have three levels with a total of about five hundred groups of occupations, but or operational purposes it will have specific occupational titles that will run into many thousands.
- 147. Each group of occupations will be homogeneous in nature, and within each unit or class the occupations will be grouped according to kinds of work performed and skills and abilities required; they will be arranged generally in descending order of complexity. This will permit the designation of a number of levels and kinds of skills. It will give not only the entry occupations but also the advancement possibilities to occupations that require greater degrees of skill and knowledge.
- 148. The problem of the social scientist is to find a classification that will enable him to ascertain the actual changes which have taken place in the structure of the labour force, so as to carry out analytical studies and to make projections and forecasts. It is highly desirable, therefore, in designing a new classification to ensure, as much as possible, the historical continuity of statistical data. Therefore, so far as is both practicable and advantageous, the CCDO will be convertible to the Canada Census 1961 so as to provide for historical continuity, and it will be related to the revised International Standard Classification of Occupations for purposes of international studies and reports; it will also be convertible to the U.S.E.S. Dictionary of Occupational Titles because of its usage in the past thirty years.
- 149. A standard multipurpose occupational classification should be designed to meet the various needs of statisticians, census takers, analysts and counsellors who usually work with the broader groupings as well as the needs of placement officers, employers, training officials and manpower planners who require the more precise and specific occupational titles.

- analysis will be recorded on magnetic tape. This will be used to facilitate the publication of the several volumes that are planned; and it will be made available for a wide variety of uses in research and analysis. If a computerized occupational information service is provided to subscribers across the country the data on this magnetic tape could provide a substantial input.
- 151. The CCDO is to be published in both English and French.
- 152. It is anticipated that when the whole of the present project is completed there will be a program of continuous revision to take into account subsequent or impending changes in the occupational structure.

DEPARTMENT OF MANPOWER AND IMMIGRATION

BRIEF TO SPECIAL SENATE COMMITTEE ON SCIENCE POLICY

APPENDIX A APPENDIX A

List of Books and Journal Articles Arising from Research Activities, 1966-1968

Table A(1): Regular Publications by the Department

Table A(2): Special Publications by the Department

Table A(3): Journal Articles

Table A(1): Regular Publications by the Department

Occupational Research

The Occupational Research Section of the Research Branch undertakes research to produce and revise four different publications:

<u>Canadian Occupations - Briefs</u>: Short outlines of factors affecting the choice of a career, such as the nature of work, personal qualities, and occupational outlook. They are used extensively in vocational counselling.

Canadian Occupations - Entry Requirements: Legalistic and regulatory data to acquaint prospective immigrants with Canadian employment conditions in a particular occupation.

Bibliography of Career Information Publications

Canadian Occupations Monographs: Considerably longer than Briefs, and indicate to the reader the relationships between various related occupations in a group.

Manpower Information and Analysis

University, College, and Technological Institute Guide: A statistical summary published annually in June. Contains tables on estimated starting salaries for university and technological institute graduates and on estimated graduations and enrolments by discipline and by university (graduate and undergraduate) or technical institute.

Canadian Institutes of Technology and Related Industries: Full-time post-secondary enrolment. A survey conducted annually on a co-operative basis with the Education Division of the Dominion Bureau of Statistics.

Operational Retrieval Newsletters: A series of specialized newsletters designed to relay labour market information to Canadian university students studying abroad.

<u>Directories of Canadian Recruiting Employers:</u> Published in connection with Operation Retrieval: contains profiles on 700 employers recruiting Canadian university students studying abroad.

Directory of Canadians Studying in the United Kingdom: Printed in 1966 and 1967, replaced in 1968 by "List of Canadians Studying Abroad".

Directory of Canadians Studying in the United States: Printed in 1966 and 1967, replaced in 1968 by "List of Canadians Studying Abroad".

List of Canadians Studying Abroad and Available for Employment in Canada: To inform Canadian employers of highly trained and professional talent that will be available for employment later in the year.

Career Outlook for University Graduates: Published annually, contains information on career opportunities available to students in various disciplines, expected starting salaries, course offerings and other developments in university education.

Career Outlook for Technological Institute Graduates: Published annually, contains information on career opportunities available to students in various disciplines, at institutes of technology and community colleges, expected starting salaries, course offerings and other developments.

Anticipated Requirements and Rates of Pay for University Graduates: Published annually: up-to-date estimates of anticipated starting salaries for university graduates from various fields of study.

Table A(1) (Continued)

Anticipated Requirements and Rates of Pay for Technological Institute Graduates: Published annually: up-to-date estimates of anticipated starting salaries for technological institute graduates from various fields of study.

Mid-Season Survey of Anticipated Requirements and Rates of Pay for University Graduates: Published annually in February, a supplement to the Fall survey.

Mid-Season Survey of Anticipated Requirements and Rates of Pay for Technological Institute Graduates: Published annually in March, a supplement to the Fall survey.

New University Graduates: Supply and Demand: An analysis of the supply and demand situation for new university graduates - deals principally with past and present supply of graduates by faculty, the demand for graduates and the starting salary rates paid to each discipline, published annually.

Rehabilitation Research

Rehabilitation in Canada: Periodical dealing with developments in Canada and the world in the field of rehabilitation of the handicapped and the older worker, two issues per annum.

Table A(2): Special Publications by the Department

Gross Movements of the Labour Force, by Mary Hutton and A.N. Polianski, published 1966.

National Needs in Educational Planning in Emerging Strategies and Structures for Educational Change, by K.V. Pankhurst, published by Ontario Institute for Studies in Education, 1966.

A Selected and Annotated Bibliography for Policy and Research: Labour Mobility, published 1967.

A Selected Bibliography for Policy and Research: Cost/Benefit Analysis, published 1967.

A Selected Bibliography for Policy and Research: Manpower and Education, published 1967.

Career Decisions of Canadian Youth, a Compilation of Basic Data, Volume 1, study conducted by R. Breton and J.C. McDonald, published 1967.

Manpower Implications of Prospective Technological Changes in the Eastern Canadian Pulpwood Logging Industry, by D.R. Campbell, E.B. Power and published 1966.

The Geographic Mobility of the 1955 Class of Graduates from Canadian Universities in Science and Engineering, by D. Dyck, published 1967.

Manpower in Canada, 1931-1961, by N.M. Meltz, published 1968.

Canada's Manpower Requirements to 1970, by N.M. Meltz and G.P. Penz, published 1968.

The Counsellor and Canada's Manpower Markets, by K.V. Pankhurst, published 1968.

Study of Labour Market Information Systems: Final Report, by N.M. Meltz, published 1968.

Table A(3): Journal Articles

Migration Between Canada and the United States, by K.V. Pankhurst, Annals of the American Academy of Political and Social Sciences, Philadelphia, Volume 367, September 1966.

Manpower Requirements in the Construction Industry, by F.D. Upex, Journal of the Canadian Construction Association, 1967.

Manpower Mobility Program - A Pilot Project in the Method of Evaluation of Government Programs, by A.N. Polianski. Paper delivered at 25th interstate conference on Labour Statistics, June 1967.

DEPARTMENT OF MANPOWER AND IMMIGRATION BRIEF TO SPECIAL SENATE COMMITTEE
ON SCIENCE POLICY

APPENDIX B

List of Reports Issued from Department of Manpower and Immigration 1966-1968

Table B(1): Periodic Reports

Table B(2): Special Reports

Table B(3): Reports Resulting from Research Grants

Table B(1): Periodic Reports

National Manpower	Review	Bi-monthly
Regional Manpower	Review	Bi-monthly
Canada Manpower Bu	lletin	Monthly
The Labour Force: and Unemployment (Monthly
with Dominion Bure	au of	
20001201100		

Table B(2): Special Reports

	Year of Publication
Production Functions for Canadian Manufacturing Industries, 1947-1961, by Y. Kotowitz	1966
A Method for Determining the Nature of a Skill Bottleneck: A Pilot Study, by D.A. Dodge	1966
Manpower Mobility Program: Six Months' Statistical Report, December 1965- June 1966	1966
Three Reports on French Immigration to Canada:	1967
(1) Image of Canada in France, by Institut Français d'Opinion Publique (2) Attitude of French-Canadians regarding Immigration, by Institut Français d'Opinion Publique (3) French Immigrants in Greater Montreal, by Prof. J. Brazeau, Université de Montréal	
Operation Retrieval: Evaluation	1967
Economic and Employment Outlook for 1968	1967
Characteristics of Unplaced Applicants and Trainees in Program 5:	
Volume II	
Barriers to Mobility, by Prof. Jane A. Abramson, University of Saskatchewan	1968
Efficiency in the Allocation and Utilization of Manpower, by M. Galatin	1968
Utilization of Caribbean Seasonal Labour	1968
Problems and Prospects of Increased Japanese Emigration to Canada: A Case Study of the Attitudes of a Selected Sample of Japanese Canadians to Immigration to Canada	1968

Table B(3): Reports Resulting from Research Grants

		Year of Receipt of Report
		Canada
(a)	Manpower and Immigration	
	Research Grants	
	A Study of the Migrant Population of a Specific Community in Toronto, by W.A. Head, Social Planning Council of Metropolitan Toronto	
	Immigration to Canada from the British Isles, 1946-64: an	1968
	Econometric Analysis, by W.R. Needham, University of Waterloo	
	The Economic Adjustment of North	1969
	African Jewish Immigrants in	ri norranno
	Montreal, by Mrs. Naomi Moldofsky, McGill University	
	The Industrial Structure of	1968
	Employment in Canada, by R.M. McInnis, Queen's University	A. Dodge
(b)	Manpower Training Research Grants	
	Manpower Training Requirements for Nova Scotia, 1970 and 1975	1966
	Manpower Resources and Skill	1966
	Requirements in the Construction	o shart (T
	Vocational Plans of Alberta's Youth	1966
	British Columbia Manpower:	7066
	Current Status and Needs of the Future	MINISTRATION.
	Present State of Manpower and	1967
	Future Training Needs in Farming	1)01
	and Farm-Related Industries of	
	the Atlantic Region managed because and an and	
	An Estimate of Manpower Coefficients, by Industry, in Nova Scotia, with Special Reference to Manufacturing	1967
	Survey of Training in Industry and Business (Québec)	1967
	Operation Départ (Québec)	1968
	Ser anitaballa adi a	

DEPARTMENT OF MANPOWER AND IMMIGRATION

BRIEF TO SPECIAL SENATE COMMITTEE
ON SCIENCE POLICY

APPENDIX C

List of Projects Conducted 1966-1968

Table C(1): Intramural Research Projects

Table C(2): Extramural Research Projects

Done on Contract

Table C(3): Research Grants by Department
of Manpower and Immigration

Table C(1): Intramural Research Projects

Project	Year Stated	Year Completed
By Planning and Evaluation Branch:		
Development of a new program of occupational training, embodied in the Adult Occupational Training Act, 1967 (described in section 9(b) of the brief)	1966	1967
Review of the Manpower Mobility Program, and drafting of the new regulations which came into effect in 1967	1966	1967
Position paper on the Seasonal Stabilization Program in preparation for 1967 federal-provincial meeting	1966	1967
Evaluation of Operation Retrieval through a survey of Canadian students in the United States	1966	1967
Planning and organization of the annual Program Review of the Department	1967	Continuing
Participation in Immigration Task Force to draft new regulations and procedures for selection of immigrants	1967	1967
Study of qualifications for employment of persons laid off from automobile and parts plants in Oshawa, from information in the files of CMC's	1967	1967
Participation in review of the Vocational Rehabilitation Agreements with the provinces	1967	1967
Position paper on the definition of under-employment	1967	1967
Report comparing the manpower programs of Canada and six other leading industrial countries	1967	1968
Analysis of the emergency functions of the Minister of Manpower and Immigration, as part of an interdepartmental analysis in depth of the total Canada Civil Emergency Measures Program	1968	1968
Construction of a cost/benefit model of CMC referral activity	1968	In progress
Cost/benefit evaluation of the Occupational Training of Adults Program by further adaptation of the cost/benefit model developed by Operations Research Institute	1968	In progress
Cost/benefit analysis of the Manpower Mobility Program	1968	In progress
Paper on the expected tenure of workers in Canadian industries (as part of background for analysis of the Mobility Program)	1968	1968

Table C(1) (Continued)

Project Project	Year Stated	Year Completed
By Research Branch (Manpower Requirements Section):		
Paper published on "Migration between Canada and the United States"	1966	1966
Projection of manpower requirements in the construction industry	1966	1967
Monograph on Canada's labour markets prepared for use in a training course for manpower counsellors	1967	1968
Preparation for publication of historical statistics on the Canadian labour force, 1931 to 1961	1967	1968
Crash project - projections of supply and demand for manpower, by occupation and region		In progress
Report on supply and requirements, past and future, of engineers and scientists in Canada, based on revision of a doctoral thesis by A.D. Boyd	1968	progress
By Research Branch (Manpower Supply Section):		
Study of the geographic mobility of the 1955 class of graduates from Canadian universities in science and engineering	1965	
Pilot cost/benefit analysis of the (pre-1967) Manpower Mobility Program	1966	
Participation in development of a Basic Manpower Data Form for collecting information on rural people receiving ARDA, mobility, or training assistance	1966	
Developmental work and evaluation studies on pilot Indian relocation projects	1967	Continuing
Evaluation of seasonal movement to Canada of Caribbean agricultural workers (in co-operation with Planning and Evaluation Branch)	1967	Continuing
Study of gross movements of manpower into and out of the labour force, etc.	1967	In progress
Bibliographies prepared on labour mobility and on cost/benefit analysis	1967	1967
Study of development of data on persons with marginal attachment to the labour force	1967	In progress
Analysis prepared of the vocationally disadvantaged in a technological society	1967	1967

Table C(1) (Continued)

Project	Year Stated	Year Completed
Position paper on information the Department would like from the Supplementary Labour Force Survey	1967	1967
Study of hired labour in agriculture	1968	In progress
Service sector of the economy - study of the feasibility of a comprehensive study	1968	In progress
By Research Branch (Immigration and Foreign Manpower Section):		
Evaluation of the new selection criteria for immigrants (both before and after the criteria were put into use)		In progress
	1967	
Preparation of a set of statistical data on post-war immigration	1967	1967
Study of immigrant family expenditures, based on DBS data and supplementary analysis	1967	In progress
Analysis of the socio-economic adjustment of immigrants, from data on the 1961 applicants for citizenship		
Report on immigration to Quebec, based on review of a study (made on contract) of French immigrants in Greater Montreal, and other extensive material		
Pilot study of the recognition given in Canada to trade and professional qualifications obtained in foreign countries	1968	progress
Study of characteristics of immigrants receiving adjustment support	1968	In progress
Study of Canadians resident in the United States, from U.S. 1960 Census data	1968	In progress
Development of a Canadian Classification and Dictionary of Occupations (described in section 9(b) of the brief)	1966	In progress
By Research Branch (Economic Conditions Section):		
Report on the economic and employment outlook for 1968 (updated by later reports)	1967	1968

Table C(1) (Continued)

Project	Year Stated	Year Completed
By Research Branch (Technology and Productivity Section):		
Study of manpower implications of prospective technological changes in the Eastern Canadian pulpwood logging industry		
By Research Branch (General):		
	1966	
Preparation of a statement of the needs of the Department for information from the 1971 Census By Manpower Information and Analysis Branch:	1967	1967
Production of area profiles of CMC areas, by branch staff at national and regional headquarters	1967	In progress
Revision and definition of boundaries of CMC areas	1967	1968
Occupational shortages survey, based on information sent in by the CMC's about local manpower shortages by occupation	1967	Continuing monthly
Survey of professional and scientific manpower, Canada, 1967 (described in section 9(b) of the brief)	1967	1968
Survey of graduating classes of Canadian universities, to expand the professional manpower data bank	1968	Annual
Employment forecast survey: quarterly narrative report based on interviews with leading employers By Pilot Projects Branch:	1966	Annual
Studies of occupational training for persons in economically stagnant areas through pilot training projects (see the note which follows)	1966	1968

Addendum to Table C(1)

Work of the Pilot Projects Branch

The Pilot Projects Branch formed part of the Program Development Service of the Department of Manpower and Immigration from the time of the formation of the Department until late in 1968, when the Pilot Projects Branch was transferred to the Department of Forestry and Rural Development.

The function of this Branch was to develop and administer the Canada NewStart Program. The purpose of this program was to conduct experimental training projects ("pilot projects") to motivate and qualify disadvantaged persons in economically stagnant areas ("pilot project areas") for stable employment.

The pilot projects were organized under agreements between the federal and provincial governments. In each province signing an agreement, a corporation was formed to plan, organize, conduct, and evaluate suitable pilot projects. Each corporation was set up jointly by the federal and provincial governments, but financed by the federal government.

The Pilot Projects Branch maintained a Technical Support Centre to conduct studies in support of the NewStart Program. Extramural consultants were also employed on contract.

Table C(2): Extramural Research Projects Done on Contract

Research By	Year Contract Signed	Year Report Completed	Subject of Study
Contracts Arranged by			
Planning and Evaluation Branch:		1968	
Operations Research Inc.	1966	1967 ^(a)	Cost/benefit study of program of Occupational Training for Adults
Canadian Centre of Community Studies: Subcontracted to Prof. Abramson, University of Saskatchewan	1966 (c)	1968	Barriers to manpower mobility, in four economically lagging areas in Quebec and Atlantic provinces
Prof. Graeme McKechnie, York University	1967	(b)	Preliminary cost/benefit study of the Vocational Rehabilitation Program
Peat, Marwick and Co.	1968	(b)	Follow-up study of persons assisted under the Manpower Mobility Program: tabulations of results of survey
EDP Associates	1968	(b)	Preparation of a computer program to manipulate data on clients of the Manpower Mobility Program in 1967-68
Prof. C. Pentland, University of Manitoba;) Prof. Tim Ryan, Lakehead University;	1968	(b)	Evaluation of manpower adjustment programs arranged by the Manpower Consultative Service at North Sydney, Selkirk, and a Quebec location
Prof. JM. Tremblay,	ertung o		

Footnotes at end of table.

University of Montreal)

Table C(2) (Continued)

Research By	Year Contract Signed	Year Report Completed	Subject of Study
Contracts Arranged by Research Branch:			
Prof. Raymond Breton, Johns Hopkins University;) Prof. J.C. McDonald, Trent University)	1965 (d)	(b) (P)	Career decisions of Canadian youth: a sample survey of the educational and occupational choices of Canadian secondary school students
Prof. Noah Meltz, University of Toronto; with G.P. Penz, Department of Manpower and Immigration	1965	1968	Canada manpower requirements in 1970, projected by industry, by occupation, and by level of education required
Dr. J.K. Sharma	1966	1968 ^(a)	Civilian labour force projection by educational level in Canada, 1970
Prof. Jacques Brazeau, University of Montreal	1966	1968	Exploratory survey of French immigrants in Greater Montreal
Computing Services Company	1966	1968	Tabulation of 1964-65 income tax data by province for use in studies of mobility
Prof. David Dodge, Princeton University	1967	1968	Study of returns to investment in education
Prof. P. Belanger, Carleton University	1967	1968	Problems and prospects of increased Japanese immigration to Canada: a case study of the attitudes of a selected sample of Japanese-Canadians to immigration to Canada
Prof. S.T. Nielsen, Simon Fraser University	1969.	(p) 120 120 120 120 120 120 120 120 120 120	A model of the impact of immigration on the economy

Table C(2) (Continued)

Research By	Year Contract Signed	Year Report Completed	Subject of Study
Contracts Arranged by Manpower Information and Analysis Branch:			
Prof. Noah Meltz, University of Toronto	1967	1968	Study of labour market information systems within the Department of Manpower and Immigration
Dominion Bureau of Statistics	1967	(e)	Development and administration of quarterly Job Vacancy Survey

⁽a) Internal report for use in the Department of Manpower and Immigration.

⁽b) Report not yet completed.

⁽c) Joint contract shared by the Department, ARDA, and ADA.

⁽d) Funds allocated through Manpower Information and Analysis Branch.

⁽e) No final report intended: purpose is to develop the Survey.

Table C(3): Research Grants by Department of Manpower and Immigration, to December 31, 1968

(a) Manpower and Immigration Research Grants

Researcher and Institution	T.B. Approval Date	Title of Study	Amount \$
W.A. Head Social Planning Council of Metropolitan Toronto	June 1/67	A Study of the Migrant Population of a Specific Community in Toronto	9,924
W.R. Needham University of Waterloo	June 1/67	Immigration to Canada from the British Isles: 1946-64; An Econometric Analysis	2,670
A.G. Green Queen's University	June 1/67	An Economic Study of Canadian Emigration to the United States: 1951-61	4,500
(Mrs.) Naomi Moldofsky McGill University	June 1/67	The Economic Adjustment of North African Jewish Immigrants in Montreal	1,250
(Miss) A.E. Annopoulos McGill University	June 1/67	The Greek Immigrant in Montreal: A Study of Network Analysis	3,000
John A. Sawyer University of Toronto	June 1/67	Research on the Labour Market Within an Econometric Model of the Canadian Economy	11,000
P.E. Coulter Lakehead University	June 1/67	The Evaluation of Equivalent Standing in Canadian Adult Education	2,980
P.M. Rowe University of Waterloo	June 1/67	Decision Process in the Assessment - Interview	2,300
R. Marvin McInnis Queen's University	Feb. 2/68	The Industrial Structure of Employment in Canada	9,100

Table C(3) (a) Manpower and Immigration Research Grants (Continued)

Researcher and Institution	T.B. Approval Date	Title of Study	Amount \$
W. Donald Wood Queen's University	March 28/68	Preparation of an Annotated Bibliography on Cost/Benefit Analysis	4,000
Peter Y. Comay Princeton University	April 3/68	The Migration of Professional Manpower Between Canada and the United States	8,300
John A. Sawyer University of Toronto	June 5/68	Research on the Labour Market Within an Econometric Model of the Canadian Economy (Final Phase)	8,750
Gerald Halpern Collegiate Institute Board of Ottawa	Oct. 24/68	Computer-Based Counselling: A Feasibility Study	5,800
John G. Crispo University of Toronto	Oct. 24/68	An Examination of the Allocative Mechanism of the Toronto Labour Market	12,967
Richard Béland University of Sherbroo	Oct. 24/68	Forecast of Manpower Requirements by Occupational Groups in Canada	4,850

Table C(3) (b) Vocational	Rehabilitation	Research	Grants
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	T.B.		
Researcher and _Institution	Approval	Title of Study	Amount \$
E.J. Signori University of British Columbia	June 1/67	Attitude Toward the Hiring of Socially Disadvantaged Persons	4,100
H.I. Day Ontario Institute for Studies in Education	March 28/68	An Examination of Intrinsic Motivation in Unemployed Male Adults	20,000
W.J. Lockert Canadian Hearing Society of Quebec	May 16/68	The Employment and Utilization of Graduates of Schools for the Deaf in Metropolitan Montreal	27,225
Milton Friedman Jewish Vocational Service of Metropolitan Toronto	June 12/68	Operant Conditioning Techniques Applied to a Rehabilitation Work-Shop to Improve Motivation and Work Habits: A Feas- ibility Study	28,710
David Gibson University of Calgary	June 19/68	Actuarial Forecast of Vocational Habilitation of Mentally Retarded Youth	4,950

Table C(3) (c) Manpower Training Research Grants

Province	Title of Study	Federal Contribution	Approval Date
NOVA SCOTIA	Manpower Training Requirements for Nova Scotia, 1970 and 1975	5,326	July 26/65
NOVA SCOTIA	Manpower Resources and Skilled Requirements in the Construction Industry in Nova Scotia	2,635	Nov. 26/65
	Chemiston paper, Restricted, Vermalianal and		
QUEBEC	The Students' Plans for the Future	2,120	Dec. 22/65
ONTARIO	Effectiveness of Vocational and Technical) Training Programs as Preparation for Employment in Ontario;	81,200	Feb. 1/66
	Success in Employment as Related to) School Programs, Guidance Services and)		
	Job Experience in Ontario;		
	Vocational Guidance in Ontario Schools:) Its Status, Effectiveness and Future)		
	Process State of Nary sact Ball Balter		
ALBERTA	Vocational Plans of Alberta's Youth	3,425	July 26/65
BRITISH COLUMBIA	B.C. Manpower - Current Status and Needs of the Future	4,000	July 26/65

Table C(3) (c) Manpower Training Research Grants (Continued)

Province	Title of Study	Federal Contribution \$	Approval Date
NOVA SCOTIA	Present State of Manpower and Future Training Needs in Farming and Farm Related Industries of the Atlantic Region	16,000	Nov. 9/66
NOVA SCOTIA	An Estimate of Manpower Coefficients, by Industry, in Nova Scotia, with Special Reference to Manufacturing	7,250	Nov. 9/66
NEW BRUNSWICK	An Investigation of Certain Parameters of Manpower Development in New Brunswick	21,750	Mar. 31/67
QUEBEC	Survey of Training in Industry and Business	8,000	Apr. 4/66
QUEBEC	Operation Depart	250,000	Mar. 31/67
ONTARIO	A Study of Factors in Workers' Decision to Forego Retraining	15,000	Sept. 27/66
ONTARIO	The Counselling of Small Groups in) South Western Ontario Secondary Schools;	288,800	Nov. 25/66
	The Measurement and Prediction of Success in Vocational and Technical Training Programs using Non-Verbal Material;		

Table C(3) (c) Manpower Training Research Grants (Continued)

Province	Title of Study	Contribution \$	Approval Date
ONTARIO (Continued)	Proposal for a Computer-Based Training) Laboratory for the Improvement of Skills) Training among Technical, Vocational and other Students;) Proposal to Adopt Computer Technology)		last grant
	to the Actual Construction of Time-Tables) for Vocational and Composite Schools, Technical Institutes and Colleges of Applied Arts and Technology in Ontario		
ONTARIO	Human Resource Planning in Europe; Technology, Education and Employment II Population Study - (Ontario)	60,225	Dec. 20/66
ONTARIO	Technology, Education and Employment I -) A Study of Interactions;	12,652	Feb. 3/67
	A Study of Adult Education Drop-outs		

Table C(3) (c) Manpower Training Research Grants (Continued)

Province	Title of Study	Federal Contribution \$	Approval Date
NOVA SCOTIA	Management Education Survey and Plan for Nova Scotia	10,750	June 12/68
NOVA SCOTIA	Nova Scotia's Manpower Requirements and Supply 1975 and 1980	5,722	Nov. 8/68
QUEBEC	Operation Sesame	262,500	Dec. 5/68



First Session—Twenty-eighth Parliament
1968-69

THE SENATE OF CANADA

PROCEEDINGS

OF THE

SPECIAL COMMITTEE

ON

SCIENCE POLICY

The Honourable MAURICE LAMONTAGNE, P.C., Chairman
The Honourable DONALD CAMERON, Vice-Chairman

No. 29

WEDNESDAY, FEBRUARY 12th, 1969

WITNESSES:

Public Service Commission: John J. Carson, Chairman; and Dr. Donald H. Laughland, Director, Bio-Physical Sciences Program.

APPENDIX:

30.—Brief submitted by the Public Service Commission.

MEMBERS OF THE SPECIAL COMMITTEE ON SCIENCE POLICY

The Honourable Maurice Lamontagne, *Chairman*The Honourable Donald Cameron, *Vice-Chairman*

The Honourable Senators:

Aird Grosart Nichol Belisle O'Leary (Carleton) Haig Blois Hays Phillips (Prince) Bourget Kinnear Robichaud Cameron Lamontagne Sullivan Carter Lang Thompson Desruisseaux Leonard Yuzyk Giguère McGrand

Patrick J. Savoie,

Clerk of the Committee.

WEDNESDAY FEBRUARY 12th, 1969

ervice Commission: John J. Carson, Chairman; and J

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ORDERS OF REFERENCE

Extract from the Minutes of the Proceedings of the Senate, Tuesday September 17th, 1968:

"The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That a Special Committee of the Senate be appointed to consider and report on the science policy of the Federal Government with the object of appraising its priorities, its budget and its efficiency in the light of the experience of other industrialized countries and of the requirements of the new scientific age and, without restricting the generality of the foregoing, to inquire into and report upon the following:

- (a) recent trends in research and development expenditures in Canada as compared with those in other industrialized countries;
- (b) research and development activities carried out by the Federal Government in the fields of physical, life and human sciences;
 - (c) federal assistance to research and development activities carried out by individuals, universities, industry and other groups in the three scientific fields mentioned above; and
 - (d) the broad principles, the long-term financial requirements and the structural organization of a dynamic and efficient science policy for Canada.

That the Committee have power to engage the services of such counsel, staff and technical advisers as may be necessary for the purpose of the inquiry;

That the Committee have power to send for persons, papers and records, to examine witnesses, to report from time to time, to print such papers and evidence from day to day as may be ordered by the Committee, to sit during sittings and adjournments of the Senate, and to adjourn from place to place;

That the papers and evidence received and taken on the subject in the preceding session be referred to the Committee; and

That the Committee be composed of the Honourable Senators Aird, Argue, Bélisle, Bourget, Cameron, Desruisseaux, Grosart, Hays, Kinnear, Lamontagne, Lang, Leonard, MacKenzie, O'Leary (Carleton), Phillips (Prince), Sullivan, Thompson and Yuzyk.

After debate, and—
The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Thursday, September 19th, 1968:

"With leave of the Senate,

The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That the name of the Honourable Senator Robichaud be substituted for that of the Honourable Senator Argue on the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Wednesday, February 5th, 1969:

With leave of the Senate,

The Honourable Senator McDonald moved, seconded by the Honourable Senator Macdonald (Cape Breton):

That the names of the Honourable Senators Blois, Carter, Giguère, Haig, McGrand and Nichol be added to the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—

Resolved in the affirmative.

ROBERT FORTIER,

Clerk of the Senate.

MINUTES OF PROCEEDINGS

Wednesday, February 12th, 1969

Pursuant to adjournment and notice the Special Committee on Science Policy met this day at 3.30 p.m.

Present: The Honourable Senators Lamontagne (*Chairman*), Blois, Cameron, Carter, Haig, Kinnear, Robichaud and Thompson—8.

In attendance:

Philip J. Pocock, Director of Research (Physical Science).

The following witnesses were heard:

PUBLIC SERVICE COMMISSION:

John J. Carson, Chairman; and Dr. Donald H. Laughland, Director, Bio-Physical Sciences Program.

In attendance:

Edouard A. Robillard, member of the Bio-Physical Sciences Program.

(A curriculum vitae of each witness follows these Minutes.)

The following is printed as Appendix No. 30:

-Brief submitted by the Public Service Commission

At 5.30 p.m. the Committee adjourned to the call of the Chairman.

ATTEST

Patrick J. Savoie,

Clerk of the Committee.

Extract from the Minutes of the Proceedings of the Senate, Thursday, September 19th, 1968:

MINUTES OF PROCEEDINGS

"With leave of the Senate."

Control Beneficient, F.C., moved, seconded by the Honourable Senator Beneficient, F.C.

Pursuant to adjournment and notice the Special Committee on Science Policy met this day at a 30.P misses crotaned to the do over some some oderwood out Present: The Honourable Senators Lamontagne (Chambian) Bloik Canadon Cader.

Haig, Kinnear, Robichaud and Thompson—8.

In attendance:

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Philip J. Pocock, Director of Research (Physical Science).

At Science Vebrands of the Spinessory of the Spinessory of the Policy Westernesses were heard.

PUBLIC SERVICE COMMISSION:

The House Shairmantendose, bovom blancol votered sidescond and Dr. Donald H. Laughland, Director, Bio-Physical Sciences Programment blanchoand

That the names of the Honotustic Senators Blois, Carter Capacity Big Hair Big Hair Carter Capacity Cap

The following is printed as Appendix, No., 36 norm and no suggests nothing additionally submitted by the Public Service Commission switzerrafts and ni bevious At 5.30 p.m. the Committee adjourned to the call of the Chairman.

KOBERT FORTSETTA

Patrick J. Savole, Clerk of the Committee.

CURRICULUM VITAE

CARSON, JOHN J., B.A., M.A. Mr. Carson was born in 1919 in Vancouver and studied at the University of British Columbia and the University of Toronto. During World War II he was with the Directorate of Personnel Selection at National Defence Headquarters as a staff captain. After the war, he became senior personnel consultant with J.D. Woods and Gordon, and in 1952, he joined the Ontario Hydro as director of Employee Relations. He joined the B.C. Electric as director of Industrial Relations in 1956 and subsequently became vice-president and assistant to the president. In 1961 he was loaned to the Glassco Commission by the B.C. Electric Co. and in 1964 became a special adviser on personnel to the federal Treasury Board. This relationship with the federal government was culminated when he was appointed chairman of the Civil Service Commission (now the Public Service Commission), September 1, 1965. In 1966, he was appointed a member of the United Nations' International Civil Service Advisory Board. This year he took on the National Presidency of the Canadian Y.M.C.A. Mr. Carson is married and has six children.

LAUGHLAND, DONALD H., B.S.A., M.A., Ph.D., F.C.I.C. Dr. Laughland was born in 1917 in Collingwood, Ontario and is a graduate of the Ontario Agricultural College and the University of Toronto. He served in the Royal Canadian Navy from 1942-1945. He joined the Science Service of the Department of Agriculture in 1945 as a research scientist in the biochemistry and nutrition division. In 1959 he was appointed Director of Administration for the Research Branch of the Department of Agriculture. In 1966 he became Director, Bio-Physical Sciences Program in the Public Service Commission. Fellow, Chemical Institute of Canada; member, Canadian Biochemical Society, Canadian Physiological Society, Nutrition Society of Canada, Agricultural Institute of Canada, Public Personnel Association. Approximately 25 papers in scientific journals in the field of fat-soluble vitamins. Dr. Laughland is married and has four children.

CURRECULUM VIEWE

CARSON, 10HN J., B.A., M.A. Mr. Carson was born in 1919 in Vancouver and studied at the University of Foresto. Desire World War II has used with the Directorate of Fersonnel Solection at National Defence Hendquanters as a stuff captain. After the war, he became senior personnel consultant with J.D. Woods and Gordon, and in 1952, he joined the Gutario Rividro as directors of Employee Relations. He joined the Gutario Industrial Relations in 1955 and subsequently became vice-president and assistant to the president. In 1951 he was louned to the Glasseo Commission by the B.C. Bioetric Co. and in 1954 became a special advisor on personnel to the federal Treasury Board. This relationship with the federal government the Eublic Service Commission (now the Public Service Commission), September 1, 1955, In 1956, he was appointed a member of the United National Presidency of the Canadian Y.M.C.A. Mr. Carson is married and has also children.

LAUCHLAND, DONALD H., B.S.A., M.A., Ph.D., F.C.I.C., Dr., Loughland was born in 1917 in College and 1917 in College and Is a graduate of the Ontario Agricultural College and the University of Toronto. He served in the Royal Creadian Plays from 1942-1945. He colemiat in the Science Service of the Department of Agriculture in 1945 as a research sciential in the biochemistry and nutrition division. In 1959 he was appointed Director of Administration for the Research Branch of the Department of Agriculture. In 1966 he became Director, Bio-Physical Sciences Program in the Public Service Commission, Fellow, Chemical Institute of Canada; member, Canadan Biochemical Society, Canadan Physiological Society, Nutrition Society of Canada, Agricultural Institute of Conada, Physiological Association. Approximately 25 papers in scientific journels in the field of fit-soluble vitumms. Dr. Laughland is married and has four children.

THE SENATE

SPECIAL COMMITTEE ON SCIENCE POLICY

EVIDENCE

Wednesday, February 12, 1969.

The Special Committee of the Senate on Science Policy met this day at 3.30 p.m.

Senator Maurice Lamontagne (Chairman) in the Chair.

The Chairman: We have the pleasure this afternoon of having with us the Chairman of the Public Service Commission, Mr. John J. Carson, and two of his colleagues, Dr. Donald H. Laughland, Director of the Bio-Physical Sciences Program, and Mr. Edouard A. Robillard who is a member of the Bio-Physical Sciences Program of this commission.

I understand that Mr. Carson does not intend to make any opening statement in support of what is contained in the brief. Therefore, we are now in a position to proceed immediately to the question and discussion period. Senator Haig.

Senator Haig: Thank you, Mr. Chairman. Dealing with the brief presented by the commission, in paragraph 1 you say there should be co-ordination with respect to the recruitment. How is that being done at the present time?

Mr. John J. Carson, Chairman, Public Service Commission: There is no real co-ordination, except of a very informal nature between the exempt agencies and the Public Service Commission. So far as all of the departments and ministries are concerned, the commission does provide very complete co-ordination.

Senator Haig: In respect to positions?

Mr. Carson: No, in respect to recruitment. The co-ordination of whether this department has enough positions or insufficient positions is a Treasury Board responsibility.

Senator Haig: In connection with paragraph 2 you say the inventories and staff techniques should be standardized. How is that being done?

Mr. Carson: There is a pretty complete inventory developing within the departments of Government,

done by the Public Service Commission, both inventories and development of staff appraisal techniques, but there is no consistency between what we are doing for the departments of Government and the independent agencies are doing on their own.

Senator Haig: In other words, there is duplication.

Mr. Carson: There is an exchange of information. Yes, there could be some duplication.

Senator Haig: You mention on page 1 the various changes that have occurred in the act, and you say that these legislative changes have had a more profound impact on personnel management in the Public Service than any other change since the Civil Service ACt of 1918. How does this apply?

Mr. Carson: The 1918 act which provided the basis for the merit system in the Public Service of Canada remained virtually untouched until 1967. In 1967 there was a massive realignment of authority and responsibility, the introduction of collective bargaining, the recognition that an independent agency like the commission could delegate out to departments a lot of its historic responsibilities which the previous act prevented us from delegating. It was just a total new philosophy of management flowing, of course, from the Glassco Commission's recommendations.

Senator Haig: In other words, your commission does all the hiring and firing.

Mr. Carson: All the hiring.

Senator Haig: Who does the firing?

Mr. Carson: The departments, sir, are responsible for releasing employees for incompetence and for misbehaviour. In the case of incompetence, the employee can appeal to the commission a decision against release for incompetence. We will hear that appeal and judge whether he really has lost merit or whether he fooled us in the first place and never had merit. In the case of employees being released because of misbehaviour or for disciplinary reasons,

those are handled through grievance procedures and go through the Treasury Board.

Senator Haig: How many members are there in your commission?

Mr. Carson: Engaged in staffing? About 600.

The Chairman: Those are not members of the commission. You have only three members.

Mr. Carson: I misunderstood the question. Yes, we have three members on the commission.

Senator Haig: I thought a 600-member commission was a trifle large.

Mr. Carson: The staff do all the work, senator.

Senator Haig: Mr. Carson, what criterion in your methods do you use in evaluation of a scientist or a personnel man? Do you use personal interviews, university marks, questionnaires, reports from personnel and others in the field?

Mr. Carson: We use all of these things. I will let Dr. Laughland speak specifically respecting the scientists. If you then want me to elaborate on the executive category or administrative personnel, I will.

Senator Haig: Let us deal with scientists first.

Dr. Donald H. Laughland, Director, Biophysical Sciences Program, Public Service Commission: In answer to your question, senator, there are two aspects to this. One is the assessment of scientists coming into the service prior to joining the service and then the assessment or appraisal of them after they are in. I gather you are interested in both aspects. From the standpoint of people entering the service, the assessment is done largely through the personal interview. We conduct very extensive recruiting campaigns, both in Canada and in the United States, and for the past two years we have done so overseas as well. Teams which consist of a commission officer and two or three experts, scientists from departments directly concerned in the area, will visit universities and interview students. I am speaking here chiefly of those in scientific positions at the Ph.D. level. Similar teams also interview students at the Bachelor level.

Assessment is based, therefore, on personal interview, on recommendations from professors, on the academic standing of the student and on any information we can get. On the basis of this a decision is made.

With respect to scientists in the Public Service, their appraisal is conducted in the first instance by

departments. There is a class called the Research Scientist Class which has a special connotation in that only people whose advancement is based primarily on research accomplishment are included. They are appraised annually by departmental committees, and the recommendations of departments come to the Interdepartmental Appraisal Committee consisting of a senior scientist from each of the major scientific departments, a representative of Treasury Board and a representative of the Public Service Commission. The Chairman at the present time of the Interdepartmental Appraisal Committee is Mr. A. M. Pennie of the Defence Research Board.

The Interdepartmental Appraisal Committee then accepts or modifies the departmental recommendation with respect to salaries for scientists. I should also mention that in this class, advancement is strictly on the basis of merit. In the Research Scientist class there are no annual increments; the salary is related to the research accomplishment of each individual on the basis of an annual merit appraisal.

Senator Haig: Then the interdepartmental committee will recommend that an increase should be granted and this will go through to Treasury who will be asked to authorize the increment, or can the interdepartmental committee itself authorize the increment?

Dr. Laughland: The Interdepartmental Appraisal Committee has no executive authority. Its recommendations go to Treasury Board.

The Chairman: Would this procedure extend to all so-called professional and scientific manpower within the authority of the commission? For instance, what about social scientists?

Dr. Laughland: At the present time this applies only to scientists in the biological and physical sciences. It does not apply to engineers or to social scientists.

The Chairman: Why?

Dr. Laughland: The plan was established to apply to these people because of interest in this area. I know of no reason why it could not extend to others. But it was developed in the context of the biological and physical sciences because this group covers most of the people in the departments of government who are working in the pure sciences.

The Chairman: We have received again this morning complaints from various research agencies within departments, especially those who are working in the fields of the social sciences. People and directors of branches are complaining that they could not get the researchers they wanted at a cer-

tain prior level because they couldn't offer them a high enough salary unless they would more or less abandon research to become administrators. This complaint has been presented to us again this morning by the people in the Department of Manpower and Immigration, for instance.

Senator Haig: Then in Appendix "B" you state . . .

Senator Thompson: Continuing on Senator Haig's first question . . .

The Chairman: You can go on after Senator Thompson, Senator Haig.

Senator Thompson: Concerning the interviewing of graduate students, my question is, is there a science of selecting scientists and professional people? I say this because you see a number of independent organizations which are very successful in this for business, and they suggest that it requires certain sensitivities and knowledge and not just the fact that a fellow got good marks and has a recommendation from his professor, and so on. You have to be able to make an assessment of temperament and motivation which you cannot make on paper. Is there a science of selecting young scientists and professional people?

Dr. Laughland: In answer to your question, we have had a survey done by the Selection Procedures and Testing Division in the Commission, a literature review essentially, and on this subject the literature is voluminous. There have been something in the order of 5,000 papers published in this area in the last few years. There have been some very extensive studies done in the United States, and one large one with respect to the NASA project, but speaking generally and by way of summary, and I hope to answer your question, I would say there are no clear-cut criteria that can be used. A great deal is known about the attitudes and aspirations of a successful scientist, but trying to work back from this to recognize these characteristics in the enthusiastic and potentially capable individual who has not yet performed in research is another question. Most of these studies indicate that biographical type information is probably still the best source of data on which to base a judgment.

Senator Haig: But you could get a brilliant man at university who had excellent marks and yet who had been an absolute flop.

Dr. Laughland: This is true.

Senator Haig: Where does your personal interview come in? How long do you keep him before he fails?

Mr. Carson: There is a probationary period of one year.

Senator Haig: And then he becomes permanent?

Mr. Carson: Continuing. We try to avoid the term "permanent staff". Contrary to public opinion, there is no permanence in the public service and there are positions that are disbanded and employees released every day.

Senator Haig: Do you transfer people from one department or from one discipline to another within the government service?

Mr. Carson: Yes, indeed. Those who have had brilliant careers within a relatively specialized field are likely to stay with their discipline and with the department that originally engaged them. Agriculture, for example, has tremendous career potential for people in the particular fields that they attract. But there is movement back and forth between departments in those disciplines that are common to a number of departments. We encourage this. The system of interdepartmental competition and central inventory that the commission maintains is designed to try and encourage as much interchange and movement of personnel from department to department as is advisable. We, of course, don't encourage movement for the sake of movement but in order to enrich the mix from one department to another. This seems to be sensible.

Senator Blois: In being moved from one department to another, would that go through the commission or is it done simply between one department and another?

Mr. Carson: Anything that takes place between the departments is inevitably handled by the commission. However, departments are free to make promotions of a certain kind within the department and movement between one branch and another branch within a department.

Senator Haig: They don't need approval by you?

Mr. Carson: They operate under various degrees of delegated authority in the area, and perhaps we should let Dr. Laughland describe the various controls he has in scientific classifications. In the administrative levels, let us say below \$12,000 a year, departments have a fair amount of freedom to move people and promote them and transfer them on their own authority. When you get up to a level in which the commission really must satisfy itself that the career aspirations of other people and other departments have to be considered, at that point we try to keep a rein on the making of appointments.

Senator Haig: Before you go on with that, in Appendix "B" you say "Staffing Statistics for 1967 Calendar Year", in which you received 5,481 offers and appointed 4,066. What happened to the other 1.415?

Mr. Carson: They didn't come with us. They turned us down.

Senator Haig: You made these offers and only got 4,066 answers. Or did the 1,415 not come to you for various reasons?

Mr. Carson: We only sent out 5,481 offers and we lost 1,415. This is pretty good experience. Major employers going into the highly competitive areas of university recruitment usually envisage that you see four students, and you make two offers for every one you get. It is a proportion of one to four. We think our ratio of acceptance has been pretty high.

Senator Haig: Then dealing on page 3 with paragraph 6, it says "Universities are the major source of supply for staff in the scientific disciplines...". How successful is this? When you go to the university and ask for courses or sciences, and here let us take an example which I don't know anything about, forestry—I suppose there are certain universities that give forestry courses. Do you encourage universities to produce this course and to find out the requirement for government service needs?

Mr. Carson: Very much so, but one of the points we make in our brief is that because of the lack of good long-range planning about the kind of direction in which scientific activity is going to go in the federal Government we are not in a position to give the sources of supply adequate lead time to be able to produce the kind of product we are going to need at the moment we need it. We are constantly engaged in crash recruitment programs to obtain a new kind of person that nobody envisaged in adequate time. We have established additional liaison officers in all major regions of Canada to keep in constant touch with universities and to keep them informed of the shifting patterns of our needs and to encourage the universities to develop a product that they knew we are going to be requiring. But I would be misleading you, senator, if I said that it was a really well organized cohesive effort. It is hit or miss-we do the best we can, we do not have enough lead time in our information on departmental needs. Departments, of course, do not have enough lead time in terms of being able to do their own long term planning.

Senator Haig: Why is this not being done?

Mr. Carson: I assume that is the purpose of your inquiry.

Senator Haig: On page 5 of your brief, paragraph 11(a), you say:

Perhaps better communication between Government planners and university officials would provide the kind of cross-fertilization necessary...

In other words, you have no definite long-range program in dealing with universities?

Mr. Carson: We do, but we only speak for one part of the scientific community in the public service—just the departments and agencies that are under our act. There are other organizations: there is the National Research Council, the Defence Research Board, the Fisheries Research Branch, and the Atomic Energy Commission. These are all separate employers who jealously guard their independence. So we can speak only for research and the scientific community within the traditional departments of Government.

Senator Thompson: If I could follow up Senator Haig's question: you say it is a sort of crash program when you go to a university, and you are told you will need so many more scientists, and you have to get out and get them. Is there any co-ordination, long-term forecasting, when you go to the university? When I say "you" I am referring to the members of your Commission. They probably are suggesting to university faculties: "Look, we can see there is going to be a need for some form of scientist in the future." The university will say: "Thank you for this information" and this will soak down to the students who then will enroll.

From what I can gather, there is confusion as to whether we are going to have a glut in the market on scientists. No one seems to have the facts. Where would you go to get the facts, to ensure that you are not encouraging enrolment in branches of study for people who actually may not have the opportunities in the future?

Mr. Carson: One of the problems is that the business of a university student enrolling is one of the last ditches of free enterprise in our society. The course that he chooses is entirely his own decision. He makes it upon the best hunches or whims or advice that he may get.

On the demand side, then, the employers are all fragmented. The federal Government happens to be the largest, but it is not even united in its approaches to the universities, so you have serious problems of the information being fed into the universities.

The universities now, because they have a major vested interest in the production of scientists themselves for their own purposes, either taking seriously what the demand is, (supposing it were well articulated), what the demand is going to be—perhaps shifting the emphasis because of their own special interests and somehow or other this is getting interpreted down at the university enrollment level in a

most incoherent fashion by a father or a friend. Those of you who saw that strange movie "The Graduate" will remember that classic line in which the friend of the father says "plastics, my boy".

This is the kind of vocational guidance that still goes on in this country. There are a great many chances for error and failure in this whole process and it is a wonder that we come as close to getting a match of supply and demand as we do.

Senator Thompson: But we hear, sir, that the Department of Manpower and Immigration are telling us that they put out forecasts. It was my assumption that those forecasts went through provincial governments and into high schools so that when a young fellow is graduating through high school, the counsellors-unless they are flying completely blind-when they are giving directions, I would think, to the students, they would see they are not directed into a cul de sac or something that is empty, or perhaps they are because it moves into the university level and I understand that the student has not always a hunch, that there is someone who advises him, speaking perhaps for the vested interest of a department, who will say perhaps "do not go into mechanical engineering, take civil engineering, because that is the thing of the future." You say we are applying it in darkness all around.

Mr. Carson: Not all around. The Department of Manpower, since it developed its efforts on manpower analysis, is obviously making a great and major improvement. But if you sit down and read the forecasts of supply and demand put out by the Department of Manpower, they are extremely accurate on the supply. They can tell you with precision the number of students enrolled in every course by year. But when you get into the precision of their estimates in respect of demand, it is terribly fuzzy, because employers are not used to doing this kind of manpower planning in the long term.

Let me share with you our own situation in the federal Government, because these things very often are the subject of changing attitudes and values.

In a period of austerity, when departments are under serious constraints to stay within their manpower ceilings, when you would think that it would be very easy for us to do adequate forecasting and prediction of requirements, landed on our desk right now we have requisitions for 400 economists. We have never dreamed of anything of that order in the past, and yet all of a sudden, all at once, every department wants economists.

Senator Haig: One would want a royal commission on that one.

The Chairman: Or resign from the Senate?

Mr. Carson: Ideally, we should have been telling every university in the country four years ago: "It is not plastics any more, it is economics."

Senator Thompson: Was it ever plastics?

Mr. Carson: We should have been directing a lot of young people into economics. Unfortunately, we have a long way to go in being able to do more effective manpower planning.

Senator Thompson: There are countries that have done such forecasting and are making more use of the young people moving into employment.

Mr. Carson: That is true. They tend to be a more controlled economy and have a more controlled university admittance policy. Our country and our people have not been prepared to accept that.

Senator Thompson: Where should the forecasting be done? Who should do it?

Mr. Carson: The Department of Manpower is obviously the only agency that can do this for the whole of the country. As a commission, we can do it for the departments of Government, and we try to do this. This is the reason that we have set up our educational liaison officers with all of the universities across the country, so that we can give them the most current information that we have.

The Chairman: In terms of forecasts, if you cannot forecast the needs of the federal Government, how can you forecast the needs of the nation?

Senator Haig: To get back to the 400 economists, how far in advance did the department advise you of this request. Yesterday?

Mr. Carson: Sometimes, yesterday.

Senator Haig: Should there not be some better organization than that? They must know a couple of months ahead or a year ahead, what they want?

Mr. Carson: I think that is true. But, we do not always know, of course, whether they are going to get Treasury Board approval for their estimates that they have put in.

Senator Haig: They can put in a request; they may not get it. At least you would know they have something to go on.

Mr. Carson: This is true. But more and more departments are doing their manpower forecasts in terms of man-year budgets without detailed breakdowns of so many of this kind and so many of this kind, as used to be the case.

The Chairman: The five-year forecast does not contain that breakdown

Mr. Carson: Probably not specifically. Dr. Laughland can speak in terms of the scientific departments and how detailed a breakdown they have of the types and kinds. The economic situation that I am referring to happens to be an extraordinary one that is worrying me at the moment. I would like to assure you it is a freak.

Senator Haig: Before Dr. Laughland continues, on page 6, subparagraphs (a) and (b) you mention that the different agencies of the Government may be in competition for the same types of individuals and sometimes for the same individual. You also say responsibility is divided between too many agencies to permit an effective overall program of manpower management. What can be done to correct that?

Mr. Carson: One very simple step, if Parliament felt that it was desirable would be to reunite the scientific agencies that have been taken out from under the Public Service proper with the Public Service proper.

The Chairman: Some of them were never under.

Mr. Carson: That is right. Many of them have been independent since birth.

Senator Haig: Another question before Dr. Laughland goes on. Does the agency or department apply to you for manpower?

Mr. Carson: They apply to the Treasury Board for the position. Once the positions are approved they apply to us to fill the jobs.

Senator Haig: Do not the departments go out and try to steal a guy from the universities?

Mr. Carson: No, but they try. If we catch them we get very cross with them. You cannot have 35 departments and agencies all tramping onto the campuses of every university in the country.

Senator Haig: One of the witnesses this morning said he has gone out and spoken to a chap, I do not hope without your approval.

Mr. Carson: Of course we are not going to discourage individual initiative. If it remains at the level of softening someone up and then coming to us and saying, "Look here, I have done part of your job for you. Would you take a look at him and see, if in your view, he is just as meritorious as we think he is."

Senator Haig: Do they ever circumvent you?

Mr. Carson: They cannot. The man cannot get paid without a certificate from us.

Senator Haig: Then he can go and try and get the man and then he has to come to you and say, "I have got Joe Blow and the Treasury Board has approved this position and you go and hire him."

Mr. Carson: Yes.

Senator Haig: In the science sections of the different departments there must be a disparity in salaries.

Dr. Laughland: In the research area the system that I described for Research Scientists is designed, I would say, to eliminate this because it is truly interdepartmental and the scientists are assessed by their peers only on the basis of research accomplishment. The recommendations are made on that basis. From the standpoint of disparity I would say this does not exist in departments of Government for those individuals who are involved in research.

Senator Haig: You said, Dr. Laughland, that you have a range of high and low. Within that section of high and low there is a differential dependent upon the man's research ability.

Dr. Laughland: That is right, sir. There are four grades in the Research Scientist Class, one to four, and this is designed to accommodate the individual coming into, the new PhD, if you wish, the Public Service, from the time he joins to the time he retires 35 year later. If he wishes to stay in research the class does two things. It provides a basis for consistent treatment from the career development standpoint throughout all departments of Government. The other thing it does is it permits him to stay in research if he so wishes and he can be a productive research scientist without having to move off into an administrative type position to obtain higher salary, because the range for this class goes from-at the present time our recruiting rate is \$10,500 for a PhD up to a maximum as high as \$23,000 or \$24,000.

Senator Haig: He goes in different classes then from one to four.

Dr. Laughland: He would progress from one grade to another in research and he does not have to go out to an administrative type position to obtain a high salary. There is another Research Management Class which is designed to accommodate the productive research scientist, possibly when he reaches his mid-forties or fifties, who has become a director of an institute with administrative responsibilities. These are parallel classes.

Senator Thompson: One of the agencies came before us and, as I recall, said they did not want to have to go through the Public Service Commission in order to recruit because of the inflexibility attached to going through your agency. How would you answer that?

Dr. Laughland: It is true, of course, that the exempt agencies such as DRB or FRB have operated over the years with their own act and they have considerable flexibility. Our procedures now with respect to selection and appointment enable us to move just as quickly as any of the exempt agencies. I can give you an example of how rapidly we can operate. We had an interview team last year at Berkeley, California. A recommendation came back and after checking with the department an offer was in the hands of the man the same afternoon.

Senator Kinnear: Mr. Chairman, I would like to answer a question. It is a paragraph you skipped over, Senator Haig. It is on page 5 at the bottom:

A shortage of human resources, once it is clearly established and known, tends to attract a very considerable amount of interest.

And then it goes on to say once you get it rolling it is hard to stop.

Mr. Carson: Indeed.

Senator Kinnear: That is what makes me think it would be very valuable if you could give some advice to the universities. I suggest that you are getting too many in that discipline and probably that would tend to stop a glut in certain areas in those having too many scientists or too many chemical engineers—you do not deal in that area—or too many something else. It seems to me with your analysis you could suggest to universities when you see an overproduction of scientists or whatever it is.

Mr. Carson: We do this to the extent that we can, but the train of events really started with the high school counsellor who stated to young Jimmie when he was 16, 17 or 18, saying, "You know, organic chemistry is the thing." and so he goes off to university and pursues this kind of a career. The university is reluctant to dictate to students what courses they go into.

Senator Kinnear: They often switch them after the first year.

Mr. Carson: On a permissive basis.

The Chairman: Not according to market forecasts. They might switch them for different reasons.

Mr. Carson: Today there is a potential glut of organic chemists. At what point did we know this precisely and how much good is it to tell the

universities today? We can stop the thing getting worse, but our problem was that we should have been able to tell the high school counsellor five or six years ago.

Senator Kinnear: That would be the thing to do, to try and forecast for five or more years and to get your trends better developed. Have you thought of doing that?

Mr. Carson: Yes.

Senator Kinnear: Are you doing it?

Mr. Carson: To the fullest extent that we can. I do not want to leave the impression with you that we are just a reactive body that is sitting back responding to data that comes unto us. We are out in all departments trying to cultivate as much information as we can about the direction in which they are going and the kinds of people that they are going to need. But this is an element in personnel administration that managers have got on to only very recently. Up to recent years I think people have felt that they could let tomorrow look after itself: "We will tell you what we require when we know exactly that we require it."

Senator Kinnear: Today is changing; everything is speeding up.

Mr. Carson: That is right.

The Chairman: So far as giving that general information to the universities, this would be more the responsibility of manpower and immigration. You can give them some information so far as the federal Government is concerned.

Mr. Carson: That is right. Manpower has the job of giving them global information for all employers over the country. We want to make sure, of course, as the largest employer that we look after our own. We would be abdicating our responsibility, if we left it entirely to the Department of Manpower and Immigration. We want to make sure that the universities have as much current information and projected information as we can possibly give them. The burden of our brief is that so long as we have the utilization of scientific personnel within the central Government fragmented among a number of agencies, the degree to which the federal Government is going to be able to speak coherently to universities is going to be a little less clear than if one voice was speaking.

Senator Kinnear: I think that is what is troubling us all—the fragmentation of departments, boards and commissions.

Senator Haig: Perhaps, Mr. Carson, there is a lack of co-ordination and co-operation among the different departments in the scienfitic fields.

Mr. Carson: I think that would be a legitimate comment, but once you grant autonomy to people there is a preciousness—I think all of us have a preciousness in this respect—about preserving autonomy. Bear in mind that some of these agencies view themselves as our competitors, and they are.

Senator Haig: Why?

Mr. Carson: They are our competitors in the labour market. They want the best; we want the best.

Senator Haig: But you are the co-ordinating body; you are the employer.

Mr. Carson: Not for the National Research Council or for the Defence Research Board.

Senator Haig: Leave them out. What about minor departments such as agriculture?

Mr. Carson: Oh, there is no problem of co-ordination there. We speak with one voice and divide the labour pool at the university level equitably among all departments.

Senator Haig: I am relieved. I did not understand

Mr. Carson: Perhaps I am being a little too subtle in this brief.

Senator Haig: Well, the whole brief indicates a lack of co-operation and co-ordination in scientific planning. That is my impression. You mention a lack of co-operation between universities and you go down even to the high school level. But I would think that at the university level or maybe at the pre-university level, grade 13 in Manitoba for example, that there would be an indication that there is a field, say, in forestry, which is an example I happen to know something about, where there is going to be over the next five years a reasonable chance of employment in that service.

Mr. Carson: Well, we can do this for the Public Service, senator, at least for the part that comes under the Public Service Employment Act. The burden of this brief is to draw to your attention the fact that we have four different approaches of personnel administration for research science in the Government of Canada. We are responsible for the largest element, but there are as many research scientists put together in all the other agencies as there are under the Public Service Employment Act.

The Chairman: You would say it is about 50-50?

Mr. Carson: I think that is roughly it.

Dr. Laughland: That is approximately correct.

Senator Haig: You only handle half of them.

Mr. Carson: Of research scientists?

Senator Haig: That is what I am talking about.

Mr. Carson: Yes.

Senator Blois: You have also competition from the various provincial research foundations?

Mr. Carson: Oh, yes, and private employers as well.

Senator Haig: How does the rate of salary compare to that of industry, as a general thing? Do you lose many people to industry because of salary?

Mr. Carson: It depends on the field. In certain fields, I think it is fair to say that we lose very few to industry. But the industrial market responds more rapidly, sometimes, to shortage areas than we do and it will build up the market. The field of geology, for example, is an up-and-down thing. We do not respond as dramatically. There will be some years when we will lose in shortage areas. I think Dr. Laughland will agree that it is fair to say that salary levels in recent years have not been our most serious consideration in the recruitment or retention of scientific personnel.

The Chairman: Again, here you do not speak about the social sciences, because we have a different story from certain departments.

Mr. Carson: This is true, Senator Lamontagne.

The Chairman: We were told again this morning that salaries and other fringe benefits—which may not be fringe benefits, really—in universities are much higher than the salaries that can be offered in, for example, the field of economics in the federal Government.

Mr. Carson: I think we have to start out on the assumption that the development of the demand end in the social sciences has been fragmentary and neglected in the past in a way that we have corrected, or made great strides, with respect to in the hard sciences. We have been working at the hard sciences longer and we have learned a lot more about them. We have applied ourselves to them in a much more intelligent fashion. The utilization in the social sciences has been quite fragmented amongst a great many departments. We are making progress now, hopefully,

but we have not had the same kind of coherent information to go on, coming from a few major employing departments.

When we developed the Research Scientist Class a few years ago, we only had five key departments to work with. They were the major significant employers of research scientists. So it was relatively easy to get those five departments to work vigorously and energetically with us to create an approach to the research scientist classification and appraisal program. It was a magnificent performance of co-operation and co-ordination amongst those five departments. We have been anxious to get that same kind of coherent attack on the problem of the research scientist in the social sciences, but in the first place departmental utilization of the social scientists is not nearly so well developed or recognized and there is no experience with the management of this kind of resource, and we just have not been able to pull out of the employing departments of the social scientists the same kind of co-ordinated activity and effort that we were able to on the research scientists program three years ago.

I assure you that one of our really early objectives will be to try to come up with a comparable approach in the area of the social sciences. It will mean, of course, that the employment of the social scientist is going to have to become a much more clearly recognized and organized activity than it has been up to now.

Senator Haig: Do you have any in-service training in your commission?

Mr. Carson: Yes, we do have a good many kinds, senator. We do not train research scientists in the Commission and I realize that is your major concern. The commission's major contribution to the field of training and development is in the area of administrative training and development. We do provide administrative training courses both in residence and in classroom for all of the departments of Government. We have young engineers, young scientists, coming to learn the craft of administration; then these young men return to their departments. But this is the main job that we do in terms of centralized and co-ordinated training for all departments, and we do this at many levels, starting out with the young recruit whom we hire from university right on up to the executive training level.

Senator Haig: Thank you.

Senator Robichaud: On page 3, paragraph 7, of the brief you state that the Public Service Commission "has developed flexible methods of recruitment and selection which are highly responsive to the requirements of departments." This has to do with the

question we have just been debating. What I would like to know is what are those methods of recruitment which are so flexible, and particularly during the recruitment and selection process how much use does the commission make of the department involved?

I will give you one example. Let us say the Department of Fisheries is asking for a biologist for its oyster culture station at Ellerslie, Prince Edward Island. Now, there are biologists all over the country who have different degrees and different abilities. Who determines which of the applicants will be the most suitable for that particular position?

Mr. Carson: I think the answer to your question is going to be pretty simple, Senator Robichaud. The department probably phones Dr. Laughland and says "This is a problem" and he will probably say to them "I suppose there are only two qualified people in Canada and you probably know them." The research manager involved will say "Yes, I know them both; I can get them on the phone and find out which is available." And it will all be done in five minutes. We can do this now. Historically-prior to the passage of this last act in 1967—the act laid upon us the requirement to advertise nationally, and so we would mount these enormously burdensome competitions when the deputy head or the research manager knew there was only one person in Canada.

Senator Robichaud: You still had to advertise?

Mr. Carson: Well, we thought we had to. I can remember when I was here with the Glassco Commission talking to one deputy about this problem. He said "I am looking for a research director, and the commission told me I would have to advertise. I told them that there were only two people in the country. After two months they came back and said yes, there were only two people-one has gone to the United States and the other is still here." That was two months later. Now that could have been done with a phone call in five minutes. Fortunately the new act allows us to make appointments without running these terribly laborious competitions. The act permits us to use such other methods of personnel selection as in the commission's judgment are sufficient to ensure a meritorious selection is being made. So we can apply common sense now. It has cut the delays down enormously.

Senator Thompson: I suppose the purpose behind the national advertising was to ensure that there was no preference by someone person in the department for an associate or something.

Mr. Carson: That is true, and we still use advertising in administrative ranks. We use it intelligently when we want to know what the market is like. But in the scientific area, it is such an intimate commu-

nity in Canada, our scientists in the Government in collaboration with Dr. Laughland will know who is available. We are beating the bushes all the time, visiting the universities, visiting scientific gatherings to try and keep in touch with the labour market.

I am talking about the experienced scientist now and it really is a much simpler task to perform in the scientific area.

Senator Haig: Do you have much co-operation between the professors of graduate students who are intelligent and bright enough to become members?

Mr. Carson: Yes, this will depend, of course, on the faculty involved. I would suppose that Dr. Laughland has close ties with every agricultural faculty and every one of the scientific disciplines associated with agriculture, and this would be true in many other fields such as Forestry and Fisheries. But when you get off into the area where there are going to be many other competitors, including the National Research Council and the Defence Research Board, the departments of the federal Government have no guaranteed access to the best students. We cultivate this and we work on it, but we are just one of a number extending blandishments to professors and presidents of universities and deans and placement officers. We don't have a corner on the employment of young people.

The Chairman: Would there be the same prestige involved working in a department or working for a crown agency or would there be better working conditions working for NRC than working for the Department of Agriculture?

Mr. Carson: Well, senator, I presume you are giving equal time to the exempt agencies so I can feel free to stick my neck out...

The Chairman: Please do.

Mr. Carson: ... and say under the present circumstances I don't think that we need to take second place to any of the other employing agencies in terms of prestige of work we have to offer, the interest and working conditions and stimulating work associations. We think our salaries for the most part are competitive. From time to time there will be little lags, but we don't feel we need to take second place to any of the other government agencies that are recruiting in the same market.

The Chairman: Take, for example, the flexibility of working hours. Would there be the same flexibility within a crown agency and crown corporations in the field of research?

Mr. Carson: I don't know. I know the National Research Council is terribly proud of the fact that their people walk in at three o'clock in the afternoon and maybe go home at three o'clock in the morning. They tell this story everywhere they go. My own impression is that the same kind of person who had the same reason for doing that kind of work would find a co-operative milieu within the departments of government as well. We are not robots in the government departments. I would like to think that there is as much flexibility of management and administration in the departments of government as there is in any other research establishment. But we don't make a fetish of encouraging "kooky" behaviour.

Senator Haig: You don't go from three to three.

Senator Thompson: One of the points raised before the committee in one of the briefs or by one of the witnesses was that a scientist is at his most imaginative in research up to about the age of 35 or 40. You have explained before that you cannot fire people, and I would assume therefore that as a man grows in age he grows in responsibility within the Government, so that the bright input in scientific research is made up of the younger fellows who are not heads of departments. I suppose I am making a sweeping statement here, but am I right that it might be more helpful to be working outside of government where the head of research division may be

Mr. Carson: This is true and, senator, I do think we have an opportunity here to do some imaginative thinking in the area of our superannuation arrangements. People do tend to feel locked in to our present superannuation arrangements which do not provide for retirement before age 60, except on health grounds, without accepting an actuarial reduction in pension. It does become an impediment to mobility after, let us say, the age of 50 and certainly after 55 it becomes a very real impediment to mobility.

I think there is real justification for the Government to examine the possibility of either having more flexible interchange arrangements with universities and provincial governments so that we could encourage mobility of people who perhaps have reached the peak of their creative contribution, who may not have the strengths or muscles that would enable them to go on, being perhaps less creative in a research sense, but quite creative in an administrative or managerial sense.

The Chairman: In teaching.

Mr. Carson: These are people who could go out, if they had the skills, to the university as a gifted teacher bringing with them a wealth of experience. At the present time, because of our rather inflexible superannuation plan, this is not easy to effect. I wish it were.

Senator Thompson: Would you like to enlarge the Senate? It would help.

The Chairman: Is this a limitation that the Crown agencies do not have?

Mr. Carson: No, they are under the same superannuation plan.

Senator Thompson: I notice another thing which causes some concern. You are recruiting outside Canada and in the United States and Europe. I would suggest in would indicate that our own graduate schools are not producing the necessary people, and the question is, are we lacking in graduate schools in these particular requirements?

Mr. Carson: I should clarify that. We only go outside this country when we cannot meet our requirements within. The Public Service Employment Act lays the responsibility on the Commission to give first priority to Canadians, so we never recruit in the United States or the United Kingdom unless we can satisfy ourselves that there is a specific shortage in this field in Canada, and then we go off to the U.K. or the United States and recruit. Part of our recruiting, of course, in the United States and in the United Kingdom is to bring back Canadians. We run in co-operation with the Association of Universities and Colleges of Canada a rather mammoth operation "Retrieval" each year to try to locate Canadians who are studying abroad or working abroad and try to bring them home, so we really only recruit in the areas where the Canadian universities or the Canadian market has not been able to supply.

You asked a question as to whether we should be doing something about this in Canada. Very often, these are in fairly specific areas where, for one reason or another, the United States, the American universities or the British universities have been pioneering for so long that even if a course in a Canadian institution became mounted it would take some time before it had the prestige and the reputation of the institution in the United States or Britain.

Dr. Laughland, who has been involved in organizing our efforts at recruitment in the U.K. and U.S., may want to comment on this.

Dr. Laughland: In commenting on this question, senator, the problem as it has been indicated, is a question of specialized training to meet particular needs. As an example of this, we have just finished our Canadian recruiting at Canadian universities. About 35 universities were visited by recruiting teams and we were looking for approximately 80 scientists at the PhD level. We feel we may be able to

fill about 40 of these positions in Canada. One of the problems in some cases is that no one may have turned out to the interview. In other cases, for example in organic chemistry, we might have 20 people interested and only one position available. There are new and developing areas and I could cite the example of the Canadian Centre for Inland Waters at Burlington, which is a new program, requiring specialized training in certain areas of geology, such as limno-geology where geologists must be knowledgeable of areas surrounding lakes and the shoreline. Paleantologists are in short supply. For this reason, you have to go to the United States or in some cases overseas, in an attempt to meet specialized requirements of the federal Government program.

Senator Thompson: Could you not do this? Take, the example of Senator Robichaud and the oyster beds wanting a supply of chemists. When he was minister, he decided that this is going to be the best research division in the western world, so he got some famous person from Europe or Japan, because he knows this will attract other scientists. I understand other scientists will come if they know that there is a top man going to run the show. A man from Japan says I want \$50,000, or this would be the attraction, plus certain space, and so on. This means you are going to be flexible, because this is necessary. Would Senator Robichaud get that man, or would you say: "Look, there is a category for \$18,000 in Class 5 and that is as far as we can go?"

Dr. Laughland: With respect to the position and the instance you cite of the oyster breeding project at Ellersley, the Commission staffing officer responsible for this is a former employee of the Department of Fisheries, a biologist himself, and he would be working very closely with the departmental officials. If I could mention this in passing, the staffing officers who are involved in this professional staffing are all graduates in science themselves, operating in the field of personnel administration. The question of the individual, Senator Thompson, and his position, on the assumption that the position has been established by the Treasury Board and classified at a certain level, would be resolved by working very closely with the department in the light of any suggestions or advice they might have concerning the individual, wherever he might be. We also, from the standpoint of flexibility in recruitment operate with what we call a continuous staffing program. This is done by an announcement, usually on an annual basis, or it may be more often, indicating that the Government of Canada, the Public Service of Canada, has a requirement for biochemists, biologists, and so forth. This then permits us to maintain an inventory of individuals, anywhere, who are interested in employment with the Government of Canada. Two things might happen, in the example that you cite. The Department might come forward with a recommendation concerning a particular individual. We would welcome this, and we encourage departments to do it. Conversely, we would have a look at the inventory and see what we could do. If unsuccessful, we would have to go on the open market with a special competition.

Senator Thompson: Do you have an inventory for position of Chairman of the CBC?

Mr. Carson: We have an inventory with a lot of interesting names in it, but we have not been asked to supply candidates.

Hypothetically, the research scientist classification scale has no upper ceiling, and so if that individual was really outstandingly well qualified in comparison with all other research scientists we have in the Public Service there is no barrier for him to being paid \$50,000. We have made major breakthroughs in the new approach to the administration to the research scientist category. We were able to persuade the Treasury Board not to put a top salary at the top level of the research scientist grade on the assumption that it may be in the public interest to keep someone in the research scientist community in the federal Government even if we have to pay him \$100,000. The Treasury Board went along with this, but I think they have asked us not to test or press them too far.

Senator Thompson: Would you say that the reason Canadian scientists in the United States remain there rather than come back to work for the Government of Canada is that for the most part the facilities available to them there are more important than the salary aspect?

Mr. Carson: This will certainly vary and it is pretty difficult to be precise about it. I would like Dr. Laughland to add to this because he talks to far more of them than I do, but our impression is that the major arguments they put up are the facilities and the opportunities given to them. The salary considerations do not, at least at the oral communication level, come through to us as the major or overwhelming reason. There are a number of them who I think would cheerfully accept a lower standard of living and all that goes with it for some of the psychic benefits of living back home, but our experience has been that the toughest hurdle for us to overcome are the opportunities, the equipment, the facilities and the perhaps a more challenging environment. If you feel, Dr. Laughland, that I am being too optimistic then please correct me.

The Chairman: Before you go on, you were just mentioning a moment ago that the superannuation fund, was an arrangement that could be an obstacle for people wanting to get out of federal departments.

Mr. Carson: At a certain age.

The Chairman: Could it be also an obstacle to come

Mr. Carson: No. We can hire people right up to 64 years of age. They do not get a very large pension, but pensions are geared to the last or the highest six years of employment. Coming in at an advanced age is really no serious handicap.

Senator Thompson: It would be an obstacle in that you do not have a reciprocity.

Mr. Carson: Exactly.

Dr. Laughland: With reference to your question, Senator Thompson, it is quite true that the salary structure we have in the Public Service now, again speaking generally, is quite competitive with industry and universities. The reason for this is that the determination of salaries in the Public Service is done chiefly on the basis of comparison with university salary curves, industry data and any data that the Pay Research Bureau may accumulate.

In speaking to the young scientist who is completing his PhD in university, we find that he is very interested in where he is going to work and whom he is going to be working with and the nature of the equipment. Toward the end of the interview he will perhaps inquire about salary. I may be oversimplifying it, but in general we are in the market and we are competitive.

With respect to students in the United States, I think that in general this is due to the fact that they wish to work at a university with some individual or in a particular laboratory where they can get outstanding training. They go to California or Wisconsin for biochemistry. They do this sort of thing because they are with the man. The same thing, though, is true in Canada. We do not have as many in a numerical sense, but we do have some very outstanding people. You find this also at the departmental level, where there are outstanding scientists in departments such as Energy, Mines and Resources, National Health and Welfare, Agriculture, and Fisheries and Forestry. Students want to work with these individuals.

The Chairman: To come back to one of Senator Haig's original questions and your first paragraph here, which we have already touched on, you say that there should be co-ordination with respect to recruitment selection and promotion techniques. Could there be more co-ordination without these agencies, which are not responsible to the Public Service Commission now, becoming responsible to you for these purposes?

Mr. Carson: We would love to co-operate. I think, Mr. Chairman, to answer your question honestly there could be more co-operation. I think we are moving in the direction of more co-operation. I was encouraged recently when the Commission decided that it would

like to have the National Film Board make a film on science and Government that we could use for vocational guidance classes throughout the country to try to stimulate youngsters to think in terms of Public Service careers in science. We realize that we could only show a portion of the picture of science in Government and I went to the National Research Council and the Defence Research Board and said, "How about coming in on a joint venture with us? Obviously, we can show to the youngsters of Canada a much more complete picture of science in the Government if we can show the things that are going on in your laboratories as well as our own." Now, I do not know, but I believe that a couple of years ago the inclination would have been, "You go your way and I will go my way; I can look after myself." In response to this inquiry there was absolutely no question that this would be a joint venture, the Public Service of Canada, the National Research Council of Canada, the Defence Research Board and the Fisheries Research Board would be listed as participating agencies in the creation of this film. They all agreed to make their facilities available so that they could be part of this film.

The Chairman: Do you have at present a pool of knowledge or of potential candidates? You certainly have one in the Public Service Commission. Do these agencies have access to that pool of information about manpower?

Mr. Carson: Absolutely, if they want it.

The Chairman: Do they have access to it and do they use it?

Mr. Carson: Dr. Laughland, my impression is that they do not make use of it.

Dr. Laughland: Yes, that is correct.

Senator Haig: Why not?

Mr. Carson: They like being independent and most people who are independent do like being independent.

Senator Haig: That is the best use of this bank.

Mr. Carson: We do not think it is. That is the purpose of our brief.

Senator Thompson: They have also an inventory. Can you make use of their inventory, and do you?

Mr. Carson: Dr. Laughland, you will have to answer that; I do not know.

Senator Haig: Chicken!

Mr. Carson: I do not know.

Dr. Laughland: I think the answer to it is that we probably could because many of these agencies have inventories of various types. The type of contact that was mentioned before between departmental scientists and university professors, were contacts made at the scientific meetings. I would think that our inventory is probably more extensive than any of the others. Certainly, if we received any inquiry, we would be only too happy to provide any assistance we could. In fact, it does sometimes happen that we will encounter candidates who are not in an area in which federal Government departments are involved, for example, some specialist area, and on occasion we refer these to the exempt agencies.

Senator Thompson: That was not really the answer I was expecting. I was asking if you would go and look at their inventories. Are you permitted to?

Dr. Laughland: I expect we would be permitted to, but we have not. We do not use their inventories, no.

The Chairman: All of them have their systems of recruitment and selection and promotion. All these agencies have their own.

Dr. Laughland: That is correct, sir. Their systems are very similar in many respects. They use appraisal boards. There is a point that could be made with reference to the claimed advantage of being exempt from the Public Service Employment Act. The exempt agencies do not use this exemption in the sense that they are violating common practice. They have restraints on hiring. They do not go out and pay \$15,000 for an individual for whom we would pay only \$10,000. This is the sort of thing I mean.

Senator Thompson: The Glassco Commission Report did not mention anything about this. Did you not quote the Glassco Commission Report?

Mr. Carson: The Glassco Commission Report said that if the Civil Service Act were amended and major changes were made, really the arguments for exempt agencies remaining outside the jurisdiction of the Public Service would come to an end.

The Chairman: This is when the big fight started-after the report.

Mr. Carson: Mr. Chairman, I find myself in a delicate position here. I debated very seriously about whether we should come out and say the things we have said to you. We feel that we have accomplished all of the changes that the Glassco Commission Report urged had to be made in personnel management—well, not all of them, but we are well embarked in that direction. We now feel that we are in a stage where the preciousness of autonomy that

seemed to be very important to some agencies and departments in the past should not be so precious a concern any longer.

Senator Haig: Hear, hear.

Mr. Carson: We think that we are in a position to co-operate with providing services to all departments and agencies of Government and that we can do it probably more completely, more economically and just as rapidly as a bunch of individual entrepreneurs going out on their own could do.

But going further than that, I do not feel is a mandate of our Commission. That will be a decision that Parliament or the Government of the day will have to make. The new Public Service Employment Act does make provision for the Governor in Council to add additional agencies or bring additional agencies under the provisions of the Public Service Employment Act. Interestingly enough, a number of agencies are already seeking to come in that direction-agencies which have been exempt from the provisions of our act for some time. We are in negotiation with a number of them to start providing employment services to them, to give them the advantages of having access to our inventories and to give their employees the opportunities of having access to career opportunities in the much larger Public Service.

Senator Robichaud: Is this not due to the flexibility that the Public Service Commission has now compared to the old Civil Service Commission which certainly had no flexibility—or very little. I remember my experience with them, and it was outrageous. I recall one incident where I sent them a letter—and unfortunately I happned to be a politician—warning them about a certain applicant to whom they were going to give a position. I warned them that after six months or so they would have to fire the man. I suggested to them that they should investigate. They looked at my letter and threw it in the basket. They refused to make an investigation. I hope this situation does not exist any longer.

Mr. Carson: I hope not. But further than that I do not want to go.

The Chairman: The trend you were describing a moment ago does not seem to be general. We will have before us tomorrow an agency of the Government which is at present a department of Government. I suppose I can refer to the brief that we will consider tomorrow where it says that corporation agency structure is the type of Government structure which will provide the greatest degree of flexibility, co-ordination and autonomy of operation.

It is just a contradiction of the statement you have been making this afternoon. So the trend is not general yet.

Mr. Carson: This is a difficult issue that you and your colleagues will have to wrestle with, Mr. Chairman. I think we have put our house in far better order than it ever was before and that we are prepared to provide service now in a much more professional effective and coherent fashion than we did in the past, and under these circumstances I think for some parts of the public service now exempt from the provisions of the act there might be real advantage in being part of the public service proper. I should mention to you that the Commission has delegated out all of the operational category which consists of 100,000 positions and virtually all of the administrative support category which is roughly now 40,000 positions. The commission's major effort from now on is going to be conentrated on doing the most efficient job of professional, scientific and executive search and recruitment that we possibly can. We may be dealing now with a constituency of roughly 40,000 positions in the public service instead of the 200,000 we were coping with in the past. Under these circumstances I think we can offer an integrated service to the professional and scientific agencies we were not in a position to provide before.

The Chairman: Does it mean that now the individual departments can recruit stenographers?

Mr. Carson: Absolutely.

The Chairman: So that now they have their own recruiting system.

Mr. Carson: Yes.

The Chairman: So we are back in the position you were trying to avoid?

Mr. Carson: No, we monitor their recruiting system and we set the standards but they go out and do the job. We merely ensure that the merit system is being maintained and that patronage, either bureaucratic or political, is not creeping in. But we feel that for the largest employer in the country it makes eminent sense to have a highly efficient, highly energetic, imaginative, specialized recruiting agency in the shortage areas where you are in toughest competition with industry, universities and other levels of government. That comes in the professional scientific and executive area. It is an area which we will specialize in to provide the best possible service to departments and agencies.

Senator Thompson: Dealing with the Manpower offices, studies have shown that in the United States instead of using Manpower offices for professional and

executive people they use much more private agencies. Do you use private agencies?

Mr. Carson: Not at all. I would like to feel that as we continue in the direction we are going our various staffing programs filled with specialists with knowledge in the particular occupational field that they are looking after are going to know more about the labour market and are going to know more about the availability of specialist resources in this country than all of the private placement agencies put together. We are now at the stage where we know more about the available supply of personnel administrators than all of the private placement agencies. They come to us and say "What can you tell us about so-and-so?" Because we have a dossier on virtually every personnel administrator in the country. We have been hiring so many of them in recent years and so many have replied to our advertisements and we have been screening them and sifting them. Similarly, Dr. Laughland and his group in the bio-physical staffing area probably know more about the bio-physical labour market in Canada than anyone else does.

Senator Thompson: Do you see this situation? Here you have the Government paying for Manpower offices, executive-professional Manpower offices and they are to provide both for Government as well as for private industry. You seem to have developed a most sophisticated method of looking after Government. I am just wondering whether there should not be some sort of advice given to Manpower offices to get them into a more sophisticated position and yet if you do, your competitors, private industry, quite obviously will be served as well as the Government.

Mr. Carson: We do work most intimately with the Canadian Manpower centres and as we delegated out staffing responsibilities for the operational category, the blue- and grey-collar workers and the administrative support, the clerical employees-as we delegated that out to the departments, we laid on the requirement that they had to use the Canada Manpower centres to do their recruiting and the Canada Manpower centres are doing the initial recruiting for all departments of Government now. We are not proposing that recruitment in the professional scientific area and the executive area should be done by Manpower. We feel these are very scarce resources, that all employers are in tough competition with each other and it would put the Department of Manpower into a potential conflict of interest situation if we burdened them with making sure we got our fair share of the employment market. I do not think other private employers would believe that the Canada Manpower centres were giving them a fair break, because they would feel that, understandably, their first feeling of responsibility would be to us. So we are preserving the highly competitive short supply area in which you have to have intimate liaison with the universities,

with the specialized labour market. We think we can do this better than anyone else can do it for the Government departments.

The Chairman: To come back to another question that I raised a little earlier. Would it be possible, if it is not done already, to include more detailed breakdowns of Manpower requirements in the professional and scientific field in these five year forecasts?

Mr. Carson: This would be an enormous help. I wonder if I could ask Dr. Laughland if he could give us some feel of how effectively this is being done now.

Dr. Laughland: Yes, there is some information of this sort available. When the departments present their estimates each year. With respect to new programs, for example, there is an indication of the type of individual and perhaps the level of competence that they may require to conduct a program. I feel that we, the Commission, can have some real input into this with respect to shortage areas, our knowledge of shortage areas and whether or not it is actually possible to mount a program, if you do not have the people to do it.

Mention was made earlier with respect to forestry. At the present time, the forestry schools in Canada graduate something of the order of 150 people each year, I believe. This is a shortage area. We are competing with industry. There would be little point, I suggest, in establishing a major program, that was going to require 40 or 50 foresters tomorrow.

The Chairman: I thought the Government decided recently to build two new research labs, one in Ottawa and one in Alberta. They may not have staff to use these facilities then.

Dr. Laughland: When I mentioned forestry I was picking a specific area.

The Chairman: It is a good illustration.

Dr. Laughland: In many others it would not apply. This is the sort of thing I think has to be done, recognition of the long term needs, and there is a great deal of co-ordination in this respect by staffing officers who are in daily contact with developmental scientists and moving back and forth discussing areas of research and new and proposed programs. We are a little bit ahead of the actual day on which the requisitions arrive in the commission to be filled and I think—

Mr. Carson: Not as far ahead as we should be.

The Chairman: Certainly not in respect to the

Mr. Carson: Rather than discourage you with that illustration, which was an extreme one, I should tell you that we have this week brought together all key departments that were involved in this accumulative demand for economists. As you can imagine, this is a ridiculous situation. There are not 400 economists available in the world to come and work in Canada. We are going to have to make do with other kinds of people, but you know how fads go, all of a sudden economists are in-a few years ago it was engineers. Everybody thought they were the solution to all our problems. I am a psychologist and I am still waiting for the day when my group may be in short supply. Hopefully, by bringing departments together and pointing out to them that there is not a hope of supplying their requirements in this way you can get them to restructure their task, and explore the possibility of utilizing other kinds of people.

The classification system that the Treasury Board has established envisions a social science support sort of person. We have not experimented with this effectively in the Public Service of Canada yet. We have in DBS and we have some support kinds of people, but we have not gone to the Ryersons and the other. Institutes of Technology and said, "Produce an assistant economist kind of person," but we are starting to

The Chairman: I do not want to pursue this too far. In the case of these 400 economists, would they be mostly engaged in research or as policy advisers?

Mr. Carson: This would be an accumulation of everything, and of course all of them with 50 years' experience.

The Chairman: And young.

Senator Cameron: I was going to ask, are you finding any change in attitudes with respect to an appreciation of the expanded role that the blue collar worker can fill in our society as opposed to the university graduate? You see, some people say you have got to have a university graduate for everything, but we know in actual practice a man from Ryerson or one of the equivalent technical schools can do the job as well or even better, but there is not just quite the prestige factor to it.

Mr. Carson: The technologist has saved our life in the Public Service during the last few years. And it probably is not just by fluke. Certainly everyone was keenly aware this was a new frontier that had to be explored, but if we did not have the output of Ryerson and the institutes of technology in the other provinces, across the country, we would be really in serious straits. I would be misleading you if I said this was an easy battle to win, because when we go in and urge departments to look at their engineering chores

or any other specialist or scientific category, they know the product of the university and they feel comfortable with that. To get them to see how you could write out certain duties and have them done by a new breed of animal, is always a battle. We have been making real strides in this and thank God we do have the institutes of technology. I visited some of them this last winter. The product that is coming out of them is marvellous. I suppose we are the largest single employer going onto the campus of the British Columbia Institute of Technology, Ryerson and others.

Senator Cameron: Is there much of a wage differential between a university graduate and a graduate of the Institute of Technology which requires grade 12 plus two years? How would that chap's salary compare with that of a B.A., just in general terms?

Mr. Carson: Some of these chaps are getting into just as short a supply situation as the university graduates are. If you take the total university graduation, liberal arts as well as sciences, the graduates of the institutes of technology are probably going to receive more offers of employment per person than the graduation classes of all the universities in the country. They have really established their product. But how do the salary levels compare?

Dr. Laughland: In general, you can equate the Institute of Technology graduate with a three-year university graduate. Pass course graduates earn approximately \$5,900 to \$6,000.

Senator Cameron: I thought it would be higher than that. I was wondering if there was much of a differential.

Mr. Carson: This may vary with category. I do not know where we would be without the computer systems people some of the institutes of technology are turning out. We would just be in desperate straits without them. Of course, their product is, generally speaking, more geared to hard work and enterprise, and all of the Horatio Alger values that seem to be in question at some of the universities.

Senator Robichaud: In other words, they are more practical.

Senator Cameron: University students do not seem to like computers in some places.

Senator Carter: I have several questions, Mr. Chairman. I am afraid they are perhaps not too related, but I think the witness said just after I came in that they are now concerned with about 40,000 personnel instead of 200,000. That is because departments now hire their own help up to a certain classification level.

Mr. Carson: That is the direction we are going in. We have not got rid of all of the 160,000 yet. We are up to about 130,000 now.

Senator Carter: Do you have any figures on the median salary of that 40,000? How would that compare with 200,000? What has happened to it?

Mr. Carson: I probably have that in our annual report.

The Chairman: Well, in general, I suppose that you are trying to get rid of classifications involving blue-and grey-collar people and are concentrating on professional and scientific personnel. That will give you a range of salary to work with.

Mr. Carson: I can work this out. Unfortunately, our annual report which gives a distribution of all employees in the Public Service by salary levels does not give me, without some arithmetic, the exact variation that you are looking for. I suppose, if I were to take a rough stab at it, it might be \$10,000 as opposed to \$6,000.

Senator Carter: That would be the median or the average?

Mr. Carson: I think the average.

Senator Carter: You said you monitored what goes on in the departments when they recruit. Do you do any monitoring about their ratings, the ratings each department does? I understand we have a whole variety of departments and they all have different systems with regard to ratings. Does the commission concern itself in that at all?

Mr. Carson: We are concerned about it very much. We don't have statutory authority, but we have a very real interest in it because in our central inventories for the 40,000, for example, we hope to retain on a central basis in what is going to be a meaningful way the appraisal information coming from the department about people and it has to be good, consistent and usable. If different departments were using different rating systems and different approaches to appraisal we would be in a chaotic state. That aspect of our inventories would be meaningless. We are very careful about this; we are attempting to produce guidelines in conjunction with Treasury Board which will be issued to all departments in the hope of getting uniformity of approach across the board. I have to confess that you are right and that departments have been left to use their own individual initiative in this field. The commission did send out a recommended approach to performance review back in 1962, but it had no teeth in it. Some departments picked it up and are using it, and others thought it was more fun to go out and invent the wheel for themselves and they have taken

different approaches so that there is a wide variation of practice at the moment. Both the personnel policy branch of Treasury Board and ourselves are seriously concerned. We have just completed a joint study of what is being done in all departments and we were a little shocked to find out how widespread a variation there was, but I can assure you that hopefully with good will and co-operation we will work ourselves out of this one.

The Chairman: I would like to excuse myself as chairman at this moment. I thank you, Mr. Carson, and your colleagues at least for the time being because I am wanted at another committee and they are waiting for me. I will ask Senator Cameron to take my place.

(Senator Cameron assumed the Chair.)

Senator Carter: I have just one more question, Mr. Chairman. I think the witness said that the Public Service Commission has accumulated a lot of information about personnel administrators and classifications like that that private agencies now come to them.

Mr. Carson: Not officially.

Senator Carter: I was wondering. If this information is confidential and you have private agencies coming to you—

Mr. Carson: It is confidential, but you know when you are out sleuthing around the country and meeting a lot of people and they phone you on the "old boy" network and ask "What can you tell me about so-and-so? We understand you didn't hire him." This is what I mean when I say they are coming to us for information.

Senator Carter: But they are not coming officially.

Mr. Carson: No, no, I am sorry; I misled you there. They just recognize that we happen to know more about certain specialist areas of talent in the country than they do. They are depending upon putting ads in newspapers, and I think they get to know the people in their community very well, but they don't usually have the kind of Canada-wide information about specialized classifications that we have.

Senator Thompson: I always have a certain apprehension about the privacy of the citizen when you speak of this "old boy" network and giving information about people.

Mr. Carson: I call them for references too, sometimes, senator.

Senator Thompson: I am thinking of credit cards and everything else we have in computers. I am sure

that does not mean that someone is blackballed because your people did not take particular liking to them and therefore it spread throughout the community.

Mr. Carson: No, I can assure you that we are extremely cautious in anything we do say, and anything we have received of a confidential nature of course we would not be sharing at all.

There is a large number of professional job hoppers in the country, of course, and they are the ones people are most interested in finding out about.

The Acting Chairman (Senator Cameron): May I again express our appreciation to you for coming and giving us this information.

Mr. Carson: Senator Cameron and your colleagues, we are very grateful to you for giving us an opportunity to share these thoughts with you and for your interest and your patience which has encouraged us greatly. Thank you.

Senator Haig: It has been one of the most thought provoking briefs we have received.

Mr. Carson: Thank you, sir.

The committee adjourned.

APPENDIX 30

A Brief

to

THE SENATE OF CANADA

SPECIAL COMMITTEE ON SCIENCE POLICY

Presented by the

Public Service Commission of Canada

BRIEF TO THE SENATE OF CANADA
SPECIAL COMMITTEE ON SCIENCE POLICY

BY THE

PUBLIC SERVICE COMMISSION

SUMMARY

The Public Service Commission, in carrying out its statutory responsibilities to meet the requirements of government departments for scientific and professional personnel considers the following points of particular significance in the development of a national science policy:

- There should be coordination with respect to recruitment, selection and promotion techniques between government departments and agencies primarily involved in scientific research.
- Manpower inventories and staff appraisal techniques should be standardized to provide comparable information with respect to all scientists in the public service.
- 3. There is a need for increased liaison between the universities and the federal government, as a major employer of scientific personnel, in order that long-term planning may be effective in relation to the use of manpower resources.

The Public Service Commission in Perspective

The Public Service Commission is directly responsible to Parliament with respect to its statutory responsibilities under the Public Service Employment Act. The present act came into force on March 13, 1967 along with the Public Service Staff Relations Act and certain amendments to the Financial Administration Act. These legislative changes have had a more profound impact on personnel management in the public service than any other change since the Civil Service Act of 1918. The new legislation resulted from the recommendations of the Royal Commission on Government Organization, the report of the Preparatory Committee on Collective Bargaining and the deliberations of the Special Joint Committee of the Senate and the House of Commons on Employee-Employer Relations in the Public Service.

- 2. With the introduction of a collective bargaining system, the responsibilities of the Civil Service Commission for such matters as pay, classification and conditions of employment became inappropriate for an independent Commission. Under the new legislation these responsibilities were transferred to the Treasury Board and the Public Service Commission is now able to concentrate its resources on activities directly related to the efficient staffing of the public service under the merit principle.
- 3. The Commission does not provide direct financial support for scientific research carried out in federal government departments but it does devote a major portion of its resources to activities that result in the appointment of the scientific and professional staff required to perform such research. Appendix "A" provides information with respect to the organization of the Commission and particularly those segments concerned with staffing in the scientific and professional areas. The scope of staffing activities for 1967 is given in Appendix "B".

Operational Aspects of Staffing

- appraisal, transfers and promotions. The Staffing Branch of the Public
 Service Commission is organized into a number of "Programs", each Program
 being responsible for a family of related occupational groups. Three
 staffing programs, the Applied Science Program, the Bio-Physical Sciences
 Program, and the Social-Economic Program, share the staffing responsibilities
 for the applied, pure and social sciences respectively. These programs are
 comprised of officers who are responsible on an interdepartmental basis
 for a number of disciplines related to their own area of professional jurisdiction. Appendices "C", "D" and "E" provide information concerning the
 responsibilities of these programs and some of their major interests.
- supports the staffing programs. The Selection Standards Division, for example, creates selection standards which parallel the revised scheme of position classification being established by Treasury Board; the Delegation and Monitoring Division develops monitoring and auditing systems for actions taken under delegated authority; and the Management Information Service provides data on manpower needs and resources within the public service. All manpower inventories of the Staffing Branch are being integrated into a system known as, "Data Stream", which will permit a more rapid identification and effective use of available human resources

through the use of an on-line computer. In addition, the Test Development

Section is responsible for the establishment of procedures whereby the
attributes and skills of employees may be quantified and presented in a
form suitable for comparative purposes. In similar fashion a Staff Training
and Development Bureau is concerned with the assessment of training needs and
the introduction of training and retraining programs in order that manpower
resources may be used with greater effectiveness.

- 6. Universities are the major source of supply for staff in the scientific disciplines and increased and improved liaison could well result in new forms of cooperation which would benefit the country as a whole.

 The Public Service Commission has already appointed regional educational liaison officers in order that there may be more direct and continuing contacts between the Commission and the universities. These officers are aware of the courses being offered by the universities and technological institutes and are able to bring the federal government's staffing requirements to the attention of university authorities. In addition, the educational liaison officers are of great assistance in introducing new plans or activities to the university community in their region and are in an admirable position to participate in the overall recruitment, selection, and appointment functions.
- conduct of the nation's business should brook no delay because of unnecessary procedural complexity in recruitment", the Public Service Commission has developed flexible methods of recruitment and selection which are highly responsive to the requirements of departments. Insofar as the quality of these operations is concerned, the Commission is confident that it compares favourably with any other organization, public or private, engaged in this same activity. Appendix "F" provides staffing statistics for some professional classes.
- 8. The Research Scientist and Research Manager classification and pay plans are of particular significance with respect to the research activities of federal government departments. The Research Scientist Classification and Pay Plan, which was introduced by the Commission in October, 1965, provides for the advancement of scientists on the basis of research accomplishment as determined by an annual appraisal. Under this merit system the outstanding scientist can be adequately rewarded whereas the less meritorious individual

receives little or no monetary increase. There is a financial control
established by Treasury Board but apart from this constraint there is
considerable flexibility with respect to salary determination. The
introduction of this plan has been a distinct advantage in attracting
and retaining well qualified scientists in the public service and a
similar pay plan, but with some notable differences, is used for
research scientists who have assumed positions involving the management
and direction of research programs. The Research Scientist and
Research Manager classification and pay plans enable the Commission,
in cooperation with the Treasury Board, to provide consistent personnel
administration for all research scientists in the departments of
government. The distribution of research scientists and research
managers by department and grade is given in Appendix "G".

- 9. The availability of these plans together with the use of modern and effective recruitment and selection techniques means that appointments can be made with a minimum of delay and effective service provided to all government departments. Indeed, progress has been such that it would perhaps be valid to consider if scientific agencies not included under the present Public Service Employment Act could not now, in the words of Glassco, "be quite happily reunited with the older, traditional departments and agencies in a unified public service". Certainly the economies to be gained in both human and material resources argue in favour of a more unified service which would be more responsive to national science policies and would permit equitable treatment for all federal government scientists. National Priorities, Science Policy and the Public Service Commission
- 10. Several of the eminent scientists who have appeared before this distinguished committee have alluded to the importance of qualified people in the development and implementation of science policy. Professor Arthur Porter expressed it succinctly as follows:

"When we talk about science policy, we are talking about people, and how best they can be utilized and put in the right sort of environment so that they are going to create."

Because human resources are essential to the development of scientific research, it follows that they must be considered and given priority in the earliest stages of policy development. Since it is the Commission's role to find and develop the human resources necessary for the effective

implementation of science programs within the framework of a system of national priorities, one cannot help but be aware of certain problems which exist in the absence of a national science policy. The following areas are of particular significance and merit serious consideration.

The Relationship Between the Consumers and Suppliers of Talent

- Il. There are three main users of talent: the government, industry and the universities, but there is essentially only one supplier: the universities. The relationship between supplier and user should be symbiotic, but to describe the existing situation as ideal would be misleading. Of primary concern to the Commission is the relationship between government and the universities and a few syndromes may be recognized:
 - (a) Because the universities are consumers of their own products,
 there is the possibility that they can become the centre of
 a self-sustaining supply and demand cycle. The "ivory tower
 syndrome" may manifest itself in out-dated courses providing
 training which finds little application outside the university
 and represents, potentially, a severe wastage of human and
 material resources. Perhaps better communication between
 government planners and university officials would provide the
 kind of cross-fertilization necessary to ensure that a cycle
 of this type does not get started, and this without doing
 violence to the spirit of independent inquiry that the universities uphold so well.
 - (b) The more exciting areas of scientific research tend to generate
 a great deal of interest and may stimulate universities, government departments or agencies and industry to begin or expand
 investigations in identical areas. The "me too" syndrome may,
 on occasion, be productive from the standpoint of scientific
 research but it brings with it the very considerable risk of
 so dispersing available talent that progress is in fact delayed.
 - (c) A shortage of human resources, once it is clearly established and known, tends to attract a very considerable amount of interest. University output may increase, recruiting outside the country is stepped up, and even a new cycle of immigration may result. Unfortunately, these activities have a tendency to continue

independently of any change in the supply and demand situation.

The machinery may be slow to start, but once it is operative

it is very effective - and very difficult to stop. The "too

much too late" syndrome may result in a wastage of human

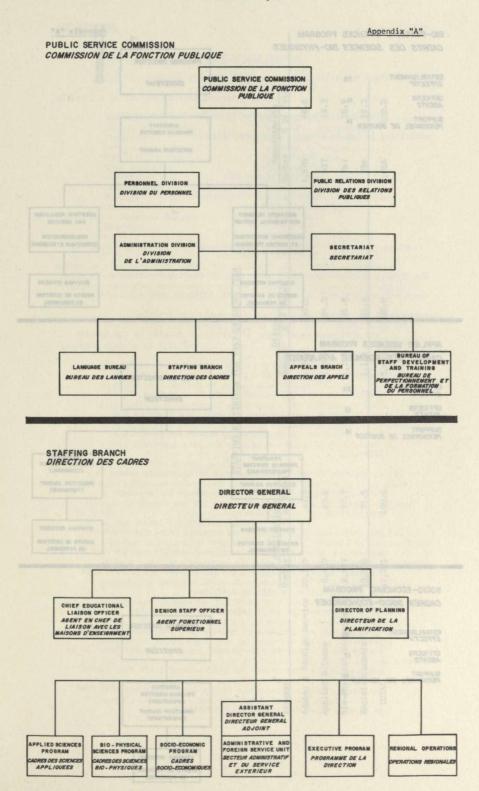
resources that we can ill afford.

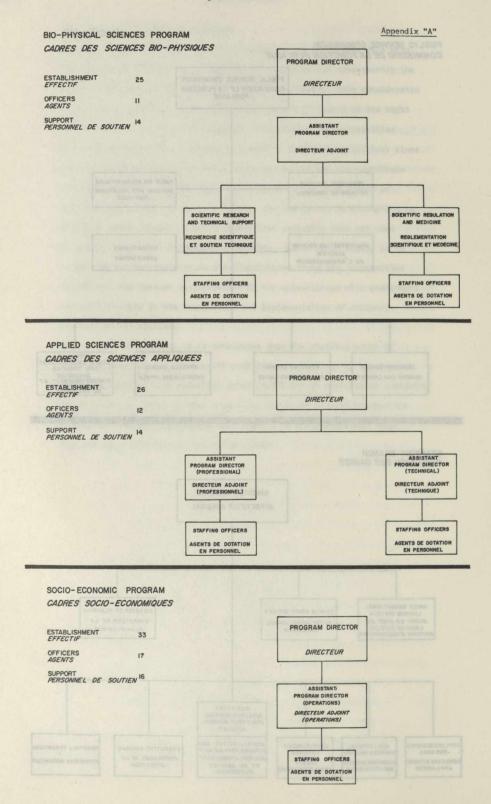
The Nature of Government Staffing Activities

- 12. While the Commission can take justifiable pride in its staffing operations, it is necessary to recognize the need for improvement in certain activities. The public service has been criticized on occasion as being cumbersome in action and inflexible in adapting to new situations. We have been slow to initiate the type of aggressive, imaginative and responsive recruiting and public relations methods necessary to attract a generation of students which is more interested in challenge and change than it is in security and routine. But we are making progress, we are attempting new things, and applying greater intelligence and competence than we have done in the past to these problems. We have within our staffing branch more technical and administrative competence than we have ever had before and the results are encouraging, new approaches are being developed and implemented and these are proving themselves in use. However, certain problems require greater study:
 - (a) It is perhaps inevitable that on occasion various scientific agencies of government may be in competition for the same types of individuals and sometimes for the same individual. To what extent the national interest is damaged or served by this competition in the market place is very difficult to assess. One suspects that each staffing agency would be happy to recommend that the others defer to it and anomalies are created when different selection standards, salary scales and manpower inventory systems are used.
 - (b) The location, identification, selection, recruitment, development and retention of first-rate talent requires a unified approach that is rational and coherent in both its design and its operation. This has not been achieved, nor is it likely to be achieved until the total staffing function is integrated into a national priority and policy network. At the moment, responsibility is divided between too many agencies to permit an effective overall program of manpower management.

The Unique Role of the Universities

- 13. The universities are both custodians and developers of a very significant portion of our national human resources and consequently the policies followed by the universities will, inevitably, have considerable impact on our ability to marshal the right kinds of talent at the right times in order to achieve our national objectives. The universities must remain centres where thought can develop freely along original lines but they must be aware of national needs and priorities and contribute in a major way to the formulation and implementation of a system of national goals. As a recruiting agency, the Commission is attempting to identify future manpower needs in order that available data are used as wisely as possible in meeting objectives. There would appear to be a need for greater cooperation and coordination among the universities themselves, and greater participation by the universities with government and with industry in the formulation and implementation of national policies and priorities.
- In conclusion, it is considered from the staffing point of view that research and development activities carried out by the federal government will be most effective under conditions of coordinated personnel administration. There is also a need for increased liaison between the government and the universities with respect to the current and long-term use of scientifically trained personnel.





STAFFING STATISTICS FOR 1967 CALENDAR YEAR

	Appl	ications	Of	fers	Appoi	intments
Program	Number	% of Total	Number	% of Total	Number	% of Total
Admin. & Foreign Service	20,595	43.2	1,782	32.5	1,976	48.6
Applied Science	8,423	17.6	1,329	24.3	537	13.2
Bio-Physical Sciences	8,467	17.7	1,197	21.8	767	18.9
Social-Economic	10,286	21.5	1,173	21.4	786	19.3
TOTAL	47,771	100.0	5,481	100.0	4,066	100.0

Appendix "C"

APPLIED SCIENCES PROGRAM

The Applied Sciences Program is responsible for staffing activities in the following occupational groups:

Engineers
Architects
Aircraft Operations
Air Traffic Control
Drafting and Illustration
Electronics
Radio Operatio.
Ships Officers
Ships Pilots
Engineering Support
Technical Inspection

The Program has been relatively successful in meeting departmental requirements for professional and technical staff, although some difficulty has been encountered in recruiting personnel with specialist training.

The following aspects are of particular concern to the Applied Sciences Program:

- (a) Engineers are involved in a variety of projects such as satellite communications, water pollution studies, the development of international airports, and roads in the north, and there is an increasing demand for specialist training.
- (b) In addition to the traditional role of architects, there is an increased demand for people experienced in landscape architecture and rural planning.
- (c) The institutes of technology are distinct from, but complementary to, universities and vocational schools and the graduate technologist bridges the gap between the professional and the technician or skilled craftsman.
- (d) An extensive program of recruitment at universities, institutes of technology and colleges of applied arts and technology permits the Applied Sciences Program to meet its major objectives. It is anticipated that the demand for professional staff will exceed the supply for the foreseeable future and greater use will need to be made of technologists and technicians.

Appendix "D"

BIO-PHYSICAL SCIENCES PROGRAM

The Bio-Physical Sciences Program is responsible for staffing activities in the following occupational groups:

> Agriculture Biological Sciences Chemistry Dentistry Forestry Meteorology Nursing Occupational and Physical Therapy Pharmacy

Physical Sciences Scientific Regulation Scientific Research Research Scientist
Research Manager Home Economics Veterinary Science
Medicine Scientific Support General Technical Primary Products Inspection Technical Inspection

It has been possible to meet departmental requirements in most occupational groups in a satisfactory manner but shortages still exist in forestry, veterinary medicine, mathematics and some specialist areas in the physical sciences.

The Bio-Physical Sciences Program has a major concern with the following aspects of staffing:

- (a) Scientists trained in the biological and physical sciences are involved in a variety of projects being carried out by the scientific departments of government. In addition to basic research, these include regulatory and service aspects required in the development of our natural and human resources and in the protection of the public health.
- (b) Very extensive recruiting campaigns have been carried out since 1964 in Canada and the United States, and for the past two years in the United Kingdom and Europe.
- (c) A Career Introduction Program has been established for outstanding students who are interested in summer employment. Under this plan a carefully selected group of students will be provided a unique opportunity to work in highly skilled and career oriented environments. This plan involves a high degree of cooperation between government departments, the universities and the Commission.
- (d) The Institutes of Technology and Community Colleges are now providing excellently trained technologists and technicians and recruitment is very active and successful in these areas.

SOCIAL-ECONOMIC PROGRAM

The Social-Economic Staffing Program is responsible for staffing activities in the following occupational groups:

Economics, Sociology and Statistics Law Mathematics Social Work Welfare Programs . Translation Education
Historical Research
Library Science
Psycology
University Teaching
Commerce
Social Science Support

While shortages exist in most groups, considerable success has been achieved in meeting departmental requirements. At the present time, three occupational groups provide the greatest problems - Economics, Sociology and Statistics; Library Science; and Translation.

In order to alleviate the shortages in these groups in particular, as well as in the other groups shown, the Social-Economic Program is currently engaged in several projects:

- (a) A continuing program of visits to universities is underway in an attempt to gain further knowledge concerning the university student population. In addition, discussions are held with faculty members, placement officers and students to outline career opportunities in government service.
- (b) Discussions are held with university faculty members concerning training in special areas. For example, consultation with York University regarding "energy economics" has resulted in the establishment of a graduate level course in energy economics which will be offered beginning in the fall of 1969.
- (c) Two programs involving the sponsorship of students at university are currently underway:
 - (i) Librarians-in-training
 - (ii) Translators-in-training
- (d) Overseas recruitment campaigns, in the United Kingdom and France in particular, are conducted for economists, statisticians and translators.

Appendix "E"

- 2 -

(e) A program designed to encourage married women to return to the labour market, in certain serious shortage areas, was begun last year. While the initial success of this program was not great, it is felt that further efforts are warranted.

(f) Internship programs involving summer employment for students in economics, sociology and statistics have proved successful in introducing students to work in the federal public service, and a number of very competent persons have been recruited as a result of the program.

PERSONAL PROPERTY.

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Appendix "F"

STAFFING	STATISTICS	FOR	SOME	SCIENTIFIC	AND	PROFFSSTONAL	CIASSES

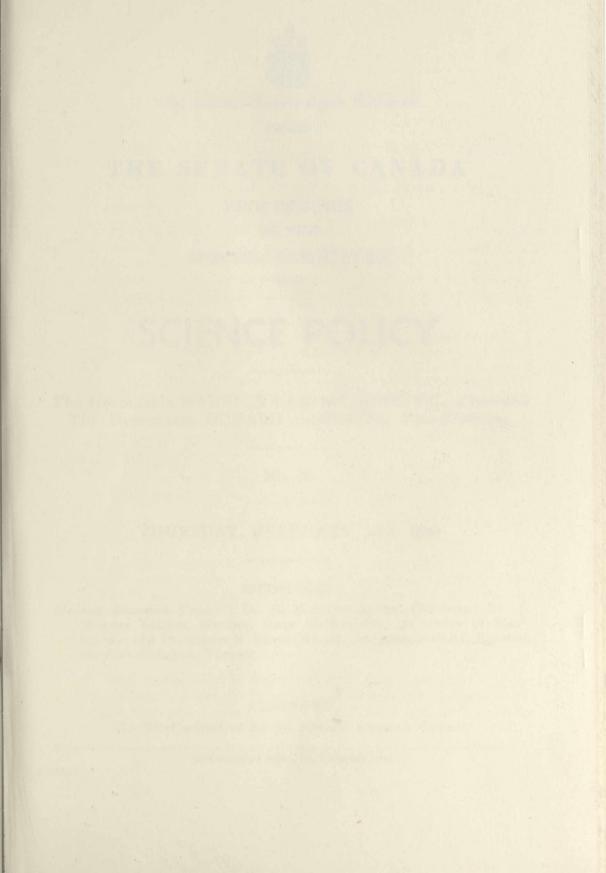
	NO. OF NEW APPOINTMENTS				OTHER	OTHER APPOINTMENTS TO				TOTAL APPOINTMENTS			SEPARATIONS			
CLASS	POSITIONS	1965	1966	1967	1965	1966	1967	1965	1966	1967	1965		1967			
							A	8 8 8 4		4 1 2 1	8 8 4					
1. Architect	177	21	12	37	38	27	40	59	39	77	15		12			
2. Bacteriologist	71	17	9	12	13	14	11	30	23	23	8	13	6			
3. Biologist	195	28	35	49	38	44	39	66	79	88		7	13			
4. Chemist	193	41	37	24	60	41	17	101	78	41	26	13	22			
5. Dental Officer	76	11	5	12	1	1	3	12	6	15	11	11				
6. Economist	483	34	47	90	67	107	123	101	154	213	18	24	3			
7. Engineer	2068	174	238	290	319	382	413	493	620	703	130	114	136			
8. Food and Drug Officer	188	24	29	20	54	47	48	78	76	68	10	11	1			
9. Librarian	251	19	33	45	42	49	57	61	82	102	19	17	2			
10. Meteorologist	360	8	13	16	82	56	70	90	69	86	13	6	1			
ll. Meteorological Officer	287	25	53	45	104	106	94	129	159	139	19	19	2			
12. Medical Officer	529	40	50	47	60	55	62	100	105	109	36		5			
13. Patent Examiner	200	15	28	23	41	49	39	56	77	62	20	13				
14. Professor	193	36	31	36	33	26	41	69	57	77	33		3			
15. Research Scientist	1531	5	57	125	1	1290	236	6	1347	361	4 9	28	7			
16. Research Officer (Agr.)	155	67	33	24	183	154	13	250	187	37	48		1			
17. Research Officer (For.)	188	30	49	50	34	83	17	64	132	67	25					
18. Scientific Officer (E.M.R.)	275	33	45	43	31	76	29	64	121	72	21		1			
19. Solicitor	165	10	13	30	35	36	23	45	49	53	10		1			
20. Statistician	451	39	48	105	88	104	147	127	152	252	32		2			
21. Veterinarian	540	35	27	31	64	67	52	99	94	83	38		3			
22. Welfare Officer	849	21	17		39	46	1-	60	63	8 -	14					
TOTALS	9425	733	909	1154	1427	2860	1574	2160	3769	2728	552	457	58:			

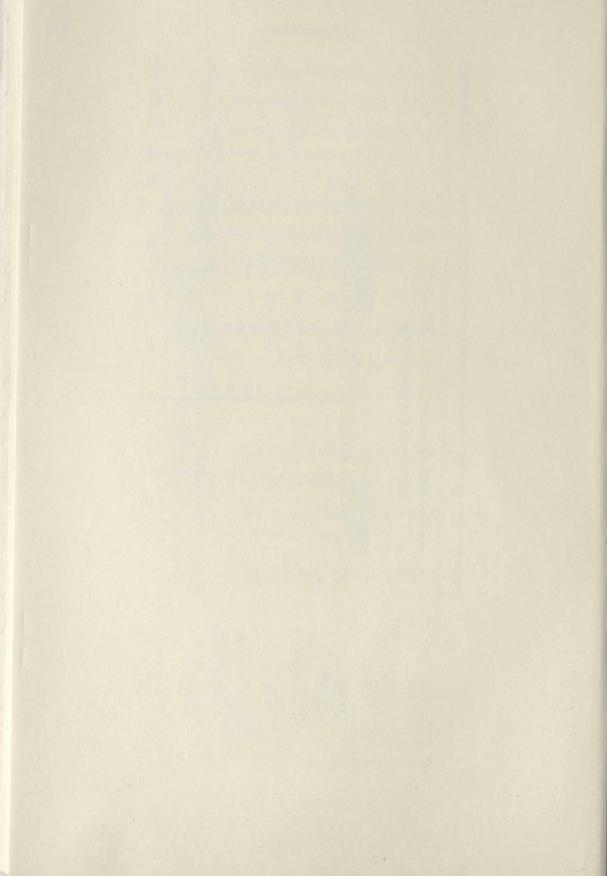
RESEARCH MANAGERS AND RESEARCH SCIENTISTS - SEPT. 9, 1968

Distribution by department and grade

		EARCH MANAGE			RESEARCH SCIENTISTS Number of Staff							
DEPARTMENT	R.M. 1	R.M. 2	R.M. 3	R.S. 1	R.S. 2	R.S. 3	R.S. 4					
AGRICULTURE	9	13	40	136	488	75	14					
FORESTRY AND RURAL DEVELOPMENT	4	16	11	114	141	14	3					
NATIONAL HEALTH AND WELFARE		2	3	26	51	10	1					
SECRETARY OF STATE	-	-	-	9	12	2	-					
INDIAN AFFAIRS AND NORTHERN DEVELOPMENT	3	2	-	8	12	1	-					
ENERGY, MINES AND RESOURCES	1	8	21	98	245	60	11					
TOTAL	17	41	75	391	949	162	29					

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First Session-Twenty-aighth Parliament

1968-69

THE SENATE OF CANADA

PROCEEDINGS

OF THE

SPECIAL COMMITTEE

OW

SCIENCE POLICY

The Honourable MAURICE LAMONTAGNE, P.C., Chairman
The Honourable DONALD CAMERON, Vice-Chairman

No. 30

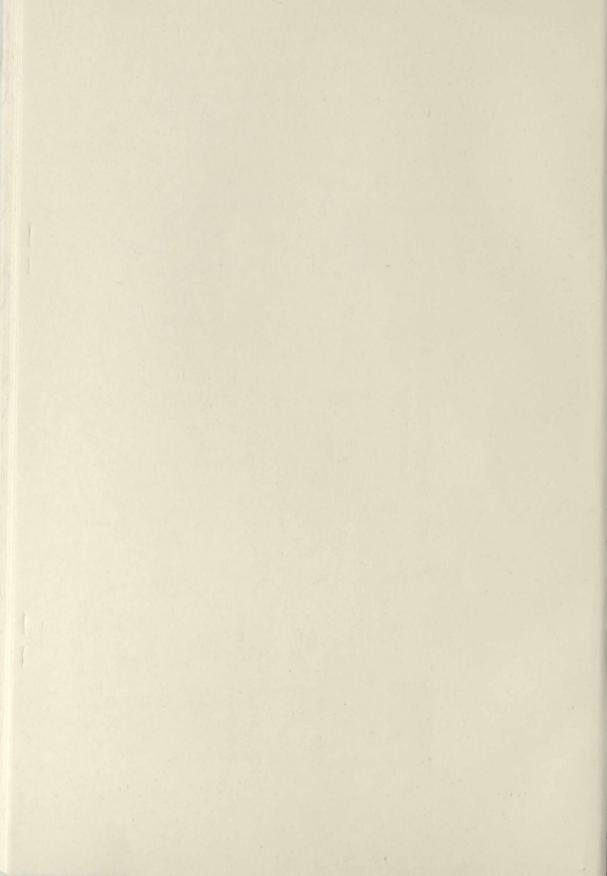
THURSDAY, FEBRUARY 13th, 1986

WITNESSES.

Medical Research Council: Dr. G. Malcules Brown; Chairman; Dr. J. Maurice LeClair, Member, Dean of Medicine, University of Sherbrooke; and Dr. Robert B. Salter, Member, Surgeon-in-Chief, Hospital for Sick Children, Toronto.

APPENDIA

31.—Brief submitted by the Medical Research Council.





First Session—Twenty-eighth Parliament

THE SENATE OF CANADA

PROCEEDINGS OF THE

SPECIAL COMMITTEE ON

SCIENCE POLICY

The Honourable MAURICE LAMONTAGNE, P.C., Chairman The Honourable DONALD CAMERON, Vice-Chairman

No. 30

THURSDAY, FEBRUARY 13th, 1969

WITNESSES:

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APPENDIX:

31.—Brief submitted by the Medical Research Council.

MEMBERS OF THE SPECIAL COMMITTEE

ON

SCIENCE POLICY

The Honourable Maurice Lamontagne, Chairman

The Honourable Donald Cameron, Vice-Chairman

The Honourable Senators:

Aird Grosart Nichol Belisle O'Leary (Carleton) Haig Phillips (Prince) Blois Hays Bourget Kinnear Robichaud Cameron Lamontagne Sullivan Carter Lang Thompson Desruisseaux Leonard Yuzyk Giguère McGrand

Patrick J. Savoie, Clerk of the Committee.

WITNESSES:

edical Research Council: Dr. G. Malcolm Brown, Chairman; Dr. J. Maurice LeClair, Member, Dean of Medicine, University of Sherbrooke; and Dr. Robert B. Salter, Member, Surgeon-in-Chief, Hospital for Sick Children, Toronto.

APPENDIX:

ORDERS OF REFERENCE

Extract from the Minutes of the Proceedings of the Senate, Tuesday, September 17th, 1968:

"The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That a Special Committee of the Senate be appointed to consider and report on the science policy of the Federal Government with the object of appraising its priorities, its budget and its efficiency in the light of the experience of other industrialized countries and of the requirements of the new scientific age and, without restricting the generality of the foregoing, to inquire into and report upon the following:

- (a) recent trends in research and development expenditures in Canada as compared with those in other industrialized countries;
- (b) research and development activities carried out by the Federal Government in the fields of physical, life and human sciences;
- (c) federal assistance to research and development activities carried out by individuals, universities, industry and other groups in the three scientific fields mentioned above; and
- (d) the broad principles, the long-term financial requirements and the structural organization of a dynamic and efficient science policy for Canada.

That the Committee have power to engage the services of such counsel, staff and technical advisers as may be necessary for the purpose of the inquiry;

That the Committee have power to send for persons, papers and records, to examine witnesses, to report from time to time, to print such papers and evidence from day to day as may be ordered by the Committee, to sit during sittings and adjournments of the Senate, and to adjourn from place to place;

That the papers and evidence received and taken on the subject in the preceding session be referred to the Committee; and

That the Committee be composed of the Honourable Senators Aird, Argue, Bélisle, Bourget, Cameron, Desruisseaux, Grosart, Hays, Kinnear, Lamontagne, Lang, Leonard, MacKenzie, O'Leary (*Carleton*), Phillips (*Prince*), Sullivan, Thompson and Yuzyk.

After debate, and—
The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Thursday, September 19th, 1968:

"With leave of the Senate,

The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That the name of the Honourable Senator Robichaud be substituted for that of the Honourable Senator Argue on the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—

Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Wednesday, February 5th, 1969:

With leave of the Senate,

The Honourable Senator McDonald moved, seconded by the Honourable Senator Macdonald (*Cape Breton*):

That the names of the Honourable Senators Blois, Carter, Giguère, Haig, McGrand and Nichol be added to the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—Resolved in the affirmative.

ROBERT FORTIER, Clerk of the Senate.

MINUTES OF PROCEEDINGS

Thursday, February 13th, 1969

Pursuant to adjournment and notice the Special Committee on Science Policy met this day at 10.00 a.m.

Present: The Honourable Senators Lamontagne (*Chairman*), Blois, Bourget, Giquére, Kinnear, Leonard, McGrand, Sullivan and Thompson – 9.

In attendance:

Philip J. Pocock, Director of Research (Physical Science).

The following witnesses were heard:

MEDICAL RESEARCH COUNCIL:

Dr. G. Malcolm Brown, Chairman;

Dr. J. Maurice LeClair, Member; Dean of Medicine, University of Sherbrooke; and Dr. Robert B. Salter, Member; Surgeon-in-Chief, Hospital for Sick Children, Toronto.

In attendance:

Dr. James M. Roxburgh, Secretary, Medical Research Council.

(A curriculum vitae of each witness follows these Minutes).

The following is printed as Appendix No. 31.

Brief submitted by the Medical Research Council.

The Council has submitted the Annual Report on Support of University Research 1967-68 in support of their brief. This has been retained by the Committee as an exhibit.

At 1.00 p.m. the Committee adjourned to the call of the Chairman.

ATTEST:

Patrick J. Savoie,

Clerk of the Committee.

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Dr. G. Malcolm Brown, Chairman

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ATTEST

Patrick J. Savoie, Clerk of the Committee

CURRICULUM VITAE

BROWN G. MALCOLM Born in Campbellford, Ontario, July 16, 1916 Education: M. D., C. M., Queen's University, 1938 Rhodes Scholarship 1938 D. Phil., Oxon, 1940 Research Scholar, Radcliffe Infirmary, 1941-43 Higher Professional Qualifications: M.R.C.P. (London), 1943; F.R.C.P. (C), 1946; F.A.C.P., 1949; F.R.C.P. (London), 1961; F.R.S.C., 1966 Military Service: R.C.A.M.P., England and Northwest Europe 1943-46 University Appointments: Queen's University: Associate Professor of Medicine, 1946-51 Professor of Medicine, 1951-65 Member of Senate, 1949-52 Member of University Council, 1949-52 Member of Board of Trustees, 1966- University of Ottawa: Professor of Medicine, 1965- Hospital Appointments: Kingston General Hospital: Attending Physician, 1946-65 Director, Clinical Investigation Unit, 1961-65 Kingston Military Hospital: Consulting Physician, 1946-65 Department of Veterans Affairs, Kingston District: Chief of Service - Medicine, 1946-65 Ottawa General Hospital: Attending Physician, 1965-Ottawa Civic Hospital: Consulting Physician, 1965- Scientific and Professional Societies: College of Physicians and Surgeons of Ontario - Member of Council 1949-58 President 1956-58 Royal College of Physicians and Surgeons of Canada - Member of Council 1954-58 and 1960-66 Member of Executive 1956-58, 1964-66 President 1962-64 American College of Physicians - Regent 1965- Canadian Foundation for the Advancement of Therapeutics - Director 1963- National Cancer Institute of Canada -Representative Member 1965 Ontario Cancer Treatment and Research Foundation -Member, Advisory Medical Board 1966-Muskoka Hospital Memorial Research Fund — Chairman, Research Committee 1965- Member, Advisory Panel of the CIBA Foundation, London, England, 1966- Fellow, Royal Society of Canada Member: American Society for Clinical Investigation American Federation for Clinical Research American Society of Hematology Canadian Association of Gastroenterology Canadian Physiological Society Canadian Society for Clinical Investigation Member: Ontario Medical Association Canadian Medical Association International Society of Hematology American Clinical and Climatological Society Government Agencies: Defence Research Board - Panel on Arctic Medical Research Member 1947-54 Chairman 1952-54 Defence Research Board - Panel on Nutrition Member 1952-58 Defence Research Board - Defence Medical Research Coordinating Committee Member 1967- Department of National Health and Welfare -Canadian Council on Nutrition - Member 1950-54 National Research Council - Member 1965- Medical Research Council 1960- Member of Executive 1961- Chairman 1965 -Science Council of Canada- Member 1966-Publications: Seventy-odd papers in scientific journals in the fields of malaria research, cold physiology, hematology and gastroenterology.

LECLAIR J. MAURICE Born in Sayabec, Quebec, 1927 Education: B.Sc., McGill University, 1947 M.D., C M., McGill University, 1951 M.Sc., University of Minnesota, 1958 Higher Professional Qualifications: F.R.C.P.(C); F.A.C.P., C S.P Q. Hospital

Appointments: Hopital Notre-Dame, Montreal Attending Physician, 1958-65 University Appointments: University of Montreal Associate Professor of Medicine, 1962-64 University of Sherbrooke Professor and Chairman, Dept. of Medicine, 1965-68 Vice-Dean of Medicine, 1967-68 Dean of Medicine, 1968—Scientific and Professional Societies: Royal College of Physicians and Surgeons of Canada — Co-chairman, Committee on Credentials Association of Internists of Province of Quebec - Secretary, 1962-65 National Cancer Institute of Canada — Member, Board of Directors Member: Alpha Omega Alpha Society Canadian Medical Association Association de Medecins de la Langue française Societe medicale de Montreal Montreal Medical-Chirurgical Society Member: American college of Physicians Club de Recherche clinique de Quebec American Association for the Advancement of Science New York Academy of Science Government Agencies: Medical Research Council — Member, 1967—Member, Executive Committee, 1968—Chairman, Grants Committee for Clinical Investigation, 1968—Publications: Sixteen papers in scientific journals in the fields of internal medicine and hematology.

SALTER ROBERT B. Born in Stratford, Ontario, December 15, 1924 Education: M.D., University of Toronto, 1947 M.S., University of Toronto, 1959 Higher Professional Qualifications: F.R.C.S.(C); F.A.C.S. University Appointments: University of Toronto: Clinical Teacher in Surgery, 1955-59 Associate in Surgery, 1959-62 Assistant Professor of Surgery, 1962-1966 Professor of Surgery, 1966-Board of Governors, Wycliffe College Hospital Appointments: Hospital for Sick Children, Toronto: Orthopedic Surgeon, 1955-57 Chief of Orthopedic Surgery, 1957-66 Surgeon-in-Chief and Senior Orthopedic Surgeon, 1966-Research Associate in the Research Institute 1966-Consultant Appointments: Ontario Society for Crippled Children (travelling clinic) Ontario Crippled Children's Centre, Toronto Ontario Hemophilia Society, Medical Advisory Board Grenfell Labrador Medical Mission, Board of Directors Shriners' Hospitals of North America, Surgical Advisory Board Scientific and Professional Societies: Member: Toronto Academy of Medicine Canadian Medical Association Ontario Medical Association Royal College of Surgeons of Canada Canadian Orthopedic Association American College of Surgeons Member: American Academy of Orthopedic Surgery Association of Bone and Joint Surgery Interurban Orthopedic Club of the U.S. and Canada International Orthopedic Club Australian Orthopedic Association Government Agencies: Medical Research Council of Canada Member 1967-Member, Grants Committee for Clinical Investigation Publications: Forty scientific papers or books in the field of orthopedic surgery.

THE SENATE

SPECIAL COMMITTEE ON SCIENCE POLICY

EVIDENCE

Ottawa, Thursday, February 13, 1969.

The Special Committee of the Senate on Science Policy met this day at 10.00 a.m.

Senator Maurice Lamontagne (Chairman) in the Chair.

The Chairman: Honourable senators, we are pleased to meet again with the Medical Research Council of Canada. Unfortunately, when they were first before this committee, I was not able to chair the meeting because of ill health.

Dr. G. Malcolm Brown, as you all know, is Chairman of the Medical Research Council of Canada, and he is accompanied by Dr. J. Maurice LeClair, Dean of Medicine, University of Sherbrooke, and member of the Council; Dr. James M. Roxburg, Secretary of the Council, and Dr. Robert B. Salter, Surgeon-in-Chief, Hospital for Sick Children, and member of the Council.

As usual, we will have a brief opening statement from Dr. Brown, and then we will proceed to the usual discussion period.

Dr. G. Malcolm Brown, Chairman, Medical Research Council of Canada: Thank you, Mr. Chairman, Honourable senators, the brief that our Council has submitted is, I am sure, familiar to you. I might now just mention briefly, in a summary fashion, some of the chief points which have been made.

As you are aware, the Medical Research Council is now that part of the government structure through which by far the greatest part of the federal support for medical research goes to the universities. The purpose of the operation is the improvement of the health of Canadians through the development of research. This purpose is sought through three subsidiary goals, if you like, and these are, first of all, the contributions to new knowledge that will accrue from the research; the support of the educational process in professional fields related to health by the support of the research component of the educational process; and the provision and support of that part of the technological

back-up of health care which can be provided by research.

The Council itself is a group of 21 men, and it is a working council rather than an advisory council. It is a council which has authority, within the limits of its assigned mission, to make its own policies and to make regulations, and it has authority to make decisions with respect to the spending of the money which has been voted to it by Parliament. It is, I should like to emphasize, a working council rather than simply an advisory council. In its work it is now spending about 70 per cent of its sums in the support of research programs in the universities, medical schools and hospitals across the country.

The second largest component of the effort in terms of money is concerned with the support of research trainees, people who are themselves training to become researchers in this field, and people who are training for other fields, but are seeking the benefits of a year in a research laboratory.

Until recently the training program people have had the highest priority and it has been possible to support them to the limit of high quality demands on them. At the present time they continue to have the highest priority within the Council list of programs, but it is not possible to give them the degree of support that was once given. The Council seeks to support research in a number of other ways in addition to the grantsin-aid of projects and the various training programs, of which there are a number of subdivisions, as you know, in addition to these things the Council carries on a number of other activities, under the heading, in your brief, of Special Programs. These are concerned particularly with the development of research in special situations; they are concerned with the provision of support in situations which do not fit into the run of the other major programs. It is under this heading that special attempts are made to support the development of research in new medical schools, and to support the development of research in those schools where there is concern about its present level.

Now, Mr. Chairman, as you have seen from the brief there has been some consideration given not only to the organizational basis for the Council itself, but also to the general framework for science in the government into which the Council fits, and would fit. As has been stated in the brief, it is the strong and unanimous opinion of the Medical Research Council that the corporate agency structure is the organizational structure which is appropriate to it and which will best permit it to do its job. It is the structure which will mobilize for the job to be done the greatest number of the best people, and here again I might refer to the fact that it is a working council rathern than simply an advisory council.

As it looks to the other aspects of government organization for science, it perhaps had in mind what is quite apparent in the health field, that science is inseparable from other things. Science is part of health, and an attempt to make a clear-cut division between what one might call science and non-science within the health field is something that is bound to be arbitrary and to some extent artificial.

As the Council has thought about the arrangements for science in the government as a whole, and therefore, as it has thought about the umbrella under which it will work, it has had in mind the parallelism perhaps with economics. In many ways the problems to be faced are the same. The views of Council have been set out at a little length in the brief. To summarize them here I might say that they contain the suggestion that the first thing to be done perhaps is to decide on social goals, and after that to decide on the extent to which progress towards a particular goal can be made in a scientific fashion; and, as a third step to determine the extent to which programs will depend on further and new research in the field. This is a view then which maintains that science and research are not ends in themselves, but are servants of their goals. It would follow from this, and for many other reasons also, that decisions about the application of science and about the support and development of research must be taken really in relation to the larger goals, that is they must be taken by non-scientists for the most part. A proportion of the government members and a proportion of senior administrative people have a background in science and know some of its limitations as well as its possible accomplishments. We have thought that perhaps a large part of the present problem is that this proportion is as small as it is. We would expect that, when the proportion who have a working knowledge of the scientific method is as high as it is with respect to economics, part of this problem will be resolved.

The Chairman: You are very optimistic, sir, because from what we hear about economics—and we have been told in this committee about the organization of economic research within the government—it is far from being satisfactory from the point of view of a former economist.

Dr. Brown: It has been reassuring to the scientists, Mr. Chairman, to hear people in other major fields

castigated and derided in the same way that we often are. The problems in the two fields amount to the application of what arises from a discipline to the ordinary problems of life, and I am sure the Chairman would agree, despite what may have been said about the value of economic advice, that as much of it as possible must be brought to bear on the decision points, and this would seem to be the case in science. This means that we do not think that science is something that can be put in a corner and treated all by itself, not for administrative reasons, but because, by its nature, it is inseparable from those things that are expected from science. We have made remarks in the brief, as you know, Mr. Chairman, concerning the way in which science advice might be arranged in different areas.

Finally, in the first part of our brief we have a few remarks about some immediate problems in the health sciences area. We have started from the point that Canadians seem to have made it perfectly plain that they want a high level of health care. One of the most important contributions which research and the research effort can make to the provision of such highlevel care is to provide for the shortening of the gap between the acquisition of new knowledge and its application where it is used; that is the shortening of the time gap between the discovery in the laboratory and its application at the bedside or in the office or in the community. There are some problems here because of the size of the effort in the research field. This is not yet large enought properly to complement the educational job that has to be done by the medical schools; it is also not yet large enought to serve one of the other main goals of the Council which I have mentioned, which is to support adequately in a research way the technological back-up to health care.

In addition to these general things there are obviously a number of special problems which concern us, and mention has been made of just two of these by way of illustration. One of these illustrations concerns the field of bio-medical engineering. This is a field in which there is much to be done, as is the case with many fields, but this field has also the characteristic of having in it a number of people with the competences and with the desire to do things. It is a field, then, that is ripe for advance. It is a field that may be of particular importance to Canada because of the interface it may provide between medical research in the academic setting, and research and development in industry.

The second example chosen concerns another interface, that between health science research and sociology and economics. This is the relation between the acquisition of knowledge and its transmission in education, and the actual provision of health care. There is in our view a large amount of work to be done in the way of operational research in part, and it is our view that this is just as much a necessary complement

of medical research, taking the nation's effort as a whole, as is the development and production in factories of various products which arise from innovations and inventions of laboratories.

These, then, Mr. Chairman are the chief points of the written brief which has been submitted to the Committee.

The Chairman: Thank you very much, Dr. Brown. Now we will proceed to the discussion period and I will ask Senator Sullivan, whom I am sure you know very well, to initiate that discussion.

Senator Sullivan: Mr. Chairman, members of the panel, honourable senators: Thank you, Mr. Chairman, for again asking me to open the discussion before the Medical Research Council. This happened on March 21, 1968. I was just thinking while I was sitting here of the smallness of the delegation that is appearing before us compared to some that we have had, and probably that is the reason for such excellent quality.

Now, there are certain things, Dr. Brown, that you mentioned in your excellent resume. On page 1, paragraph 3...

The Chairman: Before you go on Senator Sullivan, would it be agreeable if we were to make a clear distinction, during our discussions, between the activities and the functions and responsibilities of the Medical Research Council, and deal with that first, and then reserve perhaps the part of the brief which deals with science policy in general for the second part of our discussion. I think it would make for a better discussion.

Senator Sullivan: Yes, sir. Then, we turn then to pages 17 and 18, the functions of the Medical Research Council, the paragraph at the bottom of page 17 and over on to the top of page 18. I will read that:

The Medical Research Council has until recently operated as an autonomous agency within the framework of the National Research Council; it has therefore had the statutory powers and functions provided in the National Research Council Act and has reported through the National Research Council to the Chairman of the Privy Council Committee on Scientific and Industrial Research. Under an interim arrangement made in August 1968 (Order-in-Council 1968-1709), the Medical Research Council is now a separate body reporting to the Minister of National Health and Welfare; it continues to function as before pending legislation establishing its statutory powers and functions for the future.

I think, Dr. Brown, you might enlarge on that a little bit.

Dr. Brown: Mr. Chairman, as is set out here, the legislative basis of the Medical Research Council for a number of years was a little unusual in what might almost be termed its informality. From 1960 to 1968 its existence was based on a Cabinet Minute directing the National Research Council to set up an autonomous Medical Research Council within its own administrative framework. This followed on the Farguharson Report which had been sought earlier by the Cabinet of the time. This meant that the Medical Research Council was within the administrative framework of the National Research Council and reported through the same lines. Then, with the reorganization and the redesign of reporting channels which took place last summer, the decision was taken that the Medical Research Council should report to Parliament through the Minister of National Health and Welfare. If this goal was to be served it meant then a separation of the Medical Research Council from the administrative framework of the National Research Council. Very temporary arrangements have been made concerning this and we have operated under these since last August. They are of such a nature that they really could not persist for very long, and the plan of the government is to provide a legislative basis, a basis in legislation, for the Medical Research Council, and, as I have said the view of the Council is very strongly that this should be legislation which would make it a corporate agency.

The Chairman: Isn't there some kind of contradiction of views there?

Senator Sullivan: I was just going to ask that, Mr. Chairman.

The Chairman: Oh, I am sorry.

Senator Sullivan: Go ahead. That is fine.

The Chairman: You say that science must be very close to policy and be in a position to advise and all this, and here you are asking to get away from departments.

Dr. Brown: Yes. I think that one must keep the matter of levels in mind. There are policies, the matter of policy in the integration of different policies and the assignment of functions, and then there is perhaps the matter of operation and the carrying out of what has to be done if these functions are to be served. With the Council more in the health stream as far as policymaking is concerned, and working through the Minister of National Health and Welfare, the task of coordination of policy may be made easier and the coordination may be more effective, not that it has been ineffective by any means in the past; but when one comes to carry out the job that has to be done under a given policy the difference between the nature of the jobs to be done is such that we feel quite defi-

nitely that there is a need for separation in operation-not separation in policy but separation for purposes of good operation.

Under the corporate agency structure our own experience has demonstrated, and the experience of other councils of the sort in Canada and elsewhere, that this can be very flexible: it can be quick in its responses to needs, it actually provides easier means of developing agreements over a term with other agencies in the field than the departmental structure does, and, finally, it is terribly economical. Our administrative costs are of the order of one per cent a year of the money administered. The figure is too small, the staff is too small, but this can be taken as a measure of the economy which can be gained using this method of procedure.

Senator Sullivan: Mr. Chairman, adding to what Dr. Brown has just stated, if you turn to page 15 it certainly must be very economical because the Council members all serve without remuneration for a period of three years with the possible renewal of their appointment for one additional term. How many Council members are there, Dr. Brown? You say they are a working council?

Dr. Brown: Yes. There are 21 and they are a working council. At the present time Council membership means the presence in Ottawa of a Council member for at least three weeks during the year, and the work that he must do in his own city or in his own town in addition to this is a matter of more weeks. When a man has to serve on the Executive and do other various jobs, then the amount of time in Ottawa rises beyond the three weeks. It has become a major job and is not something that can be taken casually any longer.

Senator Thompson: This three weeks, is that over a period, or does it take three weeks at one time in Ottawa? I understand there is a great deal of work involved.

Dr. Brown: Mr. Chairman, I meant a total of three weeks during the year, not three weeks on end but a total of three weeks as a minimum during the year. In addition, most of the members have additional duties that will bring their time spent to a level that is higher than that.

Dr. LeClair has served on the Executive and he might speak to us from personal experience.

Dr. LeClair: Mr. Chairman, Honourable Senators, I believe that as far as I am concerned

The Chairman: We have simultaneous translation that can be used.

Dr. LeClair: as far as I am concerned personally, I believe that the time I spent in Ottawa, over the

past year, amounts to about four to six weeks in addition to the work I performed at home. However, I feel it fair to mention that, as regards the members of the Council, as regards the research workers in the faculties of medicine, the efforts thus devoted are considered one of the most satisfying activities both from the educational and intellectual point of view. The importance of research in medical education is such that it is absolutely essential for us to have access to this information, and be acquainted with this group of scientists who decide on policy, and who distribute the funds voted by Parliament. Therefore, even if it does take a great deal of time, I feel that, without exception, the people who perform this task do it with pleasure, that it is a two-way street, and that everyone benefits personally.

Senator Bourget: Dr. LeClair, are there any particular research programs which interest you more than others?

Dr. LeClair: Do you mean personally, or

Senator Bourget: Personally, or in conjunction with other research workers in other universities. I am thinking, for example, of the Faculty of Cardiology of Montreal; are you interested in this in any special way?

Dr. LeClair: Are you referring to the Medical Research Council or to our committee in particular?

Senator Bourget: Well, the relations of the Medical Research Council with those other branches of research such as the cardiology branch.

Dr. LeClair: Yes, definitely. For example, as you are aware, the Montreal Heart Institute has performed nine heart transplants. They were obliged to stop because of a major problem, the problem of money. The Medical Research Council has a serum, called an antilymphocytic, which is possibly one of the answers to the problems of rejection which has so greatly troubled the people of the Heart Institute. These people are consulted and are part of our research committee.

Senator Bourget: Do you assist this Institute financially?

Dr. LeClair: As far as I know there is no financial aid given directly to the Institute. However, these research workers, the research workers of the Institute, receive funds for research through grants. There is no grant per se which goes to the Institute.

Senator Sullivan: Mr Chairman, Senator Thompson asked a very pregnant question, but we must remember, Senator Thompson, that the medical profession is used to working for charity all its life-but now, under Medicare, it won't have to do that!

Senator Thompson: I cannot argue with the doctor. He took my tonsils out, and he may take more out of me!

Senator Sullivan: On page 1, paragraph 3, you have stated, Dr. Brown, that the Medical Research Council provides 60 per cent of the extramural funds reaching the medical schools from all sources. Has this always been the case? What has been the rate of growth of the Medical Research Council's budget in the last ten years?

Dr. Brown: No, Mr Chairman, it has not always been the case. In the total funds going to the support of medical research across the country there has been a considerable re-arrangement of sources during the past ten years. Our own budget ten years ago was, for example, about \$2 million, and in fiscal 1968-69 it is \$26.9 million. Other contirbutions to the extramural funds for medical research have not been increased at the same rate at all, for various reasons. At the present time, as Senator Sullivan has mentioned, the MRC's budget is 80% of the federal contribution, and 60% of the total from all sources. Ten years ago the Medical Research Council was contributing only about 20 per cent of the money going into the schools from all sources for this purpose.

Senator Sullivan: Thank you. Then page 43, Table 5: naturally you do not provide funds to all applicants who seek them. Can you explain in more detail how you set standards?

Dr. Brown: Well, this is the essence of a large part of the work of the Council and its committees, the setting of standards, and, as a result, the making of decisions about individual applications. Applicants for funds in support of research projects are referred externally, and then they are given consideration at length and in depth by one or more Grants Committees. It is within these Grants Committees that the standards are both applied and, to a large extent, developed. The standards are those of outstanding workers in the field. The members of the committees are men who are themselves engaged in the fields concerned. They are men of reputation, men whose own work is of international standard. It is then the standard of what is good throughout the world from the point of view of intrinsic scientific merit that is applied in the assessment. The standards then are developed within these Grants Committees, which are really working groups of experts in the field concerned.

Senator Sullivan: Can you give us any idea of the award rate in 1969 and 1970?

Dr. Brown: In 1969-70?

Senator Sullivan: Yes, projected.

Dr. Brown: It is going to be low.

Senator Sullivan: Why?

Dr. Brown: We are, of course, in the midst of that operation, but it is going to be a good deal less than 50 per cent. It is low not because the percentage of outright rejections has gone up: it is low for other reasons. In any list of applications, of course, there are always some that the Committees reject and say "No, we wouldn't support that even if funds were unlimited"; these are what we call the outright rejections. Then there is a group of applications which the committees would like to see supported, but for which there are not funds. This is the group that has been growing over the last three years, and it has been growing because of the growth taking place in the medical schools, because of the increase in the number of highly competent researchers in various places across the country, and because the funds allotted to us have not been growing at the same

The gap then between what the Council would like to support because of its merit, and what it is able to support in the light of its funds, has been increasing.

Senator Sullivan: Thank you.

Senator Thompson: Could I follow on that and ask another question, or should I wait?

Senator Sullivan: No, go ahead.

Senator Thompson: I just wondered: in your award rate, Dr. Brown, it seems to me that if you are going to be taking responsibility for pharmacy and dentistry—at page 69 I think you refer to that—and the Department of Veterans Affairs is coming under your orbit—I am sorry if I am going ahead of you, Senator Sullivan.

Senator Sullivan: No, it is all right; you go ahead.

Senator Thompson: In view of what you say about it being low, is this dangerously low?

Dr. Brown: Mr Chairman, it is too low, yes-it is too low. To take these different items, if I may, for a moment, the taking over of federal support of research in dentistry was accompanied by a transfer of funds, again in rather too small amount—a transfer of funds from the National Research Council effective at the date of the transfer of support. With pharmacy the support which they had been getting before was relatively small, and it stays small although it has grown a good deal since they have been under our wing.

As regards the word "dangerously," what does it mean? I can say that one expects that during fiscal 1969/70 we will be able to give awards to only about a third of the applications for new projects, and this despite the most rigid limitation on the support to be given ongoing work. With the policies that we have had to set up for fiscal 1968/69 we have told the committees that if they want to give increased support to something that is already ongoing, they must remove some degree of support from something else that is ongoing; they must find room for the expansion of support of what is good within the total operation of what is ongoing; even with that, the money that is left over for new projects, new people, is of the order which I have mentioned, and in our view is far too low.

Senator Thompson: Thanks.

Senator Leonard: Mr Chairman, to come back to the 60 per cent that the Medical Research Council is giving of its support for medical research, on your figure of \$26 million that would leave about \$17 to \$18 million from all other sources in Canada, and that, to my mind, seems a low figure, although I accept it. I think you must have your figures correct. When I think of the Atkinson Foundation, the McLaughlin Foundation, the Bickell Foundation and others, the amount seems small. I don't know what the basis for your figures is-perhaps you might give us that-but I was really concerned to know, with regard to this total overall amount for medical research in Canada, how does it compare per capita, or by some measure, with, say, the United Kingdom or the United States? Would you have anything along that line?

Dr. Brown: Yes, Mr Chairman. About the first points which were raised, the Atkinson Foundation and the Bickell Foundation expenditures were in these figures.

Senator Leonard: Yes.

The Chairman: In order to get the picture more clearly in my mind at least, I think you said previously that your budget, your grants, constitute 80 per cent of what the federal Government is giving?

Dr. Brown: Yes in 1968/69.

The Chairman: Yes. So that that would leave only 20 per cent for the private sector and the provinces?

Dr. Brown: No, Mr Chairman. It is 80 per cent of federal expenditures in the field, but it is only 60 per cent of the grand total for the field from all sources: voluntary agencies, foreign agencies and so on.

The Chairman: But if you add the other grants given by the federal Government to your 60 per cent, how would it come, the total contribution of the federal Government to medical research?

Senator Leonard: It would be 75 per cent of the total.

Dr. Brown: 75 per cent.

The Chairman: That would leave 25 per cent.

Senator Leonard: Twenty-five per cent for the private sector, you might say. This seems to me to be a very good point, and I would just like to pin it right down so we know where we stand in Canada.

Senator Sullivan: To see how low it is.

Senator Leonard: Twenty-five per cent from the public for medical research in Canada does not seem to be a very large amount.

Dr. Brown: That other 25 per cent is made up of 21 per cent from other Canadian sources and 4 per cent from American sources.

Senator Leonard: Rockefeller, or some of the other medical concerns.

Dr. Brown: Yes. The American sources include American Government sources, which are now about \$1.2, \$1.4 million a year.

Senator Leonard: Have you something then on the comparison of total overall government and private sectors in the United States and in the United Kingdom relative to our total overall figure?

Dr. Brown: Mr Chairman, in the case of the United States the total figure is higher by a factor of the order of five to seven, on a per capita basis.

Senator Leonard: That is, they contribute seven to five from us-of what we would contribute?

Dr. Brown: They contribute five to seven times more from all sources.

Senator Leonard: Five to seven times more per capita than we do.

The Chairman: In the United States.

Senator Leonard: In the United States.

The Chairman: Than we do here.

Senator Leonard: And anything on the U.K.?

Dr. Brown: As regards the U.K., it is harder to get figures. It is higher, but, as you well know, there is a great deal of voluntary money in the U.K. A lot of it is not easily visible, is not easily traceable.

Senator Leonard: Yes.

Dr. Brown: And one doesn't know the volume there, but taking the visible money, it is higher.

The Chairman: You mean there is a black market?

Dr. Brown: A black market in charitable foundations, yes!

Senator Leonard: Thank you very much.

Senator Sullivan: I am certainly glad we brought that question out. On page 1, paragraph 1, Dr. Brown, you stated in your brief that the assigned aim of the Council is the improvement of the health of Canadians through the development of research. Can you explain more fully just how the expenditures of the Medical Research Council contribute to the health of Canadians?

Dr. Brown: Yes, Mr. Chairman. They contribute because of the research that they support, through the additions to knowledge that are made and that arise out of the projects supported by the Council; there are many examples of this, concrete examples that one could cite. Then there is the improvement of health that comes from the improvement of education, and here I would like to ask two of my colleagues, if I may, to speak, two of them who are still in medical schools. Dr. Salter, who, as has been mentioned, is the Chief of Surgery at the Hospital for Sick Children in Toronto, might speak to this.

Dr. Robert B. Salter, Surgeon-in-Chief, Hospital for Sick Children, Toronto, Member, Medical Research Council of Canada: Thank you, Mr. Chairman. I think perhaps we should point out to those present that the three doctors who are here all have very different roles in life. Although we all started out as MD's, as doctors, we are different types of people now. Our Chairman, Dr. Brown, is in fact a scientist-administrator; Dr. LeClair, is Dean of a medical school, and is a scientistteacher-administrator; and I in my role at the University of Toronto and the Sick Children's Hospital am really a surgeon-scientist-teacher. So we all have different types of activities. But to answer the question about patient care, this is something in which I am involved as a surgeon who looks after patients, as well as a scientist who does investigation, and a teacher who teaches undergraduate and postgraduate students-I am perhaps a little closer to the actual care of patients.

I think if we go back to the turn of the century and look at something that Sir William Osler said—and Sir

William Osler, as you know, was probably Canada's most distinguished physician—he said at that time that the practice of medicine is an art based on science. Now, the art of medicine is still tremendously important, but the science of medicine on which all this is based needs to be expanded a great deal. We often hear the argument, those of us who are involved in experimental surgery and experimental medicine and so on, that "you are ivory-tower people" and "you are not really concerned about patients;" But we are indeed concerned about patient care, because all of the knowledge that accrues from medical research does in fact eventually come back to the patient.

Perhaps I should point out that there are many different types of research: there is basic research that is involved, say, in the nature of cells and the nature of particular tissues, and some of this is not strictly applicable to patients' problems but may well become so in time. Then there is the type of research that is clinically applied research, or research applied to a specific problem, and, if I may, I shall perhaps enlarge on that a little bit. A practising clinician sees a problem, say, in a given disease, and there is as yet no satisfactory answer to the problem. He starts what you might call a research cycle or circle in which he thinks about that problem, thinks about possible solutions, develops a hypothesis, and then through experimental design does research that hopefully then leads to a better understanding of the problem, that develops concepts or principles in relation to the behaviour of tissues; and then this will come back, through a better understanding of all this, through a solution to the problem, to better patient care. We have many examples of this in our major teaching hospitals throughout the country, and if later you would like to have one specific example that is perhaps very, very easy to portray, I would be glad to give that. However, I go on at the moment to speak about clinical investigation, which is another type of investigation entirely. This is investigation not with animals but with patients, and, of course always within the rules and regulations of morals and ethics, which definitely leads to improved patient care and not only the care and treatment of patients but also better diagnosis of patients and, perhaps, even more important, the research work in this country and other countries leads to the prevention of disease, to the provention of some of the problems that our ancestors and our forefathers, and even our own parents, had to cope with.

This is another very important aspect of the benefit of research in this country to the individual patient, and this is really what it all comes down to.

[Translation]

Dr. LeClair: Mr. Chairman, I should like to bring forward the point of view of the medical professor, and the importance of medical research in medical education, if we consider its importance for the health of Canadians. I feel that we are all in agreement that a

certain number of well trained doctors and medical people are necessary in all the medical professions. Now if tomorrow morning, the aid we receive from the Medical Research Council of Canada were taken away from us, we would have to close our medical schools. The importance of what we receive from the Medical Research Counsil is such that a medical school, today, in Canada, could not function without this aid. Why? Because a large part of the education of a doctor, dentist, pharmacists or other medical professions, a large part of this education, I repeat, is comprised of research, of medical information. New discoveries are being made so rapidly. For example, it is said that every seven and one-half years, there is a complete revolution in medical information which one must be capable of assimilating in the rest of one's lifetime. And for this information, one must have developed what is called a feeling for research. This groundwork necessary for teaching in all the faculties of medicine is possible solely because of full-time research workers. If I may take the liberty, Mr. Chairman, I should like to mention that the importance of what I am saying is emphasized by the presence here this morning of Dr. McLeod who is Executive Director of the Association of Canadian Medical Colleges; the very presence of Dr. McLeod here indicates the importance of research in medical education.

The Chairman: However, you are not exaggerating at all when you say that, if the subsidies of the Medical Research Council were cut off, the medical schools in Canada would close?

Dr. LeClair: Mr. Chairman, I am not exaggerating in the least. I shall give you an example. In Canada, we would not be able to keep a single person in the pure sciences, let us say a biochemist, who did only teaching if he could not do research. 80 percent of these persons' time is devoted to research with the rest of the time devoted to the teaching of what they learn or of the techniques they learn through research. This is true to such an extent that we are advancing further and further towards a point where 30 percent of medical education will be in the form of what are called elective courses, that is, the student himself chooses an aspect of a certain field in which he wishes to specialize. It is only with the research workers that we have that we are able to keep these electives. I am not exaggerating. I am convinced that I reflect the opinion of all 16 deans of the faculties of medicine in Canada. Furthermore, I believe that Dr. McLeod could well confirm what I have just said.

[Text]

The Chairman: That is a very good answer.

Senator Sullivan: Yes, excellent.

Senator Thompson: Mr. Chairman, just on the last remarks, may I read from page 32, where it says:

During the present year, the four new medical schools have had first claim on half the \$750,000 devoted to Negotiated Development Grants.

That is the four new medical schools, and in view of the last speaker's remarks it seems to me, you know, that there is again this tremendous shortage of funds. Half of \$750,000 is \$375,000 for all the other medical schools, and yet you refer to the fact that if you don't have research facilities you really don't have medical schools, you cannot attract people. I have read the report here of MRC., which perhaps in my Irish way I would call a dangerous situation for the health of the people if we don't get research which is linked to the medical schools. I notice, as I say, on page 34 it will really cripple all our medical schools if something isn't done to get finances for them, for your research facilities.

Senator Sullivan: And shortage of staff.

Senator Thompson: Yes.

Senator Sullivan: The same thing. Are you going to answer that? Do you want to?

Dr. Brown: No, I agree very much with what Dr. LeClair has said, and I agree too with the assessment that has been given of the situation. It is a precarious situation.

Senator Sullivan: Mr. Chairman, I have two brief questions that I would like to ask now. I have a few more, but I will stop after these two.

Enlarging on what Senator Thompson said previously, on pages 21 and 22 you say that the Department of National Health and Welfare also has a responsibility to support medical research. How are the two programs co-ordinated—and also that of the Department of Veterans Affairs?

The Chairman: Yes, could we enlarge on this, Senator Sullivan, and ask Dr. Brown what are the federal agencies which are offering grants—all the agencies?

Senator Sullivan: That is fine.

The Chairman: Offering grants in the field of medical research at the moment.

Dr. Brown: The Department of National Health and Welfare, the Defence Research Board and the Department of Veterans Affairs.

The Chairman: This is the other 20 per cent. What would be their relative contribution as compared to yours?

Dr. Brown: Yes. In 1968/69 the Department of Health and Welfare will be spending approximately \$5 million, a bit over.

Senator Leonard: May I interrupt? Does that include equipment?

Dr. Brown: That does not include the Health Resources Fund.

Senator Leonard: But it does include machines, for instance?

Dr. Brown: The Public Health Research grants do include some equipment, but this figure does not include the Health Resources Fund figure; it represents money spent by way of grants.

Senator Leonard: Yes, that is obvious. The Health Resources Fund is of the order of \$37 million.

Dr. Brown: Yes, but only part of that is for equipment. There will be some major equipment in this \$5 million coming through Public Health Research grants, but only the usual proportion of the grants operation. The other figures are very much smaller: the Defence Research Board just over \$600,000 for 1968/69, and D.V.A. just over \$400,000. Then the National Research Council also gives a small number of grants to workers in medical schools; these amount to something over \$300,000 a year. Those are the figures, Mr. Chairman, for other federal support of medical research.

The Chairman: Would you evaluate also the budget that NRC devotes to medical research—to intramural medical research?

Dr. Brown: How would I evaluate it?

The Chairman: Yes.

Dr. Brown: At a dollar figure?

The Chairman: Yes.

Dr. Brown: It is reported by itself, I believe, to be about half a million.

Senator Sullivan: Dr. Brown, you say that the Department of Veterans Affairs has asked the Council to assess its applications for grants. Why?

Dr. Brown: I think, Mr. Chairman, there are two or three reasons. If grants are to be assessed properly and standards maintained—high standards developed and then maintained from year to year—it is necessary to have a certain volume of grants, and the operation must be of a certain size. Their operation is perhaps borderline in this respect. Also I suppose this was something of a compliment. The Council and its committees have developed a reputation in this field for both rigour and fairness I think, and, as a result, the DVA made this request for assessment of merit. They

have, in addition, to make an assessment of relevance to their particular mission. That is something that they will do themselves. That is something we will not touch; they will do that themselves.

The Chairman: Have you anything further?

Senator Sullivan: All right. I will have a few questions later.

The Chairman: Just in there, to follow that immediately, and I will recognize you afterwards, Senator Sullivan, if the DVA grants are being now integrated in your system, what about trying to integrate also other grants programs?

Dr. Brown: Yes. Mr. Chairman, first of all it is just the assessment that is being requested.

The Chairman: Yes.

Dr. Brown: Not the administration, or the definition of mission, or relevance, or those other things.

The Chairman: We seem to have all kinds of committees working all over the place. There might be some undesirable duplication. I understand that some duplication may be desirable, but there might be some undesirable duplication.

Dr. Brown: It would be my view that it is highly desirable to have more than one possible source of funding. It is highly undesirable to double-fund a given project from more than one source, and a great deal of time and effort is spent in making sure that this does not happen. But we have absolutely no objection—indeed, in some cases we encourage it—to an individual investigator applying to more than one of these bodies at the same time for support of the same research. It is up to us to sort out our responsibilities, and this is adequately supported if he deserves it, and is not over-supported.

As regards the other bodies that have been mentioned: in the case of \$5 million operation of Health and Welfare, obviously there is sufficient volume here for it to be done from that point of view without any problem at all. The Defence Research Board operation, like the NRC operation in the grants field, is carried out as part of a larger scheme, and therefore the question of volume which I raised first of all in the earlier remarks does not apply here.

The Chairman: Why? You must have somewhere some committee of experts for that immediate purpose.

Dr. Brown: Not quite, Mr. Chairman. In the case of NRC, for instance, the grants that are made to medical schools are decided upon by committees which have

very much larger responsibilities than the grants to medical schools. The decisions, the assessments of them, are made by committees with very large responsibilities, committees with standards and so on. The decisions regarding grants to medical schools are not made by a segregated committee in the National Research Council, so that that problem does not arise, the problem of difficulty of assessment because you are assessing so few; it does not arise there.

Dr. Salter: Dr. Brown, may I make a comment at this time about autonomous organizations? We could draw an analogy between the administration of all research, we will say even all medical research in Canada, and all of medical schools. You can go back a little to the time when every doctor was a physician and surgeon: now there are no such doctors; a doctor is perhaps a family physician, or he is a surgeon, and if he is an internist he is not just that, he is an internist in heart disease or he is a surgeon of the brain, or whatever, and then there is more and more specialization.

In a medical school it would seem quite unwise to me to take the Department of Internal Medicine and the Department of Surgery and try to put it all together. There obviously has to be correlation at a top level, so that undergraduate students are taught all that they need to be taught, and that there is not duplication. However, to lump all these together would not allow each to grow and develop as it needs to grow. Each division and each department in a medical school has its own particular interests, its own particular skills and its own particular problems to investigate, and I think they require a degree of autonomy. In some medical schools when they try to group everything together it looks much neater on a page of paper, but it does not really work quite so well, just because people are people and they feel too constricted. I think that this is a reasonable analogy.

The Medical Research Council has an entirely different role to play, and it has played a different role than the Department of National Health and Welfare, and I have had experience now with both. So, I think it would be unwise just to lump them together for the sake of looking a little different or seeming to work better.

The Medical Research Council, as I see it, has shown excellent stewardship of their funds that have been entrusted to it, and really have done, I think, the best possible job with the funds. I think there is much more to be done and much more money is necessary in order to do this. Medical education in itself is becoming more complex, but sometimes through good research many of the complex conditions that had to be talked about and had to be treated in years gone by are now prevented.

I would like to emphasize what Dr. LeClair said about the medical schools. If we do not have research

going on in our medical schools, then we are going to have trade schools rather than academic institutions.

Senator McGrand: Dr. Sullivan mentioned that he was going to ask a question about transplants.

Senator Sullivan: That will come a little later.

Senator McGrand: I had intended to wait until you had asked that.

Senator Sullivan: Because I thought that all Senators here would be interested in liver transplants.

Senator Leonard: And other parts too, Joe!

Senator Thompson: Brain transplants!

Senator McGrand: I may be asking Dr. Brown to repeat something he has already said. He mentioned social goals and larger goals. We may disagree on what these goals should be, but I should like to have you just say a few words on what you meant by obtaining social goals—if you recall what you said earlier in your remarks.

Dr. Brown: Yes. Mr. Chairman, I think in the setting in which those words appear, what was in mind was this general idea. We do not as a country-no country does-want science to exist simply for science's sake, with the single exception of the fostering of science as a cultural activity as one supports work in the fine arts. For the rest, for the much bigger part of science activity, we look to it because of what we think it can do for us. It would seem then that we would support it, with this most important exception that I made, because of what we expect from it, what we get from it. We evaluate it in these terms and what we get from it is related to what we want overall and, in this sense then, to our initial goals which are social and personal, communal and national. I think that was the setting in which that was written.

Senator McGrand: That would also include what you mentioned, larger goals; that would be the same thing?

Dr. Brown: Yes.

Senator McGrand: Would you list, if you can, the leading research laboratories in Canada in order of their importance? Could you do that, or is that a fair question? Could you list them in order of their importance as to the amount of work accomplished, fitting this into the wide picture that you have talked about?

Dr. Brown: Yes. Mr. Chairman, there are many reasons I might like to duck that question, and some of them are good!

Senator McGrand: That is all right. I said if you could.

The Chairman: You might get into trouble next year when we come to the allocation of funds.

Dr. Brown: Some of them are good. It is hard to isolate a laboratory in this sense. What is a laboratory? Is it the whole university complex, or is it someone's individual lab.? The second thing one comes up against is the balancing of absolutely first-class work in one field against first-class work in another field, and then you begin to say which field is better. Well, you have moved straight away from which laboratory is better, and it is for those good reasons, not forgetting some of the other reasons too, that it is difficult to go much farther with that question.

Dr. Salter: Would you say, Dr. Brown, that in a sense it is rather like comparing a violinist with a pianist or a tuba player: you may have three excellent men doing three different things. Really the important aspect of research, I suppose, is ideas, and ideas come from the minds of men, and the value of research projects are related to individuals rather than to institutions. It may be in some institutions, just because they are larger or because the administrative head has a little more foresight in gathering more of these people around him that they seem to be at one time ahead of another group. I think it is fair to say it still depends on men.

Senator Thompson: Would you go to this extent, doctor, to say that there are areas of research centres that perhaps are weaker than other research centres.

Dr. Brown: Well Mr. Chairman, in the sense of volume, of course.

Senator Thompson: The calibre of work, for instance.

Dr. Brown: The calibre of work is rising steadily, and there is a large amount of what is good. The total volume is too small. Naturally, there is some disparity from one region to another too in the distribution of what does occur.

Senator Thompson: I noticed you said in your brief that in some cases to give financial assistance might be to increase mediocrity. It is not the only answer.

Dr. Brown: No, money is not the only answer to this. Most of the problems would be difficult to solve without money, but money will not solve all of them.

Senator McGrand: That was only half the question I asked you, because I was thinking of the duplication of research on a certain project that goes on in one institution, and then perhaps that is being duplicated or will be duplicated by the research that goes on in

the laboratories conducted by the large drug companies. That is what I was thinking of, the co-ordination of this research. There must be co-ordination between the drug companies and what goes on in our university laboratories, must there not?

Dr. Brown: Not between the Canadian drug industry and the universities, save through the medium of the literature.

Senator McGrand: Well then, you have answered the question. I have another one or two.

Senator Leonard: Could we get that answer clear? You said there was no co-ordination between the drug industry and the research work done in the universities except through whatever literature might pass?

Dr. Brown: And communication. This is a terribly important qualification. If the researchers in drug companies are good, they know what is going on in various places, otherwise they would not be good, and they are not going to duplicate the work if it has already been done, unless they have some doubt about it and want to confirm it. Similarly, the university worker whose career depends to an extent on doing good research and making new contributions is going to be jolly careful not to do what has already been done. So that there are these very strong pressures to remain novel in one's work. They are very strong; they are very important. The avoidance of duplication is something that one wants to press on with. What one has to be careful of, though, in the management of science is to be sure that one does not prevent people from seeking the solution to things and the development of new ideas, and to say to too large an extent: 'Now look, we have enough people thinking about this particular problem, you are not to think about it; you are to go off and think about something else." This is a very dangerous area.

The Chairman: Just a brief question: we are told that as a result of the legislation which is before Parliament now regarding the drug industry, some research labs already existing in Canada are closing. Are you aware of this?

Dr. Brown: The details of that situation I am not aware of, no; nor the labs which it is proposed to close.

Senator McGrand: What I was thinking of is this: McKenna, Ayerst put out Premarin, don't they? They have done a lot of work on Premarin, and it has not been duplicated. The synthetics are supposed perhaps not to be as potent as Premarin. These are questions I am thinking about.

Senator Thompson: Could I just follow the doctor on that question? I was interested in that duplication question, and I notice, sir, in your MRC report. . .

Senator Sullivan: Page 385.

Senator Thompson: No, it is 355. This is the MRC Report. I notice you refer to the fact that there are fourteen universities—I am a complete layman in this area—and I note that the last type of instrumentation is telemetry, and I think there are, as I understand it, five universities doing research in telemetry. Am I right in that?

Dr. Brown: Yes, Senator Thompson.

Senator Thompson: Are they each taking individual areas, or is telemetry basic to research? I mean, why are five of them doing work on this?

Dr. Brown: Yes. Mr. Chairman, the explanation lies in the fact that telemetry is a technique which can be applied to work in many fields and many areas, and there is not duplication of effort here. One group, for instance, will be interested in the telemetry of the electro-cardiogram, so that you can have people running around a racetrack and sit down where you can read their electro-cardiograms; and another group will be applied to the head, and so on and so forth. This is the explanation for what may seem at first to be duplication, but it is really multiple attacks rather than duplication.

Dr. Salter: Mr. Chairman, commenting about instrumentation in general, some of these things seem very sophisticated to you, I am sure, but in a sense they are analogous, say, to the microscope of fifty years ago. You wouldn't say it was duplication that research workers across Canada were using microscopes. These are research tools through which information can be gained. They are research methods rather than concepts.

Senator Thompson: Thank you.

Senator McGrand: Over the last thirty years there has been a great deal of emphasis placed on this condition known as stress, and tremendous work has been done on it, and articles written on it. But, after all these years, is there any drug that has been produced, which is available to patients, that prevents them from developing this ageing process that is due to stress? Is there any drug on the market, available to patients, to counteract it?

Dr. Brown: Mr. Chairman, there is no single drug that will prevent the process of ageing.

Senator McGrand: Or combination of drugs. We will put it this way: I will say drug or combination of drugs?

Dr. Brown: Or combination of drugs to stave off the aging process?

Senator McGrand: Yes.

Dr. Brown: I am afraid the answer this morning remains no.

Dr. Salter: And perhaps it will remain so.

Senator McGrand: Well now, I do not intend to steal Dr. Sullivan's thunder or anything like that, but I just want to ask you this question about transplants. There is a gread deal of importance attached now to organ transplants, especially heart transplants, and I am wondering if money is made available: does this project get any preference in the allocation of grants? And are we any closer today than we were twenty years ago to knowing the part animal fats and vegetable fats play in the development of arterial disease? Are we any closer to it?

Dr. Brown: Mr. Chairman, to take the two questions perhaps in reverse order: I think yes, we are very much closer, and the long-term value of high animal fat diets, of course, is very much in doubt, while its bad effects are fairly clear.

With respect to the question concerning transplants, the Medical Research Council has given special attention to this, and the antilymphocyte serum project is really part of this special attention. As you will have read, this project has to do with the determination of the efficacy of this serum, first of all in renal transplants, but it will be applicable to all transplants. It is the renal transplant situation which is being taken as the test situation. Council has given special attention to it, and, within the limits of its budget, has given it the support that it can.

Senator McGrand: You say you think we are definitely closer to the part played by animal fats and vegetable fats in the bringing on of arterial disease. Are you close enough to a decision that you could say animal fats are bad and should be removed from the diet? What I am thinking about is that we have millions of people with arterial disease, and we have only relatively few, perhaps one in 50,000, who have a heart that needs to be overhauled, physically or mechanically overhauled and replaced. I am thinking of the importance of prevention of this type of heart that has to be replaced, by a good, sound practice of dieting and so on that would keep this condition from developing eventually.

Dr. Brown: Mr. Chairman, it is the excess of animal fats which gets people into trouble. Moderate amounts, small amounts, do not create the problem. It is excess amounts in the circumstances, and the circumstances vary from individual to individual. Obviously some can tolerate them better than others, and those with the same inherent capacity for this tolerance of these fats can modify their tolerance by sitting still all day, for example, as opposed to running up

and down stairs all day. So that it is a very complicated situation, when one is concerned about the role of animal fats in the development of arterio-sclerosis, it is always the role of excess animal fats, not a condemnation as a dietary source of the whole list.

Senator McGrand: But there is a relatively small number of people in the world who are aware of it today.

Dr. Salter: If it would help in answering this question, you could compare this to alcohol. Alcohol is a food; really it is the excess ingestion of alcohol that causes the problem, and it causes a problem in some persons more than others because of genetic background and so on, but just because a small percentage of the population has a problem with alcohol does not mean that you would be likely to succeed if you suggested that alcohol not be consumed at all.

Senator Sullivan: Hear, hear! That is a real good answer.

Now, on page 57, Dr. Brown, you describe pretty well what has been done by the Medical Research Council in conjunction with the Connaught Medical Research Laboratories and the Institute of Microbiology and Hygiene in Montreal on this factor of transplants. I am quite sure Dr. Salter might transplant a hip-joint one of these days. I am not sure, but he may be after it, the same as we are attempting to transplant a middle ear apparatus. Do you want to speak on that?

Dr. Salter: Well, the actual surgical exercise of transplantation of tissue or of an entire organ is not the most difficult aspect of transplantation, as you all know. The real problem is that apart from identical twins in this world we are all completely different one from another, and tissue from one individual is not accepted at least permanently by the other individual. So that the real problem to investigate here is not the technical aspects of transplanting a piece of tissue or an entire organ, but rather studying the ways in which you can first of all find matches, that is find two individuals who are most compatible with the least amount of tendency towards rejection; and, secondly, ways in which one can not only treat the rejection phenomenon, but hopefully to prevent it from occurring, and I think that the antilymphocyte serum project that has been carried out by MRC in this country is a superb example of the co-ordination of the efforts of many people across the country, initiated and fostered by the MRC, and I do not really know of any other research organization in Canada that could have quite accomplished that. One of the reasons is that the people who are most actively engaged in the MRCand I am speaking now not only of Council members but also all individuals who are on Grants Committees and who are advisers and so on,-these people repre-

sent the top scientists of the country, and they have a common goal, that is to improve the standard of research work and thereby to improve patient care. I think that the MRC has done this superbly, and it has been an example of co-ordination of efforts across the whole country—co-ordination rather than duplication.

The Chairman: Following those remarks, doctor, can we say that in Canada we are trying to specialize in certain fields of research rather than others, or do we try to cover the whole field?

Dr. Salter: I think it is not possible for any given university, or indeed any given country, to be equally expert in absolutely all aspects of medical research. It is rather comparable I think again, to a medical school, say within a given department, where you have strength that is related to individuals, and if a man is particularly strong in one facet of his work, then that is emphasized. It is important, I think, to appreciate that if you emphasize the strength that a man has rather than to try to make him equal in all things, then the most good will come from it. At present in Canada there are many individuals who are well qualified and who are skilled in this particular field, and in that sense there is emphasis at this time in relation to this program. If, on the other hand, five years from now it were found that there was some other aspect of medical care or a medical problem that was of greater importance, or for which we had people who had more skill, then the emphasis might change. I think it is fair to say that in any country from time to time there will be more emphasis on certain things than on others; it is not static. But I wouldn't think that it would be wise to say: Well, we in Canada are going to put all of our efforts into heart disease, for example, rather than other things. We should try to cut our suit according to the cloth that we have, the cloth being the human beings and the ideas and the available facilities.

The Chairman: It has been suggested that Canada could become a world leader in a few short years, and if we were to concentrate, for instance, on virus research, do we try to develop? Does the Council have its own list of priorities in the field of research?

Dr. Brown: No, the Council does not direct research in that sense, Mr. Chairman; to say, for example, for the next five years the big thing is going to be virology and applications in this field will get preferential treatment. No, it does not do that.

The Chairman: So you are really passive. You get these applications and then you judge them on their merits, irrespective to the priorities that you could have in your own mind, or in the minds of the members of the Council?

Dr. Brown: Not quite. It is true, as you said, that we receive these applications and give support to those

that we can which are good. But in addition there is probing and seeking out, and there is fostering of work in this field or that field. Your earlier question had to do with an over-riding priority: no, this does not exist. But to foster work in certain fields for a period of time, in addition to considering on their own merits the bulk of the applications, we do this yes; so that it is a mixture.

Dr. Salter: Would you say, Dr. Brown, that one priority that we consider fairly frequently is the new investigator and the new medical school, and that we have perhaps particular sympathy toward an application from someone who has committed his life to be an academic surgeon or an academic physician as opposed to a private practitioner. We recognize that the most difficult grant to be awarded in a man's career is the first grant, because he is not known and he must prove himself. I think in that sense we would have a priority which is in favour of fostering new men and getting new men started in an academic institution, but, of course, once started, they must prove themselves.

Senator Leonard: Because you never know where a Banting will turn up, do you?

Dr. Salter: That is correct.

Dr. Brown: No, characterizing it in this way there are priorities, subject areas, but not over-riding priorities.

Dr. LeClair: Mr. Chairman, I just had one remark to add on this over-riding priority: if there were such a case as let us say over-riding priority to virology research, then medical education would be impossible because that would mean that we could not get, for example, biochemists, and biochemists are essential to produce doctors. So in that sense it would be very dangerous to have an over-riding priority in terms of research.

The Chairman: I was not referring to over-riding priorities, but surely we must have a general program where we either take the risk of developing a new man, as you have just said, doctor, or of supporting and assisting excellence, that is for sure, as more or less the foundation of your general program of research. I was wondering whether on top of that the Council was trying to develop research in certain sectors rather than in others?

Dr. Brown: Yes.

The Chairman: Because we all know, for instance, that there is such a thing as an international community of research in the field of medicine as in other fields, so that we might perhaps in Canada find areas where we could do a better job than certain

other countries and try to specialize and put some emphasis on these fields.

Dr. Brown: This is done. The extent to which the Council has been able to do it is very distinctly limited by its funds, because when it has provided support by the first method which you have mentioned, on a broad basis, on a basis of merit...

The Chairman: You have nothing left.

Dr. Brown: . . . there is not all that left with which to manoeuvre. But there is the second sort of thing that you mentioned as well, and this is a matter of building on strength in most cases. The Medical Research Council's Group in neuro-physiology at the University of Montreal is an example of this. There was strength here, men with international reputations, and arrangements were made for them in conjunction with the University so that they can devote, over a minimum period of five years, essentially their full time to the prosecution of these things at which they are particularly good, and it is a red-hot field. This is the sort of thing we would like to be able to do more of, but when we have finished this broad job which is, to quite an extent, concerned with educational support and the other factors, we haven't that much left over.

The Chairman: Senator Thompson?

Senator Thompson: Mr. Chairman, I would just like to underscore again the point that seems to be coming up, that there is a great limit on finances for your work. My impression in reading the brief was that perhaps you stated this rather quietly. I refer to page 29, and I think that this is one of the only mentions of that, when you said:

Another major problem is the lack of funds to meet valid needs in the extramural program.

I have a sense that that is almost a British understatement of what your needs are. But, if I could, I am interested in the relationship of the Health Resources Fund. I suppose on the one hand you can go out and get scientists, research men, but if you do not have equipment and space co-ordinated with the scientist coming to the job, it is a frustration for him, and really is an empty exercise. I would like to ask who decides on the health resources financing, and is there a complete co-ordination between the HRF and MRC?

Dr. Brown: Yes, I see, Mr. Chairman. As you will be aware, the expenditures under the Health Resources Fund are made as a result of decision first of all at the Provincial level, and then at the Federal level; so that there must be this co-ordination of decision. The initiative comes at the Provincial level, or, beyond that, within the universities, and then is

processed at the Provincial level. So that this is the decision-making process there.

Then at the Federal level there is the limit on the expenditures per year that we all know about.

As to co-ordination, a great deal of effort is spent on this in various ways. Regulations have been drawn up and are followed so that there isn't a doublefunding of the same thing, and so that it is as clear as we can make it with the printed word what requests should come up through the Health Resources Fund channels, and what requests should come directly from the universities to the Medical Research Council. Also, at the level of the consideration of the detail of individual applications, a great deal of staffwork is done. Then a further point: the relevance of some proposed items of equipment to be purchased under the Fund may be a matter for discussion between the officials of the Department of National Health and Welfare and ourselves. These are the ways in which it is tied together.

Senator Thompson: Are you satisfied, Dr. Brown, that it is meshing well? Are there scientists across Canada who are stopping recruiting researchers because of the fact that space and equipment are not co-ordinated properly, they are not able to get it?

Dr. Brown: There are certainly scientists who are in difficulties because of space. There are universities that are in difficulties because they do not have space with which to attract good scientists. The Health Resources Fund is the federal Government's contribution, part of it, to this problem, but these other steps are a necessary part of the process. There are requirements at the provincial level. The university must convince its own provincial government that this should be supported by the provincial government, and hence in part through the Health Resources Fund. There are some anomalies that none of us foresaw at the beginning in the way of eligibility for support, and non-eligibility and so on. Some of these have been worked out, but I think that we must just be a little careful to recognize that there are two things: there are the space difficulties that many universities and departments have, and there is the Health Resources Fund, and you cannot solve all these space difficulties through Federal action in connection with the Health Resources Fund, because there is a combined decision here, provincial and federal.

Senator Thompson: I noted—I am not sure whether it is in your brief or whether I heard this—that eighteen months after the contract MRC looks after the funding. Am I correct in that?

Dr. Brown: Mr. Chairman, when the initial regulations were first set up by the Department of National Health and Welfare there was wide consultation

taken by them about this. There was provision for access by universities and provinces to the Health Resources Fund for a period which began with the beginning of construction—the signing of the general contract actually is the technical date-and a date eighteen months after completion of the building. This meant that during that time they could go to what was thought in the beginning to be this tremendous pool of money for equipment. Now, during that time it would follow that they were not eligible for Medical Research Council support, because, you see, through one channel the Federal contribution is 50 per cent, and through the other channel it is 100 per cent, and the two purposes are slightly different. So there is this exclusion from the 100 per cent support for major equipment during the period that I have mentioned, in which as far as the federal Government is concerned there is access to the Health Resources Fund; but the Provincial Government may or may not want that particularly.

Senator Thompson: Was it your decision to have that eighteen months, or was that imposed on you?

Dr. Brown: No, that decision was taken under the Health Resources Fund Act, and that is Health and Welfare.

Senator Thompson: Do you agree with this? I mean, are you happy about that eighteen months clause?

Dr. Brown: Not in its full implications. I do not think any of us are. In fact we have had many discussions about this with many people, Health and Welfare people and so on. It needs rather more complicated policies than would seem to be revealed by that simple regulation. There is some detail, some of which has been worked out, but some detail that needs to be worked out so that it makes sense across the board.

[Translation]

Senator Bourget: Dr. LeClair, is a part of your budget devoted to engineering, either mechanical or electrical engineering? Do the engineers work with the doctors and form part of the same schools, even though they belong to the faculty of mechanical engineering or electrical engineering? Do you have these figures?

Dr. LeClair: Yes, if you look on page 16 of the brief.

The Chairman: If you will allow me, I believe Senator Bourget means within the university.

Senator Bourget: Yes, within the university, among the various faculties.

Dr. LeClair: To give you a simple example, one of the committees is called "Bio-Engineering"; it has been formed to meet the demands we get from engineers who work on health problems in co-operation with scientists in the field of health. This has become so important that a committee has been set up to consider the applications for grants we get from "Engineering".

The Chairman: But, inside a university, how is this co-operation effected?

Senator Bourget: Do they work together?

Dr. LeClair: Yes, what happens . . .

Senator Bourget: Do they work together or in separate faculties, the mechanical engineering or electrical engineering branch?

Dr. LeClair: No. For example, most of the faculties of medicine have full-time engineers on their staff who undertake research in conjunction with other research workers. The majority of our faculties of medicine have such people on their staff; this is becoming the case more and more.

Senator Bourget: Now, a little while ago we were speaking of provincial contributions. What is the contribution of the provinces, let us say the Province of Quebec. What financial assistance does it devote to research? Are you familiar with these figures?

Dr. LeClair: Well, as far as Quebec is concerned, there are two methods: the first there are three methods in fact. The first is what research costs the university itself and what is called research overhead which is presently paid by the university, that is, by the province, the provincial government, the Department of Education.

Secondly, some funds are provided by the province through the national health funds, the Health Resources Fund.

And, thirdly, in Quebec at least as in some other provinces, there is a Medical Research Council. The Medical Research Council of Quebec itself gives grants in areas complementary to those for which the Medical Research Council gives grants. The two fields are not identical. There is no competition between the two.

The Chairman: What would be the amount for, let us say, the Province of Quebec?

Dr. LeClair: I believe that, in the case of Quebec this year, the amount is \$600,000, the total amount given by the Medical Research Council of Quebec. For the other provinces, I do not know. Dr. Brown is more familiar than I with what is happening in the

other provinces. But this is supplementary; there is no duplication of effort. In its expenditures, the Medical Research Council has what is called an establishment fund for young research workers; the research worker, established for one year, for one year only, has access to a grant which may vary from \$10,000 to \$20,000 to assist him in purchasing equipment before he has made a name for himself through a little research after which he may apply to the Medical Council.

Senator Bourget: What percentage of medical school graduates take up research?

Dr. LeClair: This varies from one university to the next as it varies across the country. Fifteen years ago, the figure was one, two percent; now I would say that it is perhaps twenty-five percent. But this percentage does not indicate the number who finally remain in research. There is a considerable percentage of people who begin in this field only to abandon it. Once again we must realize that for a doctor, whether a general practitioner or specialist, one or two years of training in research has become almost essential now. Learning what research entails is as much a part of his normal training as learning to prescribe medicines. When a representative of a pharmaceutical company comes to see a doctor and offers him a new product, it is very important that the doctor be capable of evaluating the research behind the new product to judge whether it is really something good.

Senator Bourget: Thank you, doctor.

[Text]

The Chairman: How many of these provincial Medical Research Councils do exist in Canada?

Dr. Brown: Of Medical Research Councils there are only two in the formal sense, and Ontario's is not actually called a Council: It is the Research Committee of the Council for Health. These are small operations, and, as Dr. LeClair has said, where they exist we desire to make them complementary, to do what needs to be done in the local situation, which is not easy to do if it has to be done through the Medical Research Council.

The Chairman: Senator Thompson?

Senator Thompson: Dr. Brown, I had wondered if there is any relation here with the debate going on in the United States, as I understand there is, concerning allocation of funds for medical research, public health and so on—if there is any relation with this? I think coming through very loud and clear is the point that you want a corporate body removed from the Department of Health. You would under-

stand this far better than I, but I am looking at this 1963 "Review of National Science Policy" in the United States, and it says:

In 1963, a Congressional Subcommittee of the House Committee on Government Operations opened an inquiry into the administration of the appropriations assigned to NIH—

which is the National Institutes of Health-

and questioned the efficiency of this agency. Following the stir raised by this approach, and on the instructions of the President, a Committee of Scientists launched a new inquiry into NIH activities.

Notwithstanding some reservations, apparently the report was favourable to the institutes. But the basis of this apparently is that the present trend nevertheless seems to be alarming the scientific world, which is afraid that fundamental research will be the victim of adjustments. Some of the NIH directorate would like to make them into an autonomous agency and HEW in its public health service would then be directly responsible for implementing medical and social policies. Would you care to comment on that? They refer to the fact that there is a great debate going on: as I understand, for the Great Society they felt that they wanted to be sure that research was going to be implemented for the benefit of people through public health policies. Do you see a relationship to the situation in Canada today?

Dr. Brown: Yes, I do, very much, Mr. Chairman. I think we must, however, avoid too much lumping here. When one speaks of the support of research, then I think to be completely meaningful one must explain right away what sort of research one is talking about. Is it research in the universities which is to a large extent basic-research in the universisities which you support to quite an extent because it is in the universities and it has all the implications that scientific work of high quality in that setting has for all of us; or is it, on the other hand, research which is not basic in that sense; it may have a basic component, but it is not basic in that sense, it is applied research. It is directly oriented to a mission and it is related to a problem which we want to have solved as quickly as possible, and it is a problem which has a scientific component which is amenable to solution. I think that the methods of support that you use in the two areas, if they are to work well, have to be quite different, and I think that the decisions about the degree of support have to be taken in different settings as a result of these two quite different situations.

This was why I suggested to the chairman earlier in the morning that really there is no contradiction between the view of the Medical Research Council that it would work best and most efficiently as a corporate agency, and the problems—and the best solution of problems—that have to do with total Federal effort, total national effort, in the health care area as a whole. One is related to the other. But you do not, for example, try to administer the spending of money or the allotment of money to university research with the same administrative machinery or the same people with which you supervise the health of immigrants. These are two different operations requiring different approaches, different techniques and different methods.

Senator Thompson: But when you get to the public,—I think all three doctors have referred to the patient—Canada today does not stand very high in its health care when you look at infant mortality, for example, in world indices. I think we are lower than Japan and certain other countries.

Senator McGrand: We are thirteenth.

Senator Thompson: Thirteenth, I think yes. I realize that we have a native population and we have problems with respect to Indians and Eskimos, but there are other countries such as Finland who have had this and tackled it well. With the actual translation of the advances in science to the patient I wonder as to your concern about doctors and the training of doctors in medical schools. I have another quote here. It is from "The Coming Revolution in Medicine." I am sure you are acquainted with this, but do you as doctors need assistance by way of computer facilities? Does this interest you?

Dr. Brown: It did interest us very much, because we are interested in the application of the results of research, and "the coming revolution in medicine" has to do really with a managerial problem, doesn't it, not a scientific problem; it is a managerial problem, and though it does come under the umbrella of the same social goal, it has to be settled by different means.

Senator Thompson: But who is responsible for that managerial problem?

Senator McGrand: Sure, that is the question.

Dr. Leclair: Mr. Chairman, I think you are quite right. Mr. Rutstein in his book "The Coming Revolution in Medicine" shows how in the United States as more money was spent for research the health of the people went down: the two curves almost crossed. But this, I do not think, is the failure or would be the failure of the Medical Research Council.

The Chairman: It is the failure of the patient!

Dr. LeClair: In a sense it is the failure of the schools of medicine themselves. I think it is up to

them to take what we can have from science, namely the help of the Medical Research Council, and apply this to the public. Our school, and more and more schools, especially the new ones because it is easier for them to do this, are deidcated to this very aspect. This is our characteristic, to be able to bring to the people the benefit of what we have in, almost in some cases, ivory towers. For example, Dr. Macleod is working a lot on this. Recently, in a symposium in Atlanta where most medical schools got together, the one over-riding conclusion of that conference is that we have now to be aware-in other words, almost the magic word now is social awareness on the part of medical schools. This is why, for example, in our own school we have three divisions; one of these is social medicine, and to us this is as important as basic science or clinical medicine, to be able to give to the population what we really should have been giving them many years ago. So I think if there is a failure-and I think there is, personally-it is at the level of the medical school, not so much at the level of the granting agencies such as the Medical Research Council.

Senator Thompson: Isn't there a science in the management of medicine, and wouldn't this be one of your functions, to be looking at people like Rutstein and others who have been doing a study of this, or do you not think so?

Dr. Brown: I do not know whether one would call it a science but yes, there are many managerial studies. Actually, the responsibility for operations research has been delegated to the Department of National Health and Welfare, and they have a very real interest in this and are prosecuting it; and there has, as you know, been the setting up of the joint federal-provincial facilitating committee in this respect.

The Chairman: You were saying a moment ago that the NRC is devoting about half a million dollars a year to intramural medical research in the field. Do they seek your advice as a Council in developing that research program?

Dr. Brown: No sir.

The Chairman: Do you know what is going on there?

Dr. Brown: Yes. Yes, we know.

The Chairman: But you have no say in the selection of programs, or anything of that sort?

Dr. Brown: No sir.

Senator Bourget: What kind of research are they doing there?

Dr. Brown: There are many kinds, Mr. Chairman. There is a good deal of research in the division of bio-sciences that is relative to health, in radio biology, in the division of mechanical engineering, in the division of radio and electrical engineering, and in the division of applied physics. There is quite a variety of projects.

Senator Bourget: It would be mostly in the engineering field, to help medicine?

Dr. Brown: The chemistry and microbiology in the division of bio-sciences is also sizeable and probably balances the engineering.

The Chairman: I think that everyone in Canada recognizes that NRC, through its intramural research activities, has made a great contribution to research in Canada, especially in the field of the physical sciences. Would you think, assuming that the money could be found, that such a similar institution would be desirable for health research or medical research?

Dr. Brown: Not a similar institution, Mr. Chairman, and this is not to be derogatory in any way of the National Research Council labs., but the needs are different and the history is different. The Council does not feel, and it has given its attention to the question several times, that a large national medical research institute is applicable to the Canadian scene, or is the best way to spend money on medical research in Canada at the moment. It is, however, interested in the possibility of smaller institutes—in the plural—situated perhaps at different places in the country, invariably in conjunction with a university.

The Chairman: You are speaking now of Government institutes?

Dr. Brown: Government institutes which would have very definite and prescribed goals, and while they would be in a university setting, they would be to quite an extent at the same time mission-oriented. So that there is, in our thinking about it, the idea of regionalization, the idea of keeping the researchers in close conjugation with the universities and research situations and all this sort of thing, and the idea of a definite, not too narrow but quite a definite, mission for these. It does not include the idea of a medical research institute which is free to roam across the whole field of medical research as the run of the cards dictates.

The Chairman: But these institutes might fulfil a kind of residual role.

Dr. Brown: They might be taken to serve for the time required definite and recognized-widely recognized-national needs. One of these the Council has explored to quite an extent, and it is concerned with

research in drug metabolism and intoxicity, that is the research and science back-up of drug testing. A great deal of research in this field has been done by the people in the Food & Drug Directorate, but they are limited in the capacity that they can devote to the research by their service responsibilities. Actually the discussions were initiated with the help of some of the staff of the Food & Drug Directorate. There is no contradiction here, there is no overlapping; but here is a field in which a great deal of additional information is needed, and in which there is the possibility of making real advances in technology by the application of recent principles and so on. Now, this sort of small institute, five to ten professionals and their supporting staff, might exist in the number of two or three, and be in two or three separate geographical situations. This is the line along which our ideas go when we think of what we call intramural labs., but they would be extramural in the sense that they would not be in Ottawa, and by that I mean in the University of Ottawa.

Senator Sullivan: To that you added computer facilities, didn't you?

Dr. Brown: The support of computer purchase, computer renting and computer services has got to be a very complicated question, and we are having a look at it to see how best we can use funds to serve our people.

The Chairman: But if you were to go into this computer business, don't you think...

Dr. Brown: No.

The Chairman: Well, I suppose, it might be very useful at some stage. Then we might need a national centre for this, or a kind of central data bank.

Dr. Brown: No, we are not exploring the possibility of MRC computer institutes. We are exploring rather the way in which we might best spend our money to meet the computer needs of our researchers. To a certain extent this will, for example, be the purchase of little computers, single-use computers, as opposed to the provision of funds to give a group of researchers access to a large computer. This is the sort of area that we are working in.

The Chairman: And they would have access to the services in the United States, for instance?

Dr. Brown: In the information retrieval situation, yes, through the National Science Library.

Senator Thompson: Doctor, on this I am just looking at "Business Week"—I am afraid as a layman I just pick up things—but it is suggested that the computer and the science of medicine would seem to make a

perfect match; for computers the mass of broad data that flows out of medical research laboratories is made-to-order nourishment, and it goes on to describe this. Who would look into this in Canada, as making a more efficient method of getting research knowledge out across to doctors? Who is responsible for this?

Dr. Brown: Could I put your question in this way: Who is responsible for the continuing education of the profession?

Senator Thompson: No, I put it this way: who is responsible, or is there anyone responsible for seeing that the research knowledge is in the most efficient way brought across to the private practitioner?

Dr. Brown: There are many people at this, as you will be aware: governments, different levels of government, and at the municipal level; universities are growing, and there are some most important educational programmes, including 8.30 Saturday mornings now in the City of Ottawa, by the University of Ottawa. The drug companies have made a contribution here too, because they have been a means of spreading information. The voluntary agencies: the National Cancer Institute, and the Canadian Cancer Society and the Canadian Arthritis and Rheumatism Society, the Canadian Heart Foundation. All of them do this too, so it is a job that is being done by many people, and there has also been a change in the material which the individual doctor has when he is sitting in his own home and has some time to put in at it at his own choice. The number of review journals has increased, and there is now in Canada a medical newspaper too, put out in newspaper format; this is Medical News. So the problem that you are after is being met at the present time in these various ways.

Senator Bourget: But there is no centre of distribution of that calibre of information?

Dr. Brown: Not one centre.

Senator Bourget: Don't you think there should be one?

Dr. Brown: There should be at least one strong one. I would doubt whether there should be one to the exclusion of others.

Senator Kinnear: Mr. Chairman, I would like to ask a question. I want to know what research now is going on regarding retardation in children, and if you are having any success in curing it, or improving their situation; and also for crippled children. Very small children, I imagine, could be helped greatly if they have crippled arms, crippled legs or something like that, with the new advances in bone transplants and so on. Also there are the mental patients, the mental health cases; what research has there been and how

effective is it at the present time in relieving hospital space and getting these people back into circulation? Could you deal with those three questions?

Dr. Brown: Yes. If we might take the one concerning mental retardation first of all, there is a great deal of work going on in this field in various places, and advances are being made, and in very practical ways. For instance, there is much wider use now being made of a very simple urine test to be used a few days after birth looking for one of the common causes of mental retardation, which is preventible, or can be treated if appropriate steps are taken during childhood. So both in the accumulation of knowledge and in its application I think there is real advance being made here; the federal Government provides specially ear-marked funds for this purpose through the Department of National Health and Welfare, not through ourselves. We are prepared to receive applications for support in this field and consider them on their merits.

In the general field of mental health, I think perhaps the change in hospital patterns in the last fifteen years provides the answer to your question. There has been this change: there has been an earlier return to the community, there has been increased emphasis on the treatment of minor but still important mental illness, with the result that the total psychiatric effort is undoubtedly much more effective than it was before in terms of keeping people at work, and in getting them back to work quicker when they have had to leave.

The part of the question that has to do with crippled children I will, of course, turn over to Dr. Salter, because this is very much his business.

Dr. Salter: Mr. Chairman, if I may just say something additional about mental retardation, because I think it is pertinent to what we were discussing earlier. It has to do with the prevention of the particular type of mental retardation which is associated with disturbed metabolism, phenylketonuria, usually referred to as "PKU". The story I wish to tell, I think, is very pertinent. The head of our Department of Biochemistry at the Hospital for Sick Children retired at the age of 70-he was actually kept on for a long time-but almost as a hobby he had always been interested in pure basic science and pure basic research; he continued to study, and he worked very hard, and he developed a test for this particular substance in the urine, not realizing at all that this would in fact be of some practical application for the prevention of any disorder in patients. However, having done this, shortly afterwards it was discovered somewhere else that this particular substance was of great importance. It was important to detect it very early, shortly after birth indeed, so that something could be done to prevent the effects of the disturbance on the brain. So this is an example of basic research that was done for the sake of research and which was terribly important

to support, and which has an application today even though the application was not foreseen.

The other thing about prevention of mental retardation is that through research that has been done largely in this country by Dr. Chown in Winnipeg, concerning incompatibilities of one particular factor in the blood, the Rh factor, studies along these lines have led to the prevention of one of the causes of cerebral palsy in children, which is often associated with mental retardation. So from a research point of view, really the emphasis has been on trying to prevent the original cause of mental retardation. We have no way at the moment of preventing mental retardation in a child whose parents are both somewhat mentally retarded, because Mendel was right and genetics does come through. But there is a good deal of research work going on in the prevention of this, and a good deal of it is supported by the Medical Research Council. The actual logistics of the care of a large number of mentally retarded children, as Dr. Brown has already pointed out is under different auspices.

In relation to crippled children, I think it is important to get away from the old concept of a crippled child as a child, for example, that had polio and who was crippled in the sense that he had a weak leg or a short leg or something of this sort. Crippling now is considered by the various associations for crippled children in Canada on a much broader basis. It is considered really more as a handicap. A child who has congenital heart disease has a physical handicap in that he cannot run and play and do the things the other children can do. It is not obvious perhaps on the outside that he is crippled, but he is handicapped. The same is true if he has chronic lung disease, or if he has diabetes. So that the concept of crippling has changed a good deal, and I think it has been a very good thing.

The Ontario Society for Crippled Children, which gets a lot of money from the public, uses some of this money for research and does in fact support a good deal of research in Ontario related to the problems that I have mentioned, the problems relating to handicaps in childhood. That is very much clinically applied research, and some of it is epidemiological research, some of it is studying the incidence of disease in various areas; some of it is related to animal experimental work in trying to develop a better form of treatment related to children's problems. So the Ontario Society for Crippled Children and some of the other societies for crippled children in Canada are doing something, but they have, of course, limited funds.

I think that the next thing I am going to say is important in relation to the role of MRC, because, as Government takes more and more initiative in paying for everything, the public feels less and less inclined to give to charitable institutions. The public twenty years ago would give a great deal of money for the care of crippled children, and indeed for research related to crippled children, but those same individuals now

would say: "But this is all done through Government, so we don't need to do this any more; it comes out of our taxes." This is happening in Great Britain, it is happening in Australia, it is happening in the United States, and I think it means that Government agencies are going to have to assume a greater and greater financial responsibility in the future.

Senator Kinnear: I believe that to be quite true, because it is very difficult now to get volunteers to go out, because they are coming around to the idea it should come out of general taxation. Anyone in that field knows that you cannot get the volunteers to do the work.

The Chairman: Senator Thompson?

Senator Thompson: I was, just wanting to ask this from your remark about the crippled children: one of the things we found out with NRC was that, almost spontaneously apparently, the informality of the relationship between two Ottawa surgeons and scientists, the scientists talked to the surgeon and then apparently went to...

Senator Sullivan: The brain cooling.

Senator Thompson: The brain cooling and a couple of other areas. In England apparently they have tried to co-ordinate this. They recognize there is a gap which is really between the best medical and technical brains, and the scientists and engineers who could develop new techniques, and they have set up an institute-and I am quoting from this-the Bath Institute of Medical Engineering with an eminent British scientist, Sir Laurence Wallace. The idea is to co-ordinate all manufacturing companies and medical people in Bath University, and they are finding that apparently once the surgeon and the engineer are working together harmoniously there are remarkable achievements-I am quoting from this article-that include the electronic heart pacemaker, artificial limbs and prototype versions of the artificial heart, and so on. I have the feeling that we have done nothing like this in Canada.

This article further goes on to say that a scientist went with doctors to look at the medical equipment used in respect to births, and was appalled at the home-made equipment that they were using, and is now working on trying, in harmony with the doctors, to develop new equipment. Now is this an area where the Medical Research Council could play a part?

Dr. Brown: There is a good deal going on actually, and much more is on the way already. There is a Institute of Biomedical Electronics at the University of Toronto which brings together medical people and engineers. There is a comparable group at McGill. In the Department of Physiology at the University of Montreal, two of the staff are trained engineers.

McMaster is building up a large institute with tentacles into industry, or tentacles of industry into it, and they are after just the sort of thing that you have in mind. Saskatoon was one of the first to get under way in an organized fashion in this field. Actually there is a good deal going on, and, as I mentioned earlier, I think it is a field that should have as much support as its people can use well.

Senator Thompson: Who should initiate this, doctor? Do I gather you think it should just come from individual companies, or could you have something in your grant structure with respect to this, or should it be a development of Welfare, or who?

Dr. Brown: We have indicated our interest by setting up a Grants Committee in this area, which is a way of saying to people pretty effectively that we are prepared to support work in this field, and indeed the existence of this committee can be taken as a positive encouragement. That sort of thing can be done. To quite an extent the initiative too must come from within the university, because it is within the university that a large part of the work must be done.

Dr. Salter: Mr Chairman, may I comment on the question also? In the University of Toronto, as Dr. Brown has mentioned, in the Department of Biochemical Engineering, the man at the head of this is a medical doctor and also an engineer. More and more, I think, in the future we will see men who have both disciplines. We have one such now in the Hospital for Sick Children, and there is a very large interface between these two disciplines: we can learn a great deal from one another. As an example of the application of engineering principles to medicine, I think that the thalidomide tragedy-and there were seventy children involved in this country-has really brought it into focus. The man who is the head of this aspect of our work in Toronto, Mr McLaurin, who had been in the United States, was attracted back to Canada to tackle this problem, and has developed many ingenious devices for this small group of children who had been born without limbs or with one or more limbs missing.

The reason for mentioning this story is that it emphasises the importance of adequate funding. When this tragedy occurred the Canadian Government gave a great deal of money to deal with it. It was a tragedy that brought about the need for a great deal of money, and as a result of that money being available, it was possible to do a great deal of research, particularly on the engineering aspects of this work, and this particular group of children have received treatment that they would not have been able to receive a few years ago. In addition to that, however, children all over the world have benefited from the research that was done for this great problem, because children have always been born with abnormalities of various types, including missing parts of limbs, or missing entire limbs; so the spin-off from that program is of value to everyone

throughout the world, and it was only possible because the Canadian Government recognized the tragic situation and gave a great deal of money to meet it.

Senator Thompson: I am just thinking again of the NRC and this informal relationship between two Ottawa surgeons and NRC scientists. Should there be any formal kind of mechanism set up so that you can use the work of these scientists more fully?

Dr. Salter: I do not think it needs to be any more formal than it is at the present. It is initiated by either the doctor or the engineer, to put it in its simplest terms, and often by both. Two men of intelligence in trying to solve the same problem are likely to be able to get along well in their efforts to do it, and each brings his own particular skills and knowledge to it. I do not think it needs to be formalized in any specific way. It is possible right now, and it is going on to a great extent in this country, this type of co-operation which you are concerned might not be happening in Canada.

Senator Thompson: I am really thinking of what you said about there being an incident of Government intervention by the provision of funds in connection with thalidomide children. I just throw this out: assuming that the NRC with the Medical Research Council had some arrangement with a group of engineering scientists who were to go across Canada to meet with surgeons, to look at equipment, to hear some of the problems of surgeons, this would be a more concerted effort than just the informal meetings between a doctor and a scientist who might be social friends.

Dr. Brown: There is a great deal of this, Mr Chairman. It is true that the project regarding brain cooling may have arisen at a cocktail party, but I do not think it is true that all projects arise in that way. Some of the very best do! But I think the sort of thing you are after actually is under way. Quite a number of institutes have been formed to bring together formally engineers and doctors; but one cannot bring together all engineers and all doctors, it must be by groups. I think actually a good deal of it is under way within an organizational and an administrative framework.

Dr. Salter: Would you not agree also that in the postgraduate training of either a physician or a surgeon the bio-medical engineering faculty do in fact participate, so that there is a good deal of dialogue between these two groups now.

The Chairman: I have a couple of questions; I do not know if you would like me to ask them. I would like first to come back to research in the drug industry. In our contacts with the drug sector, when we invited companies and universities to prepare briefs for this committee, I got one letter—I will not reveal the name of the company, though I am sure that you might

detect it quite easily-and these are two paragraphs from that letter:

From the standpoint of our own Company, we feel that it would be unrealistic to submit a brief in this connection in view of the fact that Bill C-102 which is at present being debated in the House of Commons will undoubtedly have the effect of seriously curtailing any contemplated expansion of pharmaceutical or fine chemical research in Canada.

Traditionally we have done the entire research for all our U.S. and foreign affiliated companies in Montreal and today we are one of the most highly developed pharmaceutical research organizations in the world, employing a total of more than 300 scientists. However, about a year ago we had a choice of either expanding our existing pilot plant and veterinary research facilities in Montreal, or of building new units in Rouses Point, New York. It was decided to build these facilities in Rouses Point because of our belief that the present unfavourable attitude of the Federal Government towards the drug industry could be very detrimental to our future development in this country.

My question is: are you aware of this problem, and are you prepared to give your own views about this? Is this a real problem, and who is looking after that aspect of that legislation? I do not want you to give your opinion about the legislation, but I am just wondering if there is somebody within the federal Government looking after this particular problem which is directly connected with research in the field of medicine?

Senator Sullivan: I hope they look at page 385 of the MRC report.

Dr. Brown: Mr Chairman, the Council does not have an opinion about this problem in an overall sense, because it involves the economics of the pharmaceutical industry, and this we have not studied, and opinions about the plea put forward here do not have much value unless they take into account the economics of the situation.

The Chairman: So you are not too worried about the situation that could develop with regard to its effect on research in Canada?

Dr. Brown: No, no, I have not said that. We would look on a major decrease in industrial research in the medical field as an unfortunate thing, but, as I have said, it is not within our sphere. We do not have the capacity to look at the impact of the bill on the research effort. That involves things that are not within our field.

The Chairman: That is where the scientist is not yet in a position to advise Government on science policy?

Dr. Brown: If you are talking about the group of scientists with you this morning, that is absolutely right, because it is not within our assigned area.

The Chairman: As far as I am concerned I have only one final question, and this is related to your committees. I notice that you are about to set up a Grants Committee on psychology?

Dr. Brown: Yes.

The Chairman: What kind of program do you envisage there which would not come into competition perhaps with what is already done in this field by NRC and the Defence Research Board, because, as you know, they are giving grants to research in psychology.

Dr. Brown: Yes, indeed. The MRC role in psychology is not new. There were no names on that particular sheet under the heading of psychology because a new committee was being formed. Actually we have been in this field for some little time. Naturally enough, clinical psychology, particularly when it is done in medical school settings has been supported by the Medical Research Council for a long time, and the National Research Council Associate Committee would not want to support this sort of clinical work. The Defence Research Board would support it only if it had high relevance to their mission. So there is no duplication of effort here.

In addition, the Medical Research Council supports some work in experimental psychology which involves biochemistry and physiology, and is thus to some extent inter-disciplinary. Actually it took on this responsibility a number of years ago when the funding situation for psychology as a whole looked rather bad and the threat of the removal of large amounts of American money hung over the field. We have stayed in the field in a small way, and the work we support is, as I mentioned, for the most part, inter-disciplinary in this sense. So that it is one of those interfaces with fields around us in which we have a very real interest and are prepared to consider applications.

There is also, of course, the interesting development that more of psychology social sciences of various sorts in the university administrative sense may be moved within faculties of medicine. This, then, by definition of our assigned function at the present time, will bring the part that moves within the sphere of responsibility of the Council.

The Chairman: What about psychiatry?

Dr. Brown: Very much.

The Chairman: You have no committee?

Dr. Brown: No. It is not segregated. The psychiatrists on our Grants Committee work under the head-

ing or the title of the Clinical Investigation Committee. That is where they function.

The Chairman: Senator Thompson?

Senator Thompson: Could I ask Dr. Brown about page 11 of your brief? I seem to have two conflicting points of view on that. In the top paragraph, at the end, you say:

It is necessary to have a group...

this I presume is an advisory group of scientists...

whose task it is to synthesize, and, when required, to resolve conflicting views.

Then in the next paragraph you say:

Science advice to government should be multiple, for it would be dangerous for it all to come through one final common pathway.

That seems to me to conflict with the statement which you make up above. You then go on to say:

The general policy of the government in science matters should not have only one point of origin.

I appreciate the one point of origin, but you are suggesting that science advice to government should be multiple, and further up you are saying that it is necessary to have a group whose task it is to synthesize and, when required, to resolve conflicting views. Could you clarify that for me?

Dr. Brown: Yes. I do not think there really is any contradiction, Mr. Chairman. The point made here is that there is need for science advice or advice by men who know science, which is a different thing. There is need for both of these things but we are thinking of the second at the moment.

The Chairman: But in those paragraphs you are really saying that, of course, we should have national policies by all sciences, and that insofar as that contribution of scientists is concerned it should, of course, be decentralised; but when we come to policy for science, it is it seems to me a completely different thing. There are two roles of the scientist, as adviser on what contribution science can make to policies, but there is also a policy for science. This is the distinction which has been made by various groups in France in particular, La politique pour la science et la politique par la science. You are arguing here that, of course, so far as we have a policy by science, it should be decentralised, and I think you are right; but you do not seem to have considered here-and it is no criticism of the brief-the other aspect, a policy for science.

Dr. Brown: Yes. It has been considered, but I think the consideration led to the view expressed

here, that a science policy is something that is multiple.

The Chairman: It certainly is.

Dr. Brown: And one perhaps cannot have just one policy for science. We would have thought one has to bring to the various points at which various policies are being decided the input which comes from people who have the training and knowledge of science, and then this additional point, that there is need for input by people who are part of the governmental process; not just input by organizations which have considered it only from their own particular aspect or from only part of all the features of the thing. The plea here is for the integration into the decision-making process, which is a lay processnot a scientific process, a lay process-the incorporation into this lay process of men who know science, what is going on, what can be hoped for from science, what at the present time cannot be hoped for from science, and to get them right into the centre of the decision-making process.

The Chairman: It is a plea for having science advisers like we have economic advisers.

Dr. Brown: Yes and, in addition, to have an increased number of people who are not advisers at all in this specialized sense, but are senior administrators and so on, who, instead of taking a degree in greats, have had a degree in science and know this language and know this method of thought, which is quite different. Now as there is more than one policy, and as science has its effect on almost everything, it follows perhaps that there is a need for these people and this sort of advice on a completely integrated basis-not on an ad hoc basis but on a completely integrated basis-at many points in the complicated decision-making process of government. That is the first point that was made, and then it is suggested that there is a need in addition to this for a concentration of this sort of talent, which is an integral part of the mechanism, not a replacement for the other people. In the matter of wording here, we might have re-worded it a little bit: the suggestion was not that this group would synthesize everything, but there would be occasions on which it would be necessary to bring together the demands of different policies and examine them from this point of view, or to bring together advice which had been given from this point of view from several places about one policy, and then synthesize it. They are complementary and are not contradictory, in the sense that one does what the other would do.

Senator Thompson: Thank you very much. Could I say from my point of view the concern that I have had in listening to our witnesses is really about financing for research, and the lack of financing. I

think this is affected, as Dr. Brown in his opening remarks stated, by the fact that research has so many ramifications extending, like Dr. LeClair has mentioned, into the medical schools. You do not get medical schools, effective ones, if you do not have researchers.

The other concern I have is this, and I don't really know how this works. It seems to me that in Canada we are saying that voluntary agencies, medical associations and others have the responsibility of getting medical care to the patient, and medical care, I assume, means that the doctors should have up-todate knowledge concerning new research. I suggest that there are going to be changes in the role of the doctor and the role of hospitals, in the use of computers and a whole variety of things. I just wondered who is actually looking at all this, and in order that we can get the most efficient medical care to patients. From what I gather, you do not see this as your role, and I assume this is the responsibility of the Department of Health and Welfare and the medical schools.

Dr. Brown: No, Mr. Chairman, our assigned role is the support of research, not medical care.

Senator Thompson: Are you concerned about this secondary thing? I am thinking of a study done in Ontario, for example, of the private practitioner by doctors, which was not open to the public, but we understood that they were not overly happy about it. I am thinking of the Gundy report, which indicated that we cannot be completely complacent about the standard in the various schools across Canada, and so on. Does this concern you, that the people responsible feel that there should be more co-ordination, even though it is not your particular area of responsibility?

The Chairman: You might be concerned, but you cannot do very much about it.

Dr. Brown: Mr. Chairman, I would like to say again that the Department of National Health and Welfare is doing a great deal in the field referred to in the first part of your last statement, and it is there that the function and responsibility lies; and they are being quite active about it. I think there is a good deal going on.

Senator Thompson: Thank you.

Dr. Salter: Mr. Chairman, I think it is also fair to say that the standard of the medical schools has been improved a great deal by Medical Research Council activities, and this is the role that we have to play in relation to the medical schools, to improve this aspect of their total function. The medical school has a primary responsibility to improve pa-

tient care and teach the next generation of doctors. They can do this better if they have teachers who are also doing research work. I think this delineates the responsibility somewhat, and each one of us wears different hats: we are teachers, we are surgeons, we are scientists, we are administrators and whatever. So we do have a concern, but in relation to MRC activity, I think we have to keep our focus on our primary job, which is to support and encourage research in this country.

Senator Thompson: I appreciate that.

The Chairman: Well, it is one o'clock unfortunately. We will have to adjourn, but before doing so I certainly want to thank you, Dr. Brown, and your colleagues for having been with us for three hours, and also for having agreed to adjust to a change in schedule, and appear this morning rather than this afternoon.

Dr. Brown: It was no trouble at all.

The Chairman: Thank you very much.

The committee adjourned.

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MEDICAL RESEARCH COUNCIL

A BRIEF SUBMITTED TO

THE SPECIAL COMMITTEE ON SCIENCE POLICY

OF

THE SENATE OF CANADA

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Medical Research Countries 2 (d. 414)

MEDICAL RESEARCH COUNCIL

A BRIEF SUBMITTED TO

THE SPECIAL COMMITTEE ON SCIENCE POLICY

OF

THE SENATE OF CANADA

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OTTAWA 1968

Contents

		Page
PA	RT I	
1.	Introduction	4142
2.	Policies of the Medical Research Council	4142
3.	Legislative Basis for the Medical Research Council	4145
4.	Government Organization for Science	4147
5.	Immediate Problems in the Health Sciences Area	4152
PA	RT II	
1.	Organization of the Medical Research Council	4155
	a) Organization	4155
		4158
	b) Agreements	4158
	d) Functions	4158
	e) MRC Policy	4159
2.	Functions in Relation to Other Agencies and Institutions	4162
	a) Federal Agencies	4162
	b) Industry	4163
	c) Educational Institutions	4164
	d) International Responsibilities	4165
	e) Voluntary Agencies	4165
	f) American Agencies	4166
3.	Review Procedures	4166
4.	Outside Studies	4168
5.	Powers and Programs	4168
6.	Hindrances to Effective Performance	4169
7.	Personnel Policies	4170
8.	Distribution of Activities	4171
	a) Regional Pattern	4171
	b) Regional Development	4172
9.	Personnel Associated with Scientific Activities	4174
10.	Expenditures Associated with Scientific Activities	4176
	a) Expenditures	4176
	b) Operating Funds	4177

(ii)

		page
11. Evalu	ation of Proposals	4178
b) d) e) f) g)	Peer Assessment Priorities Monitoring of Projects Implementation of Priorities Network Methods Termination of Projects Transfer of Results Expenditure of Funds Award Rate	4178 4180 4180 4181 4182 4182 4183 4183
12. Resea	arch Output	4184
b) c) d) e)	Patents Scientific Papers MRC Reports Conferences Departure of Trained Personnel Research Teams and Facilities	4184 4185 4185 4186 4187 4187
13. Proje	cts	4188
the state of the s	Number of Projects	4188 4188

APPENDICES

- A. Membership of the Medical Research Council
- B. Membership of MRC Standing Committees

MRC 31.12.68

PART I

1. Introduction

The Medical Research Council is that part of the government structure which is the main vehicle for the federal support of medical research. Its assigned aim and objective is the improvement of the health of Canadians through the development of research.

The Council itself is a group of working scientists, 21 in number, who have had delegated to them responsibility for the expenditure of a large part of the funds which Parliament appropriates for medical research. There is a small, a too small, secretariat, and there are numerous working committees which report to Council.

In Canada, where the amount of medical research done in industry and government laboratories is relatively small, the main body of medical research is carried out in universities and affiliated institutions. The Medical Research Council does not have laboratories of its own, and it uses the funds appropriated to it to promote and support research in universities, hospitals and research institutes. It now provides to the universities more than 60% of the extramural support for medical research which reaches them from all sources.

2. Policies of the Medical Research Council

Within the limits imposed by its assigned objective, the Medical Research Council has had the authority to establish policies and regulations regarding the use of monies appropriated to it by Parliament, and for policy-making and programming purposes it has selected three goals:

- a) to contribute to new knowledge in the health area,
- b) by the support of research, to develop and support the scientific and technological back-up to the provision of health care which is necessary if health services are to be of high standard, and
- c) to develop and support the research component in the education of health care personnel.

About 70% of the funds available to the Medical Research Council are used in supporting specific research programs directed by scientists across the country. These research programs are in part basic research, pure and objective, in part applied research and in part developmental research. They range from projects carried out in departments of chemistry, physics, biology and engineering, through those carried out in the basic science departments of medical schools, to the most applied and developmental type of work at the bedside and in the laboratory.

The initiative in these projects lies with the researchers who direct them.

The criteria used in selecting projects for support are almost entirely associated with the scientific merit and promise of the proposal and the responsible investigator.

Within the broad field of medical research the Medical Research

Council has only occasionally set aside specific amounts of money for

the support of work in the various sub-fields. It has, however, encouraged

work in promising fields by establishing grants committees in those fields.

Within the past two years the Medical Research Council has taken the initiative in two specific projects and has sought, and found, the cooperation of scientists in their execution. These are (1) the MRC Therapeutic Trial of Human Growth Hormone and (2) the MRC Antilymphocyte Serum Project. In both these cases there was a need to move on a national collaborative basis towards the solution of important problems, in one case the assessment of the effect of human growth hormone in various types of dwarfism, and in the other the determination of the effect of antilymphocyte serum in patients receiving organ transplants. It is the plan of Council to continue this type of stimulatory and coordinating project when there are health research problems best dealt with in this way.

Over the years the Medical Research Council has spent a very significant proportion of its resources in the training of research workers and teachers for our medical schools. At the present time it supports, for example, about 300 research trainees at the postdoctoral level and some 225 at the predoctoral level through its Fellowship and Studentship Programs. In addition many others are paid from MRC project grants held by senior investigators. Funds for training have always had the highest priority and the results have been most gratifying. For instance, an increasing number of faculty members are one-time MRC Fellows.

The Medical Research Council has been very much concerned with the special need to develop medical research in Canada in those areas where the level of research is inadequate. The main programs are now so highly competitive and, of necessity, so scheduled in time, that they do not always lend themselves readily to the rapid response to special requests for funds to attract qualified personnel or to the provision of "start-up" funds for the projects of newly appointed faculty members. To offset this, and to encourage local leadership, the Council has established a system of development grants with the main objective of facilitating the recruitment and establishment in operation of first-class researchers. Council also provides general research grants to deans of schools of medicine and pharmacy and, beginning in 1969, to deans of schools of dentistry; these grants are used at the discretion of the dean to deal with local problems. Finally, as another means of developing strength where it is specially needed, Council plans to use its Associateship Program which provides for the salary support of a limited number of established and highly competent investigators.

The success of the Council lies in the achievements of the researchers who have been supported by it and in the improvements in health care and education which they have brought to the institutions in which they work. Little of the research supported by the Medical

Research Council is susceptible to cost-benefit analysis in the usual terms, but some idea of its benefits may be obtained by imagining what our hospitals and professional schools would be like if there were removed from them two-thirds of the research and the researchers who presently exist there. In such a situation the standard of diagnosis and treatment would be much lower than it is now, and the teaching would be that provided by those who are not at the forefront of their subjects but are retailing, without critical assessment, that which has been produced elsewhere.

3. Legislative Basis for the Medical Research Council

It was in 1937 that General A.G.L. McNaughton, then President of the National Research Council, announced to a meeting of Council that an Associate Committee on Medical Research would be established and asked Sir Frederick Banting to be its chairman. The device of the Associate Committee served the needs of medical research until 1946 when a Division of Medical Research was established within the National Research Council. In 1960, following on the Farquharson Report, Cabinet directed the National Research Council to establish a Medical Research Council as an autonomous body within the administrative framework of the National Research Council.

Operating under the National Research Council Act and with the powers and responsibilities that it provided, the Medical Research Council has moved from an organization that was essentially a grants committee and a fellowship selection committee to its present form, which is characterized by a wide variety of programs designed to stimulate and support good research in the health sciences. The details of the present organization are set out later in this brief.

In July 1968 the government announced its intention to have the Medical Research Council report to Parliament through the Minister of National Health and Welfare rather than through the Chairman of the

Privy Council Committee on Scientific and Industrial Research, as it had done under the National Research Council Act. At the present time the Medical Research Council is a department for purposes of financial administration. This is a temporary situation to be brought to an end by legislation.

The Medical Research Council has given a great deal of consideration to the matter of legislation, and it is strongly of the opinion that its responsibilities within the broad area of a national program for medical research can best be discharged it if has in the future, as it has had in the past, the form, functions and authority of a corporate agency.

Corporate agency structure is the type of government structure which will provide the greatest degree of flexibility, coordination, and economy of operation.

A working Council in the framework of a corporate agency can be used to ensure a continuous input of informed opinion for both policy-making and administration of policy. The members of Council bring to their work the knowledge and judgment which can come only from those who are active scientists. Because of their duty to administer a national program, their work has about it a character which only responsibility can bring.

Much experience in several countries has shown that the government support of basic science is best provided through a council and corporate agency type of structure. There are autonomous Medical Research Councils in the United Kingdom, Sweden, New Zealand, India and Pakistan. In the United States, the National Institutes of Health are part of the Department of Health, Education and Welfare and this arrangement has been the subject of criticism. Recently the N.I.H. has been raised from "Bureau" to "Agency" status and no longer reports to the Surgeon-General but directly to the Assistant Secretary.

The delegation of responsibility to a corporate agency makes possible a flexibility in the conduct of programs, and it can also facilitate coordination. It makes easier the recruitment of scientific personnel.

Judged by the record of the Medical Research Council it permits an association association.

It should be emphasized that corporate agencies operate within prescribed terms of reference. Their proposals and programs are reviewed regularly by Treasury Board and other parts of the government apparatus. The development of programs and associated proposals for funding require the approval of the Minister to whom the agency reports. In operation, a corporate agency functioning in the way the Medical Research Council has been functioning is subject to the usual supervision of the Comptroller of the Treasury and the Auditor General. In essence, there occurs centrally the assignment of the main responsibility, and the authority and powers to develop policies and administer programs within assigned areas are delegated to the periphery.

4. Government Organization for Science

Consideration has also been given to the forms of organization and the channels of communication which the government must have if science and technology are to be exploited to the full. The conclusion reached has been that this can be accomplished not by any single step or in any simple fashion, but rather by a number of changes, some of which will take years to bring about.

Science, or science and technology, is not a part of our life, or a part of the life of the nation, that can be isolated and decided about at one time and in one place. It is an essential and all-pervading aspect of our lives, and interacts with all other types of activity. Also, and this is often forgotten, decisions taken in other areas of our community life have their effect on science, and this in turn has a feedback effect on the area of the original decision. If science is looked at in this way,

it will be realized that policy decisions taken primarily because of their effect on science have their effect on other areas, and that decisions taken on apparently non-scientific matters will often have effects on scientific and technological activities.

There is nothing new about this. The decision to support the construction of the first tanscontinental railway involved assessment of the technological as well as the commercial aspects of the proposal.

The success of the technological and financial efforts quickly had its feedback to science at the research level. For example, the opening up of the West by the railways gave rise to the necessity to develop varieties of wheat which would grow and mature in the climate of the West. Some of these varieties produced wheat with milling qualities that made it sought all over the world. This led to huge commercial benefits, and one of the many circular effects arising from the original decision was complete. It may also be remarked here that the decision to support the building of the CPR represented a decision in the technological area which was of great magnitude compared with some recent decisions affecting science and technology.

As one thinks of science, it should be realized that it is much more than research. In addition to research and invention, it includes that great effort needed to move from invention to innovation when new knowledge immediately relevant to social needs is followed by industrial production; here it is inextricably mixed with managerial decisions and attitudes. Science is, as well, the application of already available knowledge to the solution of problems. For example, in the field of pollution it is fair to ask whether early and important amelioration of pollution will come from the application of what is already knwon, or from research which has yet to be done. Science is more than research. It is above all a way of thinking, a way of analyzing and isolating problems and then proceeding to the elaboration of hypotheses which can be submitted to test.

Canada's science policy will be on the right track when more of those who make our policy decisions have some experience of science, understand the scientific method, and can recognize the difference between a social or natural or physical problem which is not yet amenable to scientific solution and a question which scientists are ready to answer if they are given the means. When there are as many in the government and the government service who have a training in science as there are with a training in economics or political science, the national problem with science will be less acute.

The problem is to bring as much as possible of the nature of scientific problems and opportunities, and of their social costs and benefits, to the minds of those who in the last analysis make the large decisions. Policy decisions are made by politicians. There is nothing special about decisions affecting science and even if there were it would remain necessary to have these decisions made by politicians. As it will be some years before a high proportion of our politicians and senior administrators have a significant knowledge of science and the scientific method, it is necessary to find means of putting beside them men who can bridge the false gap between science and politics.

It is important in thinking about the elaboration of a policy regarding science to remember the distinction between those who give advice often knowing only part of the picture and those who must take decisions after trying to balance all factors, scientific and otherwise. On the one hand there are those who elaborate advice, and on the other hand there are those who must move from advice to decision.

It is perhaps a too common belief among scientists that their advice regarding policy should almost automatically be accepted as a policy. There are obviously different levels in the elaboration of advice about scientific and technological matters. First of all, groups of scientific workers with special interests should put forward their views with force and argument. This is a necessary part of the process, and

fashion as special pleading. Examples of this sort of advice would include the submissions by national societies representing individual disciplines and the submissions by institutions or groups of institutions representing some of the main sectors in which research is carried out.

Then we move to advice which we say is at a higher level simply because the constituency represented is larger and more diversified.

Here we may take as examples the advice given to government by agencies such as the Association of Universities and Colleges of Canada, the Association of Canadian Medical Colleges, the National Research Council, the Canada Council, the Medical Research Council and the Atomic Energy Control Board. Such advice comes largely from active workers in the areas involved who have opportunities for periodic discussion in depth of the questions at issue. The grasp of the problem should be larger here, and the view taken should be broader.

Now, in Canada, we have a Science Council which has as its base all scientific activity. Here again, the advice should be more refined than at either of the other two levels, but it will still be advice which argues from the point of view of science, as of course it should. Its advice will not always be based on knowledge of the complete context in which final major decisions have to be taken. One very simple reason why this will be the case is that from time to time there will be information which must go into the final decision-making process that the government cannot make known to the twenty-four scientists who are the Science Council. One expects that an efficiently operating Science Council will provide some of the most helpful advice to government, but both the scientific community and government itself should realize that, no matter how efficient, the Science Council cannot make policy; it can only give refined advice concerning it.

Lest the division into three categories for purposes of this discussion be misunderstood, it should be emphasized that there should never be a hierarchical arrangement imposed on communication between different parts of the scientific community and the government. Each part should have the opportunity to send its opinion to the centre without what may be considered filtration through one of the inner rings.

The most difficult part of the problem is at the centre, at Cabinet level. Its solution would seem to lie in confidential and intimate scientific advisors who on the one side have open and free lines of communication with the Science Council and other bodies, and who on the other communicate with the politicians with a freedom which only mutual confidence can bring. This is the most difficult part of the whole problem to organize.

These advisors, who would be closest of all to the points of decision-making, closest to the Cabinet Ministers, should not exist within only one cluster. Many of them should be dispersed and work intimately on a day-to-day basis with those whom they advise. They should be privy to all the information which the Ministers and their other close advisors will have to take into account when evaluating policy alternatives. That dispersal of this sort should be thought necessary follows from the argument that science affects the greater part of our lives. Such dispersal would accomplish two main results. It would first of all increase the contacts of science advisors with those who have policy and administrative responsibilities; it would increase their knowledge of areas in which it is desired to achieve optimal results by the application of science and technology. It would, secondly, increase the number of points at the policy-making level where science advice would be fed in and evaluated by non-scientists. Dispersion would, then, increase the number of points in government where science policy would be critically developed.

It is also necessary, for several reasons, to have a clustering of such science advisors. It is necessary for organizational reasons, for the maintenance of continuity, and for the establishment of a chief focus of capability for some broad studies in depth. It is necessary to have a group whose task it is to synthesize, and, when required, to resolve conflicting views.

Another reason for dispersal of the science advisors should be mentioned. Any one of us may be at the mercy of a single expert advisor in a field with which we are not familiar. As soon, however, as we have two expert advisors, and therefore the opportunity to listen to them as they carry on their dialogue, we greatly increase our ability to judge wisely. Laymen can judge between scientists who argue, but they have difficulty when they always speak in unison. Science advice to government should be multiple, for it would be dangerous for it all to come through one final common pathway. The general policy of the government in science matters should not have only one point of origin; it should have multiple foci of origin with the final large decisions being made on a group basis.

5. Immediate Problems in the Health Sciences Area

This part of our submission may be concluded by raising some of the problems which are apparent now in the health sciences area. Our approach to them and their possible solution will be speeded up by improvements in the country's, and the government's, general attitude towards science and the use of it.

It is perfectly plain that Canadians want a high level of health care.

High standards of care consist essentially of the delivery at the points

and times needed of up-to-date knowledge and experienced opinion. This

is partly a scientific and partly a managerial problem, but our emphasis

will be on the scientific aspect.

The provision of high level care means among other things a narrowing of the gap between discovery and application of new knowledge

and new methods. It is obvious that the largest part of the knowledge to be applied at the bedside to-day, and the largest part of the new knowledge to be applied during the next five to ten years, will come from outside the country. As patients, or as a government, we cannot simply buy this knowledge, though it has its costs. As a community, however, we can support those who will acquire it rapidly, and apply it quickly when and where it is needed. Those who do this for us are those who are at the forefront of their subjects and know the methods by which new knowledge is acquired. These are the medical research scientists and it is their presence and their effect in communities of practitioners which will help to ensure that what is known is ued. These men and their teams of workers provide the scientific and technological back-up to health care and we need to increase their number quite significantly.

Canada now spends at least \$2.8 billion annually on health care.

The extramural money going into medical research in universities and hospitals, to take the largest component of health science research; is \$44 million. The ratio is wrong and it needs examination in its social, financial and scientific aspects.

Another large problem in our field is that of the staffing of our professional schools. In the sense that the total number of their products, the trained professionals, are too small, they need to be increased in number and perhaps in size. There are plans on foot to repair some of the deficiencies. In the medical field it is hoped that the Canadian output of trained doctors over the next five years will increase from 1,116 to 1,320. The sstablishment of four new medical schools and the enlargement of others will require large additions to faculty strength. There is the additional fact that the research component of some of the existing schools causes concern because of its inadequate size. The creation of new schools of dentistry and pharmacy, and the enlargement of existing schools, will mean additional demands. These are the main dimensions of an expansion which has to be accomplished if Canada is to produce anything like a

sufficient number of practitioners who are adequately trained and who can bring science to the bedside and there mix it properly with all the non-scientific support which patients require. Recruitment of faculty to train these doctors means the recruitment of a large number of researchers and of men who have experience with research. It has been reported to the Medical Research Council that in the quinquennium 1967-72 the number of investigators will increase from 1,365 to 2,596. The essential feature of the expansion is the people concerned, but, if they are to be persuaded to appear, new and improved facilities and the means to work will have to be provided. Both new space and new money are needed.

Two other problems may be mentioned as examples. There should, for instance, be a good hard look at the field of biomedical engineering.

The field is ripe for advance. There are increasing numbers of medical scientists who want to bring to their problems the methods of engineering, and there are increasing numbers of engineers and physicists who want to use the tools they have to serve biomedical ends. The field is ripe in its scientific development and the people are ready. Their means of support and organization have still to be worked out. If biomedical engineering develops in a healthy, well-rounded fashion, medical scientists and industry will be brought closer to each other. This will be of particular importance in a country where the industrial component of medical science is so small.

As the last example, it can be stated that the interface between health science research and sociology and economics must be examined. There should be developed organizations and approaches to health problems which will replace the present interface with a borderland of cooperation.

Again, if this is to be done, there are important policy decisions to be made by the government about methods of stimulating, supporting and promoting research in these contiguous areas.

PART II

1. Organization

Organization

"Recond of Cabinet Decision

Meeting of June 30th, 1960

Support of Medical Research

The Cabinet approved the recommendations of the Privy

Council Committee on Scientific and Industrial Research that
the government should announce

- (i) that the National Research Council

 was being instructed to establish its Division of

 Medical Research at this time as virtually an

 autonomous subsidiary, to be designated the

 Medical Research Council, within the framework

 of the National Research Council; and
- (ii) that, in the light of experience, further consideration would be given to the question of the appropriate time when Parliament might be asked to approve the detachment of the Medical Research Council from the National Research Council;

(Sgd) W.D. Halliday

Registrar of the Cabinet "

The above Cabinet Decision was implemented by the National Research Council at its 208th Meeting in November 1960, and the Medical Research Council continued to operate on this basis until 1968.

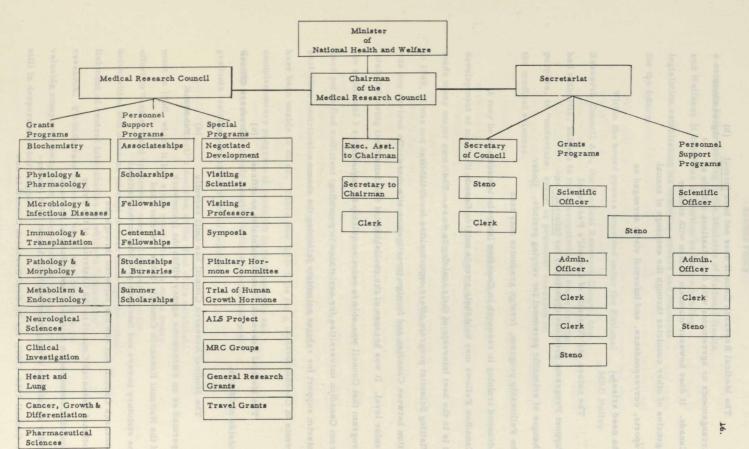
The Medical Research Council now reports, through its Chairman, directly to the Minister of National Health and Welfare but is quite independent of that Department. The Council itself consists of twenty-one members (see Appendix A) representing all major aspects of health science research; the number has recently been increased by the addition of three representatives in the field of dental research since this area will become the responsibility of MRC on April 1, 1969. With the exception of the Chairman, who holds his appointment during pleasure, Council members serve without remuneration for periods of three years, with the possible renewal of their appointments for one additional term.

Council is supported by 20 standing committees, comprising approximately 100 additional senior scientists, on whom it relies for expert advice and recommendations in the operation of its various programs. The nature of these committees and their composition is recorded in Appendix B.

The Council's full-time secretariat, in addition to the Chairman, now comprises 15 staff members.

The Medical Research Council does not operate laboratories of its own; its program is oriented towards the development and support of research in the health sciences in Canadian universities, hospitals and research institutes, and the training of research personnel in its areas of responsibility.

The organization of Council and its activities is shown in the following Chart.



Dental Sciences
Psychology
Bio-engineering

The Medical Research Council does not have <u>formal</u> arrangements or agreements with organizations outside of Canada. It does however maintain liaison with similar agencies of other countries through the exchange of annual reports, correspondence, and informal visits arranged as the need arises.

(b) Agreements

The nature and diversity of Council's Personnel
Support Programs provides opportunity for informal exchanges of scientific personnel for varying periods. Under
the Fellowship program, foreign graduates may take
advanced training in research in Canadian laboratories and
Canadian Fellows may hold their awards outside Canada if
it is in the best interests of their training to do so. The
Visiting Scientist program offers opportunities for collaboration between Canadian and foreign investigators at a more
senior level. It was because of the availability of this latter
program that Council was able to react so quickly to requests
from Canadian universities for assistance in providing
interim support for refugee scientists following the recent
events in Czechoslovakia.

The Medical Research Council maintains no offices outside of Ottawa.

(c) Overseas Offices

The Medical Research Council has until recently operated as an autonomous agency within the framework of the National Research Council; it has therefore had the statutory powers and functions provided in the National Research Council Act and has reported through the National Research Council to the Chairman of the Privy Council Committee on Scientific and Industrial Research. Under an interim arrangement made in August 1968 (Order-in-Council 1968-1709), the Medical Research Council is now

(d) Functions a separate body reporting to the Minister of National Health and Welfare; it continues to function as before pending legislation establishing its statutory powers and functions

Within the broad powers provided under the National
Research Council Act, the Medical Research Council has
had authority, subject to the appropriation of funds for the
purpose, to "undertake, assist or promote" research in
the medical sciences.

(e) MRC Policy

It may be useful here to recall briefly the recent development of medical research. Although Canada had made many major contributions to medical research prior to 1940, it was not until the Second World War that there was any serious effort to fund research in this field. Immediately following the War, the 9 existing medical schools and the additional 3 schools established shortly thereafter were hard put to find sufficient teaching staff and without the part-time contributions made by practising clinicians would have been unable to do so. There was little time for a complementary program of research in most schools and Canada was forced to rely heavily on the advances and post-graduate training programs of other nations.

It was Council's decision at the time of its establishment in 1960, which it has since confirmed, to make every effort to "assist" and "promote" medical research in the universities and make no attempt to seek funds for the establishment of central laboratories in which to "undertake" research. To undertake research would have been to draw valuable manpower away from the universities where it was still in desperately short supply.

First priority was given to producing teacher-scientists to staff the growing me dical schools. Medical Research Fellowships had been offered by the Division of Medical Research of the National Research Council since 1947. Under the same aegis, funds had been made available to the medical schools since 1956 to provide salary support for a limited number of career investigators who were expected to devote almost full time to research and graduate teaching; these programs were continued by the Medical Research Council and have been supplemented by other Personnel Support Programs.

In the past ten years there has been a very large increase in the number of medical school faculty members who have significant research capability and the programs of the Medical Research Council have made an important contribution to this growth. Because of the establishment of new schools, and major expansion programs in existing schools, even larger numbers of teacher-scientists will be required in the years immediately ahead if our medical schools are to be adequately staffed. The same may be said of schools of pharmacy and of dentistry.

Concurrently with the Personnel Support Programs, and
of much greater magnitude from the financial standpoint, the
Medical Research Council has operated a Grants Program for the
support of research projects initiated and carried out by investigators in the universities, their hospitals and institutes.

In 1960, by far the greater part of the Grants Program
was concerned with fundamental work in the basic sciences and
relatively little attention was paid to the development of clinical
research. Since that time there has been a major change in
policy with the result that about one-third of the operating grants

now go to clinical researchers. The amount of work supported in developmental research has not been great but applications of this type are now being received in greater numbers. The Medical Research Council has changed, then, from an agency which was concerned primarily with work in basic sciences to one which provides support for work across the whole spectrum of health science research and development (with the exception of certain fields supported by other federal agencies).

It is also necessary to consider research related to specific national needs which is beyond the resources of individual universities. Whole areas of research will fail to develop unless special facilities are provided. Primate facilities, for example, are needed for studies in physiology, psychology, and dentistry which cannot be undertaken on other species with any degree of relevance to man. Drug testing facilities are needed to investigate the metabolism and toxicity of newly-synthesized drugs. Computer facilities are in increasing demand. The Medical Research Council has recognized the validity of these needs and it has established ad hoc committees to study them so that appropriate recommendations may be put before the government.

The Medical Research Council has supported two national clinical trials and to that extent may be considered to have "undertaken" research. These are the MRC Therapeutic Trial of Human Growth Hormone and the ALS Project to which reference will be made later.

In summary, the chief features of the policy of the Medical Research Council within its own area are

 to provide financial assistance for the research of investigators whose work is assessed by national standards,

- to support energetically the training in research of highly qualified young men and women,
- to support a limited number of career investigators, and
- to organize and direct a limited number of research
 programs.

The Medical Research Council now provides approximately
60% of all extramural support for medical research reaching
Canadian universities and affiliated hospitals and institutes. In
Schools of Pharmacy the percentage of extramural support
coming from the Medical Research Council is much higher. Council also supports a small amount of research outside of faculties
of medicine and pharmacy if the proposed research is of immediate relevance to medical problems.

2. Functions in Relation to Other Agencies and Institutions

(a)

Federal Agencies

The other federal agencies which, in their work,
Ag
have interfaces with the work of the Medical Research

Council are: the Department of National Health and Welfare, the National Research Council, the Defence Research

Board, the Department of Veterans Affairs, the Department
of Agriculture, Atomic Energy of Canada Limited, and the

Canada Council. The Medical Research Council is prepared
to consider all research proposals put forward by Schools of

Medicine, of Pharmacy and, now, of Dentistry, with the exception of that work for which federal support is channelled
through the Department of National Health and Welfare, and
the Defence Research Board.

The Defence Research Board has a specific mission in supporting research, both basic and developmental, which is directly relevant to defence. The Department of National Health and Welfare administers a Public Health Research Grants program the scope of
which is described as follows:

"Projects likely to be approved must show a direct relation-

- (a) Prevention of disease, disability or death,
- (b) Epidemiological studies,
- (c) Hospital studies (for example, administrative),
- (d) Community based studies in health and medical care,
- (e) Operational research,
- (f) Environmental health, including sanitation,
- (g) Training and utilization of health manpower resources.

Excluded from the Public Health Research Grant will be most research in medical sciences (either basic or clinical) unless there is a direct and early preventive aspect or some special relationship to the seven areas mentioned above..."*

Liaison with other federal agencies is accomplished through an Interdepartmental Medical Research Coordinating Group comprised of representatives of the Medical Research Council, the Defence Research Board, the Department of National Health and Welfare and the Department of Veterans Affairs, through an MRC/NRC Liaison Committee, and through frequent consultation at the administrative level between the officers of the Department of National Health and Welfare, the Defence Research Board, the National Research Council and ourselves. In addition, the Chairman of the Medical Research Council has been a member of the National Research Council, the Defence Research Board Medical Advisory Committee, the Department of National Health and Welfare's Research Advisory Committee to the Dominion Council of Health, and the Department of Veterans Affairs Advisory Board on Medical Research. It might be noted here that the Medical Research Council has recently acceded to the request of the Department of Veterans Affairs that applications for research funds directed to the Department be examined and assessed for scientific merit by the Grants Committees of the Council.

The Council's contact with industry to date has been (b)
Industry
minimal. It has not seen the need for, nor has industry requested

^{*} Dept. of National Health and Welfare - Research under the National Health Grants. General Instructions, 1968. pp. 2-5.

that it establish, a grants program in this area. There are no
restrictions as to the type of industry eligible to participate in
the Industrial Assistance Program of the National Research
Council, which is primarily designed to encourage basic research in industry, or in the program of the Department of
Industry, which is concerned more with applied or developmental research. Council is concerned however with the growth of
research and development in the field of bio-engineering, and
in its concern for this field it will be anxious to see that the
industrial component is adequately supported.

When appropriate, the Medical Research Council has sought representation from industry on its ad hoc committees. It has also recorded its interest in having representation from industry on Council from time to time, particularly if it should prove feasible to establish one or two drug institutes in Canada.

Educational

institutions

The chief function of the Medical Research

Council is to support research in educational institutions.

The major initiative with respect to research in the health
sciences lies with the universities, hospitals and institutes
where it is conducted. Council's policy, and therefore its
function, is to provide support for high quality work and to
provide the incentives to encourage expansion and improvement where these are needed.

Council's activities are divided into three broad programs:

- a) Grants Program
- b) Personnel Support Programs
- c) Special Programs,

all of which are devoted to the funding of extramural research.

The procedures for implementing these programs are outlined in section II, 11 (a) (page 37).

The Medical Research Council is the adhering body for Canada in the Council for International Organizations of Medical Sciences (an international coordinating agency with headquarters in Paris, the International Union of Physiological Sciences, and the International Union of Pharmacological Sciences. In consultation with the relevant national societies Council selects official delegates to the congresses of these two International Unions and to other international congresses in fields directly related to the other areas of responsibility of the Council.

(d) International responsibilities

A number of voluntary agencies provide a signifi- (e) Voluntary cant amount of extramural support for medical research and agencies over the years their contribution in money and leadership has been very great. In percentage terms their role is now diminishing but it will be to the advantage of medical research as a whole if the voluntary agencies continue to play an effective part. It is no bad thing to have more than one source to which researchers may look for funds. Multiple agencies mean that there is more innovation in methods of research support than there might otherwise be, and here the voluntary agencies have contributed importantly. As voluntary agencies they are sometimes able to provide support under conditions which a government agency cannot accomplish. One of the most important contributions of voluntary organizations has been their educational effort. In their campaigns for funds, as well as in their society efforts, they have done much to educate the Canadian public in the importance of medical research.

Liaison with the voluntary agencies is maintained through informal and numerous working contacts, the yearly meeting of the Interdepartmental Medical Research Coordinating invited, and by membership of officers of the Medical

Research Council on the research advisory committees of
seven of the major agencies.

Useful contacts are maintained with foreign
American agencies where required, both government and voluntary,
for the Medical Research Council must adapt to occasional
major changes in their policies as they affect Canadian research. For example the U.S. Public Health Service some
years ago began to withdraw research support from Canadian
investigators, often on short notice. To avoid disruption of
valuable projects, the Medical Research Council moved
quickly to replace this support (to the extent that funds were
available) and to adjust the balance of its programs to take
this withdrawal into account.

3. Review Procedures

The Medical Research Council employes several methods of review and revision of its programs.

The actual operating procedures are kept under continual scrutiny by a five-member Executive of Council which meets at monthly intervals. At these sessions close attention is paid to the current financial situation and adjustments are made if necessary between allocations in order to meet Council's commitments or implement its decisions; current policies are discussed, and consideration is given to new problems with a view to developing alternative courses of action to be put before Council.

Ad hoc committees are set up from time to time
to review procedures and policy goals in particular areas. Two
years ago, one such committee was concerned specifically with

the review of Council's procedures for processing and assessing applications for grants-in-aid. Three other ad hoc committees are now examining three different policy goals, i.e. primate research facilities, drug research institutes, and computer needs.

The important ALS Project arose out of the preliminary studies of another ad hoc committee.

A Policy Study Group comprised of senior investigators from within and without Council has been at work for the past year reviewing the programs of Council, and its overall role in the promoition and assistance of research in the health sciences; it has recently presented its report to Council for its consideration.

The standing committees of Council send forward to Council their views on policy and their recommendations for the improvement of procedures. Some make special provision for discussion of policy and procedures at each of their meetings, and both the Committee on Fellowships and the Committee on Associates and Scholars have, within the past two years, met in extraordinary sessions to consider policy in their specific areas.

It should be noted that while the chairmen of the standing committees are not necessarily members of Council, every Council member is expected to serve as an active member of at least one committee of Council; they therefore have an opportunity to evaluate the effectiveness of Council policies at the level of the working committees. A member of the full-time staff serves as the secretary of each standing committee to ensure that uniform interpretation of Council's regulations is maintained. There is, then, effective liaison and coordination of the overall operation at all levels.

Procedures, and methods used to maintain surveillance of individual programs and projects are described in section II, ll(c) (page 39).

4. Outside Studies

To obtain up-to-date information on which to base
its planning for the future, the Medical Research Council commissioned a Survey of Medical Research in Canada.

The first phase of this Survey took the form of an enum. ration of all categories of research personnel in Canadian medical schools and their affiliated institutes, and the results were published in 1966 as MRC Report No. 1.

During 1967 the Survey was extended to an evaluation of the quantity and the quality of research in the medical sciences. The evaluation was made by 14 Assessment Groups, each comprised of 3 to 5 senior investigators in a particular discipline who visited the departments of the medical schools in their particular field to obtain first-hand information on work in progress, plans and requirements for space, personnel, and funds for the five-year period ending 1972-73. Other Assessment Groups visited Schools of Pharma cy, laboratories of federal government departments engaged in research related to the health sciences, and a number of pharmaceutical companies.

The results of this phase of the Survey, and the recommendations of the Assessment Groups, recently published as MRC Report No. 2, will receive the close attention of Council as it reviews its programs and activities.

5. Powers and Programs

The responsibility of the Medical Research Council is to develop and support high quality research in the health sciences, and the powers of a corporate agency provided in the National Research Council Act have been very well suited to the task. Under the corporate agency form of administration there has been the possibility of a flexibility and economy which would be difficult

of a corporate agency, Council has been the spending authority of for the funds appropriated to it by Parliament for the extramural support of medical research. With this authority there is possible the expeditious development of new programs and re-arrangements of old ones. Within the past three years, the Medical Research Council has instituted nine new programs and most of the others have subjected to major alteration.

Freedom to adjust its programs to meet new needs, and to take advantage of unusual opportunities, is one of Council's greatest assets and one that must be preserved if the best use is to be made of the funds available to it. The representative nature of Council and its Committees provides it with a sensitivity to these needs and opportunities that is essential to its operation. Council does not underestimate the degree of responsibility that this entails. Authority to exercise this responsibility ensures that it will be maintained.

6. Hindrances to Effective Performance

There are three difficulties in the effective performance of Council's functions at the present time. These are:

- The temporary legislative basis on which Council exists;
- 2) An inadequate secretariat, and
- 3) Inadequate funds.

The Council hopes and anticipates that early legislation will be put forward to give it statutory powers similar to those it has enjoyed under the National Research Council Act, i.e. those of a corporate body with autonomy in the operation of its program, subject always to normal government controls.

The work of the Medical Research Council as reflected in the budget of the past five years has grown rapidly.

In actual fact the work has grown more rapidly than the budget because of the institution of many new programs which require large amounts of staff and committee time. With the increase in Council's responsibilities has come a considerable increase in the number of applications, and it should be remembered that an application for funds which may in the end be denied requires just as careful consideration as an application for funds which is acceded to. The secretariat has also had increasing responsibility for the administrative aspects of Council's operation which were previously carried out by the National Research Council.

The administrative budget is subject to the restrictions common to most government agencies at the present time but it must be stated that the situation causes real concern. If the distribution of the large amounts of money now involved is to remain wise and effective, there must be people to do the job.

Another major problem is the lack of funds to meet valid needs in the extramural program. This however must be recognized as a problem common to many agencies and needs no elaboration here.

7. Personnel Policies

Since the Medical Research Council does not undertake research in facilities of its own and has therefore only a small administrative staff, it relies almost totally on the National Research Council for such staff training and development assistance as is required.

On the other rand, of course, the Council does maintain an extensive Personnel Support Program in the universities. The function of that program is to train potential investigators and to support a limited number of highly qualified scientists in universities, hospitals and research

supported through the Council's Grants Program. None of those so supported or employed can however be regarded as Medical Research Council "employees".

8. Distribution of Activities

The regional distribution of the funds available to (a)
Regional
the Medical Research Council for 1967-68 is shown in Table 1.
Pattern

	(\$ thousands)
ritish Columbia	1,638
lberta	1,310
askatchewan	524
Manitoba	1,042
Intario	7, 181
uebec	7,653
ew Brunswick	6
ova Scotia	517
rince Edward Island	
ewfoundland	di the .oronibo
outside Canada (Fellowships)	398
ieneral support.	231

This distribution is related to the number and size of the medical schools in each province. Awards made under the Grants

Program and the Personnel Support Programs, as well as under some parts of the Special Programs, are determined on merit in open competition and therefore the pattern reflects the number of good applications coming forward from each province.

In some of the Council's programs an attempt is made to keep the rich from getting richer and the poor poorer; these are referred to in section II, 8 (b).

The Medical Research Council has given a great (b)

Regional
deal of consideration to problems of regional disparity. There Development
are two categories of regional problem:

- 1) the special problems of new medical schools, and
- the special problems of weak disciplinary areas in established medical schools.

Several programs have been developed by the Council to attack these problems. Before going on to describe them, something should be said about the role of financial assistance in the support of research. It is necessary first of all to realize that money does not lead in these matters. Rather, money facilitates local leadership when it appears. Large grants go to an institution when it has collected a number of high calibre researchers; large grants going to an institution in advance of the acquisition of high calibre researchers may serve no purpose. Indeed, they may hinder the development of good research by permitting the continuation of the mediocre. At the same time it is to be remembered that an agreement about the provision of funds, if such a development takes place, may serve a very useful purpose.

Negotiated Development Grants - Negotiated Development Grants have as their chief purpose the facilitation of the recruitment of first class staff to the medical, dental and pharmacy schools. The type of application we prefer most is that which is concerned with the development of work in a field up till then relatively neglected in a given school. In such a situation, if a first class man or team were to be recruited, first class equipment available from the date of proposed appointment is almost always a condition of acceptance by the researchers concerned. Because it is an area in need of development, in such cases high class equipment of the type required has almost always been

lacking. Under such circumstances the Council is prepared to enter into an agreement with the university concerned that funds for equipment will be provided if the university is successful in recruiting the man or team in question. Both the researchers, and the equipment requested, are assessed independently by the Council.

Awards of limited duration may also provide for operating funds and for salary support for assistant staff and, occasionally, for the researchers. Normally only part of the total cost of the new research venture is covered by Negotiated Development Grants since the university itself is expected to be a contributing partner to the project.

During the present year, the four new medical schools have had first claim on half the \$750,000 devoted to Negotiated Development Grants.

General Research Grants - Every research operation of any size should at the beginning of the year have at its disposal funds not yet earmarked for any specific purpose. By and large, in our Schools of Medicine and of Pharmacy, such funds are not available in sufficient amount. The Medical Research Council has not attempted completely to repair this deficiency but it has recognized it and has made General Research Grants of \$24,000 per year to all medical schools and of \$5,000 per year to schools of pharmacy. It should be noted that in each category the same amount of money goes to each school.

Associateships - The Associateships program provides another mechanism for strengthening both geographic and disciplinary areas which are in need of development. These awards provide salary support for career investigators who have

already made their mark. While all those selected must be investigators of very high merit one of the criteria in evaluating applications is the contribution that the candidate is expected to make to the development of a weak area of research.

Grants Program - In the regular Grants Program, special consideration is given to applications from new faculty members. This means that there is some degree of special treatment given to newly recruited faculty members both in new schools and in those areas of the older schools where the universities have added to their strength.

Consultation Service - During the past two years the Medical Research Council has been asked on a number of occasions to provide advice concerning the development of research in specific situations. At times this has involved the assessment of a large situation and its possible development over a period of years. On other occasions Council has been asked to provide universities with its assessments of the potentialities of possible additions to faculty strength.

9. Personnel Associated with Scientific Activities

The total full-time staff of the Medical Research Council is now 16, five of whom are "professional" in the sense that they have university degrees. Three additional scientists are employed as consultants on a part-time basis.

All devote their time to administrative duties.

All the full-time professional personnel were born in Canada.

All took their university degrees in Canada:

Bachelor's

Ph.D.

M. D.

One of those with the M.D. degree subsequently obtained the D.Phil. degree from Oxford; both those with the M.D. degree are Fellows of the Royal College of Physicians and Surgeons.

The number of working years since graduation of the individual full-time professional personnel, exclusive of war service, are:

Bachelor's	Ph. D.	M. D.			
26, 4	19	27, 29			

One has worked for the Medical Research Council since it was established in 1960 (8 years); one was appointed in 1965, one in 1967 and two in 1968.

The average age of the professional staff is 46.

All members of the professional staff read French; two have some slight degree of proficiency in speaking French.

One of the part-time scientists is completely bilingual and another is fluent in French (as is one member of the support staff). Every effort has been, and is still being, made to obtain the full-time services of a professional with a French background, so far without success.

T	able 2.	- Pro	ofession	al Staff by	Degree	Categor	у
	1962	1963	1964	1965	1966	1967	1968
B. A.	1	1	2	2	1	1	2
Ph. D.	outed o	-	-	-	-	-	1
M.D.	(2)*	(2)	(2)	(2)	1 (1)	2 (1)	2 (3)

^{*} Figures in brackets indicate part-time staff

From 1960 to 1965, the "professional" staff of the

Council consisted of a Chairman and a Secretary, both part-time,
and a full-time administrative officer. Following the death of
the first Chairman, the present Chairman took up his appointment in Ottawa on a full-time basis; the Secretary continued to

be part-time until 1967 when his other commitments forced
his resignation. The present Secretary and the other two
professional staff members took up their appointments during
this past year. One of the current part-time professionals held a
full-time appointment with the Medical Research Council until
recently taking up a senior university post.

The three senior professional personnel have been employed in universities, two for most of their careers to date.

None have been employed by industry (except in a consulting capacity) or by provincial governments. Three transferred to the Medical Research Council from the National Research Council.

10. Expenditures Associated with Scientific Activities

The funds of the Medical Research Council are spent (a)

Expenditures in the support of medical sciences. The breakdown by function,
as defined by the Committee, is set out in Table 3.

		(\$ thousa	ands)				
	62-63	63-64	64-65	65-66	66-67	67-68	(est.) 68-69	
Data Collection	12	6	00111	15	114	133	110	
Scientific Information R. & D. in	26	18	23	25	26	75	132	
Univer- sities	3,882	4,626	6,222	11,445*	11,219	18,513	23,329	
Higher Education	377	450	679	765	991	1,779	3,372	
Totals:	4,297	5,100	6,935	12,250*	12,350	20,500	26,943	

^{*} Including Supplement of \$3,000,000 provided in 1965-66 for application to awards for 1966-67.

The Medical Research Council has made no capital (b)
Operating
expenditures. The expenditure of operating funds by units for
the fiscal years 1962 to 1967 inclusive, and estimated expenditure for 1968-69, are set out in Table 4. In addition, we have
shown the administrative costs of operating the entire program.

9-25	onw bla	in the a	SITEGES	.0.1 .00	I refere	AGTEDICO O	(est.)
	62-63	63-64	64-65	65-66	66-67	67-68	68-69
			(\$	thousand	5)		
EXTRAMURAL PROGRAMS:							
Grants Program	3,429	3,957	5,179	10,134*	9,088	15,388	18,681
Personnel Support Programs							
Associateships	305	411	533	606	850	955	1,331
Scholarships	E RECORDS 2	101	349	540	855	1,221	1,437
Fellowships	353	426	610	693	899	1,488	2,234
Centennial	deadons			agua arad	tadried (NAME OF PARTY	sen log
Fellowships						97	186
Studentships	STANTED	Brittle RELY	THE STATE OF	an dia	Service of	W. O. Thunk	725
Summer							
Scholarships	24	24	69	72	92	194	227
	682	962	1,561	1,911	2,696	3,955	6, 140
Visiting Scientists	s 4	13	17	21	44	206	294
General Res. Gra	_	144	144	144	336	336	424
Travel grants	18	4	10	14	8	20	30
Symposia	6	11	11	10	16	29	40
Surveys	1	2	1		69	102	20
Negotiated Develo	op-				the same to		
ment Grants	The state of the s				12	171	750
Groups						214	350
Visiting Professo	ors				5	9	12
Clinical Trials	12	6	11	15	45	34	100
International Affi Cdn. Council on	l'ns 1	1	1	1	2	2	2
Animal Care	M able to	Brasle	DIN DI	TOT BE SAN	De San .	21	50
Chairman's Fund		WY 757	AUT - 270	Contractor	29	13	50
	186	181	195	205	566	1,157	2,122
Total Extramural	4,297	5,100	6,935	12,250*	12,350	20, 500	26,94
ADMINISTRATIVE	57	58	89	112	156	229	303

^{*}Including Supplement of \$3,000,000 provided in 1965-66 for application to awards for 1966-67.

11. Evaluation of Proposals

All requests for financial assistance directed to the Council are referred to one or other of its standing committees for assessment.

(a) Peer Assessment

Before going to the appropriate Committee, each
application for an operating or major equipment grant is referred to external referees, i.e. experts in the field who are
not members of a Council committee. Each application, and
the external referees' comments, is then discussed in committee, a judgment is made of the scientific merit of the proposal
and the validity of the budget proposed by the applicant, and a
numerical rating is assigned to it. The ratings and recommendations of the Committees with respect to all applications are
then forwarded to Council for final action.

To assist them in the assessment of applications
the committees have before them the curriculum vitae of each
applicant which indicates his training, his experience to date,
and his publications; this enables the members of the committees
to assure themselves of the applicant's competence to carry out
the proposed project. Council also requires that applicants
provide detailed information not only about the objectives of the
proposed research but also about the manner in which it is to be
carried out.

In making awards, the following policies of the Medical Research Council are adhered to:

- principal investigators may not receive remuneration from operating grants;
- 2) those employed as assistants to the principal investigator may not be paid more than those of similar qualifications and experience who receive direct support through the Personnel Support Programs of the Council (e.g. Fellowships, Scholarships, etc.);

- the purchase of equipment for space eligible for support under the Health Resources Fund Act;
 - 4) funds are provided for equipment that is essential to the proposed research but not for teaching or service work;
 - 5) when applicable, adequate provision must be made for the maintenance and humane treatment of experimental animals;
 - 6) when applicable, clinical research projects must
 have been evaluated and approved on ethical grounds
 by university committees convened for the purpose;
 - 7) funds are not provided for overhead costs.

Applications in the various categories of the Personnel

Support Programs are similarly processed by Committees. Copies
of the full applications and supporting documentation are sent to the
members for review prior to the meeting and are subsequently
discussed. Recommendations are then forwarded to Council for
final action. In assessing applications, care is taken to ensure that:

- the candidate meets the high academic requirements
 of Council;
- 2) that the regulations of the particular program have been complied with;
- 3) that the department in which the award is to be held is able to provide the necessary facilities.

The proposals put forward under the Special Programs of the Council are reviewed by the Executive, in consultation with the chairmen or individual members of the appropriate standing committees if this is desirable, and recommendations are then forwarded to Council for its consideration and final action.

The priorities of various programs are assigned by (b)

Council. Council receives for this purpose inputs from the Priorities

Executive, the Grants and Selection Committees, the secretariat and, on occasion, ad hoc committees. Priorities are assigned to programs for a given year when the budget target for that year is known. However the process is flexible and changes may be made by Council during the course of the year.

Within programs, priorities are assigned to projects for the most part by the Grants Committees, Selection Committees and the Executive. On occasion Council itself has re-arranged priorities assigned by the committees to groups of projects within a program. For example, it has at times said that applications for operating grants from new faculty members are to receive favourable consideration as compared with the applications from established faculty members who have been given the same priorits ratings by the Grants Committees.

The most important part of the monitoring process (c)

takes place within Grants Committees when grantees apply for Monitoring of Projects continued support of an on-going project or when they apply for support for a new project. The assessment of previous accomplishment is an important factor in the decision about a new award or renewal of an old award, as has been noted in para. a , page 37. The assessment of progress by Grants

Committees is based on published papers, submitted progress reports and personal knowledge. When this basis may prove to be inadequate for sound decision, an on site visit is arranged.

The visitors may spend one or two days in the laboratory concerned, and in the selection of visitors an attempt is made to combine both expertise in the special field and knowledge of Council policies.

It may be remarked here that the standards applied are not only national but international. Referees are drawn from England and the United States as well as from Canada.

Americans have frequently made on site visits for us. One of the Grants Committees has an American among its members.

Several members of our Grants Committees work on comparable committees in the United States.

Renewals of Studentships and Fellowships are contingent on the receipt of satisfactory reports from supervisors.

Scholarships, which are awarded in the first instance for three years, may be renewed for a further two years on receipt of a satisfactory report from the university and satisfactory assessment of the grant applications which the Scholar has submitted.

Associates are appointed initially for a term of three years and may receive renewals of their appointments for periods of five years. As each term expires, the Associate writes a report on his work, he is visited in his laboratory and all the information which Council has about his performance is brought together for committee review.

As has been indicated, priorities are assigned to

(d)

Implementation
programs in the light of funds available, and the assignment of Priorities
of priorities is essentially the decision to allocate resources.

It is obvious that the most important part of a list of priorities
is the bottom of the list. Only by deciding what is not to be
done can funds be made available for that which should be done
when resources are limited.

The allocation of funds to projects within programs in the basis of their scientific merit.

Network methods are not used to plan and monitor projects. Expertise in the many special fields concerned is Methods available in the Grants and Selection Committees, the referees and on site visitors.

Network

Decision to terminate research projects is made by the machinery described in para.(c) above. When such a decision has been made, a "terminal grant" is awarded. Terminal grants are for a period of 3 - 12 months and provide protection for the personnel involved during the period of readjustment. Both the terminal award rate and the rejection rate for new proposals are at comparatively high levels.

Some years back the Medical Research Council lived within its budget by spreading its funds rather thinly among a very high percentage of applicants. Three years ago Council took the decision that high quality researchers should be funded not necessarily at the level they wished but at a level which would not put unreasonable financial barriers in the way of rapid progress of good work. This has meant, and it was known that it would mean, that the terminal award rate and the rejection rate would rise. One result has been the withdrawal or withholding of support from investigators of significantly lesser merit. Many of these investigators perform important functions in the training of graduate students and in the teaching of undergraduate students. Consideration is now being given to methods by which they can be provided with funds adequate to sustain modest research programs which are desirable complements to their teaching function.

(f) Termination of Projects

Contributions to knowledge arising out of extra-(g) Transfer of mural research are transferred to points of use through the results scientific literature, conferences and symposia. Within the institution, such contributions may of course immediately be put to work either in diagnosis or treatment or in the elaboration of further research. This however is only one of the benefits of extramural research to the institution in which it is carried out. Another, and not by any means a minor one, is the effect which the prosecution of good research by good people has on the diagnosis and treatment and teaching in that institution. For one thing, good researchers are at the edge of knowledge in their field, they are up to date. Aside from contributions they make to new knowledge, their possession of up-to-date knowledge and technology in their fields contributes to the scientific and technological level of the institution and hence to the level of diagnosis and treatment.

All the funds available to the Medical Research

(h)

Expenditure

Council for its extramural program have been expended in

of funds

each of the years 1962-63 to 1966-67.

Funds provided by the Medical Research Council (i)
Award Rate
in response to specific applications for grants-in-aid and
for the support of the various categories of research personnel
have for a number of years comprised approximately 95% of
the total expenditures for the extramural program. The award
rate for applications considered in each of the years 1962-63
to 1967-68 is shown in Table 5.

The state of the s	son Ulivon on law and to us	MIN'S DESCRIPTION OF
Year	Grants	Personnel
	Program	Support
		Programs
1962-63	63%	63%
1963-64	55%	67%
1964-65	59%	59%
1965-66	51%	59%
1966-67	69%	79%
1967-68	63%	55%

The sudden increase in the award rate for grantsin-aid in 1966-67 is the result of a \$3,000,000 supplement
approved by Treasury Board in March 1966 to meet awards for
1966-67. The increase in volume and value of applications in
the past two years, unaccompanied by a corresponding increase
in the funds provided Council, has resulted in award rates similar to those in the early '60s.

It is difficult to arrive at a meaningful comparison of amounts requested and granted for the Special Programs.

Most of the requests in this category relate to proposals outside the normal competitive programs of the Council and are not for specific sums of money but for such assistance as Council can provide. Other aspects of the program, such as the General Research Grants and the payment of dues in international organizations, are matters of Council decision rather than response to individual requests.

12. Research Output

Ten patents are known to have been obtained in
Patents
recent years by investigators who hold MRC grants. The
work which resulted in these patents was in some cases
supported in part by other agencies as well. Only one of
these patents has yielded any economic return as far as we
are aware; royalties amount to some \$50,000 per year.
The Medical Research Council does not claim patent rights
to any inventions resulting from research supported by MRC funds.

In the guinguennium 1962-67 some thousands of (b) scientific papres were published in some hundreds of journals by grantees of the Medical Research Council. Reference to publications exists in the individual file of each grantee and this is available to Grants Committees when they make their assessments. Not for almost 15 years has the information necessary to compile a complete master list been extracted from the individual files. It has not been possible for Council staff to prepare a list of the papers involved in time for the submission of this Brief.

Scientific papers

In place of a list of publications arising out of research projects supported, Council submits copi es of the booklet "Medical Research Council: University Support 1967-68", which contains the titles of the projects supported during that year. Work on all but a few of these projects gave rise to publications.

The Annual Report to Parliament of the Medical Research Council has up to the present time been included in that of the National Research Council.

MRC Reports

For the benefit of the universities and prospective applicants, the Medical Research Council prepares annually an "Extramural Programme" booklet describing the various categories of support which it provides. "Medical Research Council: University Support", a list of all projects and personnel supported during the year, is also published annually.

The Council has recently started a "Report" series for the publication of material too lengthy for submission to the normal journals, and of the reports of its committees which would seem to be of widespread interest. This new series now includes three titles:

- Report No. 1: "Survey of Research Personnel in the Medical

 Sciences in Canada (Universities and Hospitals)

 1965-66." 1966. pp. 33.
- Report No. 2: "Canadian Medical Research: Survey and Outlook".

 1968. pp. 416.
- Report No. 3: "Health Research Uses of Record Linkage in Canada." 1968. pp. 80.

Under its Special Programs, the Council is prepared (d)
Conferences
to provide financial support for scientific symposia organized
by universities and international scientific meetings held in
Canada. A list of those supported from 1962 to 1968 inclusive
is given below:

- 1962-63: Western Regional Meeting on Medical Research.
- 1963-64: Western Regional Meeting on Medical Research.

 International Symposium on Hypertension,
 Ste-Adele-en-haut, Quebec.
- 1964-65: Symposium on the Use of Radioautography in Investigating Protein Synthesis, Montreal.

 Western Regional Meeting on Medical Research.

 Symposium on Muscle, Edmonton.
- 1965-66: Symposium on the Regulation of the Antibody
 Response, Toronto.

Symposium on Gastric Secretion, Edmonton.

Western Regional Meeting on Medical Research.

Symposium in Medical Engineering, Halifax.

- 1966-67: Symposium on the Biochemistry of Virus Infection and Replication, Edmonton.
 - Conference on Biomedical Engineering, Ottawa (jointly with NRC).

Western Regional Meeting on Medical Research.

International Symposium on Immunological Aspects of Polymorphism, Quebec City.

1967-68: Symposium on Cellular Differentiation, Montreal.

Third Parthyroid Conference, Mont Gabriel, Quebec.

Symposium on Use of Animals in Medical Research, Kingston.

Conference on Surgical Education and Research, Winnipeg.

Bremer Symposium on the Cerebral Cortex, Montreal.

Symposium on the Relationship between Basic Sciences and Clinical Medicine, Winnipeg.

Conference on the Endocrine Aspects of Disease Processes, Montreal.

Conference on Cold Physiology, Edmonton.

Symposium on Anaerobic Bacteria, Montreal:

International Congress on Allergology, Montreal.

The Medical Research Council itself has organized only one Conference and one Workshop, both in association with its ALS Project.

While Associates, Scholars and Fellows are not (e) "employees" of Council it may be of interest to the Committee trained if we record that only one Associate has resigned his appointment to leave the country; he went to Hawaii. Two Scholars have resigned their appointments to leave the country, one an Englishman who went to the United States and the other, an American citizen, had to return to the United States for military service but is expected to come back to Canada. Holders of Medical Research Council Fellowships who go to the United States or Europe for part of their training have with very few exceptions returned to this country.

Information concerning the development of research teams and facilities during the past five years, and also an assessment of Canadian medical research output, is contained in MRC Report No. 2, "Canadian Medical Research: Survey and Outlook".

(f) Research teams and facilities

Departure of

personnel

13. Projects

The number of grants and personnel awards held during the years 1962-63 to 1967-68 were as follows:

(a) Number of Projects

Year	Grants	Fellow- ships	Scholar- ships	Associate- ships
1962-63	445		Relations	29
1963-64	499	107	11	35
1964-65	575	122		41
1965-66	728	128	50	46
1966-67	980	144	62	52
1967-68	1,149	254	82	54

"Medical Research Council: University Support 1967-68"

(Appendix C) contains a complete list of projects supported during that year; a similar publication is available for the two preceding years, on request. Prior to 1965, the Medical Research Council did not itself publish an annual list but comparable information was included in an NRC publication.

The provision of project support by the Medical

(b)

Case

Research Council through its regular grants program

follows a very similar pattern in the majority of cases.

As reported in section 11 (page 37), applications submitted

by the investigators are referred first to external reviewers,

then to the relevant Grants Committees which send recommendations through the Executive to Council for final decision.

Case histories 1 - 5 reflect this type of procedure. Some of
the projects outlined are purely fundamental in nature, designed

to add to knowledge and to provide opportunities for graduate

students to learn the scientific method and its application.

Other projects began as fundamental or basic research but led unexpectedly to new knowledge with direct application at the clinical level. Still others have, from the start, been applied research of the most immediate interest and utility.

The remaining four case histories present examples of special mechanisms which Council employs to meet special needs: to assist in the development of research in new medical schools or of research in a new area of an established school (on occasion in conjunction with other granting agencies), to initiate developmental work in areas where there is a need for organization and coordination on a nation-wide scale, and to provide opportunities for investigators of proven capability to work on an intensive program of research and graduate training within a university environment, but without the normal distractions of administrative and undergraduate teaching duties.

Case 1. - Dr. Claude Fortier, Director of the Department of Physiology and of the Endocrinology Laboratories at Laval University, is carrying out a series of studies on the mechanism of action of hormones. These studies have resulted in a number of original contributions to the understanding of the relationship between the pituitary, adrenal and thyroid glands, and man's metabolic adaptation to environmental stimuli. The investigation has recently been extended in a novel manner by the application of techniques thus far used mainly in the study of electromechanical feedback control systems. In collaboration with colleagues in the Department of Electrical Engineering and the Data Processing Centre at Laval, a mathematical model of the pituitary-adrenocortical complex is being developed to provide data for the computation of ACTH-induced changes in corticosterone secretion rate.

The Medical Research Council has supported this extensive and imaginative research program since it was initiated by Dr. Fortier

at Laval some ten years ago. Its primary contribution has been the provision of funds for technical assistance, materials and supplies, and support for graduate students, a number of whom have subsequently joined the faculty of Canadian universities as teacher-scientists in their own right.

Case 2. - Dr. J.S. Colter, who returned to Canada from the United States in 1961 to head the Department of Biochemistry at the University of Alberta, has been investigating cell-virus interactions. The overall program is divided into two parts, one which is primarily biological in nature and one which is chemical and physical. The objective is to provide an understanding, in molecular terms, of the differing biological properties of three variants of an encephalomyelitis virus which have been isolated and maintained as pure lines. A variety of sophisticated techniques including optical rotatory dispersion, ultracentrifugation, amino acid analysis, electron microscopy, chromatography and tissue culture are applied to these studies. This fundamental work is designed to elucidate the initial steps in the replication cycle of a virus and the reason why cells are susceptible or resistant to infection with a virus agent. The investigation has led to 12 publications in the past four years and provides excellent opportunities for the training of graduate students in modern biochemical and biophysical techniques.

The Medical Research Council has, for the past eight years, provided funds for technical and professional assistants, for expendable supplies, and for several items of specialized research equipment required for the study.

Case 3. - Dr. D.H. Copp of the Department of Physiology at the University of British Columbia has been studying bone metabolism for a number of years. The aim of the investigation

is to study the normal mechanism for blood calcium regulation and the relationship of the parathyroid hormones to it. The results obtained led to extensive revision of the existing theory of parathyroid action. With dogs and pigs as experimental animals, methods were successfully developed for raising and lowering plasma calcium levels; these methods were subsequently applied to patients with osteoporosis and Paget's Disease in a collaborative study with a clinical colleague. In 1961 the research led to the discovery of a new hormone, calcitonin, which lowers blood calcium and controls hypercalcemia. Considerable work since that time has been devoted to the purification and characterization of this new hormone, the development of dose vs. response relationships, the study of the effect of changing calcium levels in t he production of calcitonin by the thyroid and parathyroid glands, the development of bioassay methods to measure its concentration and to determine its rate of production under varying conditions, as well as to other related studies.

This project began in 1950 with a modest grant of \$5,050 for the salary of a technician, and a student assistant during the summer months, and for animals and expendable supplies. As the work progressed, further funds were provided for the employment of a second technician, for the stipends of two graduate students working towards the Ph.D. degree under the supervision of the investigator, and for the half-time services of an animal attendant. Following the discovery of the new hormone, the Council was asked, and agreed, to increase the grant to provide for the salary of a qualified biochemist to purify and characterize it, and for items of special research equipment required to do this. The project is being continued vigorously and with originality with a view to the use of calcitonin in the treatment of certain disease states; the investigator himself is recognized internationally as a leading authority in his field.

Case 4. - Dr. Jacques Genest and his group, now at the Clinical Research Institute of Montreal, have for many years studied the relationship between the adrenal cortical hormones (especially aldosterone) and hypertensive cardiovascular diseases in man. The investigation has also included research into the relationship between the kidney and human hypertensive diseases. It has been possible to differentiate between various types of human hypertension and thus to determine the most appropriate means of management and treatment. A number of methods of steroid measurement have been devised by Dr. Genest and his colleagues and many new antihypertensive and natriuretic agents have been investigated. An important feature of the program is the metabolic balance studies on normal subjects and selected patients with arterial hypertension, renal disease, and endocrine disorders. These studies are carried out in special facilities which make it possible to me asure precisely dietary intake and to determine accurately the excretion of electrolytes and other body constituants; the availability of these facilities has also made it possible to define with more precision the criteria for the success of surgery in patients with hypertension associated with renal artery obstruction, and to investigate renin activity in some physiological and pathological states.

The Medical Research Council has supported Dr. Genest's program since 1950 and has, within the limits of its resources, increased the funds provided because of the withdrawal, for policy reasons, of support by the Department of National Health and Welfare and the American government. In addition to funds for expendable supplies and materials, the Council has provided substantial sums for research equipment and for the salaries of specialized personnel required to maintain the Metabolic Unit

and the costs of "hospitalizing" for short periods normal volunteers required for control studies. Dr. Genest has been responsible for the research training of a large number of clinical Fellows, many of whom have been recipients, in competition, of Medical Research Council Fellowships. Two members of the research team are supported by MRC Associateships. The Council has also contributed to the support of an international symposium on hypertension organized by Dr. Genest which was attended by other world-renowned workers in the field from England, the United States, Switzerland, Sweden, France and South America.

Case 5. - Dr. T. M.S. Chang of the Department of Physiology at McGill University is investigating methods of counteracting enzyme deficiencies. Enzymes in nature are commonly encapsulated within small aqueous compartments cells or subcellular organelles - whose limiting membranes prevent their escape but are permeable to the smaller molecules of their substrates and products. A method has been developed for producing artificial microcapsules of comparable dimensions and properties and loading them with enzymes and other proteins without loss of their biological activity in vitro or in vivo. To overcome the practical problems of injecting the semipermeable microcapsules into the body and their subsequent accumulation there, an extracorporeal shunt chamber has been devised through which blood from an artery can flow, come in contact with the enzyme-loaded microcapsule, and then be returned to a vein. To avoid possible clotting of blood while preserving the activity of the encapsulated enzyme, the microcapsules are made of nonthrombogenic collodion. Experiments are continuing 1) to

in the design of a compact artificial kidney which, theoretically, need be no larger than 10 cm. in length and 2 cm. in diameter;

2) to study the use of microencapsulated catalase for the therapeutic replacement of enzymes in deficiency diseases; 3) to investigate the effect of microencapsulated asparaginase in the treatment of leukemia, and 4) to study the use of microencapsulated detoxicants to remove permeant toxins from blood, for example in cases of barbiturate or acetylsalicylic acid poisoning of children.

Dr. Chang first conceived this novel project while holding a Medical Research Council Fellowship under the direction of Professor F.C. MacIntosh at McGill. When Dr. Chang joined the staff of the university, he applied for and received MRC funds for the salary of a technician and a graduate student taking advanced training under his direction, for expendable materials and supplies and for experimental animals. The potential of this invention is being carefully and systematically developed and the research can be expected to have important applications in a number of clinical areas.

Case 6. - Early in 1968, the new medical school at the University of Sherbrooke had an opportunity to add to its faculty a well qualified teacher-scientist, born in France but then working in the United States. In order to be able to assure this prospective new recruit of funds for the early re-establishment of his research program in the new location, the University applied to the Medical Research Council for a Negotiated Development Grant to be provided if the scientist in question did in fact accept the appointment offered him. This application involved assurance by the University of suitable facilities and the necessary equipment,

as well as the submission of a detailed research proposal, budget and the curriculum vitae and publications of the investigator
himself. Following review of this material by Canadian scientists
expert in the field, an undertaking was made to provide funds for
the project and for the support of three graduate students for a
specified period. The appointment was subsequently accepted
and the funds were made available to the University.

This case history is presented as an example of the support provided through the Negotiated Development Grant program, which enables Council to assist universities to take advantage of opportunities as they arise, without the necessity of waiting for sometimes prolonged periods and thus running the risk of losing potential faculty. This problem is particularly acute in French Canada where high standards of scientific and teaching ability must be matched with a working knowledge of French. Once their research programs are under way, those receiving initial support through the Council's special program are expected to seek support for the continuation of their research through the regular programs of the Medical Research Council or other agencies.

Case 7. - Two years ago, McMaster University was negotiating with a Canadian-born scientist, then working in a wellknown research institute in the United States, whom it hoped to
attract to the chairmanship of the Department of Biochemistry of
its new medical school. The research interests of the scientist
demanded continued access to a high resolution mass spectrometer,
costing some \$173,000, to be used in studies of nucleic acid
structure and function with a view to increasing our understanding
of the molecular mechanisms of cell differentiation such as takes
place in embryonic development, budding in plants, and the

ment was needed too for studies in organic chemistry to be undertaken by investigators already on the staff of the Department of Chemistry of the University. Application was therefore made to the Medical Research Council and the National Research Council for the funds to purchase the equipment.

Following detailed review of the research proposals

put forward and an on-site visit to the University by a group of

scientists to explore the situation, the Medical Research Council

undertook to provide half the cost of the spectrometer on the

understanding that the funds would be provided only if the investigator in question accepted the proffered appointment in the medi
cal school and the balance of the funds were obtained from other

sources. The National Research Council subsequently agreed to

make a very substantial contribution and the university to pay the

remainder. The appointment was accepted, the research program

is now well under way, and the availability of this special facility

has no doubt had its effect in attracting other faculty members to

the new medical school.

Case 8. - In 1966 the Medical Research Council announced that it was prepared to support the establishment and maintenance of research Groups within the framework of medical schools in Canadian universities. The group program is designed to provide financial support for groups of two or more outstanding investigators over a period of years in what appear to be especially productive fields of medical research.

A number of proposals were submitted by the universities and in March 1967 an agreement was reached with the University

of Montreal for the establishment of an MRC Group for the Neurological Sciences under the direction of Dr. H.H. Jasper, a
neurophysiologist of international reputation. The senior personnel of the Group, in addition to Dr. Jasper, are highly qualified investigators in neurophysiology, neuroanatomy, neurochemistry, and biomedical engineering. Together they are carrying on
an intensive interdisciplinary study of the organization of the
nervous system. Many aspects of the problems of brain diseases
and disorders, including epilepsy, are also being studied.

Under the terms of the agreement with the university, the Council's support of the Group covers the salaries of several of the investigators, their professional assistants, graduate students, technicians and other personnel, and the costs of supplies and equipment. The university, in its turn, has freed the members of the Group from the ordinary administrative and undergraduate teaching responsibilities of a member of faculty, and it has provided some 6,000 square feet of research space for the Group.

The initial period of Council's support is for five years, during the last of which the agreement will be re-negotiated with the investigators and the university.

By means of the Group program, the Medical Research

Council expects that opportunities for productive research and

training programs of high calibre will be increased in Canada,
and it looks forward to the establishment of further Groups as
suitable proposals are presented. This mechanism reflects

Council's policy to assist and promote research in universities
rather than to establish central laboratories. It permits highly
qualified scientists to devote themselves to research and at the
same time to contribute to the development of the graduate
teaching program of the universities.

Case 9. - Studies in many laboratories, both here and abroad, on mice and other animals including non-human primates have indicated that some kinds of antilymphocyte serum prolong graft survival. A number of centers have begun using ALS in the treatment of transplant patients since it appears to reduce the need for administration of undesirably high dosages of other immunosuppressive drugs. Since it has not yet been definitely proved that ALS does play an effective role in inhibition of graft rejection in man, the Medical Research Council established in 1967 an ad hoc committee to study the problem and to consider what role, if any, the Council should play in the production and clinical testing of ALS in Canada.

Following careful review of existing knowledge, of the problems (both statistical and scientific) involved, and of Canadian capability in the vaccine field, the Committee recommended to Council that it sponsor the production according to a specified procedure of antilymphocyte serum to be made available to qualified clinicians in Canada who would undertake to participate in a nation-wide collaborative trial of its effectiveness in kidney transplants. This recommendation was approved by Council and all Canadian medical schools were invited to send representatives to Ottawa to discuss with the Committee the implementation of the proposal. A group of some 60 investigators and clinicians attended this Conference in May 1968. The ALS Project was enthusiastically received and Council was assured of the collaboration of all the major centers in which kidney transplants are being carried out. Arrangements were then made with the Institute of Microbiology and Hygiene in Montreal and the Connaught Medical Research Laboratories in Toronto to produce a single pool of serum according to the procedure developed by

the Committee in collaboration with scientists at these two

The Conference was followed by a four-day Workshop in September, 1968. This was attended by some 90 basic scientists and clinicians, and the technicians and data processors who would assist them in the actual operation of the Trial in the various centers. At the Workshop, the special techniques required were taught and practised in laboratory sessions, and lectures were given on various scientific aspects of the Trial. The "faculty" was comprised of senior investigators from Canada, the United States and The Netherlands expert in the fields of immunology, tissue typing, and computer processing of clinical data. The actual working methods to be used in the Trial centers have therefore been standardized and this should contribute greatly to the accumulation of comparable data.

The Project is a complex affair involving studies of methods of production of the serum, basic laboratory work concerned with potency, effectiveness and safety, as well as the complex national Trial itself. Council has sought, and obtained, the collaboration of a number of investigators who have undertaken some of the most immediate research problems, and the Radiobiological Institute of The Netherlands has generously agreed to carry out pre-clinical tests of the Canadian sera in chimpanzees since the necessary primate facilities are not available in this country. These tests are now in fact under way and it is hoped that the Trial itself can be started within the next few months.

The Project has received international attention since it represents the first attempt at a nation-wide trial of ALS as a

working in the field in Canada is evident from the fact that
participants in both the Conference and the Workshop attended
at their own expense and investigators at the Royal Victoria
Hospital, the Toronto Western Hospital and the Hospital for
Sick Children, as well as at the Institute of Microbiology and
Hygiene and the Connaught Medical Research Laboratories,
have given freely of their time and effort in assisting Council
in the achievement of its objective.

APPENDIX A

Members of Medical Research Council

- G. Malcolm Brown, M.D., C.M., D.Phil., F.R.C.P., F.R.C.P.(C)
 F.A.C.P., F.R.S.C.
 Chairman, Medical Research Council
- A. D'Iorio, B.Sc., Ph.D., Professor and Head of the Department of Biochemistry, University of Ottawa, Vice Chairman, MRC
- J.C. Beck, M.D., F.A.C.P., F.R.C.P.(C), Professor of Medicine, McGill University and Physician-in-Chief, Royal Victoria Hospital, Montreal
- L. Berlinguet, D.Sc.; Vice-Dean, Faculty of Medicine (Research and Graduate Studies); Chairman and Head, Department of Biochemistry; Laval University
- R.V. Blackmore, D.D.S., Ph.D.; Professor of Operative Dentistry; University of Alberta, Edmonton
- G.E. Connell, B.A., Ph.D., Professor and Chairman of the Department of Biochemistry, University of Toronto, Toronto
- A.D. Dickson, M.B., B.Ch., B.A.O., M.D., M.A.; Professor and Head, Department of Morphological Sciences; University of Calgary, Calgary
- S.M. Drance, M.D., F.R.C.S. (Eng.), M.B., B.S., Professor,
 Department of Ophthalmology and Coordinator of Ophthalmic
 Research, University of British Columbia, Vancouver
- J.R. Evans, M.D., D.Phil., F.R.C.P.(C), Dean of Medicine and Principal of College of Health Sciences, McMaster University, Hamilton
- J.D. Hatcher, M.D., Ph.D., Professor and Chairman of the Department of Physiology, Queen's University, Kingston
- L. Horlick, B.Sc., M.D., C.M., M.Sc., F.R.C.P.(C), Professor,
 Department of Medicine, University of Saskatchewan, Saskatoon
- A.M. Hunt, D.D.S., D.D.P.H., M.Sc.D.; Director, Division of Postgraduate Dental Education; University of Toronto, Toronto
- J.M. Leclair, M.D., F.R.C.P.(C), F.A.C.P., Dean of Medicine University of Sherbrooke, Sherbrooke
- T.S. Leeson, M.A., M.B., B.Chir., M.D., P.A.R.C.S., Professor and Head of the Department of Anatomy, University of Alberta, Edmonton
- J.-P. Lussier, D.D.S., Ph.D., F.A.C.D.; Dean, Faculty of Dentistry and Director of Studies; University of Montreal
- B.E. Riedel, Ph.D., Dean of Pharmacy, University of British Columbia, Vancouver
- K.B. Roberts, M.A., D.Phil., (Oxon.), M.B., B.S. (Lond.); Associate Dean for Basic Medical Sciences; Professor of Physiology; Memorial University of Newfoundland
- R.B. Salter, M.D., M.S., F.A.C.S., F.R.C.S.(C), Surgeon-in-Chief, The Hospital For Sick Children, Toronto

- H.B. Stewart, M.D., Ph.D., Professor and Head of the Department of Biochemistry, University of Western Ontario, London
- J.C. Szerb, M.D., Chairman of the Department of Physiology and Biophysics, Dalhousie University, Halifax
- G. Tremblay, M.D., Professor and Chairman, Department of Pathology, University of Montreal, Montreal
- J.C. Wilt, M.D., M.Sc., F.A.C.P., Professor and Head of the Department of Medical Microbiology, University of Manitoba, Winnipeg

APPENDIX B

Executive Committee

Dr. G.M. Brown	Medical Research Council, Chairman
Dr. J.C. Beck	McGill University
Dr. A. D'Iorio	University of Ottawa
Dr. J.R. Evans	McMaster University
Dr. J.M. LeClair	University of Sherbrooke
Dr. JP. Lussier	University of Montreal
Dr. J.M. Roxburgh	Medical Research Council, Secretary

Grants Committees

Biochemistry

Dr. A. D'Iorio	University of Ottawa, Chairman
Dr. L. Berlinguet	Laval University
Dr. M.C. Blanchaer	University of Manitoba
Dr. C.W. Helleiner	Dalhousie University
Dr. V.J. O'Donnell	University of British Columbia
Dr. B.E. Riedel	University of British Columbia
Dr. L.B. Smillie	University of Alberta
Dr. D.B. Smith	University of Western Ontario
Dr. K.P. Strickland	University of Western Ontario
Dr. W. Verly	University of Montreal

Physiology and Pharmacology

Dr.	J.C. Szerb	Dalhousie University, Chairman
Dr.	G. Hetenyi	University of Toronto
Dr.	I.R. Innes	University of Manitoba
Dr.	M. Lavallee	University of Sherbrooke
Dr.	R.L. Salvador	University of Montreal
Dr.	D.G. Sinclair	Queen's University
Dr.	J.A.F. Stevenson	University of Western Ontario

Pathology and Morphology

Dr.	T.S. Leeson	University of Alberta, Chairman
Dr.	R.W. Begg and to will	University of Saskatchewan
Dr.	P. Bois	University of Montreal
Dr.	N. Kaufman	Queen's University
Dr.	G. Tremblay	University of Montreal
Dr.	D. Waugh	Dalhousie University

Microbiology and Infectious Diseases

Dr.	J.C. Wilt	University	of	Manitoba, Chairman
Dr.	J.J.R. Campbell	University	of	British Columbia
Dr.	L. Karstad	University	of	Guelph
Dr.	D.M. McLean	University	of	British Columbia
Dr.	R.G.E. Murray	University	of	Western Ontario
Dr.	S. Sonea	University	of	Montreal
Dr.	J.W. Stevenson	McGill Univ	ver	sity

Immunology and Transplantation

Dr. G.E. Connell
Dr. G.O. Bain
Dr. B. Cinader
Dr. S.O. Freedman
Dr. L.D. MacLean
Dr. E.A. McCulloch
Dr. B. Rose
Dr. A. Sehon
University of Toronto
McGill University
McGill University
McGill University
McGill University

Clinical Investigation

Dr. J.M. LeClair
Dr. B.A. Cooper
Dr. N.B. Epstein
Dr. J.I. Kessler
Dr. B. Langer
Dr. A. MacLeod
Dr. R.J. Rossiter
Dr. R.B. Salter
Dr. A. Zipursky

McMaster University
McGill University
McGill University
McGill University
McGill University
Dr. McGill University
McGill University
Dr. A. Zipursky
McMaster University

Metabolism and Endocrinology

Dr. J. Genest
Dr. J.C. Beck
Dr. J.C. Beck
Dr. B. Issekutz
Dalhousie University
Dr. J.C. Laidlaw
Dr. A. Lanthier
Dr. J.M. McKenzie
Dr. S. Solomon
Dr. B. Stewart
Dr. G.R. Williams
University of Montreal
University
Dr. G.R. Williams
University
Dr. G.R. Williams
University of Western Ontario
University of Toronto

Heart and Lung

Dr. J.R. Evans McMaster University, Chairman
Dr. R.M. Cherniack University of Manitoba
Dr. C.M. Couves University of Alberta
Dr. J.D. Hatcher Queen's University
Dr. L. Horlick University of Saskatchewan
Dr. Y. Morin Laval University
Dr. R.A. Nadeau University of Montreal

Cancer, Growth and Differentiation

Dr. J.S. Colter
Dr. M.L. Barr
Dr. F.C. Fraser
Dr. R.L. Noble
Dr. A.R.P. Paterson
Dr. L. Siminovitch
University of Alberta, Chairman
University of Western Ontario
McGill University
University of British Columbia
University of Alberta

Neurological Sciences

Dr. H. McLennan	University of British Columbia,
	Chairman
Dr. M. Colonnier	University of Montreal
Dr. S.M. Drance	University of British Columbia
Dr. P. Gloor	McGill University
Dr. G. Lamarche	University of Sherbrooke
Dr. T.L. Sourkes	McGill University
Dr. R.R. Tasker	University of Toronto
Dr. J.R. Wherrett	University of Toronto

Pharmaceutical Sciences

Dr. B.E. Riedel	University of British Columbia, Chairman
Dr. L. Berlinguet Dr. D. Cook	Laval University Dept. of National Health & Welfare
Dr. G.R. Duncan Dr. D.E. Guttman	University of Toronto State University of New York at Buffalo
Dr. I.R. Innes Dr. J. Lowenthal Dr. R.L. Salvador	

Dental Sciences

Appointments pending.

Psychology

Appointments pending.

Biomedical Engineering

Dr. H. McLennan	University of British Columbia,
	Chairman
Mr. J.A. Hopps	National Research Council
Dr. M. Lavallee	University of Sherbrooke
Dr. J. H. Milsum	McGill University

Personnel Support Committees

Fellowships

	Dr.	J.D. Hatcher	Queen's University, Chairman
		R.A. Macbeth	University of Alberta
1	Dr.	Charles Plamondon	Laval University
1	Dr.	G.M. Tener	University of British Columbia

Centennial Fellowships

Dr. G.M. Brown Medical Research Council, Chairman Membership re-constituted each year, depending on nature of applications

Studentships and Bursaries

Dr. S.H. Zbarsky University of British Columbia, Chairman

Dr. J.Q. Bliss McGill University
Dr. P. Bois University of Montreal
Dr. W. Kalow University of Toronto

Dr. B.E. Riedel University of British Columbia Dr. J.C. Wilt University of Manitoba

Associateships

Dr. J.R. Evans McMaster University, Chairman
Dr. L. Horlick University of Saskatchewan
Dr. A. Naimark University of Manitoba
Dr. H.B. Stewart University of Western Ontario

Scholarships

Dr. C.H. Hollenberg McGill University, Chairman Dr. H.B. Dinsdale Queen's University

Dr. J.A. McCarter University of Western Ontario
Dr. B.J. Perey University of Sherbrooke
Dr. G.L. Plaa University of Montreal



First Session-Twenty-eighth Parliament

THE SENATE OF CANADA

PROCESDESS OF THE SPECIAL CONSESSES

SCIENCE POLICY

The Honourable DONALD CAMPAGES COMPAGES

No. 31

WEDNESDAY, FEBRUARY

WITNESSEE

Department of Indian Affairs and Morrows Department J. A. Mac-Donald, Deputy Minister; D. A. Manuel, and record, Community Affairs Branch; C. I. Pairholm, Director, Policy Williams and Programming; A. H. MacPherson, Regional Supervision of Reviews Canadian Wild-life Service; and A. J. Kerr, Chief, Katthers Supervis Research Group.

APPENDER

32.—Brief submitted by the Department in Indian Affairs and Northern Development.

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First Session—Twenty-eighth Parliament
1968-69

THE SENATE OF CANADA

PROCEEDINGS
OF THE
SPECIAL COMMITTEE

ON

SCIENCE POLICY

The Honourable MAURICE LAMONTAGNE, P.C., Chairman
The Honourable DONALD CAMERON, Vice-Chairman

No. 31

WEDNESDAY, FEBRUARY 26th, 1969

WITNESSES:

Department of Indian Affairs and Northern Development: J. A. Mac-Donald, Deputy Minister; D. A. Munro, Director, Community Affairs Branch; C. I. Fairholm, Director, Policy, Planning and Programming; A. H. MacPherson, Regional Supervisor of Research, Canadian Wildlife Service; and A. J. Kerr, Chief, Northern Science Research Group.

APPENDIX:

32.—Brief submitted by the Department of Indian Affairs and Northern Development.

MEMBERS OF THE SPECIAL COMMITTEE ON SCIENCE POLICY

The Honourable Maurice Lamontagne, *Chairman*The Honourable Donald Cameron, *Vice-Chairman*

The Honourable Senators:

Aird Grosart Nichol Belisle Haig O'Leary (Carleton) Blois Hays Phillips (Prince) Bourget Kinnear Robichaud Cameron Lamontagne Sullivan Carter Lang Thompson Desruisseaux Leonard Yuzyk Giguère McGrand

> Patrick J. Savoie, Clerk of the Committee.

ORDERS OF REFERENCE

Extract from the Minutes of the Proceedings of the Senate, Tuesday, September 17th, 1968:

"The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That a Special Committee of the Senate be appointed to consider and report on the science policy of the Federal Government with the object of appraising its priorities, its budget and its efficiency in the light of the experience of other industrialized countries and of the requirements of the new scientific age and, without restricting the generality of the foregoing, to inquire into and report upon the following:

- (a) recent trends in research and development expenditures in Canada as compared with those in other industrialized countries;
- (b) research and development activities carried out by the Federal Government in the fields of physical, life and human sciences;
- (c) federal assistance to research and development activities carried out by individuals, universities, industry and other groups in the three scientific fields mentioned above; and
- (d) the broad principles, the long-term financial requirements and the structural organization of a dynamic and efficient science policy for Canada.

That the Committee have power to engage the services of such counsel, staff and technical advisers as may be necessary for the purpose of the inquiry;

That the Committee have power to send for persons, papers and records, to examine witnesses, to report from time to time, to print such papers and evidence from day to day as may be ordered by the Committee, to sit during sittings and adjournments of the Senate, and to adjourn from place to place;

That the papers and evidence received and taken on the subject in the preceding session be referred to the Committee; and

That the Committee be composed of the Honourable Senators Aird, Argue, Bélisle, Bourget, Cameron, Desruisseaux, Grosart, Hays, Kinnear, Lamontagne, Lang, Leonard, MacKenzie, O'Leary (Carleton), Phillips (Prince), Sullivan, Thompson and Yusyk.

After debate, and—
The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Thursday, September 19th, 1968:

"With leave of the Senate,

The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That the name of the Honourable Senator Robichaud be substituted for that of the Honourable Senator Argue on the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Wednesday, February 5th, 1969:

With leave of the Senate,

The Honourable Senator McDonald moved, seconded by the Honourable Senator Macdonald (*Cape Breton*):

That the names of the Honourable Senators Blois, Carter, Giguère, Haig, McGrand and Nichol be added to the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.

ROBERT FORTIER, self-bin alternational measurement and adaption of the Senate.

MINUTES OF PROCEEDINGS

Wednesday, February 26th, 1969.

Pursuant to adjournment and notice the Special Committee on Science Policy met this day at 10.00 a.m.

Present: The Honourable Senators Lamontagne (*Chairman*), Belisle, Bourget, Grosart, Haig, Hays, Kinnear, McGrand, Robichaud and Sullivan.—10.

Present but not of the Committee: The Honourable Senator Gladstone. -1.

In attendance:

Philip J. Pocock, Director of Research (Physical Science).

The following witnesses were heard:

DEPARTMENT OF INDIAN AFFAIRS AND NORTHERN DEVELOPMENT

J. A. MacDonald, Deputy Minister;

D. A. Munro, Director, Community Affairs Branch;

C. I. Fairholm, Director, Policy, Planning and Programming;

A. H. MacPherson, Regional Supervisor of Research, Canadian Wildlife Service; and

A. J. Kerr, Chief, Northern Science Research Group.

(A curriculum vitae of each witness follows these Minutes).

The following is printed as Appendix No. 32:

-Brief Submitted by the Department of Indian Affairs and Northern Development.

At 12.30 p.m. the Committee adjourned to the call of the Chairman.

ATTEST:

Patrick J. Savoie, Clerk of the Committee.

Without from the Manager of the Penetromes of the Senate, Thursday, September

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Wednesday, February 26th, 1969.

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ROBERT FORTIER

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CURRICULUM VITAE

MacDonald, John Allan, Mr. MacDonald was appointed Assistant Deputy Minister (National Resources) of the Department of Northern Affairs and National Resources on January 13, 1964, Senior Assistant Deputy Minister of the reorganized department on January 1, 1966, and Deputy Minister on March 1, 1968. Born in Ottawa August 23, 1921, he received his early education in that City. At the outbreak of war, Mr. MacDonald joined the Canadian Army and served in Canada and the United Kingdom. In 1947 he graduated from McGill University with a Bachelor of Arts degree (honours) in Economics and took a position with the Industrial Development Bank in Montreal. In 1949 he joined the Economic Policy Division of the Department of Finance where he remained until his appointment to the National Defence College in Kingston in 1954. On his return to Ottawa he joined the staff of the Treasury Board to work on defence budget problems. He was appointed Director of the Defence, Works and Contracts Division of the Board in 1958, and two years later was named Assistant Secretary of the Treasury Board where he was responsible for the work of the Board outside the personnel policy field. In January 1963, Mr. MacDonald was seconded to be Assistant Deputy Head of the Bureau of Government Organization-the task force set up to study the recommendations of the Royal Commission on Government Organization. Mr. MacDonald is Chairman of the Northern Canada Power Commission; member of the Board of Directors of the Panarctic Oils Ltd., and Oromocto Development Corporation; member of the Advisory Council of the School of Public Administration of York University, the Canadian Political Science Association, the Cercle Universitaire, the Canadian Club, and the Country Club. He is also a member of the Advisory Council-Federal Institute of Management. He is married to the former Jean Elliott Wright; they have three children, Ian, David and Kathy.

Munro, David Aird-Director-Canadian Wildlife Service. Date and Place of Birth-May 25, 1923. Victoria, B.C. Parents-James A. Munro and Alice Olive Bunting, Canadians of Scottish and English stock. Family-Married Harriet Ellis of Caerwys, Flintshire, Wales in 1943. Children-4 sons. Education-Elementary and High School in Vernon, B.C. University of British Columbia, 1940-42; 1946-47. University of Toronto, 1947-48; 1950-51 taking graduate studies in Zoology and Land Utilization. Degrees Obtained-B.A., University of B.C., Honours Zoology, 1947. Ph.D., University of Toronto, 1956. Employment-Summer 1946-British Columbia Game Commission, student assistant in Zoology. Summer 1947 and May-June 1948—Canadian Wildlife Service, student assistant in Zoology. July 1948 - July 1953-Canadian Wildlife Service, Wildlife Management Officer (Vancouver) July 1953 - April 1962-Canadian Wildlife Service, Chief Ornithologist April 1962 - Dec. 31, 1962-Canadian Wildlife Service, Staff Specialist-Ornithology Jan. 1, 1964 - April, 1966-Chief-Canadian Wildlife Service April, 1966 -Sept. 1968-Director-Canadian Wildlife Service Sept. 1968 - Present-Director-Community Affairs Branch War Service-Royal Canadian Air Force, Radar Mechanic, March, 1942 to October, 1945, overseas service-United Kingdom.

Fairholm, Cyril Irvin—Director—Policy, Planning and Programming Social Affairs Programme Department of Indian Affairs and Northern Development. Following graduation from Queen's University, Kingston, Ontario, joined the Indian Affairs Branch in 1949 as an administrative trainee and subsequently served as an Administrative Officer, Executive Assistant to the Director, Senior Administrative Officer, Head of the Secretariat and Head of the Policy and Planning Directorate.

MacPherson, Andrew Hall, B.Sc., M.Sc., Ph.D., Science Adviser, Science Council of Canada. Born June 2nd, 1932, London, England. Canadian Citizen. Lived in St. John's, Newfoundland, Westmount and St. Sylvère before moving to Ottawa 1945. Attended Carleton College, Ottawa, (B.Sc.) 1954 and McGill University, Montreal, (M.Sc.) 1957 and Ph.D. 1967. Participated in summer expeditions to Canadian Arctic 1949, 50, 51, 52, 54, 55, 56, 57 and 58. In 1958 joined Canadian Wildlife Services as Wildlife Biologist. Conducted studies on Canadian arctic fox populations in Keewatin and Franklin 1959-63. Appointed research supervisor, Eastern Region, Canadian Wildlife Services 1963. Also Project Leader, Manitoba-Keewatin Barren-ground Caribou Study, 1966-67. Seconded to Science Secretariat, Privy Council Office, 1967, and Science Council Staff, 1968. Author of 35 scientific publications. Married May 8th, 1957 to Elizabeth Menzer: two sons.

Kerr, A. J. 1921-Born in Edmonton, Alberta. Married Eleonar Robinson, Dec. 1943-5 daughters. 1939-Senior Matriculation-Ridley College, St. Catharines, Ontario. 1940 - 1942 - General Arts, University of Toronto. 1942 - 1945 - R.C.A.F. (Operational experience as Navigator-Bomb Aimer, 128 Squadron, No. 8 Pathfinder Group, Bomber Command, R.A.F.). 1945-1947-Completed honour course in Sociology-University of Toronto. 1947 - 1948-Anthropological field study on food habits among the Indians of Ruperts House, P.O., for the Canadian Committee for Community Health Studies. 1948-1949-Completed M.A. course in anthropology, University of Toronto. 1949 - 1951 - Varied employment including work with juvenile delinquents in Toronto. 1951 - 1952-Teacher training at Ontario College of Education, Toronto. 1952 - 1961 - Community Principal, Aklavik, N.W.T. 1961 - 1962 - University of London-studied Community Development and Education. 1962-1964-Returned to Aklavik as school principal and departmental co-ordinator in the settlement. 1964-1965-Academic Advisor to Director, Northern Administration Branch. 1965 - 1967-Senior Research Officer, Northern Co-ordination and Research Centre. 1967 - Present-Chief, Northern Science Research Group.

In the same area we have our people in TANAS aHT historic archaeologists and applied anticage.

SPECIAL COMMITTEE ON SCIENCE POLICY

EVIDENCE

Ottawa, Wednesday, February 26, 1969.

The Special Committee on Science Policy met this day at 10 a.m.

Senator Maurice Lamontagne (Chairman) in the Chair.

The Chairman: Honourable senators, this morning we will hear from the representatives of the Department of Indian Affairs and Northern Development. The delegation is headed by Mr. J. A. MacDonald, who was appointed fairly recently as Deputy Minister of the department, which was my first assignment as a civil servant about 15 years ago, when the department was quite different from what it is now.

We are very pleased, Mr. MacDonald, to have you and your delegation with us this morning. I would ask you, without further introduction, since all your biographies have been circulated already, to make an opening statement.

Mr. J. A. MacDonald (Deputy Minister, Department of Indian Affairs and Northern Development): Thank you, Mr. Chairman, senators. I might follow on the Chairman's remarks by noting that I have just been appointed recently and I am theoretically defending a brief about a structure which is of a long standing period. If the foundation is somewhat shaky, the Chairman's remarks about his participation at an earlier date will account for the rather slow start, possibly.

I would like to just sketch a few remarks to do what we found it rather difficult to do at the time the brief was being prepared. Because of the fairly scattered responsibilities, which I will touch on later, of our department, we have a very great involvement in many areas of research of one kind or another. The questionnaires elicited a fairly voluminous reply and it inclines to be somewhat segmented.

I would just as background therefore, like to talk a bit about the roles of the department and the unity or theme that lies in it.

We are in effect a department of, which for want of better words we describe as, trust responsibilities, for people or resources, for today and for future generations. You will see that this is true, that what on the base of it appear to be quite disparate responsibilities do have a unifying theme.

More formally the department is divided into three broad areas of program responsibilities: Conservation; economic development; and social affairs. We have just re-organized into that context. Prior to this the programs were: Conservation; Northern and Indian, but we have adopted this functional approach in order to address ourselves to some of the problems that are really involved in approaching the objectives that statutes or the government have laid down for us.

In the conservation side, to refresh your memory somewhat, we are responsible for the maintenance and development of the national parks system, the historic sites system and the Canadian Wildlife Service. The importance of this area is difficult to overstress. It is sometimes one that in our busy society gets overlooked as we press on with many of the things which are regarded as progress, but with sometimes little regard until too late as to the cost in our environmental qualities and other matters which this sometimes brings about.

So the program of setting aside some of the physical phenomena of this country for preservation for all time, the preservation of the species for ourselves and for our future generations and the preservation of our historic past are elements of considerable national significance.

Under economic development we touch on areas which are of equal importance; it is difficult to set out the order of priority. In this area we have the economic development of the north, that is the area which lies north of the 60th latitude. It is somewhat in the order of 38% of the land mass of Canada. It probably has that percentage, or better, of the future wealth of Canada, largely in terms of the extractive industries.

I am sure you are all aware of the great oil play that is going on in that area, which is of fairly recent origin, but one which geologically we have known about and have been pressing toward for some time, but which is now receiving more public attention and, of course, we have a considerable development even now in the metals area. Pine Point, Anvil, and many others are names well known, and the future is even greater.

In the same area we have our people in programs responsible for the economic development and enlarged employment opportunities for native people, Indians and Eskimos.

While in absolute economic terms this does not rank with the economic development of the north, in social values, in sensitivity it does and, of course, today with Canadian society very much aware of this problem, this is an area of critical importance in the field of social affairs.

In this latter area we touch on the remainder of the problems of native people in this country whose sensitivity and significance I have just referred to and we here are involved in a vast educational program, either directly or indirectly, social welfare programs of particular difficulty and fairly experimental programs called by several titles, community development in the non-physical sense and as well in the physical sense.

This is in a broad way the panorama of the departmental range of programs.

As I referred to earlier, we have re-organized recently; we have as a department of government, quite apart from our program objectives been endeavouring in what you might call the post-Glassco philosophy to be in the forefront of the development of techniques for effective management within the public service and we feel we are achieving some success in this regard.

In this connection a very necessary companion to these endeavours is in the area of scientific research; input of this nature is vital for our operational effectiveness. It helps to identify needs and it helps to evaluate the effectiveness of programs. We find it therefore present in almost all of our areas of endeavour; in some places as tools, in other areas almost the entire program is in effect a form of scientific research.

I have already noted the diverse responsibilities of the department. These many and varied responsibilities require an involvement of a wide range of scientific and quasi-scientific disciplines. These range from engineering and geology through biology and its sub-disciplines to economics, sociology and anthropology.

One of the arts of organization in this department is to in fact effectively bring these various disciplines to bear upon common problems.

The implications of this range of scientific input needs are the development of several specialized research capacities within the department in fields where the required specialists are in limited supply. I could quote examples of wildlife management, biologists, historic archaeologists and applied anthropologists, the supplies of which are extremely limited in this country and elsewhere. Correspondingly, and wherever appropriate, we make extensive use, and it involves extensive use, of contractual arrangements to supply scientific input in fields in which this seems appropriate.

I would like to just touch again on a few other aspects of our concern for the preservation of environmental quality. This is of particular significance to the parks branch and the wildlife service.

Although, happily, there is now increasing public concern and interest in the subject, it is nonetheless true that the characteristics of quality environment have never been clearly and comprehensively defined. Among other things we would believe they must be related to ecological variety and optimum capacity for regeneration of the life components of environment; standards of freedom from pollution; norms of erosion and water flow.

Now, many of these aspects individually have had public attention and much research and study, but I think there is a growing awareness pointing to the fact that most of the physical elements of the environment have been studied in relation to productive enterprises but not as part of an inter-locking system of which man is an element and with a conscience of what man in the pursuit of other objectives can and is doing to his own environment and a measurement of the weight of the consequences as against the other objectives.

One of the future objectives of the conservation program will be to undertake the research necessary from the point of view of our particular responsibilities, to define the characteristics of a quality environment from the human point of view.

The purpose, of course, will be to orient whatever we do for maximum achievement in this regard.

I would remind the committee of the importance attached to this in the speech from the throne of September 12, 1968, where a reference as follows was made:

The growth of our population and changes in the nature of our mobile urban and industrial society lend a new importance to conservation in its traditional sense.

Our conservation program relates heavily to this interpretation of conservation in its traditional sense,

Finally I would like to touch slightly on the dimensions of our responsibilities and related research in the economic, educational and social fields.

On the economic side, research here is related, self-evidently, to the economic development of the north and of Indian lands. I do not think I need to elaborate too much on that; I have indicated the scope and the scale of our responsibilities here.

The north particularly has some unusual challenges in economic engineering and economic development of Indian and Eskimo people has equally unusual challenges of a very different nature.

In the educational field, research here is concerned with the improvement of educational ways and means to prepare Indian and northern people for full participation in the Canadian community. In addition in other words to having to operate a very large educational plan we are doing so under some interesting and very severe educational challenges of language and cultural differences.

On the social side, research here is concerned with the identification and investigation of social factors that inhibit the full participation of native peoples in the Canadian community. These factors are very real and require a disciplined approach to them.

I would like to conclude by making a reference to your committee's press release of March 11, 1968, which read as follows:

We should now realize that in the new society change in growth must be promoted and stimulated to an even greater extent than in the immediate past. The key role on this front will be played by the physical and the live sciences, but it is at least as important for us to learn that we will not succeed in organizing change in affluence and in adjusting to that if the human live sciences and the social sciences are not in a position to make their full contribution in this respect. In other words, if we want to preserve our promise in the economic future and to prevent it from becoming catastrophic to our society and our people we desperately need a dynamic three dimensional scientific policy covering the physical, live and social sciences.

We heartily endorse this view and I think we find in our department probably more than many others not a deep involvement in any one of these areas but a continuing interplay among all of them.

Thank you very much, gentlemen.

The Chairman: Thank you, Mr. MacDonald. Now, we will have our usual discussion; Senator Belisle will initiate it.

Senator Belisle: Thank you very much, Mr. Chairman and Mr. MacDonald. The committee is aware that your department has recently undergone a major reorganization and appreciate that this has made it very difficult for you to prepare a brief.

Taking note that the title of your department is Indian Affairs and Northern Development, I propose to concentrate initially on the northern development aspect, not because I consider this has a priority over the important aspects associated with Indian Affairs, especially when I have on my left the honourable senator who represents this great part of our population, but rather because I think that science and technology might have a clearer role with regard to northern development.

Certainly I think I speak for all members of this committee when I say that the application of science and technology to the northern part of our north might well have high priority in Canadian science policy.

Report No. 4 of the Science Council, and I quote, Towards a National Science Policy for Canada, comments on the economic development of Canada's north as follows:

If this vast area is to be developed and its resources fully tapped, much more has to be done. Science has much to offer in the quest to make sure that the full economic potential of Canada's north is realized and that the cultural life of the population of this area is enriched.

Since you mentioned, Mr. MacDonald, in your opening remarks that you were in a sense a department with trust responsibilities, I would like to have some clarification regarding the priorities which have been set in the past and some indication about your new and most recent organization and the method of establishing priorities?

Mr. MacDonald: Senator Belisle, I think you implied yourself in your opening remarks it is very difficult to set absolute priorities, not only in this department but probably in the government as a whole.

Our responsibility is to see that we apply adequate resources to the several areas of our responsibility in a way that would optimize the return, if I may use that expression, whether in scientific value or such other values as may be involved. There can be no question whatsoever that the economic and social development of the north is of paramount importance, or at least of great importance to Canada.

It is important on at least two grounds; one I intimated in my opening remarks, that encompassing 38% of the land mass of Canada and probably greater than that proportion of its future wealth it is self-evidently important that what happens to it is important to Canada in selfish terms of the future well being of our country in material terms.

Its development, however, is also important in terms of the people who reside there and in particular the native people, the Eskimos, whose traditional way of life is disappearing for a variety of reasons and for whom some alternative life, a meaningful life has to be found.

The north as well offers extraordinary challenges of a scientific and technological nature, to cite only some fields such as transportation, which is one of the keys to economic development of the north. Energy sources is another. Similar challenges for scientific research lie in the sociological side, because the development and maintenance of communities in that area will present unusual challenges, possibly less so in the Yukon and western Arctic, where conditions are, apart from length of season, not dissimilar to those found in many other parts of Canada, but quite markedly different in the eastern Arctic, where we have an absence of trees and vegetation as we ordinarily know it, but which will probably have a requirement for communities to exist for at least specific intervals of time under quite unusual conditions.

So our priorities, while not absolute, would put economic and sociological development problems of the north and the similar challenges, for the development of native people, at the top of our priorities but we would, having said that, not want to neglect these other considerations that I have touched on here in the conservation area, for example, which have been aptly described, or at least the adverse possibilities there have been aptly described by the former Secretary of the Interior, Udall, in his book, The Quiet Crisis. They have that kind of implication, that it happens quietly without your noticing it and therefore when we do strive for our priorities we have to bear these factors in mind.

Senator Belisle: Thank you very much, Mr. Mac-Donald; I must say that this new information that you have added has assisted me in finding new lights, or giving me a new . . .

The Chairman: The northern lights.

Senator Belisle: That I did not detect in your brief.

For example, in your brief, paragraph 3, you say:

...it will be evident from this report that the Canadian Wildlife Service and the National and Historic Parks Branch have shown a strong research orientation, being the two departmental units with administrative responsibilities in which research played a major role. For this reason, the submissions of the Parks Branch and the Wildlife Service make up the major volume of this brief. At the same time, the research and economic development group and the Northern Science Research Group also conducted substantial amounts of research, primarily in the social sciences, while the Indian Affairs Branch and the Northern Administration Branch conducted little research themselves but arranged for some research to be conducted under contract.

My next question is this: In view of the above statement would it be true to assume that more effort has been deployed to wildlife service and the national historic parks branch than to the economic development of the north and to the scientific and technological problems regarding the resources of the north and the economic development of the north?

I am sorry, and I repeat that in my first reading of your brief I did not readily find out what resources were split, to which ones you referred as being split.

Mr. MacDonald: Senator, I think that this understanding arises naturally from an accident of methodology rather than the weight of the resources which are applied and it is found in rather subtle words when we refer in my opening remarks to the development of specialized research capacities within the department.

The key phrase here is within the department, where specialists are in limited supply, so it is an accident really of methodology or circumstances prevailing in or outside the department.

In the Canadian Wildlife Service, for example, we are in fact probably the centre of gravity for scientific research in the area in this country, and indeed I could safely say without bringing too many blushes to their cheeks here probably within the world they are an outstanding service in this regard.

However, on the other hand our scientific needs in the north have always excited far more attention than is necessarily found exclusively within our department. The National Research Council, the Defence Research Board, the Department of National Defence generally, scholars within universities and so forth, have all devoted a great deal of attention and we have a northern science research group and a northern coordination centre whose primary task was

not to undertake this research and re-invent the wheel on our own application, but to sustain, stimulate and to coordinate wherever possible research among other government departments and agencies within the government of Canada and outside.

We have done this through coordinating committees to ensure that problems did not fall between two stools, equally that we did not waste resources either on our own part or some other part by having two very scarce elements of capability in this area pursuing the same problem. Generally we try in absolute terms to stimulate the greatest quantum of research wherever we can do it. We have done this by coordination and by a program of university grants. We have tended in the northern side to rely more and more on that, because the scholarly interest is there, the facilities were there and we went to them.

Senator Haig: Do you direct research in any way?

Mr. MacDonald: We direct research, for example, in the Canadian Wildlife Service.

The Chairman: But not in the north?

Mr. MacDonald: In the north, Mr. Chairman, we do very little research on our own.

The Chairman: What kind of influence do you have on the programs which are going on outside the department? For instance, so far as the universities are interested in research in the north, do they merely apply and select their own areas of research, or do you try to influence them in looking at what you think are the priorities in that field?

Mr. MacDonald: I will ask Mr. Kerr to answer that.

Mr. A. J. Kerr (Chief, Northern Science Research Group, Department of Indian Affairs and Northern Development): Sir, the program contains in essence two areas of responsibility: One which is for the most part concerned with encouraging research by university people. This program of grants to universities began as a result of a suggestion from the advisory committee on northern development, which is an inter-disciplinary committee composed of the deputy ministers of the appropriate departments, including our own, the Department of Transport and so forth. At that time it was felt that in some measure the development of the north could be expedited if there were a greater supply of scientists with northern experience and northern commitment. It was also decided that perhaps the most effective means of accomplishing this was to allow organizations at universities to determine their own directions.

So in these terms our grants program to universities has been in essence undirected in so far as this department is concerned.

The Chairman: And it is undirected also in so far as research in other departments is concerned, in the sense that they select their own areas of research and you try to avoid duplication?

Mr. MacDonald: That is right, although there are a minority of situations where we have a specific requirement, but the broad philosophy is the one of stimulation and support.

I should also add that, for example, we have established the Inuvik laboratory in which we do nothing ourselves, but it is a host laboratory available to researchers, scholars and institutions with an interest in the north.

Senator Belisle: From the information you have given us regarding universities and the assistance universities are giving to your department, may I be permitted to ask in what manner does your department establish priorities and the kind of funds to be expended. I will go further: I do not think that any member of this committee would be critical if you could expend vastly more funds on research to improve the method, for example, of mineral exploration in the north. What research is being done concerning minerals or oil? They found oil in Alaska; why not in the north?

Mr. MacDonald: I would like to remind you that we put a group together called Panarctic before they found the oil in Alaska and we hope to be in there very quickly ourselves with oil.

To answer your question specifically I would like to remind you of the existence of the Department of Energy, Mines and Resources, which is a great, in effect, scientific institute in all of that area of metalurgy and related geological and earth sciences and we depend on them for the scientific work in that field.

Our responsibilities therefore are to stimulate, and to confine ourselves to direct stimulation of the industrial components to exploration. In other words, it is not within the ambit of what we are talking about here; I just make reference to the fact that we have a very extensive incentive program designed to encourage exploration.

We went to what some people might consider the extreme in the manner I have just indicated by entering into a government-industry consortium in which we have 45% and are directly concerned in searching for oil in the Arctic islands which hold out

the hope of transforming Canada's position as a world oil producer.

Senator McGrand: In the Northwest Territories and the Yukon what is the breakdown in population between Indian, Eskimo and whites; have you got that?

Mr. MacDonald: I do not know if I can give you the numbers, but I will give you the rough approximation. The population of the Yukon is somewhere around 15,000 to 18,000, of which about 15% are native and that is largely Indian. The population of the Northwest Territories will range from between 30,000 and 35,000, of which about 60% would be native, either Indian or Eskimo, predominantly Eskimo. If you divided that and took, say, the eastern Arctic, the population would probably be almost entirely Eskimo.

Senator McGrand: I was not meaning the eastern Arctic; I just meant the Yukon. Some time ago I read a report on the resources of the Yukon made by ARDA and I got the impression that...

Mr. MacDonald: Are you sure about ARDA, sir? Would it not likely be a report called the CARR report we just released? ARDA I do not think has ever made a study, although one is never sure about these things.

Senator McGrand: Anyway, regardless of who made it I got the impression that while fur trapping by the Indians and Eskimos was definitely on the decline and on its way out, I have been told by members of your branch that the fur crop is about the same every year and there is no danger of it disappearing. I would like to have you give me some idea of the livelihood of the Indian and the Eskimo from the fur trade?

Mr. MacDonald: I might just make a few remarks in general. I am not sure who we may have here to comment upon anything more specific. Of course, the animal population is subject to cyclical variations for a variety of reasons; it does go down and it does come back up and, of course, in some areas with the progression of different kinds of land utilization the population even cyclically is reduced absolutely over a period of time.

I think the most important point to make is that the other variables, of course, are market conditions and the growth of the population, which must be sustained, the human population, by this activity.

With the native population now growing much more rapidly than it did in the past, indeed, over twice the national average, from a strictly economic point of view, an economy based upon the renewable resources is not a very strong weapon. That is about what one would say in a generalized sort of way.

That does not mean that it does not remain a very important source of livelihood in various specific areas. We try to do our best in our various programs to support this kind of activity, but from a broad strategic point of view we are looking in the long run to a much greater population which will make much more sophisticated demands on the part of young people.

We see this development resting on the extractive industries and peripheral industries that will grow up around it.

Senator McGrand: On page 32 in paragraph (g) you say:

Ecological research is a slow business because of inherent difficulties.

What do you see in that research as a sort of support for the population of that area and that would include Indian, Eskimo and white? What did you have in mind? I just did not follow it.

Mr. MacDonald: I will ask Dr. Munro to elaborate.

Dr. D.A. Munro (Director, Community Affairs Branch, Department of Indian Affairs and Northern Development): Mr. Chairman, senators, I think that what was said in this paragraph was in the context of Canadian life as a whole and we were thinking of ecological research as a necessary under-pinning to the development of standards of environmental quality, to the maintenance of wildlife populations for recreation and for their own sake.

As the Deputy Minister just said, it would be a poor strategy to pin our hopes for the maintenance and the improvement of standards of living for native peoples on resources such as fur, because of the marketing problems, because of the increasing disinclination of the native peoples to go out on the trap line when facilities and services are becoming available to them in communities.

This particular statement about ecological research was not aimed primarily at the subject you are asking about.

Senator McGrand: On page 57, line 16 you say:

The Northwest Territories government has been concerned for some time about developing the best methods possible for the utilization of the white fox populations.

Now, we are going back to fur again, and the yearly resources that come off the land each year. Is there any possibility that this white fox population or other fur animals could be developed as ranch animals, rather than just simply on the wild? Is there any possibility of that? I understand that is a difficult thing to deal with, because it can travel in a very wide range.

Dr. Munro: The person who undertook this research on the white fox happens to be in this room in a different capacity; he is serving for a term with the Science Advisory Council. Perhaps if it is appropriate he could respond.

The Chairman: Are they trying to develop a new expertise in that field in the science council?

Mr. MacDonald: They are just getting a little foxy there.

The Chairman: Would you care to comment, sir?

Dr. A. H. MacPherson (Regional Supervisor of Research, Canadian Wildlife Service): Mr. Chairman and Senators: The ranching of white fox has been tried in a number of areas, including the Canadian Arctic. It has been found to be uneconomical by the Hudsons Bay Company. It is, however, practised in Poland, Norway and the USSR, where I think the inputs are a lot cheaper.

The Chairman: The same thing does not apply to mink, though.

Senator McGrand: Well, it would be slightly different, I think.

The Chairman: There have been some very interesting experiments, I do not know if they are still going on, in the north, near Aklavik.

Senator McGrand: The mink ranching is done down here; I am thinking of something to be done strictly in the north.

I would like to get some idea of the Mackenzie Delta; I notice in some material I have there are a great many articles written on the Mackenzie Delta.

Now, when you think of a delta you naturally think of soil and I presume a lot of this has been more muskeg than soil. What possibilities for agriculture, or what type of agriculture could be made adaptable to the climate of the Mackenzie Delta and what else does it give us besides there must be a place for muskrats, there must be a place where reindeer and caribou can survive, but what else has it got?

Mr. MacDonald: Certainly, senator, the Delta is an area that has received a lot of attention.

Mr. Kerr: May I rephrase your question, Senator: Your question I think was what does the Delta have in terms of physical resources?

Senator McGrand: What has it got to offer in the north? What does it mean to its economics? How much human population and industry and so on can it support? I was just thinking of is there any chance of agriculture there?

Mr. Kerr: The Department of Agriculture has operated as an outpost from the experimental farm in Fort Simpson for several seasons an experiment to investigate the possibilities particularly of the growth of leaf crops. Root vegetables do not do very well this far north.

The Roman Catholic Mission succeeded in growing quantities of potatoes a bit south at Good Hope for a good many years. The potato possibilities in the Delta are very small; leaf crops such as cabbage seem to do very well.

The Department of Agriculture kept that up for some years. They dropped it basically because of the drop in freight rates and it is now cheaper to import leaf vegetables from the south than it is to grow them locally.

In terms of fur, a considerable number of muskrat, of beaver in some quantity are coming in, although not on the scale that they are available further south in favourable beaver areas. Mink in some quantity; a bit further to the east, on the Anderson River, some marten.

Forest products: You may be aware that the tree line passes through the Delta rather to its northern extremity. In the southern area and areas adjacent immediately to the Mackenzie Delta there are trees which are now being harvested and sawn into boards for local use. It appears at the moment that this locally produced lumber can compete with outside produced lumber.

Senator McGrand: When I looked over a number of articles that are available on the Delta I felt that it must have some particular significance in the economy of the north, there as been so much written on it. That is why I asked.

It would seem to me that the Indian and the Eskimo, especially the Eskimo, in the far north is the logical person to use as a technician, to be developed as technicians for the development of the north. They are born up there; they are probably going to die there. They do not mind living there,

while people who come from the southern part go up there usually for a period of a few years, and they have no intention of leaving their bones up there.

What is being done to develop the Eskimo livelihood in the, as you say, the areas of mining and oil research?

Mr. MacDonald: Mr. Chairman, I would like to reply to that.

This, of course, goes to the heart of our whole problem, the interrelationship that I referred to earlier. I mentioned there were two important reasons for developing the north: One is the economic value of it in its own right; but the other is a sociological implication for the people who are living there.

We certainly take it as a point of departure and it would be a great tragedy that this economic development of the north which we believe to be a fact now should take place without the participation, should they be willing, of the native peoples in the north.

The specific steps we have taken, first of all with the creation of the educational system which, right back in your time Mr. Chairman and before, has been a small miracle in its own right.

The Chairman: And health.

Mr. MacDonald: And health, but as regards a transition to a different type of life, of course, the educational system has been the starter.

Next has been the area of special skills; we have a vast and interesting vocational skills training school at Churchill where they are trained; another heavy equipment training plant at Fort Smith. We take it further in terms of specific agreement with industry when we grant resource assistance. We are exacting commitments for the employment of people, I quote the Anvil agreement as an example, where we have provided for up to 25%, I think it is, under successive stages of the employment force being made up of native northerners providing we can supply them with the requisite skills.

More recently I met personally with representative of the petroleum industry in Calgary because we felt we had reached the point where we could say to them this is not a dicey game any more; the oil industry for the north is almost an established thing. We think we have the right to ask you to do some intensive planning, to make some commitments, because we do not think the Parliament and the people of Canada would accept a development which the native people did not participate in. Even on

unskilled matters, to bring up crews from southern Canada, which while the traditional practice elsewhere is not appropriate in these circumstances and, of course, we think that it would be a tragedy if when things really get booming we find say two, three, four years hence they are not being employed and the answer is they have not got the training. Now is the time, therefore, to give them the training. So this is the message we are putting to them. It was very well received and we have got specific machinery working now supplying them with the names and the qualifications, educational skills and so on that they may have.

Again more specifically in Panarctic; we are starting our first three wells this year, the first one next month. Last fall five or six Eskimo young people, mature men really, were taken down to the petroleum school in Edmonton and given the skills training, then employed in southern Alberta on established industry training and will be working on the Panarctic project this summer.

The Commonwealth Drilling also have informed me that they hope to have about another 20 employed on less skilled and non-skilled occupations. The rest of the industry have undertaken to try to follow this pattern, bringing people down, giving them the training and making specific arrangements for their employment.

That off the top of my head, senators, is what we are trying to do and the general attitude.

Senator Bourget: Have you got any technical schools up there to train those people?

Mr. MacDonald: We have the school at Churchill and one for heavy equipment handling at Fort Smith. I should also just add that the Pine Point railway is almost entirely operated by Eskimos.

Senator McGrand: Sixty per cent of the Northwest Territories is Eskimo, or mostly Eskimo. There is evidently some opportunity for them to learn these skills and get employment. I was under the impression that it had not been too successful, that not too many have been employed so far. What is the livelihood of those 60% of the population? What is their chief source of livelihood in the western Northwest Territories?

Mr. MacDonald: May I comment on your impression and then offer an assessment: There are two difficulties that have to be overcome to achieve complete success in what was established as the target of full participation, if they are willing, in this development. Mind you, not every Eskimo

necessarily wants to be a miner or an oil driller; we just cannot presume in this respect.

The two factors are, of course, the progress of the educational system, which has been a fairly recent project, so the numbers of people with the requisite preliminary minimum education upon which certain other skills could be founded is still a small source. It is streaming out now; I do not know if there is anybody here who can give the educational statistics, but I can just state it to be a fact that it is a relatively young educational system.

The other major point to bear in mind is that the majority of the mineralized developments have taken place in the western Arctic and the population is in the eastern Arctic. This is the unfortunate dichotomy that prevails and it is for this reason that we are advancing certain other interesting projects which we would like to see started if the markets of the world favour them, such as the huge iron ore development at Mary River in Baffin Island. There we have 100 million tons proven reserve of 68% grade. The main limiting factor at the moment is the shipping season of possibly two or three months and the weakness of world markets for iron ore.

That is what we need to improve the employment opportunity, or a far more difficult decision of migration of people.

Senator McGrand: I read somewhere that the suicide rate among Canadians is about 7.2 for a hundred thousand and among the Eskimos it is about 19 per hundred thousand, which is nearly three times the average of the everage Canadian.

Now, this brings up something, the change of their environment and so on.

Mr. MacDonald: Well, I do not know how comparable this figure is or even if it is in fact an accurate figure, with other peoples in the process of transition, but I think we would all probably say to ourselves that if we found a higher than average figure we would not be surprised when we thought of people undergoing the strains and stresses that they are under in the terribly traumatic cultural change that they are involved in.

Men have reached maturity with a great deal of pride because of skills as a hunter; they are eminent in their community and so on. We find this by the way in the technological change in Canada; when you are 40 or 50 and something that has made you good is no longer in demand you find yourself either a welfare recipient or at best a doer of unskilled labour and so on. So this experience is a devastating one for the people.

All sorts of changes are involved when the people are in transformation. The Indian people have suffered this over a longer period of time, probably even more acutely.

We are pressing the northern economic development so rapidly, so intensely, not so much because Canada necessarily needs its accretion of economic wealth right now, but for the very point you have raised, Senator, that it is critical for people who are living today.

Senator McGrand: Why I asked that question was because I was under the impression that the Eskimo welcomed this change of environment; he saw a better future.

Mr. MacDonald: I think the fact he in a sense welcomes it is evidenced by easier adaptability, if there is something to adapt to. The problem comes when there is nothing to adapt to. Regrettably these things do not march in nice consonance.

The traditional way of life is disappearing, or else the pull of an established community on the family, dependents and young people take them away from the other before we have prepared for that.

For example, if we could have waved a magic wand brought the Baffin Island iron ore into production three or four years ago it would have been the best thing in the world we could have done, but we have no control over the iron market of the world and it unfortunately happens to be the fact that the markets have fallen in the last two years and look like they will be down for another year or two.

We are still fighting the technological transportation problem of lengthening the shipping season; we are supporting the Alexbow; we are looking forward to helping oil companies on this huge tanker trial this summer. That is an instance of how a major economic development like the finding of oil can bring the economic drive behind research which will have benefits far beyond that which the people doing that research have in mind. In other words, it will benefit the oil industry but if that succeeds, if we have nearly a year round sea passage in the north, the economy in the north is transformed overnight and we will really make a leap forward.

While still the tragedy will remain that many people will not be recovered because it is sometimes too long, we hope to prevent more of it happening.

The Chairman: Do you sponsor a lot of research in this strategic field of transportation?

Mr. MacDonald: Yes.

The Chairman: Because this is, as you say, the big problem in the north.

Mr. MacDonald: For example, the Alexbow device was going unattended and we through our membership in Panarctic arranged that Panarctic picked up 51% of that from the company and have used it on a barge in experiments last year. We are working with the Department of Transport now for tanktesting, model tests, leading to fittings on probably two small but comparable ice-breakers, because we need objective evaluation in like circumstances of the performance with and without.

Likewise we have been rendering all assistance asked with respect to the Manhattan tanker that is coming through this summer. We are working very closely, providing such things as ice data from the various government departments. The Department of Transport will lend ice-breaker assistance and so on, because we have great interest in it.

We have had transportation studies on the Yukon, but right now there is no boubt about it that the transportation, ice free, or nearly ice free, or ice impervious transportation in the north is the key to it.

If that fails, then one is looking a little further ahead to air transportation and the huge capacities that are possible here with energy sources such as gas to reduce the weight and then taking it out and, of course, we are still looking at railroads as a probable economic means of transportation.

The Chairman: What about underwater transportation?

Mr. MacDonald: We looked at this very carefully when we went into Panarctic and before.

The whole argument used to be why bother looking for oil if you cannot get it out and we used to say this is one of the chicken and egg arguments; some people say do not look for it, because you cannot get it out; others say, if we get enough oil in vast quantities there will be a way found to get it out and that is being proved right now. This Manhattan project alone has taken \$15 millions in the way of expenditure, to show you the scale of expenditures that are involved.

We looked in that period of time at under-sea tankers. We talked about it as well with some French interests; Petrolpar, for example, were very active in exploration and had the same interest as we had; Japanese shipyards and the French nuclear research were addressing themselves to this problem. I think our present indication is that this is not now a promising outlook because the problems of byoyancy and commercial load seem to contradict each other.

We have had hydrography done on it, however, in anticipation and we have had hydrography done on underwater pipelines as well, so there is a fairly wide spread matrix of interrelated research going on either supported by us or which we are aware of and getting feedback on.

The Chairman: But do you feel that our research program in that field is sufficient at the moment?

Mr. MacDonald: You could argue in a sense that it is not; you might argue, for example, why had we not three years ago spent \$15 million to do what Atlantic Richfield are doing.

The question is in the order of priorities of the government, having to cut the pie, having sociological needs to meet and welfare and many other things, could we have successfully sold either ourselves, or the government, or the society that that was a sensible thing to do when there was no real evidence of need for it, but the moment you have a proven, or nearly proven potential like Prudhoe Bay, with reserves calculated at anywhere from 10 to 40 billion with a probability at the latter end of the scale, equal to all the reserves of the North American continent at that moment of time. There is a very high profit per barrel ratio because we have nearly middle east prices due to the oil being found in the huge pools characteristic of that area on one end and the high posted protected market of the continental United States on the other end. With this you have an enormous economic incentive against which \$15 million is nothing.

So there is always more that we could do; it is a question of when and how.

Senator Hays: I would like to ask Mr. MacDonald a few questions; I would first like to make a point. In Alberta, where I suppose oil has had a great deal to do with a better way of life as far as Alberta is concerned and the government have received in royalties anywhere from 35 to 50% of their total revenues.

In the Northwest Territories this land all belongs to the Crown?

Mr. MacDonald: In the right of Canada, federally.

Senator Hays: This is in the right of Canada, so they receive it. In your conservation of these natural resources do you take a royalty?

Mr. MacDonald: Yes.

Senator Hays: What is it, a 121/2% royalty?

Mr. MacDonald: I think it is 10% but, of course, the issue has not really arisen yet, Senator.

Senator Hays: But these are the ground rules.

Mr. MacDonald: Yes; there is a bill before the Senate now on oil and gas conservation and we can establish the royalty basis system.

Senator Hays: What is the total amount of money that we are spending in the Northwest Territories now?

Mr. MacDonald: I think we are running on the order of, I am not sure whether it is for the Yukon and the Northwest Territories, between \$50 million and \$60 million. That is our department alone.

Senator Hays: So if this oil is economic and we do not produce any oil that will compare with offshore oil today . . .

Mr. MacDonald: Yes, it is an entirely new ball game.

Senator Hays: If this were possible, then I would suppose we would have no problem with markets in so far as the United States are concerned.

Mr. MacDonald: I am not sure.

Senator Hays: If we can compete dollarwise, if it is not just for strategic purposes and that sort of thing.

Mr. MacDonald: It is hard to forecast what our market position will be in respect to the United States, but I think one thing is clear and one of the reasons we went into Panarctic was that we were told long before Prudhoe Bay that on the geological evidence if we found oil it was the most likely area on the North American continent to find it in the large pools which are characteristic of the middle east. Therefore that is high volume, low cost oil and therefore we do not have to have the American market; we can sell that oil anywhere in the world.

Senator Hays: Yes, because you will have a world market.

Mr. MacDonald: Yes, we have a world market; that is why we are in a different ball game altogether.

Senator Hays: Is this why you say then that mainly what you want to do is to get it to the sea?

Mr. MacDonald: We would get it into the United States market for as much as we could and that would pay for a pipeline, for example, down the Mackenzie Delta; we are working as actively as we can on this as a second line alternative for it.

The future, and there are attractions we hope to be able to point out to that, because the Mackenzie Delta is going to probably be the other important source of Canadian oil, but we want two or three strings to our bow, because we may find oil in truly vast quantities in the Arctic islands.

I would like to point out that the Arctic islands alone have a volume of sedimentary deposits, which is not oil but is where you find the oil, equal to the three prairie provinces combined. In addition to that, in the Mackenzie Delta you have an extension of the same formation that holds the Prudhoe Bay discovery.

Senator Hays: Geology tells you that this might be; you are not sure of these proven resources.

Mr. MacDonald: The only way you can be sure is if you drill it and find it.

Senator Hays: Because even in the Alaskan fields the off-centre wells just do not indicate that maybe there is as much there as they had anticipated at this particular spot. Mr. MacDonald: That is not our information at the moment.

Senator Hays: Well, maybe my information is not as good as yours.

Mr. MacDonald: I would not put any money either way. All I know is that the people we have been talking to and, as you know, I am a member of the task force . . .

The Chairman: Perhaps this is the difference between you, Mr. MacDonald and Senator Hays; perhaps he was willing to put some money down.

Mr. MacDonald: No, the difference is that Senator Hays has the money and I do not.

Senator Hays: Your friends were in the high Arctic and mine was a tool pusher.

Mr. MacDonald: All I can say is that I have seen no lessening of the optimism or the absent terrible sense of urgency that the companies are displaying to commit themselves to the pipeline, to do these various things, because they want to get that oil out. They believe the oil is there.

Their plans seem extraordinarily firm for 1971; they are fighting to get at 1971 rather than 1972, but I must say and everybody has noted it certainly this is the most remarkably optimistic forecast based on what at that point of time was only two wells.

Senator Hays: In the field of research, as you said, \$15 million is not a great deal if you make the right sort of discovery.

Why would it not be sensible for the government today in the field of research, instead of having a 10% royalty set aside a small amount for research, because it is a vast area. Maybe we have more in the resources there than any other unknown spot in the world.

Would you suggest that maybe this would be good thinking in so far as this particular committee is concerned? Because \$40 million or \$50 million, when you think Alberta received I think last year something like \$150 million from natural resources.

Mr. MacDonald: Our royalty revenue is minimal right now.

Senator Hays: But the potential.

Mr. MacDonald: The potential of the future will be very great when we find the oil and it begins to flow to market, but there are no in a sense disposable funds right now. I think it would be six of one and half dozen of the other, whether the government specifically earmarked royalty revenues or simply recognized that this was an enormously great return and were prepared to put the money in as an investment.

I will say that in fact the government of Canada has so recognized and has been putting a lot of money in. We know we are putting \$9 million in Panarctic. We put in \$10 million this year on major roads, all of which in their own way are speculative investments, to open up areas which we have reason to believe can prove profitable and rewarding for expansion.

There are a number of other matters which are on the cooker, so to speak, which involve that kind of deliberate investment against a reasonable expectation of return in the future, strictly on an economic analysis.

Senator Hays: I understand that this new pipeline for the Alaskan oil to the sea will cost in the neighbourhood of almost a billion dollars.

Mr. MacDonald: Right.

Senator Hays: If Canada were to have an oil pipeline; this one they are putting on top of the ground, are they not, it is a 48 inch line?

Mr. MacDonald: It is a 48 inch line; the problems there are going through permafrost. They range from arguments about whether they will cool the oil, because otherwise it will melt the permafrost and make it unstable.

Some other ideas have been for just laying a gravel road and putting the pipeline on top of it with a suitable structure over it. Senator Hays: What sort of research are you thinking about in moving oil? It is pretty gooey stuff when it is 75 below zero running through that pipe on top of the ground.

Mr. MacDonald: It all depends on what oil you pipe. It is variable, according to what kind of oil it is, and these kind of problems. It will affect the flow. For example, that 48 inch pipeline in that country will probably carry closer to a million barrels a day rather than the two millions for which it is theoretically designed, because of these factors.

Senator Hays: You mentioned in your opening statement, or somewhere along the line, that transportation is where most if it is involved. If you solve this, the economics as far as the social problems, a lot of these will be resolved, or greatly helped?

Mr. MacDonald: Not resolved, but greatly assisted.

Mr. Hays: You think then that in the field of research the amount of money you are spending is sufficient?

Mr. MacDonald: No, I think the honest answer is that there are very few areas where you could not say honestly that you could spend more money and if we had a greater budget I think we would allocate more in the area of research.

Senator Hays: Where would you spend this money? What priority, what do you feel is most important?

Mr. MacDonald: I think it would be on the technological side at this stage, primarily in the area of transportation.

The Chairman: Would it be land transportation or sea transportation?

Mr. MacDonald: I will know better next June, after the trials of the Manhattan, whether we are whipping a dead horse, because this will materially affect the kind of transportation outlook we will have in the future.

I will tell you what the Manhattan represents and I will go back and tell you what the alexbow represents in case the members are not familiar with them.

The Alexbow is a sort of an ice plough invented by a chap called Scott Alexander who had been in the Air Force and had been up north a great deal and got this idea. It differs from the traditional way in that an ice breaker runs over the ice and crashes down and crushes it, then backs up and goes over and down like that, whereas the plough is designed to run under it and by a rather interesting form just break it with seemingly great ease. Small scale trials which were run in the Great Lakes and of which I have seen films show remarkable performance, but we are all familiar with what the difference between scales can often make, sometimes an absolute difference. So we are inclined to scale up to find out what it will do.

Senator Belisle: Does it have the same ease at ten feet thick?

Mr. MacDonald: Theoretically it does. The theoretical possibilities are that it will just go on cutting through ice with the requisite amount of energy. It has no side pressures because it throws it away, unlike the ice breaker. It requires little reinforcement on the sides, again in theory.

Senator Robichaud: But is there not a tendency for thin ice to break, while the heavier the ice or the ticker the ice then the harder it is to break it?

Mr. MacDonald: That is where you come to the question of scale, but on the other hand salt water ice is easier to break than fresh water ice. The other thing is what do you do with 200 feet of ice? There has been some concern that this plough coming along and running into one of these things goes right down instead of going straight on. On the other hand, the point is made that we are talking about one year ice and that these ice islands of 200 feet or so and these ridges are something that are plotted by satellite observation, which we do now, anyway, and they are just like islands, you navigate around them. So the debate goes back and forward; we are pursuing it and these are the things that have to be found out, but that is what the Alexbow is and that is what it represents.

Now, emerging is another school of thought which simply says look if you take one of these very large vessels of a hundred thousand or more tons with a little bit of reinforcing here and there, whatever might seem to be appropriate, and the appropriate amount of power, the sheer inertial force will just go through ice like paper, even 50 feet of ice.

This is some of the argumentation on it and that is why people are spending something like \$15 million on this tanker next summer, because they now have an economic objective. A pipeline through Alaska is fine, a pipeline down the Mackenzie is fine, but there is nothing that can beat tanker shipment for flexibility and cost.

So that is where we are now and if this works then you can see that instead of facing a painful land

transportation barrier between some of these peripheral and barrenly located resources that we have and our potential markets, we have some of them practically on tide water.

This is certainly true of our oil in the Arctic islands.

Senator Hays: You said it is right on tide water?

Mr. MacDonald: Some of it would be; we have developments, the Baffin Island iron as you know is only 60 miles from tide water; Coppermine likewise and so on, and as we go on exploring further on.

Senator Hays: So what you are saying is that this oil is cheaper to take to sea and bring it around to Vancouver to pipeline, or to Montreal?

Mr. MacDonald: There is no question about this; on the economics of tankers you cannot touch it.

Senator Hayes: Do you have any cost for transporting oil from Alaska to Vancouver by tanker and pipeline?

Mr. MacDonald: I did have them; my mind is a blank, senator. We went over this just before I went away a couple of weeks ago. We had presentations by various companies when we were looking at what hope we might have to dissuade the entities involved. We were talking to Atlantic Richfield and Humble, who are connected with Standard and Imperial here, re the Alaska pipeline and about a possible preference for a Mackenzie pipeline. In that exercise we were looking at all of the numbers involved. All I can say at the moment is that the tanker costs are just incomparably cheaper, because pipelines are expensive to build; they have a lot of other virtues, but they are very expensive.

The Chairman: Especially there.

Mr. MacDonald: Yes.

Senator Grosart: Mr. Chairman, if I may descend from these lofty flights down to mere science policy, I would like to suggest to Mr. MacDonald that our task for the moment is a national science policy, which seems to have developed, if that is not too flattering a word in a science committee, as a series of ad hoc and departmental decisions over the years.

One of the consequences seems to be a fragmentation of responsibility for science policy, particularly between departments.

There seems to be on the surface, at least, an example of this in the brief. Perhaps Mr. MacDonald

can ease my mind and my concern; I am referring to the appendix, page 1; in the first paragraph there is a statement that the water resources branch and the resources development branch of the department were transferred to the Department of Energy, Mines and Resources.

Then on page 11 of the same appendix in the last paragraph I read that the assistant director is responsible for major resource development and management will be involved with major resources in the Canadian north, including mining, oil, gas, water, etc. Now, it seems to me there has been a transfer of exactly the same responsibilities that now will be undertaken to another department; is that it?

Mr. MacDonald: No, sir. The distinction is to be found in the distinction between research and study and management of a resource. The function we perform with respect to water in the north is the function that a provincial government would perform, that is licensing, decisions with respect to utilization. We rely on the water resources branch of the Department of Energy, Mines and Resources for the scientific support and the studies, water gauging, the stream flow measurement, all of these other functions. There is no duplication whatsoever; our person looks to them.

We buy from the Department of Energy, Mines and Resources just like a province does at a pro-rata cost for the placing of water gauging stations in the north, so that we can have our position in the total national priorities. It is done by the water resources branch.

Senator Grosart: Yes, but your reference in the transfer is not merely to water, that is one thing, and the resources development branch.

Now, this would seem to be the whole field of resource development.

Mr. MacDonald: The difference again, Senator, is that the resource development branch, which we had just created prior to this re-organization, had reference to a posture for the federal government as a whole with respect to resources in Canada administered by provinces and to be a focus for the policy formulation of the government as a whole as to the position it would take with regards to a variety of things, like roads to resources, other cost sharing programs, and so on.

It was simply a statement of the fact that although the resources are in the jurisdiction of the provincial governments in Canada, resources and economic development are inseparable in Canada, and because the federal government has a clear responsibility for economic development, the federal government could not afford not to have a position with respect to resource development, and this is what that branch was doing.

Now, that has moved to the designated resource department, called the Department of Energy, Mines and Resources, which is the federal department of Resources. It has relationships with provincial governments; it has relationships with us. Our role with respect to the territories is that we stand in lieu of a province; we have the jurisdiction over the actual management of the resources.

The Department of Energy, Mines and Resources does not manage any resources; it is a policy department that forms the policy.

The Chairman: Mainly a research department?

Mr. MacDonald: Research and policy.

The Chairman: Very broad policy.

Mr. MacDonald: Water research, energy, trans-Canada grid lines and all those things which can come under the heading of the desirability and importance of developing resources in this country and what the federal government might or might not do alone or in conjunction with a province or in some cases with us.

The Chairman: At best they can only, I suppose, in terms of policy, indicate targets, because they have no constitutional responsibility.

Mr. MacDonald: That is right; whatever they do and when we had that responsibility, whatever we did was through the process of agreements with provinces. We simply agreed, either through the council of resource ministers or bilateraly, it may have been regionally like the tidal study in the Atlantic provinces, that this was a desirable objective and to secure the consent of the government when Parliament and money were involved and go ahead and do it.

Senator Grosart: It seems to me to be not merely a departmental fragmentation, but a fragmentation of the federal government itself, which to me does not make sense.

Mr. MacDonald: Did I make myself clear, Senator, about the fact that you must recall that we stand in lieu or in place of provinces? North of 60 there are no provinces, so because of that this is a special circumstance. The reason it was set in a special department, in the department of northern development, as opposed, for example, to putting it into the Department of Energy, Mines and Resources, was

because the constitutional and political development and the resource and economic development are held to be inseparable; they are all of a part and the people there would not want it melded into one large pot dealing with all other things. That is the answer; that is the rationale.

Senator Grosart: I will not argue the theory. I am concerned with this: If as has been suggested our total funding of R & D in Canada might move in the near future from say 1.3% of GNP to 2% of GNP, this means that there is going to be a billion dollars we hope available for research and development.

If this type of fragmentation continues, where can the people of the north or the people of Canada who are interested in the north expect to find the advocate for an adequate part of that being spent in the north?

Mr. MacDonald: That I think, Senator, is to me at least obviously the reason why one has a Department of Northern Development. If you did not have it there would not be this focus; this is the argument I think against placing it in the Department of Energy, Mines and Resources, because it would not be singular.

In other words, the north, because there are not provinces and at the moment as far as we can see no foreseeable likelihood of there being provinces, because of the absence of a population, there must be within the structure of the federal government just this type of advocacy which you refer to and this is what we regard ourselves as doing.

We have the northern science research group and the coordination centre; our task is not necessarily to do this research ourselves and we do very little of it, but to try to see that it is done either in the universities or in the Department of Energy, Mines and Resources.

I gave you an example: We found that with respect to water gauging, which is a very important element of research for the whole resources basis of the future, because stream flow measurements that are less than 25 or 40 years are really very little use to you because you have got to get a mean average on these things that means something. Obviously these things have been done in the southerly regions a lot sooner, because they are closer to the development.

We found that by the fact that this was financed entirely in the Department of Energy, Mines and Resources and they had to cut their cloth budgetarily the tendency was to cut back that which was financed entirely on the part of the federal government and not that part which was financed jointly with the provinces.

So we recognized this and we, two years ago or so, entered into an arrangement with them whereby we

would pay 50%, just like a province does, so that we get the same type of priority and we advocate with them just like a province the importance of doing this kind of long-range research in the north, so we do consider ourselves an advocate; that is what we would think we are in business for.

Senator Grosart: What is the function of your advisory committee as referred to on page 8 of your brief?

Mr. MacDonald: The advisory committee on northern development?

Senator Grosart: Yes?

Mr. MacDonald: That is coordinative and also formulates policy recommendations for the government involving matters going beyond the jurisdiction of our department. Obviously there are other departments that have heavy responsibility; the Department of Transport is an obvious case, both in terms of airfields, aids to navigation and the sea transportation.

The Chairman: Defence.

Mr. MacDonald: And Defence, of course. So classes of subject matter fall either under the need to coordinate so that the left hand and the right hand do know what they are doing; to achieve some commonality with respect to housing and other matters that we have; to avoid redundancy by having a common service department frequently instead of having several; when we have an isolated area the logistics of support are very difficult; finally, to consider such major issues as, for example, we considered recently this question of the United States oil companies' desire to run the Manhattan tanker test in these waters this year. We had to consider what advice we could tender the government as to what attitude the government of Canada should take towards it, having in mind Canada's sovereignty and need to protect its sovereignty in these areas, our interest in the results of the research, and so on, our own capacity to do it.

Senator Grosart: Energy, Mines and Resources are represented on that committee.

Mr. MacDonald: Yes.

Senator Grosart: Do I understand the situation to be that this committee might come up with a science policy decision affecting the north and that you would then have to go to Energy, Mines and Resources for implementation of that policy? Mr. MacDonald: That could be, yes. I would like to say on the subject of science and research generally that there are a lot of people who do research and there are a lot of people who are customers, consumers. We are a consumer, and our interest is not to do these things necessarily, only in the case of, for example, the wildlife service, where there is in fact very little elsewhere.

The Chairman: And where you have a definite policy responsibility.

Mr. MacDonald: Yes, but for example, the Department of Energy, Mines and Resources is in fact a very large institute of science. It has got the geological survey, the metal and metallurgical research is world renowned and there is simply no point in re-inventing the wheel because we have an interest in the oil, for example, and in geology. The Arctic islands geology, for example, was pioneered by the scientists of the former Department of Mines and Technical Surveys; we simply consumed the product.

The Chairman: I understand also that with regard to research problems related to perma-frost this was done in the National Research Council.

Mr. MacDonald: We go to the building research people and we have encouraged them and worked with them for years; we are quite happy to have them. A, C & D has a sub-committee on construction in the north, and that has been headed from time to time by the director of building research in the National Research Council.

The Chairman: Has there ever been any progress, because this research program has been going on for at least 15 years?

Mr. MacDonald: Oh, yes; I would say progress in the sense now, Senator, that building in permafrost is not considered to represent any real problem any more; we know what to do.

Now, you do get a new thing coming along such as this pipeline which presents some rather different challenges and the whole background is now being brought to bear on this.

Imperial Oil on their own have been running a small diameter pipeline experimentally in the north and it tells you some things, but this is being applied and absorbed by the National Research Council right now and the output fed out to again a great number of consumers.

We can talk of fragmentation, but Atlantic Richfield are a consumer; we are interested. We are interested because it helps inform government policy. When we take an attitude with the United States government or with the American or Canadian oil companies we do not want to be advocating the importance of something unless we know ourselves whether that something is feasible. So that is our interest in it; we are not going to build a pipeline, but we wanted to know the feasibility of various alternative ways of doing things.

Senator Grosart: Mr. MacDonald, that was my point; I am not talking about who does research and development, I am talking about who has the responsibility for making the policy and obtaining the funding for it. That is the point I am making.

I am wondering if Northern Affairs have, as it is presently constructed, this transfer of policy making responsibility, if you have the tools, the structural tools to make policy and to make it stick?

The Chairman: With regard to other research agencies in the government; is that what you mean?

Senator Grosart: No, I am speaking of making policy; policy, science policy, which is a very different thing from science projects or inhouse or outhouse research. I am concerned with the policy.

Have we enough science policy in our whole northern look in this country and, if we have, who gets the credit; if we have not, whom should we blame?

Mr. MacDonald: I think in all of these matters there are some people who are customers and others who are principals. If we were to feel that we were not getting a service from a department we have at least two avenues of recourse. If we could not thrash it out in the A,C & D, if that were the forum chosen for discussion between either myself and the deputy ministers, then we might want to raise it to Cabinet, because in the long run Cabinet will resolve any interdepartmental and inter-jurisdictional disputes within the government.

If we feel that their other claims on their resources are quite reasonable and that to meet what we have in mind is a distortion and an unnecessary distortion, we with or without their agreement would decide to secure it elsewhere. There are many other ways of doing it and there are instances of that over the past.

I might say that we have not found it a difficult problem; we have found that the supporting departments have been extraordinarily cooperative. These things that we are talking about are often so self-evident that the ability to secure agreement on them has not that I can recall from my personal experience been very difficult, and I have been in quite a number of them. I cannot recall a dispute.

The Chairman: So that to come back to Senator Grosart's question, you would feel then that you are responsible for the defining of science policy or research policy?

Mr. MacDonald: Our needs.

The Chairman: Of course, this is policy and then it is carried out, of course, by other people or other government agencies or even outside the government?

Mr. MacDonald: Our job is to get certain things done.

The Chairman: And if there is not enough research being done in certain areas of the north you are to blame?

Mr. MacDonald: Absolutely; if we had not protested it; if we had not tried to do something about it, then it is our fault for not having indicated the need.

Senator Grosart: Do I take it from that that you are satisfied that your science policy requirements in the north are currently being satisfied?

Mr. MacDonald: Subject only to some unforeseen event which will reveal in retrospect that we ought to be doing something. That kind of hazard is around us all the time and subject to our appreciation of the fact that there are something called national priorities and that while we believe that the north ought to be extraordinarily important-I tried to indicate 38% of the land mass of Canada and maybe greater than that proportion of the future wealth of Canada, and that has moved now beyond the point of being a matter of faith, to the point of demonstrable fact; even though we believe in that we also recognize that there are other problems in Canada and that resources have to be allocated, that the total resources to the government itself are limited by public attitudes, tax rates and physical problems. Subject to that, senator, we are satisfied that we have always had cooperation.

I might say that the north has, fortunately I suppose for us, fascinated scientists and certainly in the last decade or so it has received a great deal of the interest of the geological survey in a variety of forms on the oil and metallurgical side, and I am not aware of anything that we feel deeply has been neglected.

Senator Grosart: That is very reassuring. Do you have a contemporary inventory of your science policy needs?

Mr. MacDonald: For the department as a whole?

Senator Grosart: For the north?

Mr. MacDonald: The inventory, strangely enough, is almost entirely in those words: Inventory. That is what is required in the north and that is fairly well advanced in the western Arctic; the emphasis has to increase in the eastern Arctic. It is again a matter of priority and people, the availability of scientists.

We have had a pretty adequate inventorying of the oil potential and we are now reinforcing that in the next successive stage, which is the Panarctic type of thing when you move from the establishment of the general geological formations to much more precise measurements through seismic studies of the subformations. We I think would obviously subscribe to the general statement that any acceleration of the inventorying of the mineral wealth north of 60 would be in the interest of Canada, because only when that is inventoried do we then enable the private capital to come closer to their decisions as to what might be more profitable or reasonably attractive to pursue.

Senator Grosart: Again I am talking not so much about a physical inventory, but a science policy inventory.

I put it to you this way, that we are sometimes told that we are lagging away behind the Russians in our science policy approach to the development of the north.

Have you the kind of science policy inventory for the Canadian north that you can contrast with the Russian science policy for their north and say, here is where we are ahead of them, here is where we are behind?

Mr. MacDonald: Yes, that kind of assessment; I cannot recite it to you, I can discuss it.

We are fully aware of the alleged advances of the Russians as against what we have accomplished with respect to the Canadian north. I use the word "alleged" deliberately, because there is a great deal of misunderstanding arising from the fact that we are comparing things which are largely unlike. The tree-line scatter is different in Russia; the transportation in terms of rivers is different in Russia. Finally, of course, their political economic system within which they operated for so long is radically different; and, of course, the population pressures that they had were different, and how they got population migration was radically different from what is present in a free society.

All of this leads us to the conclusion that while you can see certain specific material things in situ in Russia that you do not see in the Canadian north and you might well say that with cities of a population of 600,000 they are far ahead of us, the cases simply do not equate.

We are satisfied that when our north is developed it will be developed on a sounder economic basis, because everything we do is subject to the disciplines of the world market, whereas the Russians ran on a closed economy basis for a long time.

They are now backing away from that; they are now overlooking what we are doing and I say the Russian traffic has been very heavy the last several years. They are extraordinarily interested in seeing what we are doing in the way of mining, how we go into cost benefit analysis when we determine what we do.

Senator Bourget: Is there an exchange of information with Russia?

Mr. MacDonald: Yes, of varying kinds.

Senator Bourget: You have no trouble there?

Mr. MacDonald: We translate a lot of their published material; we have a lot of exchanges of visits. A lot of these visits are very hard negotiating, because there is a lot of quid pro quoing in these things as to who says what, where, and so on.

Senator Grosart: Take one specific example, the suggested Mackenzie route. After the Prudhoe Bay discovery there was some discussion for a while as to which way the oil would flow, out through Alaska or down the Mackenzie. The decision of the entrepreneurs at Prudhoe Bay was quite sudden; they must have done a great deal of research far prior to the discovery to be able to make the decision as quickly as they did.

Were we in a position to come up with the answers from research to put an input into that decision of the advantages of the Mackenzie route?

Mr. MacDonald: Yes.

Senator Grosart: How hard did you fight that battle?

Mr. MacDonald: We fought quite hard, quite hard. I want to be careful what I say now; I want to tell you as much as I can without getting into subjects that are fairly confidential.

Let me simply say that the economics of the Alaskan route were so overwhelming that one discredits one's credibility if you press too hard against something that is so manifestly economical.

The pipeline over Alaska, while admittedly in some very difficult terrain, was nothing that engineering today cannot cope with and that was fairly easily seen. There is less permafrost to go through than going through on the bias, which is involved in going through Canada. Permafrost was probably more in people's minds than anything else.

Basically, however, it is a shorter pipeline to go over to Valdez or somewhere like that than to go all the way down the big continent. As soon as you get over to Valdez you are transporting in tankers and you can go round right to the east coast if you want to and still be economical. You do not have to wait for the Seattle to Chicago pipeline, which is another possibility some day if we do not succeed in coming down the Mackenzie. That is where the real battle will be; the battle is still to come, or battle is not the right word, I should not say it that way; the discussions, the negotiations, the commonality of interest has got to be settled around the second pipeline.

There was no argument really about the first pipeline; it was the quickest, it was the cheapest and when we looked at it we thought in terms of trying to keep it down as small as possible, let us say enough to meet District 5 which is the west-coast market and therefore continue to protect the midwest market, which is the one which is of great concern to Alberta and any other futures we might have.

But here again the economics were overwhelming; the difference in that kind of thing between 36 and 48 is about \$28 million; peanuts on a project of this kind.

Senator Grosart: In other words, you had all the facts that you knew they were against you.

Mr. MacDonald: We had all the facts, the technical study that Trans-Mountain had done; we probably know more about permafrost than they did, and so on.

Senator Grosart: I was interested in your comment about the entrepreneurs; I think the phrase you used was a terrible sense of urgency. I think we would all like to think there was the same terrible sense of urgency on our side. I am not saying there is not, but we would like to believe there is in this area of science policy development in the north.

The Chairman: Would it be true to say that in so far as the research which is done in the north related to let us say physical sciences, resources and all this, that in that case you rely mainly on government agencies?

Mr. MacDonald: Right.

The Chairman: When it comes to research in the field of the social sciences, then you rely mainly on universities?

Mr. MacDonald: Right.

The Chairman: I have another specific question, still related to this: I was told that a lot of people refused to move from Aklavik to Inuvik.

Has there been any study of the attitudes and the behaviour of people in that area, why they refused and all this?

Mr. MacDonald: We have a number of studies; I am not certain whether we have had a study on Aklavik. I think we got the message pretty clearly as to why they did not move; they indicated it. We are going to face another one of these problems probably in Fort Rae, where there is a very deep division in the community between the older generation and the younger generation as to whether they should move out of Fort Rae, which simply will not sustain any further growth.

This was the problem in Aklavik and it is an insoluble problem; the place was nearly sinking. It was sinking and stinking, I should probably say.

The Chairman: I was there, I know.

Mr. MacDonald: Looking to what is going to happen in the future, you simply could not count on any further development, so the town of Inuvik was created some little distance from there where the terrain held out the possibility of physical support of a community of the size one might look for for the future.

When that was done, and notwithstanding I think some fairly generous compensation arrangements; I say that because I used to be in the Treasury Board then, criticizing this move from the other side . . .

The Chairman: When we were on the other side.

Senator Grosart: Have you got a friend in Energy, Mines and Resources?

Mr. MacDonald: Oh, I have got friends all over the place, along with enemies, in uneven quantities. Notwithstanding these compensation payments a very deep sort of human instinct prevailed; it is an innate sort of conservatism, Senator Grosart; I do not know how you look at these things. They decided they just did not want to move and to some of these people it was a very emotional thing and the more any suggestion came along that they should

move, the more deeply convinced people became that they were not going to move.

The Minister and I made a visit there last summer and immediately ran into a torrent of criticism from the people living in Aklavik about all the points which we knew full well had led to the creation of Inuvik; the sewers did not work, the place was sinking, and so on. So the place is still there and there are still problems.

I might say today that I think we can be very glad that Inuvik was built, because it is now fairly conceivable that the Mackenzie Delta area will become a great oil centre, because the most active oil play going on right now is in the Mackenzie Delta and Inuvik will make a natural base of support that would otherwise have grown as a hodge-podge, a shanty town.

It is a very splendid community, which seems to have been just sort of waiting in the wings for something like this to come along.

The Chairman: But since most of your research in the field of the social sciences is done in universities and since in that field you only receive applications for grants, are you satisfied with this kind of undirected research?

Mr. MacDonald: I should qualify that, senator: The grants program is an undirected grants program, although we have had a lot of debate internally.

My previous Minister was not satisfied about the totally undirected nature and there is a really legitimate debate here going on as to whether it should be directed or undirected and if you have a mix what the mix should be. I think we will probably make some changes.

We do commission specific studies; the Hawthorne report on the whole Indian program was a commissioned report. You can probably think of others that we have had; we do commission individual people or universities to do studies that we want.

I would be wrong if I left the impression that we rely solely on it. The grants program is merely one instrument in the way of supporting it.

The Chairman: So again in that field of social science research you are satisfied at the moment that you do not have too important gaps?

Mr. MacDonald: We have the tools if we want to use them; if we are not using them, then it is an error on our part. For example, on this question of living in communities in the close confinement of the north, which I think either we or CMHC are doing, or we are doing it jointly; CMHC is doing it and we have been working together with them. We both recognize that there is a problem which we have an interest in; they are the housing authority, we have to live with a lot of the consequences of municipal structures, of political repercussions, with people living in these circumstances.

We think this is a very big field of sociological research which CMHC is carrying out and we are participating by being interested observers.

Senator Grosart: Mr. Chairman, I am sorry, I have to leave to go to another meeting, but in view of the fact that Mr. MacDonald referred to innate conservatism I am sure you will not mind my reminding the committee that it once produced a great vision.

The Chairman: It was in the files; I know the history of that. Some people wanted to raise some questions about the Indian problems.

Senator Hays: How much research is spent in your department in Indian affairs? I have not done my homework very well; it is probably in here.

Mr. MacDonald: I have not done it much better; I do not have the budgetary figures.

I mentioned the Hawthorne report, which was a very major study directed on the whole program and on top of that we have a lot of specifics.

Mr. C. I. Fairholm (Director, Policy, Planning and Programming; Department of Indian Affairs and Northern Development): Mr. Chairman, honourable senators; we have had a few very large ones.

Senator Hays: What did the Hawthorne one come to, just to show the magnitude?

Mr. Fairholm: The Hawthorne study came to \$240,000.00. We also used the Canadian Correctional Associations and you may have read the report. That would be in the nature of \$67,000.00. There have been a number of other ones.

There is one now I think that the universities engaged in on educational problems, a study of the children moving from kindergarten and primary school over a period of time to get an assessment of progress, the use of Indian teacher aides and this sort of thing. It has been primarily though, I think, the use of university staff. These were, of course, directed in the sense that we sought out the universities to do the work.

There are, of course, some proposals that do come to us and within the financial limits that we have, some assistance was given.

Senator Hays: I wonder sometimes how qualified universities are to make Indian studies. I have neighbours; I have lived beside the Sarsee, Senator Gladstone, all my life. Then when I purchased my first ranch I was beside another reserve. I have great respect for the Indian people, their culture and their way of life.

On the other side I have neighbours that have ten or twelve sections that keep as many as 180 people; they keep them well. I am wondering if there has been any research, or any thinking about doing any research into taking some of these better reserves and using them as probably a pilot project, whereby you would instead of having the Indians dispersed all over the reserve in small houses and so on, where it seems to me they want to be together, that you set up a proper town and run their reserve in the way you would run a big ranch or something like that, which are paying a lot of them very handsomely.

I have often wondered about this, ever since I was a boy, why this would not be done. I am sure if you give me a Sarsee reserve I can keep all of the Indians drunk all of the time, Senator, and keep them in pretty handsome quarters, because they have some excellent land, and probably do it with Indian labour.

Mr. MacDonald: This is part of the Indian program; it is called physical development, but there are two aspects. One, physical development of the resources; the other is in the area broadly speaking of community development, which deals with the people themselves and attempts at motivation.

The Chairman: Do you not think, though, and you are not responsible for this, but do you not think that we have been terribly late in devoting research to these problems? I presume that we are just starting?

Mr. MacDonald: I do not think you could single out research as being a late starter Senator; the answer has to be late, but I qualify it and say not only on research, but late on a great many other things.

The Chairman: No, but we relied more or less on welfare hand-outs and all this for quite a while.

Mr. MacDonald: In 1945 the total expenditures of the government of Canada, including health, on Indian programs was \$5 million.

In the year coming up it is \$175 million, but that rush has been in the last decade. Education: It is because the problem grew like Topsy; it was a neglected society. You could debate the proportionate interest of the Indian people themselves in Canadian society, what started first, and what affected what, all of which is in a sense academic now.

It is a fact that the result is an enormous gap between the general average of the Indian people and the rest of the country; it is visible, it is manifest wherever you want to go and we are rushing very hard to catch up. A great deal of catching up has been done, more than has been appreciated. Indeed, what is happening, what we are hearing today is an index of the success because as you have more education you get more articulation and more self appreciation of what these problems are, and it leads to the things Senator Hays has been talking about, recreating the physical environment, the spiritual environment of Indian communities. It means movement into participating in the rest of Canada wherever that seems appropriate, and it is a free choice.

Senator Hays: You see, Mr. MacDonald, where I have my ranch there are four people who use Indians, I suppose maybe 70% of their help are Indians, They are excellent workers; they do certain work very well; they like to do it; they are loyal and in certain jobs they are very dependable.

These four places that I speak of are very successful; their land is no better than the reserve from which they come every day. It seems to me if this is being done, there does not seem to be any evidence of change that you can find as you look around; they are exactly the same, their houses are a little better, but not too much better than they were, say, 40 years ago.

Mr. MacDonald: Let me tell you the story right now of what is happening and why it is as you suggest:

I mentioned the great gap and the historical record where we are today, but going within that the first emphasis was on education, which I think everybody would agree was the sensible place, and that is where most of the money went. 50% of our budget goes on education. That is the first point as a starter.

The next priority was housing, because that is the raw minimum of life and it goes right back if you want, if you do not want to be sentimental about the people living today, you look at the child of tomorrow and that child going to school; you are trying to have him integrated in the provincial system where everybody else is. If he comes from a hovel, he is not really

having an equal start, so the housing program on the reserve came into being.

Finally, there was a gradual modernization, humanitarianising, I suppose, of the welfare system, which is simply a negative thing, the relief of distress in the absence of gainful economic opportunities.

What has happened in the last period of five years or so when there has been a great drive on is that the programs which would get at the economic opportunity for the Indian have suffered because of almost fantastic growth in costs of the educational and welfare programs.

This dilemma is a thing we are wrestling with now; even though our budget has grown way above the average of any other department of government, we still have never been able to get successfully off the ground a program of sufficient magnitude to cover the reserves.

We know, for example, that there is enough arable acreage in Indian reservations to support something like 4,000 people.

Mr. Fairholm: It would probably be about 8,000 people, maybe about 1,600 farms of an economic size.

Mr. MacDonald: But to do that, this means training, investment of capital, and so on.

Senator Hays: Maybe this is not the answer; who were the personnel you had on the Hawthorne study, for instance?

Mr. MacDonald: The Hawthorne study is a study which we received as a branch and as a department and we have made our recommendations on it.

Senator Hays: Who were the personnel? I wonder sometimes how qualified these people are to deal with this situation.

Mr. MacDonald: They were professors at UBC.

Senator Hays: Would it not be a lot better to have a farmer that has worked with them all his life, side by side, and made his farm successful? I do not know why you do not use this sort of personnel.

Mr. MacDonald: We do; I think you have to have many techniques. What the Hawthorne people did compared to the studies we get was a first rate study. What they brought was a professional capacity to study complex problems, sort them out, cause and effect, and give some reasonable recommendations.

It so happens, and you will be interested in this, that the one recommendation of the Hawthorne report we are not accepting is the one on agriculture. They recommended that we not pursue this, but we sat back and looked at it and said it is just impossible to ignore an asset that could give gainful employment, not just marginal, but really successful, and we are not accepting that. We will go to other people.

Senator Hays: You take the amount of property we have in most of the reserves today, properly managed; we cannot all be managers, there are just a few people that are, but it seems to me that a board of directors made up of Indians at the Sarsee reserve can work if they want to work, but that this can be self-sustaining.

Mr. MacDonald: The only other argument I have heard about on the agricultural side, and one we have to approach with some caution, is that the capital investment required for a person employed is very disproportionate; that is the only one we have to mention.

Senator Hays: Yes, but I am not thinking of little, individual farms; there is no way that they can make it today. No farming industry can be made out of these little farms; they have to be vast, big farms.

Mr. MacDonald: Yes, but if we multiply, what is it, 4,000 units, say about 1,600 major farm units and multiply the individual capitalization that is required to make them a viable economic unit in today's terms, you have a very large sum of money.

What we have to calculate is the number of people who would be gainfully employed as a consequence of that investment as against other kinds of investments we could make, and how many people would be gainfully employed.

Senator Hays: I am not much of a Communist, but let us take the Hutterite community, who work 4 hours a day and on ten sections of land, or 10,000 acres of land. They are keeping 160 people much better than the Indians living in one little community.

Mr. MacDonald: Well, Senator, I do not think we are disposed to argue the point; we think that this is one that has to be looked at.

The Hawthorne recommendation was not to pursue this avenue; we think it holds out too important a potential at least to ignore and we are looking at it.

Senator Hays: Mr. Chairman, can the Hawthorne report be distributed to the committee?

Mr. Fairholm: We could certainly check on our supply.

The Chairman: At least you could send a copy of it to Senator Hays.

Mr. Fairholm: The first volume runs around four or five hundred pages.

In answer to the point you were making, Mr. Chairman, this experiment is being made in Alberta; there is a trust established just north of Edmonton on one of the reserves, I think it is the Alexander reserve, where there are three or four farmers right around the community and successful farmers who joined with members of the Indian community to develop a parcel of land.

They are breaking so many acres per year and they are trying to bring to this the best advice they can possibly provide at that place.

At another one they also brought in some of the university people from the University of Alberta.

The Chairman: What about the cooperative formula?

Mr. MacDonald: I do not know how extensively we have used it in the Indian area, other than in the sense that many of the bands, you might bear in mind, are communally owned in the sense of cooperative by the purest definition.

We have used it very successfully, of course, in the Eskimo side in the Arctic production; this has been the standard technique.

Have you anything to add to that?

Mr. Fairholm: There are a few what you could call bands operating farms or cattle herds, just the odd one; this is a sort of cooperative effort, but more on the band hiring some managers to actually operate the farm or the herd.

Mr. MacDonald: But it has not been a prominent feature.

Mr. Fairholm: No.

The Chairman: As a result of the recent improvements in educational facilities and accessibility to education, has there been any study made about whether or not there is a generation gap developing?

Mr. MacDonald: I do not know that we have studied it, but I think we perceive that it is not too dissimilar to what you find in the rest of society. It can indeed be there subject to even more pressures because the reserves represent a certain psychological phenomenon that is very deep and very important to

a generation of Indians, and others move out more than the average.

It is a little bit different to go in from the small town to the big city, which is the normal phenomenon of Canada's progression from rural to urban areas.

The Chairman: It would seem to me that it would be very interesting to make studies about this, because if there is a developing gap then the government may try at the moment to solve problems which in the next five or ten years will not be there any more and we may be faced with another problem.

Mr. MacDonald: I will put it this way: We have not found the necessity; we know it is there and even do not have to measure it. We have to recognize it; just as you say, it could have the effect of changing the parameters of the problems in the course of time and we look at this because it affects the out migration from reserves, it affects the question of values which are placed upon education or upon physical development of communities and so on. We are conscious of it without having been precise.

The Chairman: But I think it would be worth while not only to be conscious of it, but to mention the main dimensions of the problems and all this. I would hope that at some stage when you have more money you would devote some of it to that kind of research, which I think could be very fruitful in planning ahead for the future policy of the department.

Senator Hays: The problem of the small farmer in Canada today is the problem that the Indian had long ago; there was no way when you look back that he could have resolved this problem, because you had him out on a hundred acres with no equipment. There was no way. Now we find out that every small farmer is in exactly the same position and the only answer to it is for him to become large, but there just are not 350 thousand managers in Canada to run farms.

Senator Bourget: Is the Manpower and Immigration Department working with you in that regard?

Mr. MacDonald: Yes, very closely. We, as in the question of research, try to be a consumer or a customer of services as far as we possibly can. Our basic policy with respect to Indians and Eskimos is to have them treated like ordinary citizens of the country and have available to them and have them make use of the ordinary facilities. We only come in where there are some things which do not fit the national pattern, certain age and skill levels and so on, which have to be brought up before they become available.

We work in every region very carefully on this basis.

The Chairman: They are in Manpower and Immigration doing current studies on Manpower in so far as Indians are concerned; this is done, I presume, in close collaboration with you?

Mr. MacDonald: Yes, we act as a catalytic agency and bring to their attention the desirability of doing this and ensure that they have our close cooperation; there are no problems.

Senator Hays: Do your studies in this regard indicate that the Indian is better suited for urban life or rural life?

Mr. MacDonald: I do not think one can generalize, Senator, about an Indian born in Toronto, growing up in an ordinary school system; it is a cultural thing. It depends on what you have inherited by word of mouth and how you grow up and so on; that is what makes you what you are.

I know happily a great number of Indians and they vary as much as we all vary here. There is this cultural thing; if you have lived in an atmosphere which is highly seasonal, very sporadic even within the season, highly irregular and so on, adjustment to regular hours is difficult, we often hear this brought up and it presents more acute problems.

But I find this is true of other Canadians; there are a lot of people who are better fitted to be salesmen on the road, they just cannot stand being in an office.

Senator Hays: But if 60% of the people were on the land 40 years ago and only 12 today, would the same ratio not probably apply to the Indian as well? Should we be trying to keep him out there?

Mr. MacDonald: We are definitely not trying to keep the Indian anywhere; what we are trying to do is to increase his capability to make a free choice that is really meaningful. That is education, housing, which gives them the environment. We may be physically reconstructing a reserve, not because we think that reserve is an economic unit, but they are living there and you have got to break the cycle. then a successor generation will make its own decisions as to what it wants.

I have heard much of the discussion on material civilizations and so on; I really find that this is a very confusing argument, it mixes up the cultural argument, but there is no necessary connection. Some of the greatest cultural advances have been made on a solid material base and very little without it

We feel that our job is to ensure that the Indian person has a free choice, but a meaningful choice. Someone who today is living in northern Manitoba may still be living in the traditional way of life, in fur trapping and so on, but it is maybe disappearing from him. You may say that he has a free choice to pop into Winnipeg tomorrow and get a job, but it is not really a meaningful choice; it is not truly free.

There are a great number of intermediate stages that have got to be looked at and he has got to be helped, just as the small farmer we talked about a moment ago had to be helped by society as a whole, then the Indian has to be helped to break out of some of these cycles.

Senator Gladstone: May I in a short way explain what I have seen in the last 25 years, Mr. Chairman? I have worked for the Indians in Alberta and also down here as much as I could but, as Mr. MacDonald mentioned a few minutes ago, some years ago, specifically I know it is 1947 when the Director of Indian Affairs at that time, Mr. Hoey, got up in a committee room down here and said, "All I get from the Government is \$5 million to take care of all the Indians on the reservations, when I could spend \$15 million and that would not be enough."

Now, since then there has been a lot of difference; money supplied to the Indian work has been getting more and more every year, which today is a very big sum of money, but I have taken trips throughout the country since my appointment, take for instance in Toronto there are about 5,000 Indians living right there and I know they can go back to their reserve any time they feel like it, still they have grown up and had families and inter-married in the community and very few of them even think of their reserves now.

Now, that is the best example of people who can integrate; I am very happy that in the last 3 or 4 years something that I have asked and asked for to help those who are wanting to live in the city like white collar workers and so on were getting enough money. Where they were paying \$130 rent every month that some help be given, not gifts, but a fund so that they can borrow the down payment on a home.

It took quite a long time before this really materialized, but now it is the policy in order to encourage them to move into the cities. I am talking about the white collar workers who have had education, dependable people who have moved away from the reservations, who now do have a grant to help them build their own homes.

Now, those sort of people are going to raise their families in the cities and they are going to just be absorbed in the community, because the children grow up and go to school with the others and from what I

have seen there is no discrimination or anything like that; they get along fine together, whereas before there was always this behind them, well, we get this education and go back to the reserve; what good is that to us to make a living on our reserves?

To me in the last two or three years it has been a lot different and I feel very happy about it. As time goes on and there are more Indians going on for higher education they try to beat one another, while those who are leaving the reserves now to get work because it is easier to live in the cities or towns, get in with the wrong bunch of people. That will in itself I think cure the malady, getting better association with people as they themselves are better to mix with people around them.

As far as Toronto is concerned I never hear so much about Indians being in ghettos and all that; this happens all over. I do not think the Indian was born lazy; I went up north last year to see what a little urging done ten years ago when they were getting relief had done. They did not want it, they wanted work, and I said, go out and chop these trees down and clear your land, that will be working for your relief and when the government sees you are doing this they are going to help you, there is no doubt about it.

Last year when I went up there around Battleford, and north of Battleford, places that I travelled through, there was wheat and grain growing on each side of the road.

Those Indians, once they had a little coaching and a little urging, they went right ahead.

The same happened in Manitoba, so that is what they need. If the proper people get to take care of us, that is to say coaching us, it makes a lot of difference in the results of how the thing works out.

So I myself am happy, but the people are beginning now; it will take a generation I guess. Some of the 40 year olds and those who cannot ever get out and get jobs except using their hands well, when they are taken care of the younger generation are not going to be a burden to anybody until they are old enough to be taken care of. That is the way I see it; I will not be here to see it, but I am not a bit pessimistic about it. I think, as the Minister told me, the big need I can see is the cost, the money, that is what is needed. I know more and more money every year is being spent, and I do not think it is going to be a bad investment for Canada to do this.

The Chairman: Thank you very much, Senator Gladstone.

On this very encouraging note I think this is perhaps the most appropriate time to call this meeting to an end, but before doing so I certainly want to thank Mr. MacDonald and his colleagues for this very active discussion this morning and for their brief.

You have before you three very important challenges: To serve our wildlife; to help the native people of Canada; and to develop the north.

We certainly hope that you will be most successful on the three points.

Mr. MacDonald: Thank you very much, sir.

The committee adjourned.

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APPENDIX 32

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BRIEF

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SENATE COMMITTEE ON SCIENCE POLICY

Department of Indian Affairs and Northern Development

APPENDIX 32

TABLE OF CONTENTS

An :	Intro	duction to the Department	4235
		Organization Charts and Personnel Statistics for the Department as a whole	4238
The	Cons	ervation Programme	
		Canadian Wildlife Service	4256
		National and Historic Parks Branch	4297
The	India	an and Northern Programme	
		Northern Science Research Group	4367
		Indian Affairs Branch	4399
		Northern Administration Branch	4407
		Resource and Economic Development Group	4436
The	Suppo	ort Groups	
		The Office of the Financial and Management Adviser	445
		The Office of the Personnel Adviser	458
		The Departmental Library	462
Appe	endix	A The New Departmental Organization	
Appe	endix	B Exhibits from Canadian Wildlife Service	

INTRODUCTION

The Department of Indian Affairs and Northern Development presents a mosaic of activities and responsibilities. The varied responsibilities which had been combined in the Department of the Interior until 1936 were re-united in 1966, when the Department of Indian Affairs and Northern Development came into being. In response to this regrouping of functions, an internal reorganization of the Department was planned and carried out, becoming effective in September 1968. In the re-organized structure, the substance of departmental responsibilities has not been altered, but the manner of discharging these responsibilities has been changed in favour of greater functional specialization. The new organization of the department is described in Appendix A. However, when this report was prepared, departmental plans, budgets, and staff estimates were still based on the old organization, and therefore it was necessary to prepare the brief on the basis of the organizational framework in effect prior to September 1968. Departmental responsibilities were then discharged by the organizational units listed hereunder. Some of these units have undergone little internal organizational change and retain many of their former functions, while others have been entirely re-organized or replaced. Solence General Group conducts nassirok edT

The Northern Administration Branch was responsible for the administration of the people and natural resources of the Northwest Territories and the Yukon Territory, and for the administration of Eskimo Affairs. This branch also administered the ordinances and regulations concerning education, health and mining safety on behalf of the Council of the Northwest Territories.

The Indian Affairs Branch was responsible for assisting Canadian Indians to participate fully in the social and economic life of Canada. Under the authority of the Indian Act, specific programmes were undertaken in the field of education, social welfare and community development.

The Resource and Economic Development Group was responsible for the management of northern non-renewable resources and for fostering the economic development of the North. The primary tasks of this Group were to develop

the Indian Allaira Branch and the Morthern Administration

means of expanding the northern economy and of increasing the rate of non-renewable resource production; to identify attractive investment or development opportunities for both private and public sectors; to identify the factors which influence investment in the Canadian North; and to recommend policies which, by improving the opportunities for profitable returns in all fields, would accelerate the rate of capital spending in the North.

The National and Historic Parks Branch administers the National Parks of Canada and Canadian Historic Sites, under the authority of the National Parks Act and the Historic Sites and Monuments Act. The National Parks of Canada are areas preserved for, and dedicated to, the people of Canada for their continuing benefit, education and enjoyment. The Historic Sites Division is specifically concerned with the commemoration of events and people and the preservation of buildings which played an integral part in Canada's growth.

The <u>Canadian Wildlife Service</u>, under the authority of the Game Export Act and the Migratory Birds Convention Act, conducts research on Canadian fauna, and maintains liaison with international, national, provincial and private agencies and organizations which deal with wildlife.

The Northern Science Research Group conducted and co-ordinated research on northern subjects, encouraged research by non-governmental agencies, collected and disseminated technical and scientific information on the north, and operated the Inuvik Research Laboratory. These functions will continue to be performed within the new Community Affairs Branch.

With regard to the emphasis on research in each of these organizational components, it will be evident from this report that the Canadian Wildlife Service and the National and Historic Parks Branch have shown a strong research orientation, being the two departmental units with administrative responsibilities in which research played a major role. For this reason, the submissions of the Parks Branch and the Wildlife Service make up the major volume of this brief. At the same time, the Resource and Economic Development Group and the Northern Science Research Group also conducted substantial amounts of research, primarily in the social sciences, while the Indian Affairs Branch and the Northern Administration Branch conducted little research themselves but arranged

....3

for some research to be conducted under contract.

Since research activities within the department covered such diverse fields as wildlife and education, it was felt that presentation of the reports of individual organizational components would present the most accurate picture of the role of scientific research throughout the department. Data which have been tabulated for the department as a whole pertain to scientific personnel; the appropriate tables follow this introduction.

This brief was prepared during the period of reorganization, and this made the task substantially more difficult. Hopefully, nonetheless, the information presented will meet the needs of the Senate's Special Committee on Science Policy.

> J.A. MacDonald, Deputy Minister.

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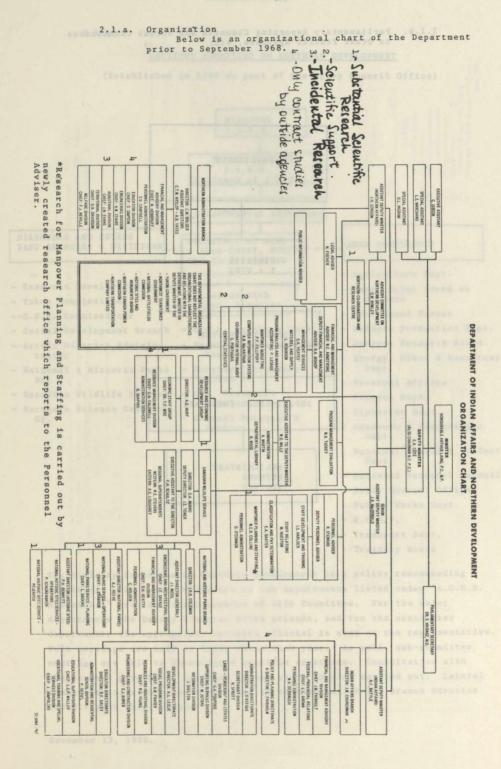
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2.1 Departmental Organization

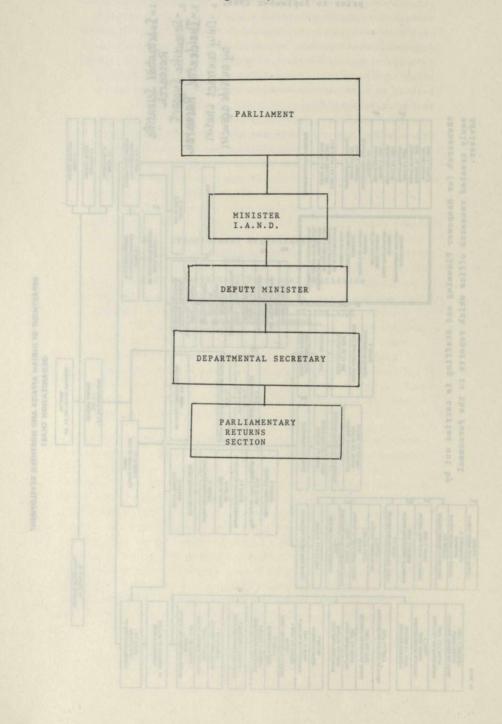
and

2.5 Departmental Personnel Statistics

(Personnel statistics for each Branch will be found at the end of the individual Branch submissions.)



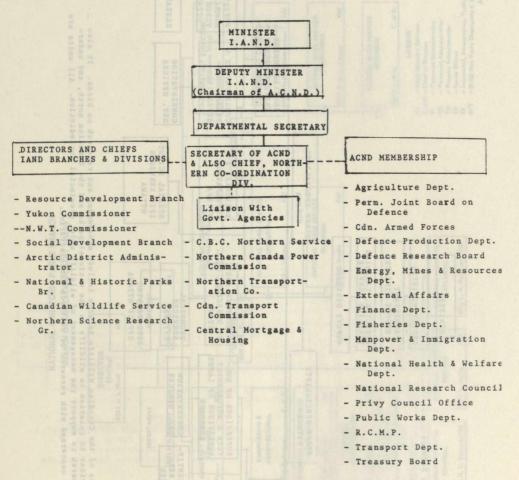
2.1.b. Parliamentary Reporting Channels and Formal Connections to Other Federal Agencies, etc.



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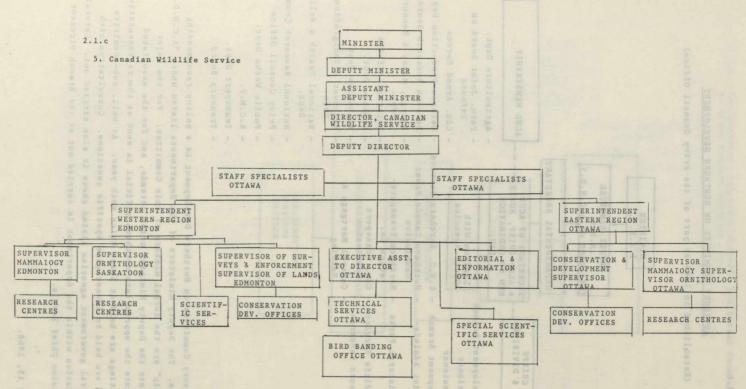
ADVISORY COMMITTEE ON NORTHERN DEVELOPMENT

(Established in 1948 as part of the Privy Council Office)



The Advisory Committee on Northern Development is a policy recommending committee. The Deputy Ministers of the departments listed under "A.C.N.D. Membership" are the formal members of this Committee. For the major departments the Deputy Minister often attends, and for the associated departments the appropriate northern official is sent as the representative. Full meetings are held at least twice each year. As well, sub-committee meetings are held to investigate specific questions. Consultation with the several government agencies listed above is also carried out. Lateral communication within the department is carried out at the Branch Director and Division Chief levels.

November 15, 1968.



The responsibilities of the Canadian Wildlife Service include management and research on birds. It also supplies advisory services in relation to wildlife in the national parks and the Canadian north, and undertakes fundamental research to support the management of wildlife under provincial jurisdiction. All units are directly or indirectly concerned with research or research administration.

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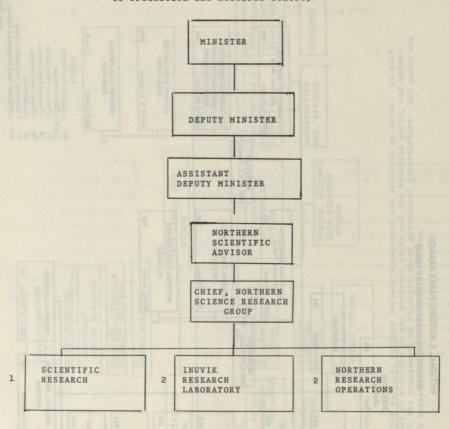
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NATIONAL & HISTORIC PARKS BRANCH **BRANCH ORGANIZATION CHART 1968-69**

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Northern Science Research Group (formerly Northern Co-ordination and Research Centre)



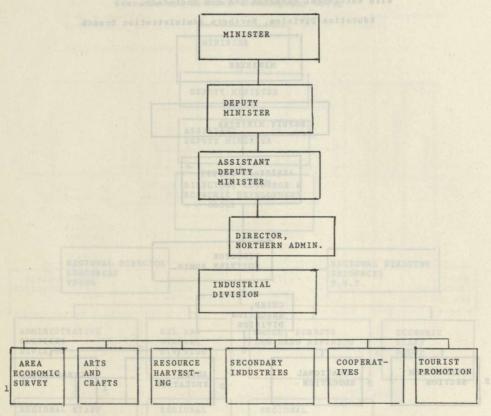
The Northern Science Research Group conducts and coordinates research on Arctic and sub-Arctic areas. It has formal and informal ties with the other branches in the Department, with other Departments, and with Universities and private institutions throughout Canada.

1. - Substantial Scientific Research

2. - Scientific Support

2.1.c Block Disgrams of Units Masponsible for Sciencific 3.1.5

Industrial Division, Northern Administration Branch

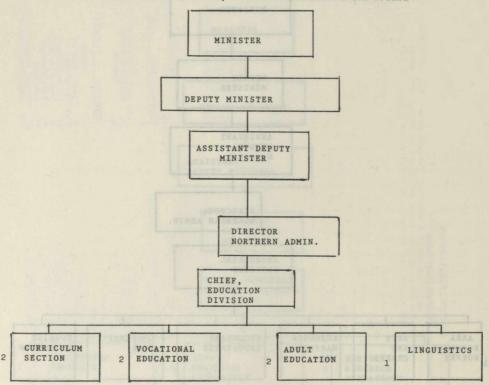


Area Economic Surveys section is responsible for doing research in economic geography in all northern regions.

1. - Incidental Research

2.1.c Block Diagrams of Units Responsible for Scientific Activities (Support services and units solely concerned with extramural research are not included).

Education Division, Northern Administration Branch

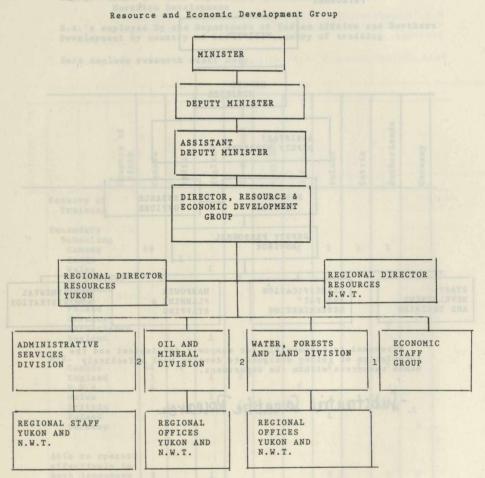


Section heads employ a specialist staff to design programs and collect information basic to program design and implementation. Their responsibilities are dual in nature, and include research and applied skills.

1. - Incidental Research

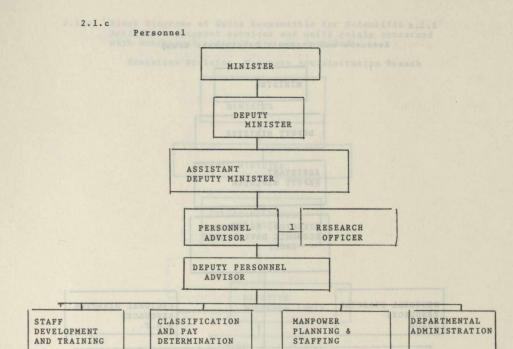
2. - Only contract studies by outside agencies

2.1.0



The Resource and Economic Development Group is responsible for management of northern renewable resources and for fostering the economic development of the north.

- 1. Substantial Scientific Research
- 2. Only contract studies by outside agencies



Personnel is responsible for manpower development and the formulation of policy designed to develop most effectively human resources within the department.

1. Substantial Scientific Research

2.5.c. CHART I - B.A. Department of Indian Affairs and Northern Development

B.A.'s employed by the Department of Indian Affairs and Northern Development by country of birth and country of training

Country of	Canada	India	England	N. Ireland	Scotland	U.S.A.	Poland	Latvia	Nether lands	Cormony
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2.5.c CHART I - M.A. Indian Affairs and Northern Development

M.A.'s employed by the Department of Indian Affairs and Northern Development by country of birth and country of training.

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2.5.c. CHART I - Ph.D. Department of Indian Affairs and Northern Development

Ph.D.'s employed by the Department of Indian Affairs and Northern Development by country of birth and country of training.

Country of Training Secondary Schooling Canada 20 1 England U.S.A. 1 Netherlands India South Africa Ph.D. Canada 13 2 2 1 U.S.A. 5 Australia 2 Finland 1 England 1 England 1 England 1 Able to operate effectively in both languages 3 3	Ph. D.	100	a de Mil		ASK S S	
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	each division.		The last			

2.5.c CHART II IAND

Average number of working years since graduation and average number of years employed in present organization of B.A.'s, M.A.'s, and Ph.D.'s employed by the Department of Indian Affairs and Northern Development, by age group.

			Age
	200	17 12 10 10 6 7 7 2	No. of individuals in age group
		2.07 4.05 7.42 9.90 13.16 13.71 23.66 15.15	Average no. of working years since graduation
	n n	1.78 1.83 3.71 5.45 5.66 3.90 12.00 10.15	Average no. of years employed in present organization
		222 117 15 7	No. of individuals in age group
		1.33 2.55 6.05 7.43 12.71 17.43 18.50 31.00	Average no. of working.
		1.33 2.28 2.88 2.88 3.73 11.57 10.28 11.00 14.00	Average no. of years employed in present organization
		2200141	No. of individuals in age group
		2.60 4.50 4.22 6.22 13.00 16.00	Average no. of working, years since graduation
	THE RESERVE	0803226	Average no. of years employed in present organization

2.5.f

Percentages of research scientists employed by the Department of Indian Affairs and Northern Development previously employed by private industry, universities, provincial agencies, and other federal agencies.

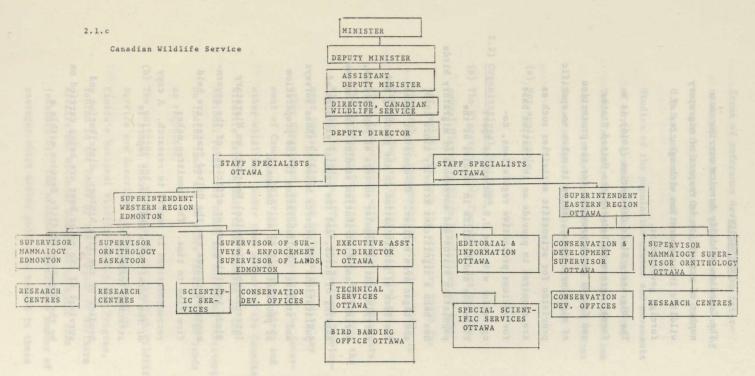
Percent
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Personnel Adviser (1)	0	0	100.0	0	
Financial and Management Adviser (7)	80.0	0	0	50.0	
Indian Affairs (5)	33.3	0	0	66.6	
Library (5)	0	66.6	0	66.6	
Resource and Econ- omic Dev. (9)	33.3	33.3	22.2	55.5	
Canadian Wildlife Service (98)	7.8	18.6	35.2	8.8	
Parks and Historic Sites (37)	10.8	21.6	16.2	13.8	1111
Northern Science Research Group (10)	10.0	30.0	20.0	30.0	100
Northern Administration (3)	66.6	66.6	66.6	66.6	
Total for Department*	14%	22%	27%	19%	

^{*}Department percentages calculated by summing weighted Branch percentages.

Numbers in parentheses indicate number of individuals in each division.

BRIEF TO SENATE COMMITTEE ON SCIENCE POLICY SENATE COMMITTEE ON SCIENCE POLICY
Department of Indian Affairs and Northern Development Canadian Wildlife Service December 1968



The responsibilities of the Canadian Wildlife Service include management and research on birds. It also supplies advisory services in relation to wildlife in the national parks and the Canadian north, and undertakes fundamental research to support the management of wildlife under provincial jurisdiction. All units are directly or indirectly concerned with research or research administration.

INTRODUCTION

The Canadian Wildlife Service carries on a number of activities in respect of migratory wildlife in co-operation with agencies of foreign governments.

The Migratory Birds Convention (1916) is a formal agreement between the United States and Canada which provides for the protection of migratory birds. While it makes no specific provision for scientific activities such as are required to provide an information base for various protective regulations, cooperation with the U.S. Bureau of Sport Fisheries and Wildlife in studies of the population status and movements of migratory birds has been a significant activity since 1949, and began even earlier. Co-operation takes the form of participation in the planning and carrying out of regular surveys of populations, mortality and distribution studies based on the banding of birds, and the regular exchange of publications and reports based on those surveys and studies. Collaboration in the preparation of publications is not uncommon.

International Technical Meetings on Migratory
Birds involving senior officials of the governments of Canada and the United States are held
from time to time. The Committee makes
recommendations in regard to research. A copy
of the Committee's most recent report is
attached (exhibit B).

Studies of the life history, distribution and survival of the polar bear are being carried on by the Canadian Wildlife Service within a frame of reference developed by an international committee on polar bears made up of
representatives of Canada, United States,
U.S.S.R., Denmark and Norway.

Studies of the population status and movements of barren-ground caribou in Alaska and the Yukon Territory have been undertaken from time to time in co-operation with the United States Bureau of Sport Fisheries and Wildlife.

(e) Not applicable:

2.2) Organizational functions

- (a) The Migratory Birds Convention Act and the annual Migratory Birds Regulations of that Act (exhibit C) form the statutory basis for research and management of migratory birds in Canada. Such activities are carried out in close co-operation with provincial governments. The Government Organization Act, 1966 gives the Minister of Indian Affairs and Northern Development jurisdiction, not by law assigned to any other department, branch or agency of the Goverment of Canada, relating to migratory birds and other wildlife. Under that authority the Canadian Wildlife Service undertakes studies in the National Parks, the Yukon and Northwest Territories, on Indian lands and on other federal Crown lands as requested.
 - (b) The policies and programs of the Canadian Wildlife Service are described in the statement on Canada's National Wildlife Policy and Program, tabled in the House by the Minister of Northern Affairs and National Resources in April 1966 (exhibit D). The statement contains a number of passages which define policy in regard to those

branches of science that contribute to an understanding of wildlife and wildlife habitat, in short - the Canadian environment.

A general statement of policy is that the

Canadian Wildlife Service will support and
undertake fundamental research in support of
wildlife management throughout Canada. Priority
is given to research on migratory birds and
their habitat, on wildlife in National Parks,
and on wildlife in the Territories, those being
areas for which there is a statutory federal
responsibility.

Specifically defined researches on wildlife in the provinces is undertaken on request and by agreement.

Certain general areas of research are occupied by the Canadian Wildlife Service as a contribution to the interests of all jurisdictions. These include studies of the relationships between wildlife and forests, the health of wildlife populations, and the effects of pesticide-use programs on wildlife populations.

A scholarship program and a directed program of extramural research (related to the Service's responsibilities) support the professional training of biologists.

- (c) The Canadian Wildlife Service discharges all foderal responsibilities in regard to wildlife, except for management of wildlife in the National Parks. Those federal responsibilities include:
 - research on and management of birds
 referred to in the Migratory Birds
 Convention Act with the United States

- research on and provision of advisory
 services in relation to wildlife
 - in the National Parks
 - in the Northwest and Yukon Territories
 - in Indian Reserves
 - on other federal lands, e.g., airports

The Canadian Wildlife Service supports the management of wildlife under provincial jurisdiction

- by undertaking fundamental research
 - by co-operating in management activities with the provinces on request and by agreement
- by providing information about wildlife to the public
 - by developing and operating wildlife interpretive centres

The primary objective of the Canadian Wildlife
Service is to ensure the preservation and wise
use of wildlife resources under federal
jurisdiction and to support the provinces
and Territories in their efforts to achieve
the same objective in respect of wildlife
under their jurisdiction. Secondary
objectives, met in part through research
programs, are noted under appropriate headings
below.

Migratory Birds

- to ensure the maintenance of migratory
bird populations at levels in harmony
with man's interests

Wildlife Research

- to provide the information and advice needed in support of wildlife management in National Parks, Indian Reserves,

Territories and Provinces

Pesticides

- to determine the effects of pesticide-use programs on wildlife populations; to recommend changes in the use of pesticides so as to favour the survival of wildlife; and to promote an awareness of the unity of biological communities and of the possible consequences of the uses of pesticides

Pathology

- to assess the occurrence and significance
of diseases and parasites affecting Canadian
wildlife populations; and to recommend
methods to combat and alleviate the effects
of outbreaks of pathological conditions

Limnology

- to provide the information and advice needed for the management of National Parks' waters and fisheries so as to maintain adequate stocks of fish under natural conditions; and to control nuisance aquatic organisms
- i) Relationships that have developed with other federal agencies in carrying out the functions and responsibilities noted above include the following:
 - (a) Steering Committee on Ecological Studies in the National Parks formed to assist in the identification and conservation of ecosystems in the various parks;
 - (b) Interdepartmental Committee on Forest Wildlife formed to further studies of problems of common interest to the Department of Forestry and Rural Development and the Branch;

- (c) Federal Interdepartmental Committee on
 Pesticides, organized to further the coordination of federal government use
 of pesticides in a manner least harmful
 to the environment;
 - (d) National Research Council Advisory Committee
 on Bird Strikes formed to develop methods
 of reducing bird impacts on aircraft.

At present 14 of the Branch staff are seconded to ARDA to provide a wildlife input in the Canada Land Inventory, one senior biologist is on loan to the External Aid Office, and one to the Science Secretariat.

ii) Relationships with industry are limited but growing, and arise mainly in relation to problems of environmental contamination.

Section 51 of the Migratory Birds Convention
Act and Regulations prohibits the contamination
of waters frequented by migratory birds by
substances injurious to the birds. This
provision has brought the Service in contact
with various oil, mining and food processing
companies that have from time to time been
offenders in this respect.

There have been some contacts with chemical companies in regard to the use and characteristics of pesticides and herbicides. Some companies have supplied products for test.

There are occasional contacts with travel agencies, mainly to explain and publicize aspects of the Migratory Birds Regulations that affect tourist hunters.

There have been contacts with ammunition and metallurgical companies in connection with the development of a non-toxic shot for shotgun shells.

- iii) The Canadian Wildlife Service has developed a close relationship with a number of universities that offer courses in wildlife research, ecology, and related subjects. In respect of those universities, to varying degrees, Canadian Wildlife Service and university staff are in frequent contact on such subjects as employment of students, selection of permanent employees, contracts, and matters of mutual professional interest. Canadian Wildlife Service staff from time to time lecture or participate in seminars at universities. At present, Canadian Wildlife Service offices and laboratories are "on campus" at the University of British Columbia, the University of Saskatchewan, and the University of Ottawa, and are close to the Universities of Alberta, Laval, Mount Allison and Memorial. Close working relationships are maintained with the Universitities of Guelph, Western Ontario and Calgary.
 - iv) The Canadian Wildlife Service keeps in touch with related scientific activities in other countries by a continuous review of serial literature from all over the world and by attendance at various international conferences. Members of Canadian Wildlife Service staff are on committees of various international organizations. The degree of participation in

international activities varies to some
extent in accordance with budgetary strictures.

Relationships with United States - based organizations are particularly close.

Attendance at meetings with those organizations is usually about as follows:

International Migratory Bird Committee - once a year

North American Wildlife Conference - once a year

Northeast Fish and Wildlife Conference - once a year

Northeast Fisheries Society - once a year

Alaskan Science Conference - once a year

Atlantic and Mississippi Flyway Councils

Meetings - once a year

International Association of State Fish and

Game Commissioners - once a year

plus a number of professional organizations
such as the American Society of Mammalogists,
American Ornithologists Union, etc.

(f) The Canadian Wildlife Service's activities and programs conform closely to the policies set forth in the statement of National Wildlife Policy. That statement of policy elaborates and defines the statutory responsibilities conveyed by the Migratory Birds Convention Act and the Government Organization Act (1966). Most activities have not yet reached the level required to make reasonable progress toward objectives.

This is perhaps the appropriate place to comment on a significant gap in the government's research activities. There is no clearly specified place in the government's present organization for the conduct of research on the ecology of natural Canadian environments. This is not surprising since ecology as a recognized discipline is less than 50 years old. By its very nature, concerning itself as it does with interrelationships among living forms (including man) and between living forms and their physical environment, it is a science of synthesis and integration, difficult to fit into the compartmentalized structure of governments. It is the science that has come to form the basis for the art of wildlife management, indeed, for resource management generally, although unfortunately many other resources are still studied and managed as though they were independent entities.

Studies of the ecology of Canada's environments are important. Degradation by pollution, erosion, and impoverishment of large sectors of the

convironment in which Canadians live and work is likely
to continue until the interdependence of elements of
the living environment is better and more widely understood and the primacy of the public interest in
environmental quality recognized in word and deed.

Degradation of the environment is largely a consequence of the continuing industrial revolution and may be one of the little known but important factors contributing to the puzzling social disorders associated with affluence

The Canadian Wildlife Service, with its professional staff qualified, experienced and interested in ecology would be the reasonable niche for the development of this sort of work

inherent difficulties. Basic data have to be obtained in a variety of environments, many being difficult of access and presenting logistic and operational problems. Many of the phenomena to be studied are seasonal. It may, for example, take five years to obtain a statistically acceptable sample of reproductive measurements. Much of the work is subject to delays and inconveniences resulting from adverse weather. Difficulties are presented by the need to deal with wild animals under uncontrolled conditions. None of these difficulties can be eliminated, but they are worth mentioning so that the pace of accomplishment in ecology can be appreciated.

The responsibilities are broad and the pace of accomplishment is necessarily slow. Provision of additional staff and funds would accelerate progress. Obtaining additional staff is not merely a matter of having the authority to hire: trained wildlife biologists and ecologists are at a premium. It will be necessary to stimulate people to enter the field by providing clear evidence that a reasonable number of employment opportunities will become available.

Perhaps the basic impediment to progress is insufficient public understanding of the significance of ecological research, and, therefore, limited public support for its expansion and intensification. However, there are obvious signs that the public is becoming more aware of the significance of ecological relationships.

Some difficulties arise from the fact that a number of agencies of both the Federal and Provincial Governments have jurisdiction over or varying degrees of interest in the many components of the environment. There is as a consequence both duplication of effort and complete neglect of important areas arising from imperfect understanding of responsibilities and incomplete co-ordination of activities. It seems ûnlikely that this problem can ever be completely resolved at the intergovernmental level, although it could be eased by the establishment of a body to co-ordinate planning and action. Perhaps the Canadian Council of Resource Ministers could meet that need. But before it can be met in any useful way, each individual government must ensure that it is internally organized to provide for proper coordination. Present arrangements in the Federal Government are far from perfect, with co-ordination between Departments largely in the hands of a number of ad hoc committees representative of interests that seem to see themselves in competition with each other.

Finally, for the sake of completeness and without any undue optimism we might mention the seemingly inevitable and eternal impediments of hureaucracy. Failure to decentralize authority
to the degree necessary to overcome
interminable delays in management of funds
and particularly personnel is the root of
the problem.

(h) The National Wildlife Policy and Program is only partly implemented and additional staff and funds are required if the potential is to be realized.

A restructuring of the Branch is planned to achieve greater efficiency and effectiveness in meeting its responsibilities, paricularly those involving migratory birds. The increasing concern for environmental quality, and the essential role that the Branch has in meeting the problems arising, will be recognized in the Branch functions.

The first wildlife research centre of the Branch is in operation. The need for additional such centres is recognized and plans are underway for their construction and integration in the organization's functions.

2.3 Personnel Policies

(a) Contact in person and by correspondence is maintained with faculty members at Canadian and United States universities known to train students well qualified for work in the Canadian Wildlife Service. By this means promising students are identified. Often students of high potential are offered temporary employment or are indirectly employed through a contract with the university concerned, thus providing a further opportunity to evaluate their suitability and performance.

The University Recruiting Program of the Public Service Commission is also helpful, particularly in locating students at those universities where Canadian Wildlife Service contacts are less well developed. In the main, however, we are better able ourselves to evaluate potential employees by the means described above than are the Public Service Commission recruiting teams.

- (b) No, but the process described above assists the Branch materially in identifying good researchers.
 - (c) In many cases such people identify themselves.

 This is really just a matter of getting to know people, offering them a variety of challenges in planning, undertaking and reviewing research, and observing their performance. We do not particularly regard research administrators as a new breed, although there are too few good ones around, and of those, most seem not to have had any special training. The research administrator, as one who stimulates, co-ordinates and criticizes, is a key figure, and often a much-maligned one. But the work of good research administrators benefits individuals, organizations, science and the public.

The universities should be contributing to their training. Though personal attributes and characteristics dictate whether a man will be a good research administrator, all researchers could well be exposed at university to the principles of research administration.

(d) Research administrators and researchers are classified as research scientists or biologists, depending on the individual's qualifications. Research administrators are senior personnel, having achieved scientific distinction and are paid accordingly. Some researchers also have achieved the same level of distinction or exceeded it, and are paid larger salaries. The research scientists' salary schedule allows for such flexibility.

Promotion into the research administrator category is from the research scientist group. Promotion into senior levels of Branch program administration is generally from the research administrator category.

(e) The Department offers training programs of many kinds, designed to improve the knowledge and efficiency of its administrative staff.

Such training is offered through Departmental instruction, Public Service Commission courses, or at universities. Part or all expenses may be assumed by the Department.

2.4 Distribution of activities

(a)

	1963/64	64/65	65/66	66/67	67/68
Newfoundland	16,363	17,332	22,687	39,163	59,759
Nova Scotia	3,680	3,851	5,041	10,000	22,481
New Brunswick	38,816	40,617	53,165	75,590	181,811
Quebec	22,587	23,635	30,937	51,514	115,550
Ontario	573,523	600,347	785,805	1,820,659	1,608,007
Manitoba	9,704	10,154	13,291	23,270	34,741
Saskatchewan	83,054	87,013	113,894	238,255	656,294
Alberta	181,534	189,958	248,641	326,188	758,893
British Columbia	37,812	39,567	51,790	94,663	131,788
Yukon Territory	12,548	13,130	17,187	34,381	41,107
N.W.T.	41,488	42.,893	56,144	108,046	136,380
Totals	1,021,109	1,068,497	1,398,582	(2,812,729	3,749,811)

No records available provincially. Figures obtained by pro-rating totals based upon 66/67 and 67/68 ratios

Actual

Amounts represent province in which expenditures originated and $\underline{\text{not}}$ where eventually made.

- (b) Certain scientific activities by their very nature must be regionally oriented. The prairies of Canada produce 70 per cent of the continent's ducks, for example, and therefore the research on such species is concentrated in Saskatoon. Most geese are produced in the Northwest Territories and therefore studies of populations are conducted there. The Territories also harbour wildlife of direct importance to Indians and Eskimos, as well as containing species of special scientific interest. In other words, where information about the ecology and life history of animals is required it is essential that scientists go to those areas where the animals naturally occur. Each region of Canada contains species endemic to it and the selection of scientific studies therefore is done on a basis of scientific or management need and only on a regional basis if the species requiring study is sufficiently widespread to warrant such consideration. Laboratory study of animals, of course, does lend itself to regional considerations.
- (c), (d) & (e) These questions suggest that the scientific activities being considered are those which have a direct relation to regional economic development. Wildlife research does have such a relationship, but is indirect in nature and difficult to quantify.

2.5) Personnel associated with scientific activities

- a) Establishment 199/2 seasonal Vacancies - 24
- a) People on strength by category of personnel

Senior Officer	1
Chief of Division	1
Research Manager	3
Research Scientist	24
Biologist	59
Statistician	1
Administrative Services	4
Program Administration	7
Technical Officer	12
Technician	13
F.I.	1
Clerical and Regulatory	22
Secretarial, Stenographic and Typing	25
Storeman	1
Administrative Trainee	1

Staff on loan

23.20

14

Biologist 5 - External Aid Research Scientist 2 - Science Secretariat

Seconded to ARDA

(8 Biologists; 6 Technical Officers)

- b) Number of professional staff devoting most of their time to administrative duties 4
 - c) Professional staff associated with scientific activities by degree level, etc.

Degree								
level	i	ii	iii	iv	v	vi	70.4	
B.Sc. (Bishop)	Canada	Canada	Canada	1)2	23 -	bilingual	B.Sc) F.	
B.Sc. (Anderson)	Canada	Canada	Canada	1)42)2	37 -			
B.Sc.	Canada	Canada	Canada	2	25 -	bilingual		
B. Comm.	Canada	Canada	Canada	1)20	53-			
B.SA	Canada	Canada	Canada	1)9 2)1	39 -			

Degree Level	o) continu	ii	iii	iv	v	vi (8.5
B.A.	Canada	Canada	Canada	1)72)9	36 -	
B.S.A.	Canada	Canada	Canada	1) 4 1) 4	25 -	
B.A.	Canada	Canada	Canada	1) 18 2) 18	48 -	
B.S.A.	Canada	Canada	Canada	1)92)6	34 -	
B.Sc.	U.S.A.	U.S.A.	U.S.A.	1)82)3	30 -	
B.Sc.	Canada	Canada	Canada	1)18 2)2	49-	
B.Sc.	Canada The	Canada	Canada	1)3	25	
в.А.	Netherlands	Canada	Canada	1)11 2)8	39 ~	
B.Sc.	Canada	Canada	Canada	1)222)2	25 -	
B.A.	Canada	Canada	Canada	1)8 mos. 2)8 mos.	27-	
B.S.A.	Canada	Canada	Canada	1)10 2)2	45-	
B.A. (Hons)	Canada	Canada	Canada	1) 19 2) 20	51-	
B.A.	Canada	Canada	Canada	1)42)4	26	bilingual
B.Sc.	Germany	Germany	Germany	1)12 2)1	46-	bilingual
B.S.A.	Canada	Canada	Canada	1) 16 2) 15	40 -	
B.Sc.	Canada	Canada	Canada	1)92)1	34	
B.Sc.	Canada	Canada	U,S.A.	1)3 2)1	29 -	
B.A.	Canada	Canada The	Canada	1)42)4	33 -	
B.Sc.F.	Netherlands	Netherlands	Canada	1)14 2)10	44	bilingual
B.Sc.	England	England	England	1)20 2)1	43	
B.Sc. (Hons.)) Canada	Canada	Canada	1)52)2	30 -	bilingual
B.Sc.	Canada	Canada	Canada	1)222)1	24 -	
B.Sc.	Canada	Canada	U.S.A.	1)17 2)1	47-	
M.Sc.	England	Canada	U.S.A.	1)13 2)2	41 -	
M.A.	Canada	Canada	Canada	1) 13 2) 13	41 -	
M.Sc.	Canada	Canada	Canada	1)1 2)1	29 -	

Degree Level	V sei	ii H iii	iv v	vi lavel
M.Sc.	S.W. Afr	rica Canada Canada	1)1 27-2)1	
M.Sc.	Canada	Canada Canada	1) 3 29 - 2) 1	
M.A.	Canada	Canada U.S.A.	1) 14 39 - 2) 13	
M.Sc.	Canada	Canada Canada	1)2 29- 2)1	
M.Sc.	Germany	Canada Canada	1) 7 34 - 2) 6	
M.A.	Canada	Canada Canada	1)18 47 2)1	
M.S.A.	Canada	Canada Canada	1) 4mos 27 - 2) 4mos	
M.S.	England	Canada U.S.A.	1) 2 32 - 2) 3	
M.Sc.	Hungary	Hungary Canada	1) 3 36 2) 3	
M.Sc.	Canada	Canada U.S.A.	1) 17 41 - 2) 17	bilingual
M.S.	U.S.A.	U.S.A. U.S.A.	1)20 50- 2)7	
M.Sc.	U.S.A.	U.S.A. U.S.A.	1) 3 34 2) 3	
M.Sc.	U.S.A.	U.S.A. U.S.A.	1)11 34 2)2	
M.Sc.	Canada	Canada Canada	1) 3 27 2) 6	bilingual
M.Sc.	Canada	Canada Canada	1) 4 29 - 2) 3	
M.Sc.	Canada	Canada Canada	1)6 43 2)14	bilingual
M.Sc.	Canada	Canada Canada	1)2 25-2)2	
M.Sc.	England	England Canada	1)12 38	bilingual
M.S.	Canada	Canada U.S.A.	1)13 48 2)10	
M.Sc.	U.S.A.	Canada U.S.A.	1) 3 29 -	
M.S.A.	Canada	Canada Canada	1) 2 27	
M.Sc.	Canada	Canada U.S.A.	1) 15 47 - 2) 3	
M.F.	Hungary	Hungary Canada	1) 3 30 -	
			m Sie man	

Degree Level	i	ii	iii	iv v	vi taval
M.A.	Canada	Canada	Canada	1) 17 41 2) 17	
M.Sc.	Canada	Canada	Canada	1)1 25-2)1	
M.A.	U.S.A.	U.S.A.	U.S.A.	1)2 31 2)1	
M.Sc.	Canada	U.S.A.	U.S.A.	1) 5 39-	
M.Sc.	Canada	Canada	U.S.A.	1)12 41	
M.S.	Phillipine Islands	Phillipine Islands	U.S.A.	1): 34	
M.Sc.	Canada	Canada	Canada	1) 3 37-2) 3	bilingual
M.A.	Canada	Canada	Canada	1)18 55-	
M.Sc.	Canada	Canada	Canada	1) 17 47	
M.Sc.	U.S.A.	U.S.A.	U.S.A.	1)2 26-2)2	
M.A.	Canada	Canada	Canada	1)1 28-2)3	
M.Sc.	Canada	Canada	Canada	1)2 29 - 2)2	M.Sc.
M.A.	Canada	Canada	Canada	1) 19 52-2) 19	bilingual
M.Sc.	Canada	Canada	Canada	1) 3 31 2) 3	bilingual
M.Sc.	U.S.A.	U.S.A.	U.S.A.	1)2 27 - 2)2	
M.Sc.	U.S.A.	U.S.A.	U.S.A.	1) 15 40 -	
Ph.D.	England	England	England	1)6 33-2)1	bilingual
Ph.D.	U.S.A.	U.S.A.	Canada	1)1 43-	
Ph.D.	Canada	Canada	U.S.A.	1)6 31-	
Ph.D.	Canada	Canada	Canada	1)16 53 -	bilingual
Ph.D.	Canada	Canada	Canada	1)1 40-	
Ph.D.	Canada	Canada	Canada	1) 3 37 2) 2	bilingual
Ph.D.	U.S.A.	U.S.A.	Canada	1)1 38 - 2)2	
Ph.D.	Canada	Canada	Canada	1) 3 2) 19	

Degree level	i	ii	iii	iv	ν	vi
Ph.D.	Canada	Canada	Australia	1)222)20	43	
Ph.D.	Canada	Canada	Canada	1)12 2)20	45-	
Ph.D.	Canada	Canada	U.S.A.	1)82)9	39	
Ph.D.	England	Canada	Canada	1)222)11	36	bilingual
Ph.D.	Canada	Canada	Canada	1)52)17	42 -	
Ph.D.	Canada	Canada	Canada	1)3 2)12	42 -	
Ph.D.	Canada	Canada	Finland	1)6 2)6	30-	
Ph.D.	Canada	Canada	U.S.A.	1) few mos.		
Ph.D.	Canada	Canada	Canada	2)7 1)9 2)10	39	
Ph.D.	U.S.A.	U.S.A.	U.S.A.	1)1 2)1	29 -	
Ph.D.	Canada	Canada	Canada	1) 16 2) 13	52	bilingual
Ph.D.	Canada	Canada	Canada	1) 13 2) 15	49 -	
Ph.D.	Canada	Canada	Canada	1)3 2)9	37 -	
Ph.D.	Canada	Canada	Canada	1)8 2)19	43-	
Ph.D.	The Netherlands	The Netherlands	Canada	1)1 2)2	38 -	
Ph.D.	Canada	U.S.A.	U.S.A.	1)10 2)17	40 -	
Ph.D.	India	England	U.S.A.	1)16 2)7mos	51 -	
Ph.D.	Canada	Canada	Canada	1)3 2)19	57	
Ph.D.	Kenya	England	England	1)1 2)1	43 -	
Ph.D.	Canada	Canada	U.S.A.	1)22)3	31	

v - Average age - 37 years vi - percentage able to operate efficiently in Canada's two official languages - 13.3%

N.B. In the case of M.A. & Ph.D. holders, the year from graduation refers to the time since last degree was obtained.

	-	-	and the same of the same of							
d)	Degree	No.	1962	1	1963	1964	1965	1966	1967	1968
	B.A.		4		4	4	5	8	7	10
	B.S.A.		1		3	3	3	5	5	5
	B.Sc.		1		1	1	5	4	15	15
	D.V.M.		1		1	1	1	1	1	1
	M.A.		6		6	4	7	6	8	8
	M.S.		1		2	2	3	4	4 39	4
	M.Sc.		7		7	8	16	23	28	28
	Ph.D.		18		19	19	19	21	26	27
	M.S.A.						2	1	2	2
	M.F.							1	1	1
	B.Sc.F.								3 1 37	1
	B.Com.								1 pann	1

Total estimates for years 1969-73 = 89 man years

Percentage of turrover of professional staff in the three degree categories for each of the years 1962 to 1967

Our records are not sufficiently complete to provide the percentage of turnover, however, the numbers of personnel separating in the years 1962 to 1967, are shown below by degrees

				A STATE OF THE PARTY OF THE PAR			
	1962	1963	1964	1965	1966	1967	Dilli
Bachelor	no record	no record	1	2	1	1 1	
Master	no record	no record		25.2	2	1	
Doctorate	no record	no record	1	0	0	0	

f) Percentage of current professional personnel who since graduation

- i) have been employed by industry at one time 7.8%
- ii) have been on the staff of universities

 18.6%
- iii) provincial departments or agencies
 35.2%
 - iv) other federal agencies
 8.8%

g) Number of staff in each degree category on educational leave

B.Sc. - 1

h) Number of university students given summer employment in the field of scientific activities for the years 1962 to 1967

1962 - 6 1963 - 6 1964 - 8 1965 - 11 1966 - 16 1967 - 18

2.6 Expenditures associated with scientific activities

(a)		(\$	(# 000's)				
	1962/63	63/64	64/65	65/66	66/67	67/68	68/69 (est.)
Intramural Data Collection Scientific Information Support of Research	596 255 40	741 317 40 *	748 366 60 *	923 564 65 56	1,461 627 214 121	1,824 767 206 154	2,678 687 201 175
	980	1,098	1,174	1,608	2,423	2,951	3,741

*Separate data not available for these years. Included as part of intramural expenditures.

Capital 91 71 94 393 760 778 1,100

- (1) Intramural research and development includes wildlife research (mammalogy), migratory bird research, migratory bird damage, pathology, pesticides, limnology.
 - (2) <u>Data collection</u> includes migratory birds surveys and enforcement. Enforcement expenditures are negligible (largely salaries).
 - (3) Scientific information includes that portion of the information activity related to reports, monographs, plus a fraction (2/3?) of salaries.

All under (2) natural sciences, and (b)
biological sciences except for three contracts
for economic studies.

(16)Other

Other wildlife conservation, outdoor recreation, environmental quality.

(b)

Expenditures	-	Operation	and	Maintenance
		(NOC	0/5)

	("					
	1966-67	1967-68	1968-69			
Administration	639	767	734			
Migratory Birds	561	1,089	1,851			
Mammals	433	589	601			
Pesticides	48	159	192			
Pathology	102	58	80			
Limnology	65	93	101			
Interpretation		20	78			
Information	214	206	201			
	2,062	2,981	3,838			
		A STATE OF THE PARTY OF THE PAR				

Expenditures - Capital

	1966-67	1967-68	1968-69
Administration	91	44	41
Migratory Birds	612	636	594
Mammals	35	56	42
Pesticides	3	4	2
Pathology	3	2	6
Limnology	16	19	1.0
Interpretation		17	405
Information	rang - Long	an property	
	760	778	1,100
			-

2.7 Research Policies

- (a) (1) To answer this question it is necessary to distinguish between (a) activities that the Service carries on in the discharge of those responsibilities that fall exclusively within its purview, (i.e., all activities in support of migratory bird management), and (b) activities that are undertaken as a service to other units and agencies (e.g., research in support of wildlife management in the National Parks and Territories).
 - (a) Broad guidelines and priorities are set by the Directorate to govern the definition and selection of specific projects, which usually are the product of consultation between researchers and their immediate supervisors. Occasionally a specific project is assigned by the Directorate, but whether it is assigned by the Directorate or developed at the field level in response to the general statement of guidelines and priorities, the individual researcher has the responsibility for detailed project planning. It has been our policy to see that all researchers are aware of and appreciate broad guidelines and priorities, and as a result most projects are initiated by the researchers themselves. It is considered that better work is accomplished if the individual researchers feel that they have played a major role in project selection and development.

The Service has a project planning and reviewing routine which requires that projects be justified and described in terms of objectives. operational plans, dollar and personnel costs before they are begun. Project proposals as well as annual progress and completion reports are reviewed and approved by supervisors. The level at which new projects are approved depends upon the extent to which the project appears to conform with broad guidelines and priorities and is a matter for the judgment of the supervisors. Directorate staff specialists in each discipline review programs and projects on a more or less continuous basis. The project reporting routine is tied in with the preparation of estimates and procedures for personnel evaluation and salary recommendations.

(b) The same system of project control is employed in respect of projects that are undertaken primarily as a service to other units and agencies, but project selection and initiation is influenced to varying degrees by the client unit. In most cases, the client outlines the management problem and the Service defines the research required to contribute to its solution.

In the National Parks and Territories, where the Service's association with the management agencies is of long standing, Service researchers often anticipate or detect problems and recommend research projects required for their solution.

(2) Priorities in research are established by

judgment and are affected by recommendations
at succeeding levels upward in the

organization. Judgments are influenced

primarily by short- and long-term operational
requirements, and the availability of funds
and personnel.

Priorities are implemented by direction to those concerned and, of course, by the allocation of funds and personnel.

- (3) Because most Canadian Wildlife Service research projects employ only a few people, network methods have not been used in their planning and undertaking. Simple network methods have been used in connection with the gathering of data on migratory bird harvest and the assembly of information required for the establishment of migratory bird hunting regulations. Along somewhat similar lines we have recently contracted for a study of the feasibility of developing a mathematical model of the interactions between migratory bird populations, habitat and hunters having in mind the possibility of using simulation techniques to evaluate various alternative research and management strategies.
 - (4) All Canadian Wildlife Service research programs have a component of projects contracted out, and the amount of contracts has increased substantially in recent years. Details of contracts let for the years 1965-66 to 1967-68 are given in Exhibit E.

These include projects which stand by themselves (e.g., studies of Arctic-nesting
geese - Dr. C. MacInnis, University of
Western Ontario), and those which should
be termed research support services (e.g.,
analysis of pesticide residues - Dr. D.J. Ecobichon,
University of Guelph.)

(5) Extramural research supported at universities

(Canadian Wildlife Service does not support research in industry) by the Canadian

Wildlife Service has a dual objective:

to get needed work done and to facilitate the training of graduate students by providing opportunities that would not otherwise be available for part-time or term employment in wildlife research.

The Canadian Wildlife Service has awarded

16 scholarships a year the past two years,
a modest increase from the initial awards of
a few years ago. The awards are based on
academic excellence, relevancy of research
to the work of the Service and referee
recommendations. The amount of the award is
\$1,200 and is given to the student, not
to his university.

- (6) This is really just another way of asking question 2.7 (a) 2) above and the answer is the same.
- (7) By the transmission of reports, memoranda and publications and by personal contact.
- (b) Not applicable.

2.8 Research Output

- (1) Not applicable.
 - (2) Books or journal articles arising from research activities are listed in Exhibit F.
- in Exhibit G.
- (4) Frequent conferences are held or attended to transfer information, such as the Federal-Provincial. Wildlife Conference, meetings of the Administrative Committee for Caribou Preservation, the National Committee on Wildlife Lands, several interdepartmental committees, and a number of international conferences and meetings.
- (5) We don't assume any particular responsibility for this function. We recognize its potential value but haven't the resources to undertake it.

 On an ad hoc basis, data are sent to scientists working in related fields in other countries, particularly the United States.
 - (6) There has been very little turn-over. Drs.

 W.A. Fuller, G. Moisan, L. Lemieux, are
 examples in the category cited above.

 Dr. Fuller is Professor of Zoology, University
 of Alberta; Dr. Moisan, Professor of Biology,
 Laval University, and F.A.O. adviser in the
 Cameroun; Dr. Lemieux, former Director of
 Fish and Game and former Director, Quebec
 Provincial Parks, and now Canadian External
 Aid adviser to Tanzanian Government.
 - (7) Research teams have developed in response to the need to solve major wildlife problems and include those engaged in barren-ground caribou research, studies of the ecology of western National Parks, prairie migratory birds and wildlife pathology.

- (8) The most significant facility is the construction of the Prairie Migratory Bird Research Centre, established on the campus of the University of Saskatchewan, Saskatoon, and officially opened June 1967. Apart from the significant contributions made to new knowledge, valuable processes in pathology and in aging, tagging and surveying animal populations have been developed. New statistical techniques have been developed to gather and better interpret wildlife parameters.
- (9) The Canadian Wildlife Service scientific activities contribute primarily to the enhancement of opportunities for outdoor recreation and to scientific knowledge. They have some impact on economic activity but it would be certainly difficult to measure.

Contributions to scientific knowledge have been primarily with respect to the life histories and ecological relationships of vertebrate animals. These have been substantial, and are internationally recognized, particularly with respect to a number of Arctic mammals and some species of ducks, geese and sea-birds. Citations of Canadian Wildlife Service publications in the publications of ecological theorists doing works of synthesis in the field bear this out.

In respect of outdoor recreation, it may be said
that most Canadian Wildlife Service research
is directly in support of managing some of the
resources upon which outdoor recreation is
based, and that all support it at least indirectly. The maintenance of huntable populations

of migratory game birds, of populations of large mammals in National Parks of a size that they are in harmony with their environment, and of optimum populations of wildlife in the Territories all depend on the information resulting from Canadian Wildlife Service researches. All those conditions have a demonstrable though at the moment immeasurable economic aspect. Hunting. garage fishing and tourism in National Parks generate economic activity, but the precise extent to which it can be attributed to supporting research cannot be quantified. Wildlife in the Territories has additional social and economic value related to the dependence of some of the inhabitants of the Apparent stand and Territories on wild meat and fur. Again the relationship with supporting research behivers cannot be quantified.

(10) Dr. L.M. Tuck was awarded the Terrestrial
Wildlife Publication award of the Wildlife
Society for his monograph, "The Murres". He also
received a honourary doctorate from Memorial
Univeristy. Thirteen regular Ph.D.'s have
been awarded our professional staff and a
a number of others have received their
Master's degree. Dr. L.P.E. Choquette was
awarded the St. Eloi Medal of the College of
Veterinary Surgeons of the Province of Quebec
in recognition of his scientific contribution.
Several staff have been made Fellows of
professional and scientific organizations.

2.9 (1) The publication "Canadian Wildlife Service '66"
documents by discipline the projects undertaken between
1962 and 1966 inclusive. A copy of the publication
is attached in exhibit H. There were a few changes
in 1967, the most significant being the Wetlands
Easement Program which became operational.

(2) Ornithology

(1) Program - Breeding Ecology, Taxonomy, Population Dynamics of Arctic Nesting Geese. This program began in 1952 and is continuing. It consisted of studies of the greater snow goose*, lesser snow goose*, blue goose*, Ross' goose*, white-fronted goose, Atlantic*, brant, black brant* and two races of Canada geese. This is a co-ordinated program which for each species listed above has moved from basic to applied to developmental research. For all species listed, the basic research has nearly been completed. The hard core of the 11 man team who attacked this problem was provided by three Canadian Wildlife Service Scientists and by five contractural scientists. A total of 8 Ph.D. theses will have resulted by 1969-70, as well as 80 publications. Major contributions in basic research have been in the areas of population genetics, mortality tables, environmental control of reproductive success, physiology of migration, nutrition. Applied Research - The main contributions have been in Development of Mass Capture Techniques which have resulted in nearly 200,000 birds being captured and banded, method of forecasting reproductive success in advance of hunting season. Development -Areas essential to the survival of the 6.5 million geese involved have been set aside as Federal Migratory Bird Sanctuaries. Indians have been encouraged to open tourist hunting camps in areas

^{* =} completed

where goose populations were underharvested,
because of basic research it has been possible
to set larvest regulations which have resulted
in the doubling of numbers of Ross', greater
snow and one population of white fronted geese.

The techniques developed in banding, censusing and forecasting have now been applied in Alaska Siberia, European Russia and Iceland.

	Basic	Applied	Development
DIGC			and recting are
L. Snow	*		Land Acquire
G. Snow	1813 ****		
Ross'	acr *	9-7-	THE WATER AND ADD
Canada	cneus or		
B. Brant	HU. *, 203	*	
A. Brant	* 10	*	

*Major portion completed

(ii) Whooping Crane - Basic Reseach in Conjuntion with the United States Bureau of Sports Fisheries and Wildlife - Life History, Nutrition, Artificial Propogation, teratological effects of varying amounts of heat and oxygen applied to incubating eggs, disease.

Attempts are being made to create a captive flock of this rare and endangered species. Seventeen birds are now in captivity as a result of injury and 10 survivors of eggs taken from Wood Buffalo Park.

Total world population in 1964 - 46, 1965 - 48, 1966 - 51, 1967 - 55, 1968 - 65. One major publication has resulted from this primarily operational project. Eventually it is hoped to release 100 birds per year into the wild.

(iii) Basic Research Mortality and Distribution of
Mallard Ducklings, Kindersley Area, Saskatchewan.

This fundamental study was concluded in 1966 and
showed clearly the relationship between mortality
and phenology of nesting. It was also shown that
upon fledging ducklings made migrations northwest
for distances of 350-500 miles. This has had an
important bearing on regulations relating to the
harvest of mallards in western Canada.

Land Acquisitions and Easements

(i) The Last Mountain Lake National Wildlife Area in Saskatchewan is located about half way between the cities of Regina and Saskatoon. It covers 20,800 acres and extends around the northern portion of Last Mountain Lake. Development and management of the wildlife area is a joint undertaking by the Canadian Wildlife Service and the Province of Saskatchewan. Over 13,000 acres of farmland and marsh have been purchased by the Wildlife Service and 7,000 acres of Crown lands have been contributed by the provincial government. A resident manager, employed by the Canadian Wildlife Service, is now preparing a long-term plan for multiple use of the area which will include sanctuary and feeding areas for migratory birds, public access and hunting areas, and controlled grazing of renewed pasture lands. (ii) The Kootenay River Flats, near Creston, British Columbia, is the most important area for waterfowl between the Alberta boundary and coastal British Columbia. A co-operative program to protect and manage the flats for wildlife has been initiated by the Canadian Wildlife Service and the British Columbia Game Branch. Of the 15,000 acres involved, 12,000 acres belonging to the provincial Crown have been set

aside for wildlife and 3,000 acres, within Indian reservations, have been secured by a long-term lease. A resident manager, employed jointly by the co-operating agencies, is now preparing long-term development and management plans for the wildlife area. (iii) The Sand Pond National Wildlife Area in Yarmouth County of Nova Scotia consists of fresh water marshes, lowland bogs and upland meadows. Located within a few miles of large coastal marshes the area provides an important alternate feeding and resting area for migratory waterfowl. In addition, the area supports good populations of woodcock, deer and upland game. Of the 1,300 acres included in the wildlife area, 237 acres of provincial Crown land were transferred to the Department of Indian Affairs and Northern Development and 1,263 acres were purchased by the Canadian Wildlife Service. In co-operation with the Nova Scotia Department of Lands and Forests, a development and management plan is being prepared.

The study of some of these populations has been completed and the information obtained the information obtained the information obtained the information of the Northwest fertitories for their action on the salvhe fertitories for their action on the management of the information obtained in the salvhe was used for a doctoral thesis which successfully presented.

Successfully presented.

(iii) Muskozen of the Northwest Territories and anique, long protected from hunting and located anique, long protected from hunting and located anique, long protected from hunting and located

the life-mistory of the animal and finally to distribute the population dynamics and status of the snimal throughout the Arctic. Both major studies have been completed and have resulted in the production of a dectoral thesis, numerous

Mammalogy Mammalogy

Completed projects were largely centred on specific animals which are either unique or have created problems in management. It is our role to provide the best information, based on research, to management agencies we advise. Significant projects are listed below:

- (i) Although we expect to be doing short-term investigations on particular problems arising from over-populations of elk in the Western National Parks the basic research necessary to understand the animal and its response to its environment is complete. The results have been published thus far in the form of a doctoral thesis.
- (ii) The white fox is an important fur-bearer, particularly in the Northwest Territories. The Northwest Territories Government has been concerned for some time about developing the best methods possible for the utilization of white fox populations. The study of some of these populations has been completed and the information obtained presented to the Government of the Northwest Territories for their action on the management proposals. The information obtained in the study was used for a doctoral thesis which was successfully presented.
 - (iii) Muskoxen of the Northwest Territories are unique, long protected from hunting and located in isolated areas. Initially the study of muskox was carried out to learn as much as possible about the life-history of the animal and finally to determine the population dynamics and status of the animal throughout the Arctic. Both major studies have been completed and have resulted in the production of a doctoral thesis, numerous publications and a monograph of high quality.

Information on the management of muskox populations has been presented to the Northwest Territories

Government in the form of management recommendations.

(iv) A long-term research and management study of the bison in Wood Buffalo National Park has been completed.

The research has been directed toward a study of population dynamics of the free roaming hybrid population and salvaging from the Park the extremely rare wood bison. Management studies have involved disease control.

The end result has been:

- (a) Population statistics for the bison in Wood

 Buffalo National Park have been established

 on an annual basis.
 - (b) The wood bison has been transplanted as
 disease-free stock into other areas
 within its former range.
 - eradication of named diseases in the bison of Wood Buffalo Park has been developed and approved.

The Canadian Wildlife Service will continue to advise the National and Historic Parks Branch as the management proposals obtained from our research are followed through. Numerous papers and reports have been published on our bison studies.

Limnology to the same of the s

Research is carried out on basic limnology, on fish ecology and on fishery management in order to advise the authorities with respect to the management of National Parks waters.

Completed phases of some projects have been submitted

in the form of manuscript reports or published in scientific journals. Significant projects are:

(i) Limnology of Alpine lakes The management of high mountain lakes for game fish production presents numerous problems on species selection, and intensity of stocking programs. Data on primary production are essential to the development of a sound policy.

Reports have been submitted on the limnology of numerous lakes in Yoho, Banff and Jasper National Parks. Investigations include water quality, lake morphology and animal community composition, particularly of zooplankton.

- (ii) Zooplankton dynamics in Alpine lakes Because of the relative simplicity of the zooplankton community in Alpine lakes, research is carried out on the distribution and the dynamics of the populations in terms of seasonal abundance, diurnal migrations and successional changes in the community. Results obtained in projects (i) and (ii) have been used for a doctoral thesis which was successfully presented.
 - (iii) Limnology of lakes in Terra Nova National Park
 This project includes the study of chemical and
 biological characteristics of most of the park
 waters. A special emphasis is given to the
 study of brook trout. The primary production
 is study by the Carbon 14 method in selected
 lakes to evaluate the importance of lake
 morphometry on the lake productivity in
 terms of plankton, bottom fauna, brook trout

and other game fish. Field work is completed;
results are being analysed and will be used
for a doctoral thesis.

- (iv) Atlantic Salmon Since one of the purposes of the National Parks is to preserve ecological habitats typical to given areas, it is also imperative to rehabilitate species of game fish such as Atlantic salmon in the National Parks when conditions permit. Such a run has reappeared in Fundy National Park. This population of salmon has been studied to determine its characteristics such as age, size and time of spawning.
- (v) Genetics of Salmonids This is a co-operative project which involves several species of trout and their hybrids. The purpose of this study is to determine the effects of natural selection on the transmittance of genes controlling morphological characteristics and certain enzymes. The enzyme coding of natural populations has been determined particularly in Terra Nova National Park. Several papers have been published.

2.10 Organizations not currently engaged in scientific activities

Not applicable.

2.5.c CHART I Canadian Wildlife Service

B.A.'s, M.A.'s, and Ph.D.'s employed in Canadian Wildlife Service Department of Indian Affairs and Northern Development, by country of birth and country of training.

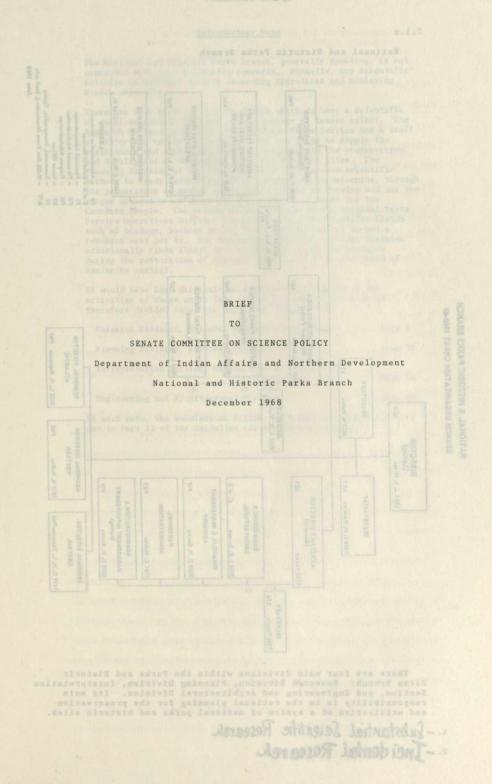
Data include research staff only.

Country of	Dirth	1	Netherlands >	Germany	England	Canada	England	S.W. Africa x	Germany	Hungary	U.S.A.	Phillipine Is.	Canada	England H	U.S.A. U	Netherlands	India	Kenya
Country of Training Secondary	SON GEO		out to be	WASSER WE		TAGE OF STATES		REG ELG		Salks Age	VANCE WEN		MARKETER		DESCRIPTION			
Schooling Canada England U.S.A. Germany Netherlands Hungary Phillipine I	23	1	1	1	01000000	25	2 1	1	1	2	1 7	1	20	1	3	1	1	1
B.A. Canada U.S.A. Germany England	21 2	1	2	1	1			4 THE		The state of the s								20-1
M.A. Canada U.S.A.						20	3	1	1	2	8	1						
Ph.D. Canada England U.S.A. Australia Finland													13 5 1 1	1	2	1	1	1
Able to operate effectively in both languages	4	-	1	-	1	6	1	-	-	-	1	-	3	2	-	-	-	-

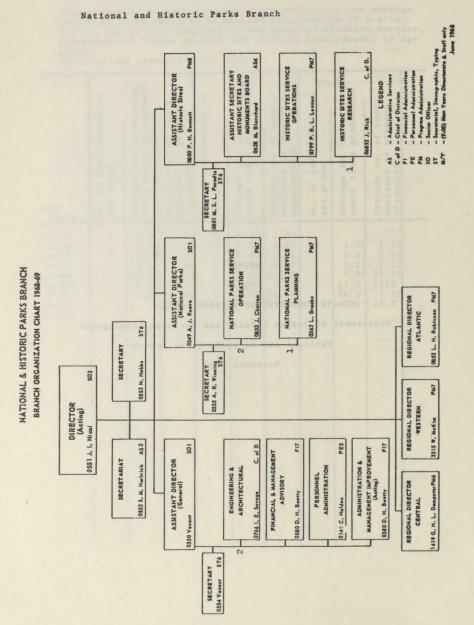
2.5.c CHART II Canadian Wildlife Service

Average number of working years since graduation and average number of years employed in present organization of B.A.'s, M.A.'s, and Ph.D.'s employed by the Canadian Wildlife Service, Department of Indian Affairs and Northern Development, by age group.
Data include research staff only.

Age Group	No. of individuals in age group	Average no. of working years since graduation.	Average no. of years employed in present organization	No. of individuals in age group	Average no. of working.	Average no. of years employed in present organization	No. of individuals in age group	Average no. of working. years since graduation	Average no. of years employed in present organization
21-25 26-30 31-35 36-40 41-45 46-50 51-55 56-60 61-65	6 5 3 5 3 4 2	2.5 4.12 7.33 9.40 14.66 16.25	2.5 2.12 3.66 7.00 4.33 5.50 11.00	2 14 7 6 6 5 2	1.50 2.09 5.00 8.33 13.00 16.60 18.50	1.50 2.23 2.86 4.83 12.00 7.60 11.00	2 4 9 8 1 3 1	3.50 3.62 4.22 4.38 13.0 16.0 3.0	3.50
	1 2		8	1 1	0		4	al ange	Fig. C. A. Conda Ph. C. Conda



2.1.c



There are four main divisions within the Parks and Historic Sites Branch: Research Division, Planning Division, Interpretation Section, and Engineering and Architectural Division. Its main responsibility is in the rational planning for the preservation and utilization of a system of national parks and historic sites.

1. - Substantial Scientific Research
2. - Incidental Research

Introductory Note

The National and Historic Parks Branch, generally speaking, is not concerned with pure scientific research. Normally, any scientific activity is oriented towards improving operations and achieving Branch objectives.

There are four units within the Branch which do have a scientific or quasi-scientific function. To a greater or lesser extent. The Research Divison of the National Historic Sites Service has a staff of historians and archaeologists whose job it is to supply the preliminary and continuing research necessary to the preservation and development of nationally important historic sites. The Planning Division of the National Parks Service uses scientific methods to study outdoor recreation demand and to determine, through the preparation of master plans, the best way to develop and use the unique natural areas which the Branch holds in trust for the Canadian people. The interpretation Section of the National Parks Service Operations Division becomes involved in scientific fields such as biology, zoology and so on, although again it is not a research unit per se. Our Engineering and Architectural Division occasionally finds itself in a research fole, as for instance during the restoration of historic buildings, or in the field of avalanche control.

It would have been difficult to combine a description of the activities of these units into one brief. This submission is therefore divided into four parts, as follows:

Research Division, National Historic Site Service	page 1
Planning Division, National Parks Service	page 35
Interpretation Section, National Parks Service Operations	page 58
Engineering and Architectural Division	page 64

In each case, the submissions follow the format and numbering set out in Part II of the Guideline for Submission of Briefs.

SUBMISSION BY THE NATIONAL HISTORIC SITES SERVICE, RESEARCH DIVISION, TO THE SENATE SPECIAL COMMITTEE ON SCIENCE POLICY

The following information is provided in accordance with the guidelines established by the Senate Special Committee on Research Policy to deal with the research work of the National Historic Sites Service (Research Divison), National & Historic Parks Branch, Department of Indian Affairs and Northern Development. The numbering system and the topics covered are those set out in the above-mentioned guidelines.

2.2 ORGANIZATIONAL FUNCTIONS

2.2 (a) The Department is established under the Indian Affairs and Northern Development Act. The research of the National Historic Sites Service, however, stems indirectly from the Historic Sites and Monuments Board of Canada Act. This empowers the Minister to designate and acquire places of national historical significance and established the Historic Sites and Monuments Board of Canada to advise the Minister on matters of an historical nature. The first responsibility of the Research Division is to provide the Board with the date (historical, archaeological or architectural) necessary to enable the Board to evaluate the proposals placed before it and to advise the Minister thereon. Once an historic site has been acquired by the Department, the Research Division must supply the information which will permit the development (restoration, reconstruction, etc.) and interpretation of that site for the public. The Division is also responsible for providing advice to the National Park Service on the interpretation of historical places and events within the national park system.

2.2 (b) It is the policy of the National Historic Sites Service that all site development and interpretation be based on thorough research to ensure that restorations, exhibits, publications and all other forms of development and interpretation fully and accurately reflect the historical significance of the sites concerned and represent a wise exploitation of irreplaceable cultural resources. It is the responsibility of the Research Division to provide the professional Research support necessary to accomplish this.

2.2 (b) cont.

It is the policy of the Service that no one shall dig or alter the ground contours on any national historic park or site without the permission, in writing, of the Assistant Director (Historic Sites).

Such permission is granted (or refused) only after the request has been reviewed by the Research Division and, where necessary, the excavation is permitted only under the supervision of a professionally qualified archaeologist.

A similar policy is currently being drafted in regard to alterations and repairs to historic structures. Review of requests will be carried out by the Restoration Section of the Engineering and Architectural Division in conjunction with the Research Division.

The purpose of this and the previously listed policy is to ensure that development activities and visitor use requirements do not result in the loss of irreplaceable archaeological and architectural information.

It is the policy of the Service that research activities must be "Applied" in that they must relate to the requirements of the Historic Sites and Monuments Board of Canada or to Departmental requirements for planning and/or development purposes. The relationship may be direct (as in the case of archaeological excavations at a national historic park) or indirect (e.g., excavation of a site outside the park system to provide comparative architectural data so as to permit reconstruction of similar structures inside the park). It is considered that "pure" research in the historical field is not the responsibility of this Service.

Ownership of all research financed by the Service is vested in the Crown which also has complete publication rights. No staff member or contractor may publish on Service-financed research without permission. It is, however, also policy that staff and contractors shall be actively encouraged and assisted to publish and that permission to publish shall not be withheld except for good reason.

Within the framework of available resources and development requirements, it is considered highly desirable that the "Applied" research of the Division should also constitute a contribution to knowledge.

2.2 (b) cont.

It is, therefore, the policy of the Service to encourage the formulation and resolution of research problems which satisfy both goals.

- 2.2 (c) The contacts with the organizations listed in the section are on the basis of co-operation rather than as a result of statutory functions or organizational policies. Roughly speaking this co-operation may be described as follows:
 - (i) Archival material which is discovered in the course of research activities is contributed to the Public Archives of Canada. This would include such things as original documents which will form a lasting record for future researchers. In addition, there is frequent consultation with the National Museums of Canada particularly in the field of prehistoric archaeology. This permits the Research Division to obtain the advice of museum staff in an area where the Division is not justified in retaining specialized staff of its own.
 - (ii) and (iii) With regard to both industry and educational institutions, the National Historic Sites Service is sometimes called upon to provide information and advice for these groups. Occasionally, the Division requests advice from a private organization on technical matters, e.g. from J. Wedgewood & Co. on the dating of pottery found in archaeological excavations. Research contracts are sometimes awarded to universities.
 - (iv) Contacts with international organizations are primarily through the memberships of individual researchers in the organizations. Research staff are encouraged to play active roles in learned societies and, particularly in the case of archaeology, most of these are international in character. Monitoring is done only informally in the sense that staff members must keep abreast of developments in their particular areas of research.

- 2.2 (c) cont.
 - (v) The Division is frequently called upon to supply information to members of the public, and local or regional historical groups. The research papers prepared for the Historic Sites and Monuments Board are generally in response to requests from such individuals or groups. Advice is given on request, primarily in the architectural field, to municipal and provincial agencies.
- 2.2 (d) The process whereby the operational effectiveness, duties and goals are reviewed and revised may be broken down into three separate areas: (1) Budgetary planning and review; (ii) internal control by senior officer review of managerial accomplishments through the process of the annual employee evaluation; and (iii) actual assessment of developments in the field of national historic sites and parks. This may be expanded as follows:
 - (i) Each year the previous year's annual estimates are reviewed and recommendations are made for these funds which will be required for the effective operation of the Division for the following fiscal year. If projects have not been completed or in fact started, decisions must be made and justified regarding the inclusion of a request for the re-allotment of the same funds in the next fiscal year for these same programs. This results in reviews not only by the managers directly concerned in the operation but also control areas such as the Branch Financial and Management Adviser's Office.
 - (ii) The current employee evaluation system operative in the

 Department calls for the setting of goals for each person
 involved in the operation of the Division. These goals are
 subsequently reviewed in the subsequent assessment to discuss
 actual accomplishments. While this is done on an individual
 basis, it reflects very directly on the over-all operation
 of the National Historic Sites Service as the goals of each
 individual are intrinsically linked with those of the other
 employees of the organization and in turn to the total goals
 of the Service.

2.2 (d) cont.

- (iii) As with any operating organization, goals are set and commitments are made relating to the progress and anticipated on the various programs undertaken by the National Historic Sites Service, Research Division. The fact that the Minister is ultimately answerable for the progress of his department results in continuous review by senior management of at least the major programs and, through them, ultimately, the over-all operation of the Service.
- 2.2 (e) The Department and the National & Historic Parks Branch
 have carried out and implemented various studies, but none
 have been directly concerned with the Research Division. In point
 of fact, the Division has existed as a separate organizational entity
 for only a little over a year. It came into being as a result of
 management's examination of the historical programs and the consequent
 decision to create a separate division so as to give research a
 stronger voice in these programs.
- 2.2 (f) The broad function of the Service is the protection of that portion of Canada's historical heritage which is of national significance. Existing legislation seems adequate in that it permits the Department to acquire and protect places of national historic importance; the limiting factor here is money and staff rather than statutory authority. Sites which are not of national importance (or have not yet been so declared) would appear to fall within the purview of provincial antiquities acts. (It should be noted, however, that at least one provincial agency has argued that archaeology is a federal rather than a provincial responsibility under the BNA Act. This view does not seem to be widely held at the provincial level.) There remain two areas in which the federal government could act to preserve historic resources. These are the protection of underwater archaeological sites (currently covered only inadequately by Section VIII of the Canada Shipping Act) and the export of antiquities.

2.2 (g) The chief indrance has been lack of trained staff and, to a lesser extent, money. Historical archaeology is a new, and highly specialized, field and qualified personnel are scarce.

Moreover, our own expanding program has been parallelled by a growing demand for historical archaeologists in the U.S.A. and Great Britain; our inability to compete with U.S. salaries has restricted our access to the relatively few qualified persons available. The same applies in the area of architectural history. As a result, we have been forced to hire comparatively inexperienced researchers and, in effect, provide training through on-the-job experience. This has substantially reduced our output at a time when a number of new parks have been added to the system and increased productivity is vital.

In view of the above and of the relatively small size of the present research staff, our ability to absorb new personnel quickly is limited.

Thus, the implementation of blanket "hiring freezes" has particularly harmful effects. (See also 2.9 (2)).

2.2 (h) Since the Research Division has only been in existence for about a year, it is premature to consider further organizational changes until we have had time to adequately evaluate the present structure.

The most likely change in basic orientation is an increased emphasis on Indian sites as a result of recent Historic Sites and Monuments Board recommendations. This will necessitate greater involvement in prehistoric archaeology and ethnology. It is likely that this research will be contracted out in its entirety to university staff. We do not feel that we are justified in building up staff expertise in an area in which the universities are already carrying out a substantial proportion of the research. (See also 2.7 (2) (4)).

2.3 PERSONNEL POLICIES

- 2.3 (a) As in any other professional area, the personal contacts are most essential in the locating and hiring of professional staff. This results from not only contacts made on a person-to-person basis but also through the various university departments in Canada, the United States and abroad, contacts at professional conferences and through previous areas of employment. Frequently, university students work with the National Historic Sites Service during the summer in the fields of both historical research and archaeology and managers within the Service are given the opportunity to assess the work of these students first-hand. This has often led to offers for permanent positions being made to these students once they have completed their university careers. There is of course in conclusion the usual formal system of advertising through the Public Service of Canada, the conducting of formal interviews and the recommendations made for hiring based on these interviews and assessments made by professors connected with these students.
- 2.3 (b) No. Whenever possible, we try to hire persons who have already proved their research ability either through previous research employment or academic research (e.g. thesis).
- 2.3 (c) There is an annual employee evaluation program set up within

 The Department which results in the assessment of each employee
 by his supervisor with a view to reviewing goals set the previous year,
 progress made toward developing those areas identified as in need of
 improvement, evaluating the training requirements of the individual and
 assessing for current or future reference the wishes of the employee
 for areas of future employment and the views of the supervisor as to
 the areas where the employee could make an effective contribution. The
 basic results of these evaluations are used in planning staff
 advancements including the choice of those researchers who have the
 capabilities and potential interest for moving into the research
 administration field.

2.3 (d) Job classification (and, hence, salary) is determined by the Bureau of Classification Revision. Generally, research managers are classified at a higher level than the research staff they supervise; however, it appears that the new Historical Research classification (not yet in effect) will permit exceptional researchers to reach the same levels of classification on the basis of research productivity alone. Thus, the acceptance of managerial responsibility will not, in a sense, be a promotion, but merely a change of duties which is reflected in a change in classification. Within the Division, managers are recruited from the research staff and any researcher who is interested (relatively few are) and shows administrative ability is eligible for consideration for appointment to managerial vacancies at the lowest (Assistant Section Head) level. It is not likely, however, that a more senior management post (Section Head or Division Chief) would be open to a researcher with no managerial experience; generally, the senior posts are filled from the junior management levels.

2.3 (e) The Department has already established an Educational Leave Policy through which employees can be granted leave to return to their university studies on leave without pay from their Public Service position. Dependent upon the work that they will be doing when they return to the educational institution, allowances equivalent to a portion of their current salary can be granted together with the payment of certain additional expenses such as tuition, travel for research purposes, research expenses and removal expenses to the university concerned. The allowances made are based on the relationship of the thesis work involved to the actual work of the employing agency. This means that the more value to an organization the results of this university work would be, the higher the allowances are apt to be. The above, of course, refers to a full-time return to university of the employee in question. In addition, the Department has expressed a willingness to accept half the cost of university or other extramural training courses that would be of value to both the employee and the

2.3 (e) Cont, the treates asset but asserted the table of the

organization. In a professional field, there are few courses offered intramurally that would be of benefit to research staff. Should such courses be made available, every reasonable attempt is made, within the limits of the numbers of persons who can normally be accommodated on such courses, to make this training available to staff of the provision.

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2.4 DISTRIBUTION OF ACTIVITIES

2.4 (a) Documentary research is concentrated in Ottawa because the

Public Archives of Canada is the best repository of source
material in the country. Archaeological excavations, naturally, take
place on the site (the post-excavation analysis is carried out in
Ottawa because of the facilities which the capital uniquely affords).

Some architectural research must also be carried out on the actual
buildings. Other things being equal, there are more archaeological
sites (historic) and old buildings in eastern Canada than in the west

2.4 (b) Historical research, per se, is not restricted by regional considerations. However, specific research topics may very well relate to a particular region. Thus, the archaeological investigation of, say, Acadian settlement patterns would necessarily be restricted to the Maritimes. On the other hand, the archaeology of fur trade posts would involve sites all across the country.

and this has been reflected in the spending patterns to some extent.

2.4 (c) The National Architectural Inventory has carried out pilot

projects at Niagara-on-the-Lake, Kingston and Halifax and is

currently recording historic buildings across the country. Archaeological

excavations are carried out at sites across Canada. As was noted above,

we doubt that this work can properly be regarded as "investigation of

regional problems or phenomona". However, the following lists major

archaeological excavations to date by province:

Newfoundland

Castle Hill National Historic Park L'Anse aux Meadows	1965, 1968 1963, 1968	contract contract (in
		conjunction with provincial support)

Nova Scotia

Fortress of Louisbourg National		
Historic Park	1962 to present	staff and contract
Fort Anne National Historic Park.	1963	staff

2.4 (c) (Continued)

**	-	
New	Brun	swick

Fort Beausejour National Hist Fort Gaspereaux National Hist Fort Meductic		staff staff contract (in cooperation with N.B. Electric Power Commission)
Fort La Tour	1963	contract
Restigouche	1967	staff
La Coupe Drydock National		
Historic Site	1963	cont.ract.

Prince Edward Island

Fort	Amherst National	Historic	Site	1963	staff
Roma	Settlement			1968	contract

Quebec

		contract staff staff and contract staff and contract contract
walker's rieet	1905	contract

Ontario

Fort Malden National Historic Park Dollier-Galinée National Historic Site		staff staff
HMS Radcliffe	1966, 1967	staff
Fort St. Joseph National Historic Site		contract
Rainy River Burial Mounds	1966	contract
Point Pelee National Park	1968	contract (in conjunction with
		National Parks Service)
Cahiagué	1966	contract (in conjunction with
		University of Toronto)

Manitoba

Lower	Fort	Garry	National	Historic	Park	1965-8	contract

Saskatchewan

Sturgeon Fort National Historic Site 1962	contract
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Alberta

Rocky Mountain House National Historic Site Waterton Lakes National Park	1966 1967, 1968	contract contract (in
	Mariament 198 1980 Parks 198	conjunction with National Parks Service)

British Columbia

Friendly Cove	1966	staff
LITERALLY GOVE	1900	Stall

- National Historic Sites Service do not contribue directly to regional development. However, the work done forms a basis for the acquisition or development of national historic parks and sites across the country. Such work affects the regional economy through the use of local labour and materials (e.g., in excavation and reconstruction), increases in tourist traffic and the like. Thus it can be said that regional development is a result of the work of this agency but not a role as such.
- 2.4. (e) Since our work is related to the development and interpretation of physical sites throughout the country, non-distribution of research activities is an impossibility; and costs are therefore the total costs to the government of the Research Division. As indicated in 2.4. (d), regional development is not a role nor is it a primary objective of the research. The parks and sites developments -- interpretive displays, restorations and reconstructions -- which require research input do, of course, have a decided effect on regional development since they provide employment for the local work force and foster tourism.

It should be noted that archaeological excavations offer a means of temporarily alleviating unemployment in the areas of sites. The excavation utilizes a good deal of unskilled labour, provides summer jobs for university students (as "line" supervisors), does not compete with local industry, makes a contribution to knowledge, and may result in a potential tourist site. There are a number of potential drawbacks which mitigate against indiscriminate use of archaeology to relieve regional unemployment, but, applied judiciously, the scheme is feasible. Any archaeological work to be undertaken in this way should, however, conform wherever possible with already established priorities of the National Historic Sites Service in order to ensure the best use of federal resources.

2.5 PERSONNEL ASSOCIATED WITH SCIENTIFIC ACTIVITIES

2.5 (a) The following totals include both the staff at the Research
Division in Ottawa and the research staff involved with the
Fortress of Louisbourg National Historic Park restoration project at
Louisbourg, Nova Scotia. (It should be noted that this project is
the only one of its kind in the current National Historic Parks system
in that, because of its size, it has its own research staff.) The
staff listed as permanent below fill regular Public Service positions
on a full-time basis.

It is extremely difficult to estimate the man-year content of research contracts. University contracts generally require the university to employ sub-contractors (i.e., university staff and students) and we have no record of these since we normally evaluate performance on the basis of the finished report. The contracts shown below are only those who are on contract at present and who are devoting more-or-less full time to carrying out the contract work.

	Permanent Staff	Casual Appointments	Contractors
Administration			
professional administrative and clerical	1 3	0	0
Historical Research			
professional support staff	14	0	4 0
Archaeological Research			
professional technical support	8	2	10 16
National Architectural Inventory			
professional support	2 0	0	2 2
Fortress of Louisbourg National Historic Park			
professional - history professional - archaeology support staff	1 2 1	0 0 Prev. rate 1	7 1 abour 0

- 2.5 (b) A total of ten of the above professional personnel are involved in largely administrative duties -- six in Ottawa and four at Louisbourg.
 - 2.5 (d) Since 1962, there has been one permanent professional staff member at the B.A. level working in the field of historical architectural research. One additional staff member (B.A.) was added in 1968. The following tables will give the same information for the fields of historical research and archaeology. Contractors are not shown for the reasons stated above. Louisbourg staff is included for previous years.

	HISTORICAL R	ESEARCH	
	H.A. Honours	M.A.	Ph.D. or near Ph.D.
1962 1963 1964 1965	1 2 2 2 2 2	2 2 3 3	
1966 1967 1968	2 3 7	3 4 3	2 (4) 8.5
	ARCHAEOLOGIC	AL RESEARCH	2001
1962 1963 1964 1965 1966 1967 1968	2 2 5	1 1 2 4 4 3	Adort Ad

No positions have been included in estimates for 1969-70 because of the hiring restrictions. Beyond this period, staff requirements will depend on the size of the development program for which research is required. If the present 5-year forecast is carried out, a minimum of 25 professional positions in 1970-71 and 5 per year thereafter will be required to meet the demands of the program. 20 of the first 25 should be M.A. or at least Honours B.A.; for the remainder, Ph.Ds would be preferred, but we may well have to settle for M.As or even B.As. This will depend on the salary scale and job market at the time.

2.5 (e) There has been no turnover in the architectural research
field during the time period specified. One person at the
B.A. level was lost to the Archaeology field in 1966. The following
charts will provide this information for the historical research field:

HISTORICAL RESEARCH

	B.A. Honours	M.A. P	h.D. or near Ph.D.
1962	no turnover	no turnover	n/a
1963	no turnover	no turnover	n/a
1964	no turnover	lost 1-33 1/3%	n/a
1965	no turnover	lost 1-33 1/3%	n/a
1966	no turnover	lost 1-33 1/3%	n/a
1967	no turnover	no turnover	n/a
1968	no turnover	lost 1-25%	lost 1-33 1/3%

2.5 (g) There have been two members of the Research Division granted educational leave during this time, one a research historian, the other an archaeologist. Both have M.A.'s and have returned to university to obtain their doctorates.

2.5 (h)		Historical Research	Archaeology	Louisbourg
	962	5	2	6
1	963	5	18	11
1	964	5	25	9
1	965	5	32	10
1	966	8	30	60
1	967	15	7	63

The above figures are only approximate. Some students are hired as prevailing rate labourers but our records are not arranged so as to readily know which labourers are students and which are not.

Many students are employed by universities working under contracts with us, but we have no record of the number.

2.6 EXPENDITURES ASSOCIATED WITH SCIENTIFIC ACTIVITIES

2.6 (a) The Research Division of the National Historic Sites Service has been set up in its present form for only a little more than a year. For that reason it is not possible to break down expenditures into the areas designated in the guidelines for this question. It can however be said that the work of the Research Division can be outlined as follows:

> Functions: 1. Intramural R & D 2. Data Collection
> 3. Scientific information

Scientific Discipline: 3. Social Sciences (a) anthropology (archaeology)

4. Historical Research

Areas of Application:

Construction
 Regional Development
 Education techniques and policies

16. Other - Publications - Conservation

2.6 (b) As indicated above, because of the recent establishment of the Research Division, it is not possible to itemize expenditures that would relate specifically to research. However the following table will outline expenditures during the period requested for the National Historic Sites Service in Ottawa (i.e., that area which controls the research activities) and the total Louisbourg Project. Note that these figures include administration, interpretation and other non-research activities.

YEAR	OTTAWA		LOUISBOURG	
contributions to agricult	M300	CAPITAL	O&M	CAPITAL
	\$	\$	\$,	\$
1962-63	607,504	998,945	107,394	1,593,658
1963-64	651,780	705,834	170,150	1,554,096
1964-65(First year of Regionalization)	191,000	321,260	244,456	1,429,899
1965-66*	415,187	408,233	233,128	1,495,951
1966-67**	424,851	687,614	457,153	1,739,567

* A further breakdown is available for this fiscal year in the following areas:

OTTAWA-CAPITAL: Archaeology and Historical Research \$209,714 Architectural Inventory \$ 22,945 2.6 (b) Cont.

** A further breakdown is available for this fiscal year in the following areas:

OTTAWA-CAPITAL:	Archaeology	\$306,416
	Historical Research	\$ 8,503
	Architectural Inventory	\$ 13,305

The following estimates are available for the Research Division,

National Historic Sites Service, for the 1968-69 fiscal year:

(This is for the Ottawa operation only.)

Area	<u>0&M</u>	CAPITAL
Historical Research	78,300	25,000
Architectural Inventory	10,500	40,000
Archaeology	58,400	272,000
	147,200	337,000

For Louisbourg, the capital research budget for 1968-9 is as follows:

Historical Research	\$ 78,000
Archaeological Research	\$ 174,000
Total	\$ 252,000

2.6 (c) Education leave costs for the period under consideration are as follows:

1962-63	NIL
1963-64	NIL
1964-65	NIL
1965-66	NIL
1966-67	NIL
1967-68	\$8,900
1968-69	\$15,300

2.7 RESEARCH POLICIES

2.7 (a) (1) The bulk of research programs and projects are initiated by either (i) the Historic Sites and Monuments Board of Canada, or (ii) departmental senior management, or (iii) the Research Division itself.

In the case of (i), the Board requests research on a topic which it has been asked to consider; that is to say, a member of the public, a local historical society, etc. will have requested the Board to consider a particular person, place or event for national commemoration. The research is required to provide the information on which the Board will base its decision.

In the case of (ii), which accounts for most of the research output, the impetus is a departmental decision to develop an existing national historic park or site. The "problem" is not stated in scientific terms and goal-orientation is simply development of the site in terms meaningful to the visitor. The research input involves finding out as much as possible about the history, archaeology and architecture of the whole site or various aspects thereof so that this information can be used in planning and development. The research themes pursued are, however, broader than the above statement may seem to imply. For example, it is not possible to consider the Motherwell Homestead (a new park in Saskatchewan) without taking into account the broad picture of agrarian politics and Canadian contributions to agricultural research. None the less, the research is very definitely "applied" and originates in non-research considerations.

The Research Division must re-state managerial instructions in terms of problems susceptible to solution by research. This sometimes necessitates the creation of other programs designed to solve questions raised by the primary research. For example, operational requirements dictated the archaeological excavation of a number of 18th century French forts: louisbourg, Gaspereau and Beausejour. Very little is known about the artifacts of this period, yet these must be analysed because the information is needed to interpret stratigraphic and architectural sequences which

2.7 (a) (1). Cont.

in turn are vital to site development. Thus, it was necessary to initiate an artifact research program to solve these, and other, problems. Such "secondary" research is applied in that the results are ultimately used in park development, but the goals are defined by research needs rather than operational requirements.

Because of the pressures for immediate application, research programs are not primarily geared to broad research-oriented themes. However, such possibilities are kept in mind as a long-range ideal. Thus, the Service has excavated three fur trade sites and carried out various documentary studies relating to the fur trade. Some of these individual pieces of research are, in themselves, contributions to knowledge; others are more restricted in scope and of use primarily as "in-house" reports. The work of other agencies (provincial and university) on fur-trade sites is kept under review and at some time in the future a sufficient number of "pieces" will have been accumulated to permit a synthesis and, perhaps, a definitive statement of the role of the fur trade in Canadian history. Whether this statement is made by the Service, or by outside researchers using our material is irrelevant. The point is that, broadly speaking, most of the research of the Service can be viewed as components of long-term research-oriented goals. Operational demands do not permit us to approach these goals in the most logical or efficient (from a research point of view) manner, but it is not properly the role of the Service to do this. Ideally, we strive for programs which will result in park development and a contribution to knowledge, but, to some extent, the former task must have priority. Obviously, there is some danger development considerations will be given too much weight, with the result that a major expenditure on research will be channelled into avenues which do not produce results usable by the research community at large. So far this has not been the case, and the recent creation of the Research Division (which gives researchers a much greater voice in planning and policy) would indicate that senior management has seen the potential problem and acted to circumvent it.

2.7 (a) (1) Cont.

The only other federal agency involved in this process is the
National Park Service. That Service would assign its own priorities
to research and allocate sufficient funds. The Research Division of
the National Historic Sites Service would assist in a chiefly
advisory capacity — by defining research problems, obtaining qualified
contractors, reviewing reports, etc.

- are based on a number of considerations. For example, the preponderence of military sites now in the existing park system makes it desirable to concentrate new acquisitions in non-military fields.

 An emphasis over the pas, few years on sites in the Maritimes is now to be balanced by development in the west. The absence of a major national historic park in Alberta and Prince Edward Island suggests that high priority be given to these two areas, just as priority was recently given to developing parks in Newfoundland. Special events such as the tricentenary of the Hudson's Bay Company suggest related development of parks relating to this theme. Sites in proximity to population centres would be given preference over isolated sites. These and many other factors would be weighted in allocating available resources to development and research.
- 2.7 (a) (3) These techniques are used by the Department for major park development projects, especially those involving construction. They are not used by the Research Division and, because of the nature of the work, do not seem applicable.
- 2.7 (a) (4) Extensive use has been made of contracts; the results have not been entirely satisfactory.

The current orientation among academic historians does not dispose them towards an interest in, or understanding of, the applied documentary research which we require. Best results have been obtained where contractors work closely with staff in our Ottawa office where the necessary direction can be supplied.

2.7 (a) (4) Cont.

In the field of archaeology, we have awarded contracts both to individuals and institutions. The former do not usually have the resources (laboratory space, reference works, etc.) to adequately handle the post-excavation analysis and we have swung to a system under which the contractors carry out this analysis using the support staff and facilities of the Service in Ottawa. In the case of institutions, the problem has been the relative isolation of the principal investigator who is usually the only person at the institution dealing in historic archaeology. We have frequently had to send staff specialists to assist contractors in various specialized aspects of the work. Generally speaking, our contractors have produced good work, but, in retrospect, the same expenditure would have produced better results had it been concentrated directly in one organization large enough to have the necessary specialists, collections, library, etc.

Contracts have been used extensively for the recording work of the National Architectural Inventory and this is continuing. The results will improve, however, when we have sufficient staff to provide contractors with more direction and better monitoring of program and results.

A problem with some individual contractors has been the fact that they also hold university appointments and the requirements of such positions, naturally, take precedence over our contract requirements. This has led to lengthy delays in the preparation of reports with serious consequences for development scheduling.

In summary, we feel that the bulk of our historical and archaeological work is highly specialized in areas peripheral to academic interest. University staff and individual contractors may not be experienced in these areas and, particularly with historic archaeology, lack the necessary support staff and facilities. It is our view that this work should be done by staff (or by individual contractors working closely with staff) for maximum utilization of resources. Prehistoric archaeology, however, should be contracted out to universities which have the specialized staff and facilities; we see no merit in building up staff expertise in this area

2.7 (a) (4) Cont.

in direct competition with the universities. Contracts for architectural recording have been more-or-less satisfactory and we plan to continue this work under contract.

- 2.7 (a) (5) Generally speaking we provide funds only for work directly applicable to our needs. We regard such finding as a contract calling for the production by the contractor of specific goods and services by specified dates; we do not consider it our responsibility to finance "pure" research or to provide grants.
- changes in development priorities; such changes are not occasioned by technical developments. On small projects, the change is made simply by reassigning staff to new research topics. On large projects with substantial investment, an attempt is made to bring the project to some logical (and preferably publishable) conclusion so as to protect the investment and make it easier to pick up the threads if work can resume at a later date. There have been many small project changes, but few on large projects. The chief problem is staff morale which is adversely affected by frequent changes and sudden cancellations.
- 2.7 (a) (7) The transfer is primarily through papers presented at conferences and through publication. The Department has started a new scientific series as an outlet for staff and contract work and the first two issues are now in press.

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2.8 RESEARCH OUTPUT

2.8 (2)

COLEMAN, MARGARET

The Roma Settlement at Brudenell Point, Prince Edward Island.

Accepted for publication in <u>Historic Sites</u>.

DIUBALDO, RICHARD J.

1968 Wrangling over Wrangel Island. <u>Canadian Historical Review</u>, Winter.

FOLAN, WILLIAM J.

1966 A Note on Pre-Columbian Structures in Mani, Yucatan, Mexico.

American Antiquity, vol. 31, no. 5, part 1.

1967 Don- and Donaship Terminology in Merida, Yucatan, Mexico.

America Indigena, vol. XXVII, no. 1.

A Note on Page Class and Status in Merida. Yucatan Mexico.

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Anthropologica, vol. IX, no. 1.

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	, JOHN H. RICK and WALTER ZACHARCHUK
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INGRAM, GRORGE

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Anthropologist, vol. XVII, no. 2.

Archaeological Research at the Fortress of Louisbourg, 1961-5. Accepted for publication in <u>Historic Sites</u>.

LEE, DAVID

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MARWITT, RENEE H.

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A Preliminary Survey of Seven Coarse Earthenwares from the Fortress of Louisbourg. The Conference on Historic Site

Archaeology Papers 1965-1966.

RICHARDSON, A.J.H.

An Early Settler on the Ottawa (offprint from <u>Caradian Historical</u>

<u>Review</u>)

- 1963 The Old City of Quebec and our Heritage in Architecture (offprint from Canadian Historical Association Report)
- 1966 Architectural Guide and Period Walking Tours of the Old City
 of Quebec, prepared for Society of Architectural Historians
 (co-authored with Alan Gowans).
- 1968 Architectural and Town-planning Historical Tour of Quebec.

 Prepared for Canadian Council on Urban and Regional Research.

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RICK, JOHN H.

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____, and WALTER ZACHARCHUK

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, and L. de S. WALKER

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- 2.8 (3) Some three hundred reports have been produced in the last
 seven years for the Historic Sites and Monuments Board of
 Canada and for departmental use. These are not usually distributed
 outside the Department. It is our intention to publish as many of
 these as warrant such treatment as fast as our resources permit.
 This will eliminate the vexing problem of requests from outside
 researchers for unpublished staff material to be incorporated in someone else's publication.
- 2.8 (4) Staff attend a number of conferences such as the annual meetings of the Canadian Historical Association, American Anthropological Association, Society for American Archaeology, Society for Historical Archaeology, Society of Architectural Historians. Papers have been presented at a number of these and it is the policy of the Division to encourage presentation.
- 2.8 (5) Not applicable.
- 2.8 (6) A number of students who have received initial or substantial research experience with the Service are now completing Ph.D. studies or have received their doctorates and are professionally employed. The Service has not been carrying out research long enough for even the initial groups of students to have made "substantial contributions".
- 2.8 (7) The Research Division has three units which are unique in

 Canadian historical research. The underwater research unit
 is carrying out the excavation of historic period shipwrecks in a

 manner which compares favourably with similar work done elsewhere in
 the world; the only other Canadian professional group in this general
 field is the Royal Ontario Museum which concentrates on fur trade
 material and has not become involved in wrecks. The artifact research
 unit has been recently formed and clearly has the potential for

international leadership in research on historic period artifacts; there are other agencies with greater knowledge of specific artifact areas, but none which are pursuing the problems on such a broad front. Moreover, the artifact research program is backed by major archaeological excavations which (particularly in the underwater field) is a vital source of datable material for analysis. The technical research unit. also recently formed, has concentrated primarily on the applications of electronic surveying to archaeology. The principal work in this field is carried out at the Universities of Pennsylvania and Oxford, but, to our knowledge, ours is the only continuing program of investigations in Canada. We are fortunate in having a large excavation program which provides facilities for testing and evaluating the various techniques and devices. We do not intend to compete with larger organizations in developing new devices or exploring theoretical implications; rather, we propose to explore the applications of such work to our own problems which by extension, should relate to other archaeological sites.

In archaeological research generally, we have concentrated on the techniques and methodology of large-scale excavation best suited to our particular sites. Such methodology is not entirely relevant to prehistoric excavations in Canada and relates more to the methods employed in Central America and the Near East. For the past six years, we have offered a summer training program in field methods to Canadian university students which is the only source of training in large-scale excavation of masonry sites available in Canada. The number of applications received suggests that this program fills a very real need.

Potentially, the National Architectural Inventory of Canada can be the primary focus of research in Canadian architectural history.

This potential has not yet been realized because of severe staff shortages — the result of a general shortage of trained personnel plus unrealistic salary scales.

- 2.8 (8) We are concentrating on building up the Departmental library in the areas of historic archaeology and artifact research.

 These are areas not adequately handled by other Canadian libraries.

 The potential of the National Architectural Inventory has been noted in 2.8 (7) above. The artifact collections of the Service are of immense value for artifact research, but staff and space shortages have prevented us from making this material readily available to outside researchers; there seems little likelihood of improvement in the near future. We have developed a number of systems and procedures of general applicability to large excavation and artifact processing.
- 2.9 (9) The Research Division has been in existence for only a year and publication of our massive research backlog has only just begun. It is, therefore, premature to discuss general impact.

 In view of the comments of outside researchers familiar with our work it is likely that the chief impact will be in the areas of: architectural history, excavation and architectural recording techniques, underwater archaeology and naval architecture and artifact research.

2.9 PROJECTS

- 2.9 (1) The major archaeological projects have been listed above under section 2.4. Examples of historical research projects are:
 - (a) research on Sir John A. MacDonald, the Bellevue House and
 19th century furnishings in connection with the restoration
 and furnishing of Bellevue National Historic Park in 1967.
 - (b) Written histories of the following National Historic Parks and Sites:
 - 1. Battleford Post (1966)
 - 2. Grand Pré (1968)
 - 3. Fort Chambly (1966)
 - 4. Fort Lennox (1965)
 - 5. Fort Beausejour (1967)
 - market by the second second second

6. Signal Hill

- 7. York Redoubt (1965)
- 8. St. Andrews Blockhouse (1966)
- 9. Lower Fort Garry (1966 present)

(1965)

- (c) Research report for restoration and interpretation of the Factor's House at Lower Fort Garry, Manitoba (1968)
- (d) Research reports on growth, nature and distribution of Acadian settlements in Maritime Province. Programme commenced in 1966, continuing in conjunction with archaeological research.
- (e) About 200 documented research reports prepared on various aspects of Canadian history for use of Historic Sites and Monuments Board of Canada.

In the architectural field we have carried out the following studies (in addition to the actual recording of old buildings):

(i) Pilot Studies of Architectural Types in three selected regions in Canada (Halifax, Quebec City and Niagara-onthe-Lake, 1962-63) as part of program to establish criteria for selection of outstanding or typical examples of Canadian architecture, for use of proposed Inventory of Old Buildings in Canada. 2.9 (1) Cont.

- (ii) The Development of Suburban Villas in Canada (1967).

 Program to determine evolution of architectural styles in Canada, and secondarily to provide selection criteria for Historic Sites and Monuments Board of Canada.
- 2.9 (2) After basic research reports have been completed for a
 development program, there is still a continuing need for
 research input and assistance. In this sense, research is not completed
 until development is finished and, by this standard, no major research
 project has yet been completed.

Fort Beausejour may be wited as an example of almost ideal research conditions. Basic historical research was completed before excavations began rather than being carried out concurrently as is the case with many high priority development projects. Three seasons were allotted to excavation with sufficient staff to permit complete excavation; on other sites, development timetables have sometimes forced the pace of research rather more than is desirable for best results. The project historian worked on the site during the excavations, thereby adding materially to the quality of the inter-disciplinary approach; staff shortages in the past (less so at present) have usually prevented the historian from devoting this much time to a project. Control of the stabilization of ruins (for exhibit purposes) is in the hands of the archaeologist rather than of engineers. Artifact analysis is just beginning and for the first time we have a nucleus of trained analysts on the job thus permitting faster results and less loss of time due to dead-end approaches.

Another project in the final stages of completion is the "Mallorytown wreck". This is a British gunboat (possibly the <u>Radcliffe</u>) dating from the War of 1812 period. It was discovered and excavated in 1966. Recognizing the value of this vessel, the Research Division proposed that it be raised and preserved for exhibit. This was accepted by senior management and the raising and preservation were carried out by research staff in 1967. The preservation will be completed in 1969 and the

2.9 (2) Cont.

53-foot vessel will be moved to a nearby national historic park where it will become the focal point of an exhibit relating to the naval warfare on the Great Lakes. Preparation of the final report is well advanced with publication slated for next year. Thus, this project has contributed to our knowledge of naval architecture, preserved a unique specimen of a little known class of warship, and provided the nucleus of a major exhibit at an undeveloped national historic park.

In the area of historical research, the first section of a major three-part study on the fur trade in Canada has been completed for the Historic Sites and Monuments Board of Canada. Part 2 is scheduled for completion next year, with publication of both Parts 1 and 2 to follow in 1970. The study is designed to provide a framework within which the Board can consider individual sites proposed for commemoration. Beyond this, it provides a contribution to knowledge both in terms of hitherto unknown material and as a synthesis of existing, but scattered, data.

2.10 ORGANIZATIONS NOT CURRENTLY ENGAGED IN SCIENTIFIC ACTIVITES

2.10 (1) Various studies are underway or contemplated which may result in improvement, but no radical changes are predicted as a result of technological developments. The major developments to date (e.g., computer processing of date, C14 dating) have provided new tools for the historian, but have not altered the theoretical framework or basic approaches.

2.10 (2) A mechanical method of washing artifacts has been devised by Research Division staff; this has been in operation for a year with labour savings estimated at \$10,000. Other improvements are under study in the areas of excavation and artifact recording. As stated above, various electronic surveying devices -- such as the resistivity meter and the magnetometer -- are being investigated. We are exploring the feasibility of electronic data processing and storage. As soon as resources permit, we intent to investigate the applicability of dendrochronology to Canadian historic archaeology.

2,10 (3) Advice has been sought from:

- (a) Department of Mines and Technical Surveys on the identification and dating of metal artifacts;
 - (b) R.C.M.P. on the identification of human remains;
 - (c) Department of Forestry on the identification of wood
 - (d) National Museum of Natural Sciences on the identification of animal bones and molluscs;
 - (e) National Museum of Man on evaluation of research proposals and reports in the field of prehistoric archaeology.
- 2.10 (4) See 2.10 (2).

NATIONAL PARKS SERVICE
PLANNING DIVISION
BRIEF TO
SENATE OF CANADA
SPECIAL COMMITTEE ON SCIENCE POLICY

2.2 Organization functions

(g) To adequately perform our function and responsibilities there is need of a co-ordinating agency in the Federal Government to undertake research on recreational needs, demands, and resources, to co-ordinate general activities in the recreational field, to maintain liaison with the provinces, and to encourage development of an overall outdoor recreational plan.

An important current difficulty facing the Planning Division is the obtaining and training of sufficient and competent researchers and park planners.

2.3 Personnel Policies

- (a) During the summer months the Division employs a number of undergraduate university students in park use research and master planning studies. Through exposure to the Division the student's interest and potentiality may be developed. This aids in the identification and selection of university recruits for full time positions.
- (b) N/A
- (c) N/A
- (d) Current practice is to have research administrators recruited from among the research staff. Career advancement of the researcher is more limited than that of the administrator and accordingly distinctions do arise between administrators and researchers in terms of promotion and salary.
- (e) The Planning Division follows the usual departmental policy regarding intramural and extramural education for staff members.

2.4 Distribution of Activities

There exists no particular regional pattern to the Division's expenditure of funds on scientific activities. However, the Division does become involved in the assessment of National Park potentialities inothe less developed regions of Canada and this may contribute to a form of regional development. Nevertheless, our basis concern is a fully representative and adequate National Park System.

2.5 Personnel associated with scientific activities

(a) current establishment positions:

total 31

professional - administration 5

research 20

support - technical 3

stenographic 3

- (b) Professionals in administration 5
- (c) please see separate questionnaires previously submitted.
- (d) professionals by degree category.

	B.A.	M.A	O PHD
1962	1	3	0
1963	1	4	0
1964	3 - 11	5 11	0
1965	5	6	0
1966	10	7	0
1967	12	7	0
1968	13	17	0
1968-69	13	18	0
1969-70	10	19	0
1970-71	5	29	0
1971-72	5	33	0
1972-73	5	34	0
1973-74	5	36	0

(e) percentage turnover of professional staff

	B.A.	M.A. PL.
1962	levelope + region	potentialities in othe Less
1963		hand a of statistate you
1964	solianimes idea	20%
1965	HE SHAFFELLING AN	mary in the Pederal Government
1966	SPREEDED OF THE	15% -
1967	8%	Personnel nesociated with scient
1968	15%	18%

(f) percentage of current professional personnel who have:

been employed by industry	259
been on staff of universities	69
provincial departments	69
other federal agencies	199

- (g) staff on educational leave none
- (h) number of university students in scientific activities

1962	unknown	1966	18
1963	unknown	1967	4
1964	9110		
1965	0 13		

2.6 Expenditures associated with scientific activities

(a) funds spent on scientific activities by category:

	64-65	65-66	66-67	67-68
function:	intramural R&D	142,688	180,216	317,589
	data collection	35,671	45,053	79,397
scientific	engineering & technology	26,753	33,790	59,547
discipline:	natura1			
	sciences biological	35,671	45,053	79,397
	social sciences			
	economics	35,671	45,053	79,397
	sociology	26,753	33,790	59,547
	demography	17,835	22,526	39,698
areas of application:	(8) health	8,900	11,263	19,849
	(12) regional development	17,850	22,500	40,000
	(13) social welfare and			
	social policy	8,900	11,263	19,849
	(15) administration	24,000	33,600	60,000
	(6) transportation	8,900	11,263	19,849
	(16) other- recreation	107,000	135,161	238,200

(b) operating and capital funds:

	Operating	<u>Capital</u>
1964-65	131,	85,685
1965-66	131,262	47,097
1966-67	167,307	57,962
1967-68	280,556	116,430

* Please note - before 1965-66 the Planning Division did not operate
as a separate entity with regard to the budgets. These were included
under National Parks Service Administration, with no separate
accounting for the Planning Division.

(c)	funds	expended	to	further	prof	essional	university	education
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62		

02-03

63-64

64-65

65-66

\$7,340

66-67 67-68

\$ 500

68-69

2.7 Research Policies

(a) Units concerned with intramural research

- 1) Programmes and projects are selected by the Minister, initiated and monitored within the Branch. Other Federal agencies sometimes are involved, but only to a limited degree and they do not participate in the setting of objective or programmes.
- 2) Priorities are established by the Branch and by the Department.

 These priorities are expressed and reassessed every year in the

 Division's Programme Review.
 - 3) The PERT network method is used by the long range planning section to plan and monitor dealings between provincial and federal authorities in the establishment of new parks.
 - During the last few years use has been made of contracting out projects in support of intramural programmes. This has been necessary because of the limitations in numbers and expertise of the Division's staff.

In all sectors of the Division use has been made of contracting out:

Town Planning - examples

- Dr. W. Oberlander, Professor in the Department of Community

 Planning, University of British Columbia. Townsite plans for
 Banff and Jasper.
 - Project Planning Associates Lake Louise and Waskesiu
 Townsite Plans.

Research Section - examples

- Ben Crow Associates, marketing researchers and consultants,
 - Dr. J. Knetsch, Director of Natural Resources Policy Centre,

 George Washington University, consultant for Outdoor Recreation

 Demand Study.

Master Planning - examples

- Phillip Flores, landscape design and resource planning consultant

 East Lansing, Michigan, Master Plan Riding Mountain National Park
- Marshall, Macklen Monaghan engineers and planners, Toronto, Marmot

Long Range Planning - examples

- Acres Research, Toronto Economic Impact Study of Bloodvein,
 Manitoba.
- Institute of Public Affairs, Dalhousie University Economic Survey Kejimkujik Park Area.
- 5) N/A street institute off at about tomograph anignati
 - 6) The Planning Division has been developed too recently to experience the necessity of shifting research resources from one programme to a new programme. No process has been developed to do this.
 - 7) There are no formal means of transferring research to outside agencies as most research is done for internal use. However, as the Division's work has national implications, our research and planning is of interest and benefit to certain individuals

and agencies. Such research results are transferred on an informal basis through distribution of the Division's reports, as well as through attendance and participation of officers at various national and international conferences, meetings and seminars,

(b) N/A

2.8 Research Output

- 1) N/A
- Books and journal articles arising from research activities
 1962-68.

Brooks, Lloyd:

"Demands of Forest Recreation on the Forester and the Forest Resources."

Forestry Journal, 1963.

"National Parks for Canada's Northlands"

Canadian Society of Landscape Architects 1967

Eidsvik, Harold K:

"Planning a New National Park in Nova Scotia"

Community Planning Review, 1965.

Taylor, Gordon:

"Camping Equipment Trends in the National Parks of Canada"

<u>Trends in Parks & Recreation</u>, Jan '65.

"An approach to the inventory of Recreational Lands"

Canadian Geographer, June '65.

"Research in non-urban recreation"

Trends in Parks & Recreation, July '65.

"Proposed methodology for an inventory and classification of land for recreational use"

Forestry Chronicle June '66

"Research into Outdoor Recreation on Private Land" " Dash and 1-20"
Park News, Nov. '65

"Demand Study of Canadian Outdoor Recreation"

Parks and Recreation in Canada, 1968

3) Reports from Planning Division 1962-68

SPECIAL REPORTS

62-1 Proposed National Parks Zoning

Policy - Using the western

Mountain Parks as an Illustrative

Example L. Brooks January 17, 1962

62-2 Riding Mountain National Park - L. Brooks

Katherine Lake Development Plan H. Eidsvik January 31, 1962

62-3 Point Pelee National Park - An
analysis of Attendance Figures G.D. Taylor February, 1962

62-4 Prince Edward Island Nat. Park

1961 Traffic Survey, 1961 G.D. Taylor March, 1962

62-5 Prince Edward Island Nat. Park

Maximum Use Survey, 1961 G.D. Taylor March, 1962

62-6 Trends in Location and Type of
Commercial Accommodation in

Four Mountain Parks G.D. Taylor March, 1962

62-7 Proposed National Park at

L Brooks October 16, 1963

Kejimkujik Lake, Nova Scotia G.D. Taylor November, 1962

62-8 Proposed National Park on G.D. Taylor

Bruce Peninsula, Ontario L. Brooks December, 1962

63-1 Proposed Development for Tunnel Mountain, Banff National Park H.K. Eidsvik January, 1963 63-2 Terra Nova National Park, Saltons Brooks - Proposed Developments. H.K. Eidsvik January, 1963 63-3 National Park Potentials. Northwest Territories and Lloyd Brooks Yukon, Report of Field Operation and Recommendations H.K. Eidsvik January, 1963 63-4 Maligne Lake, Long-Term Lloyd Brooks January, 1963 Development Plan. 63-4 Chadburn Lake; A H.K. Eidsvik April, 1963 Park Proposal 23 Jasper National Park, Maligne Lake Long-Term Development Plan L. Brooks 1962 24 Prince Edward Island National Park Proposed Development Plan J.C. Jackson February, 1963 (revised April, 1963) Recommended Nat. Parks Policy J.C. Jackson January 15, 1962 National Parks Policy J.C. Jackson January 9, 1962 25 Terra Nova National Park Sandy Pond Beach Development L. Brooks October, 1963 26 Kootenay National Park L. Brooks October 16, 1963 Radium Hot Springs Redevelopment 27 Elk Island National Park Relationship of Zoning and Interpretive Plan to Long-Range Development H.K. Eidsvik October, 1963

in Banff, Jasper, Yoho and Kootenay National Parks - 1963 J.B. Ramsey December, 1963 Proposed Development for the Two Jack Camping Area, Banff National Park. H.K. Eidsvik January, 1964 Banff National Park. H.K. Eidsvik January, 1964 Wood Buffalo National Park, A Significance Study C.L. Merrill December, 1963 Planning New National Parks in Canada: A Case History H.K. Eidsvik, 1964 Prince Edward Island Shoreline Reconnaissance C.L. Merrill July, 1964 Reconnaissance Renfrew County C.L. Merrill July, 1964 Shoreline Reconnaissance Terra Nova National Park, Newfoundland. D. Cline October, 1964 A Reconnaissance of the Proposed National Park, Kejimkujik Lake, Nova Scotia G. Lee October, 1964 Review of Park Potential Beaubear's Island, New Brunswick H.K. Eidsvik September, 1964 Cape Breton Highlands Land Acquisition Program, East Coast H.K. Eidsvik September, 1964	28	An Economic Study of Accommodation		
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36 Cape Breton Highlands Land	35	Review of Park Potential		
		Beaubear's Island, New Brunswick	H.K. Eidsvik	September, 1964
Acquisition Program Fast Coast H K Fidsvik September 1964	36	Cape Breton Highlands Land		
requirement, new court in, a, baddia oppositely 1701		Acquisition Program, East Coast	H.K. Eidsvik	September, 1964

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Policy and a Development Program

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L. Brooks January, 1965

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	Rogers Pass Area	H.K. Eidsvik	September, 1965
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	Outdoor Recreation	P. Matrosovs	November, 1965
50	Fundy - Wolfe Lake Activity Centre	D.N. Major	December, 1965
51	Point Roberts - A proposal for		
	Future Land Use	P. Matrosovs	March, 1966
52	Kouchibouguac Bay National Park -		
	A Recommendation	D.E. Cline	May, 1966
53	Ship Harbour: A National Proposal	D.E. Cline	November, 1966
54	A Preliminary Examination of Two		
	Potential National Parks in Manitoba	G.D. Taylor	November, 1966
55	Dinosaur Provincial Park -		
	A National Proposal	G.D. Taylor	December, 1966
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	Master Plan	G. Miller	April, 1967

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National Park, 1961 G.D. Taylor May 1962

2. Trailer Entries - National Parks

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National Park, 1962 G.D. Taylor February, 1963

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Park - Maximum Use Survey, 1962 G.D. Taylor March, 1963

5. Prince Edward Island National

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6.	Some Comments on the Commercial		
	Accommodation in Banff National		
	Park	G.D. Taylor	March, 1963
7.	Park Use Survey,		
	Cape Breton Highlands Nat. Park		
	1962	G.D. Taylor	May, 1963
8,	1962 Travel Survey, Banff,		
	Jasper, Kootenay and Yoho National		
	Parks	G.D. Taylor	January, 1964
9.	1963 Public Use Survey		
	Terra Nova National Park	G.D. Taylor	March, 1964
10,	Camping Equipment National		
	Parks 1963	G.D. Taylor	April, 1964
	Mariamil Park, 1907, Also,		
11.	Camping, Cape Breton Highlands	G.D. Taylor	April, 1964
12.	A Camper Survey, Tunnel Mountain		
	and Two Jack Lake Campgrounds,		
	Banff National Park	G.D. Taylor	June, 1964
13.	Traffic Report 1964 - Fundy		
	National Park	G.D. Taylor	February, 1965
14.	The Visitor to Fundy National		
	Park 1964	G.D. Taylor	March, 1965
15.	Prince Edward Island National		
	Park - Traffic Studies 1961 -		
	1964	G.D. Taylor	March, 1965
	Seasonal Camping - Prince		
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17.	Mount Norquay Ski Study 1965		
	Banff National Park	G.D. Taylor	October, 1965
18.	Staff Accommodation,		
	Banff National Park, 1964	G.D. Taylor	October, 1965
19.	Visitors to Five National		
	Historic Parks, 1965	G.D. Taylor	February, 1966
20.	An Appraisal of Public Reaction		
	to Campground Facilities and		
	Standards - Two Jack Lake		
	Campground, Banff National Park	D. N. Cyslentiff ast to	
	1965	G.D. Taylor	April. 1966
21.	Traffic Report - Cape Breton		
	Highlands National Park, 1965	G.D. Taylor	July, 1966
22.	Wilderness Travel Survey	G.D. Taylor	Not released
23.	Visitors to National Parks -		
	A Summary Report	G.D. Taylor	November, 1966
24.	Visitors to Waterton Lakes		
	National Park, 1966	J.W. Thorsell	Spring, 1967
25.	Visitors to Kootenay National		
	Park, 1965	H.N. Nixon	February, 1967
26.	Staff Accommodation - Jasper		
	National Park, 1966	H.N. Nixon	March, 1967
27.	Fort Wellington National		
	Historic Park - A Visitor		
	Use Study	G.D. Taylor	February, 1967

28.	Banff National Park -		
	Aspects of Visitor Use	N. Nixon	March, 1967
29.	The Visitor to Yoho National		
	Park	J.W. Thorsell	May, 1967
30.	St. Lawrence Islands National		
	Park - A Visitor Use Study, 1966	G.D. Taylor	July, 1967
31.	Jasper National Park, Visitor		
	Use Survey, 1966	H.N. Nixon	
32.	An Analysis of Mountaineering and		
	Ski Touring Registrations, Banff		
	National Park, 1966-67		December, 1967
33.	Trail Use Survey Banff and Yoho		
	National Park, 1967. Also,		
	Appendix E	J.W. Thorsell	February, 1968
	intermitable congress or wo		
34.	Prince Albert National Park		4040
	Visitor Use Survey, 1967	H.N. Nixon	January, 1968
25	Pil Taland National Dark		
33.	Elk Island National Park,	H.N. Nixon	November 1067
	Visitor Use Survey, 1967	n, Nixon	November, 1907
26	Lower Fort Garry National Historic		
30.	Park - A Visitor Use Study, 1967	Miss M E Hirs	h Anril 1068
	rark - A visitor use Study, 1907	MISS M.D. HIIS	mpili, 1900
37	Riding Mountain National Park,		
01.	Visitor Use Survey 1967	H.N. Nixon	May, 1967
	Sheetle Sheetler Forestry Comit	rator of soul dat	STATE AND THOUGH
38	Mountain National Parks;		
		J.W. Thorsell	June. 1968
39.	Riding Mountain National		
	Park Visitor Pattern Survey	H.N. Nixon	July, 1968

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Kejimkujik National Park, Nova Scotia Master Development Plan.	H.K. Lidsvik	March, 1965
Fundy National Park, New Brunswick Park Master Plan.	D.N. Major	September, 1966
Terra Nova National Park Provisional Master Plan.	D.N. Major	December, 1966
Waterton Lakes National Park Provisional Master Plan.	P. Matrosovs	April, 1967
St. Lawrence Islands National Park Provisional Master Plan.	G.O. Lee	June, 1967
Riding Mountain National Park Provisional Master Plan.	Philip E. Flore (consultant)	
Jasper National Park Provisional Master Plan	D.N. Lockwood	December, 1967
Banff National Park Provisional Master Plan - 1967.	D.N. Lockwood	December, 1967
Kootenay National Park Provisional Master Plan - 1967.	D.N. Lockwood	December, 1967
Yoho National Park	D.N. Lockwood	December, 1967
Provisional Master Plan - 1967.		

- 4) means to transfer information of a project to extramural groups.
 - (1) conferences participation and papers:

Canadian Association of Geographers Canadian Institute of Foresters Canadian Society of Landscape Architects Conservation Council of Ontario Federal-Provincial Parks Conference International Union for the Conservation of Nature Northern Resource Conference Virginia Outdoor Recreation Symposium World Forestry Congress XIV International Congress, IUFRO American Institute of Park Executives National Forestry Conference Parks and Recreation Association of Canada Northeast Fish and Wildlife Conference Provincial Conference on Parks and Recreation, Toronto Canadian Symposium of Recreation International Congress of the International Landscape Architects Park Naturalists Conference Eastern Canada Conference on Camping and Roadside Development

(ii) committee membership:

Intergovernmental Committee on Outdoor Recreation

Interdepartmental Committee on Resources ad Hoc Committee on Recreation

Joint Committee on National Parks - Canada and United States

National Committee on Forest Land

North American Forestry Commission of FAO Wildlife and Recreation

Committee

Research Committee of Conservation Council of Ontario

Canada-Ontario Rideau Study Group

(iii) seminar participation:

Civic Affairs Committee, Vancouver Board of Trade
Federal-Provincial Land Inventory Seminar
Land Use Seminar, Department of Geography, Carleton University
Parks and Leisure Seminar, University of British Columbia
Recreational Planning Seminar, Department of Geography,

University of Saskatchewan

Symposium on Forest Recreation

Faculty of Forestry, University of Laval

- 5) N/A
- 6) N/A
- 7) N/A
- 8) N/A more than the same and the same as a second of the same and the same as a second of the same and the same as a second of the same as a second o
- 9) Activities of the Planning Branch have increased knowledge of national parks in respect to the park users and resources within the park and within potential park areas. However, the impact of our activities on scientific knowledge generally is negligible.

 While the establishment of a National Park does bring about economic development in the surrounding region, this is not the park's prime aim. The amount of economic development varies with the region.

 The actual impact of scientific activities must be said to be secondary on Canadian economic development.
 - 10) N/A second has abled a second treatment to the second treatment treatment to the second treatment treatment

2.9 Projects DAL ON DE MARKET AND COMPANY OF THE PROJECT OF THE PR

1) Title of projects 1962-68

Long Range Planning: surveys and reports on:

1962 Bruce Peninsula

Kejimkujik N.S.

1963 Yukon

Nahanni - Great Slave Lake

1964 East Point P.E.I.

1965 Serpentine River Nf1d.

Rideau Lakes

Boundary Bay - Pt. Roberts

Elliot Lake

Pukaskwa

Cypress Hills Sask.

Val Marie Sask.

Grose, Morne Nfld.

1966 Northumberland Strait

Atlantic Coast N.S.

Canadian Shield Man.

1967 Dinosaur Prov. Pk Man.

Master Planning - Provisional Master Plans for:

Waterton Lakes Elk Island

Glacier Prince Albert

Revelstoke Riding Mountain

Yoho Point Pelee

Kootenay Fundy

Jasper Banff

Kejimkujik Terra Nova

Cape Breton Highlands Prince Edward Island

St. Lawrence Islands Georgian Bay Island

other projects:

Ground Cover Study - Waterton Lakes

Yoho Valley Plan

Jasper Miette Hot Springs Plan

Banff/Yoho Corridor Plan

Prince Albert Kingamere Plan

Maritime Parks Activity Centre Plans

Park Expansion Program

Policy:

National Parks Policy

Research: user studies of:

Kootenay

Yoho

Jasper

Waterton

St. Lawrence Islands

Ft. Wellington National Historic Park

Point Pelee

Fort Malden National Historic Site

Lower Fort Garry

Prince Albert

Mountaineering and Ski Touring Banff

Trail Use - Banff and Yoho

Riding Mountain

St. Lawrence Islands

Demand Study - Mountain Parks

- Maritime Parks

Town Planning: townsite plans of:

Banff

Jasper

Prince Albert (Waskesiu)

Riding Mountain (Wasagaming)

Yoho (Field)

2) Significant completed projects:

All projects fall under the applied research heading

Long Range Planning - this section is responsible for the searching
out and assembling of potential park areas as representative
examples of Canadian Landscape. Analyses of the areas resources
are made. More recent reports have made more comprehensive
analyses involving a team participation by biologist and wildlife
experts, economists and representatives from the mining and
forestry fields. An economic impact study is also included.
A representative example of this team approach was taken in the
Bloodvein, Man. study. Investigation of 19 areas has been made.

Master Planning - the first step in the planning of an established park is the making of a Provisional Master Plan organization and evaluating data on floral, fauna, geology, climate, fish and water. A general development plan is produced based on this date, again incorporating a team approach. This involves engineering, wildlife, and social inputs for the planning area. A model study is that of Banff National Park.

Town Planning - Town planners have been used in the evaluation and planning of existing service centres in the national parks. Significant work has been done by this section in amendments to the National Parks Act. This has resulted in townsite legislation for Banff and Jasper in 1967 and 1968 respectively.

Research Section - is responsible for the provision of a bank of information on national park use and trends, in co-ordination with the Master Planning Section. It is anticipated that after the initial use study for each park, a follow up study will be undertaken every five years as will be the case with master plans. The key user study is the Riding Mountain National Park User Study 1967-68. The methodology used in this report will be used in all subsequent work.

A significant contribution of the Research Section has been in the initiation and co-ordination of the Outdoor Recreation Demand Study.

This is the first attempt at a nation-wide study of recreational resources

and needs. This study is intended to provide information on motives and activities of the entire Canadian population. This information is to be used in the establishment of new parks and in the continuing development of existing ones. This has involved co-ordinating and attaining the co-operation of federal and provincial departments as well as private agencies and consultants. All provincial governments and such federal agencies as the Canadian Government Travel Bureau, and the Dominion Bureau of Statistics are directly involved.

Policy - in the preparation of long range plans for the development of a sound National Park System consideration must be made of the legislation, the ultimate objectives of each of the parks and of the system as a whole. Thus a clear conception of park purpose and policy is required to direct planning of the individual units and the park systems, as well as a guide to the administration of this system. Previously the general purpose of the National Parks had been interpreted in many different ways, causing conflict of purpose in the administration, as well as in the development of the individual units of the system. With the establishment of a positive, organized and coherent statement of policy, planning now proceeds toward sound objectives.

2.10

- With the simplification and increased sophistication of computer methods, increased use of computer techniques will be made in all phases of planning and research.
- 2) This will allow more comprehensive scientific research into outdoor recreation demands and needs in a more leisure oriented, mobile society.
- 3) The main type of technical advice sought in the last five years has been in regard to our Outdoor Recreation Demand Study. The source of our advice has been Dr. J.L. Knetch, an American consultant in the economics of recreation at George Washington University. He was subsequently hired as a part-time adviser in design and co-ordination of the study.

BRIEF FOR THE SENATE SPECIAL COMMITTEE ON SCIENCE POLICY NATIONAL PARKS SERVICE - OPERATIONS DIVISION INTERPRETATION SECTION

SUMMARY

- A. The Interpretation Section engages in scientific activities in three general categories:
 - in established National Parks, when the information is needed to preserve park values, to interpret the park to visitors or to characterize a park as part of a national system.
 - in proposed areas for inclusion in the system of National Parks.

 Such areas are assessed for their validity as nationally significant, high quality, unimpaired and adequate examples.

 Interpretive potential is assessed. Problems are anticipated when possible. Much of this function is in the form of a service to the Planning Division of the National Parks Servic.
 - controls under permit, the activities of outside persons and agencies
 wishing to pursue their own scientific programs in National
 Parks. Permits are granted to qualified persons or agencies
 if their programs are scientifically valid, will not impair
 park values and cannot be carried out elsewhere.
- B. The Interpretation Section carried out scientific activities through its own research staff, presently numbering one, to be increased to two as of November 1. Field staff do not normally undertake scientific activities.
- C. The Interpretation Section obtains the services of qualified scientists through contracts when necessary or desirable.
- D. Scientific activities are carried out as part of a service to, and in the best interests of, the nation, under the clause of the National Parks Act dedicating National Parks to the "benefit, education and enjoyment of the people" and requiring that the parks be maintained unimpaired.

E. It is expected that scientific activities in National Parks will increase as park utilization increases, as new parks are required, and as the growing world population puts increased stress on the total environment.

Part II

2.2 Organizational Functions

- (c) Contacts with -
 - (i) Other Federal agencies -
 - Departments of Forestry; Energy, Mines and Resources, Secretary of State.
 - (ii) industry none
 - (iii) educational institutions with many universities, through contracts or permission for research.
 - (iv) international Section personnel participate in the International Biological Program (I.B.P.), a world-wide organization with United Nations affiliation, which investigates all aspects of interactions between living organisms, including man, and their environment. It is expected that some I.B.P. scientific activities will be carried out in National Parks, and that active collaboration will take place.
 - (v) other through contracts with, or permission to research granted to, some selected scientific workers.
- (d) Operational effectiveness, duties and goals are under continual review and are revised annually as needed, when employee appraisals are performed.
- (e) Outside studies Ecological studies, to study primitive natural communities in parks and the present or future effect of man's activities on them. Several studies now in progress. Archaeological studies, to determine the impact of planned park development on buried historical values. Major projects under way in Waterton Lakes National Park and Point Pelee National Park. Geological studies, to assess fossil beds, mineral occurrences, glacier phenomena and so on. Several studies now under way or planned for 1969. A continuing program of research into natural

- cave phenomena has been carried out in three mountain parks
 for the past three years and is expected to continue for
 several more years. Major visitor developments may result
 from this work.
- (f) In order to meet its responsibilities under the dedication clause of the National Parks Act, the Department will in the foreseeable future have to increase its involvement in scientific activities by increasing its staff, increasing its contract activities, or both.
 - (g) Lack of a clearly defined research policy has been probably the major hindrance to effective performance of scientific activities, with lack of staff a significant contributing factor.
 - (h) An increase in research staff (to 2) is imminent (Nov. 1, 1968).
 A research policy is under preparation, and is expected to be available in the spring of 1969.

2.3 Personnel Policies

- (a) No formal steps are taken by this section to identify and hire graduating researchers. Informally, graduates are contacted when they come to our attention.
- (b) No unique criteria for research staff have been developed.
- (c) One headquarters staff member has been designated as responsible for "Interpretation Research and Planning". One field staff member has been appointed to a headquarters position.
- (d) No formal distinction has been made, since no classification exists for a position which is wholly research or wholly research administration.
- (e) No formal policy is in effect. One research staff member has been granted educational leave to take a graduate degree in Science (Biology).

2.4 Distribution of Activities

- (a) Scientific activities by the Interpretation Section can and do take place in any region of Canada where a national park exists or is contemplated.
- (b) All types of scientific activity associated with national

parks could theoretically take place in every park, with obvious exceptions such as the exclusion of most forestry activities in a truly prairie park.

- (c) No scheduled annual activities other than annual field travel by Ottawa staff to all three regions (Western, Central and Atlantic).
- (d) The role of this section in contributing to regional development is restricted to an organizational role in the development of the national parks, and such development takes place with park boundaries.
- (e) N/A

2.5 Personnel

As stated previously, there is at present only one staff member engaged in scientific research. The personnel questionnaire submitted gives relevant details.

2.6 Expenditures

This information would be extremely difficult to extract from the financial records of the National Parks Service as a whole, and as expenditure on research so far has been relatively small, it is not considered significant enough to warrant the time required to compile this data.

2.7 Research Policies

(a) A research policy is now being developed. To date, scientific

activities have been undertaken either when the need arose or

when a favourable opportunity presented itself. Programmed

research is being developed and will become policy when all

aspects are agreed upon. In the meantime, each project is

treated individually. Programs are presently contemplated for

Waterton Lakes National Park (Archaeology), Point Pelee National

Park (Ecology), Banff and Jasper National Parks, (Ecology, Geology).

A further analysis does not appear to be warranted at this time, because of the limited scope of the program. (b) N/A

2.8 Research Output

- 1) N/A
- A bibliography of the extensive scientific literature on Point Pelee National Park has been published and put on sale to the public.

A series of handbooks on the geology of the national parks has been published, though this series was not the direct responsibility of this Section.

 Numerous reports, retained within the Branch, have been produced by contract scientists and by Ottawa staff.

2.9 Projects

It is probably too early to comment on this section. Most projects and programs are still in progress. Many are too restricted in scope at this stage to qualify for discussion.

The most important projects currently under way are the archaeological investigations at Waterton Lakes and Point Pelee National Parks, a forestry-oriented ecological study by the Forestry Department in Waterton Lakes, the beginnings of an ecological investigation at Point Pelee, and the cave research program in Glacier, Banff and Jasper National Parks.

2.10 Effects of Scientific Activities

General comments only are applicable here. In the future, development of the National Parks system will undoubtedly rest more heavily on information supplied through scientific activities and agencies. Scientific input will be required at all stages, from the first selection of areas for national parks, through development and interpretation, to continuing maintenance of park values in the face of visitor use pressures.

Modern discoveries, technologies and improvements will have considerable effect on all aspects of park activities but it is not foreseeable that these will change the basic concept or practice of the National Parks philosophy. More people will have to be accommodated in a larger number

of parks, and will have to be served with a higher quality program more closely geared to the main purpose of National Parks. Briefly stated, this is to allow visitors to experience the natural world without altering it. All developments of science and technology which apply to this purpose will have a bearing on the operation of the National Parks system in Canada.

BRIEF FOR THE SENATE SPECIAL COMMITTEE ON SCIENCE POLICY ENGINEERING AND ARCHITECTURAL DIVISION NATIONAL AND HISTORIC PARKS BRANCH

2.1 Organization

The organization of this Division is geared to executing a capital program. The organizational structure is not adapted for the purpose of scientific investigation.

2.5 Personnel

None of the Division staff are involved to the extent that a major portion of their time is devoted to scientific investigation; this activity is ancillary to other applied objectives.

2.6 Expenditures

No monies are expended on educational grants for immediate or longterm scientific investigation.

Funds consumed intramurally or through consultants on the acquisition of new engineering knowledge, primarily in the restoration and construction fields, are not identifiable as they are spent in conjunction with comprehensive restoration, design and construction projects.

2.8 Research Output

"Restoration of the Louisbourg Fortress" by A.D. Perry, Science Affairs, September 1968;

"Restoration of the Fortress of Louisbourg" by A.D. Perry, EIC Journal, April 1968.

2.9 Projects

Areas of semi-scientific investigation include:

- Avalanche Control, Glacier National Park in conjunction with the National Research Council.
- 2) Stabilization and restoration of historic structures.

2.10 Effects of Scientific Activities

Areas of interest in which effectiveness could be improved through new scientific or technical developments:

 Development of a small package, self-contained, maintenancefree sewage treatment and disposal unit. This would help prevent water pollution in National Parks which are generally

- 2) Study the general sociological effects of highly urbanized living and population pressures as they relate to the need for natural, outdoor, space-oriented recreation and man's need to keep in touch with a natural environment.
- Study the techniques of managing a natural environment through its normal cycles in spite of the unnatural activities, intrusions, observations, etc., of man.
- 4) Broad land use research in the field of ratios of habitation, food production, non-renewable and renewable resource exploitation, waste areas, essential watershed, etc., as applied to areas devoted to conservation and preservation of a natural environment for the study and recreation of man.
- 5) Study and develop the technisques of undersea conservation, observation, preservation and presentation to the public of underwater and shoreline National Parks on the continental shelves.
- 6) Transportation methods for remote areas having minimum impact on the natural environment while moving moderate numbers of people as freely as possible through the area.
- 7) Stabilization of decaying timber through polymerization of impregnated chemicals via irradiation.

2.5.c CHART I Parks & Historic Sites

B.A.'s, M.A.'s, and Ph.D.'s employed in Parks and Historic Sites Branch, Department of Indian Affairs and Northern Development, by country of birth and country of training.

Data include research staff only.

		В.А.				M. A				Ph.D.
Country of Birth	Canada	Poland	Latvia	U.S.A.	Canada	O. 10 AL.	England	U.S.A.	Scotland	Canada
Country of Training	100	1 to 10	1018	a de la constante de la consta		0.00			K T	
Secondary Schooling Canada	17	1	1	1	9	NA BANK		YOUR		1
U.S.A. England Scotland		0.23	0.44	1 2	SO	2	9 2		1	
B.A. Canada U.S.A. England Wales Mexico	14 2 1	1	1	1 2	8 1	1 1	1			1
M.A. Canada England U.S.A. Scotland	ed a				5	1 1	2		1	1
Ph.D. Australia										1
Able to operate effectively										
in both languages	3	1			1	-			1	-
				t total						

2.5.c CHART II Parks and Historic Sites

Average number of working years since graduation and average number of years employed in present organization, B.A.'s, M.A.'s, and Ph.D.'s employed in Parks and Historic Parks Branch, Department of Indian Affairs and Northern Development, by age group.

Data include research staff only.

221-25 26-30 31-35 31-35 41-45 51-50 51-65	A GROUP
211267	No. of individuals in age group
1.79 4.5 5.0 3.0 16.0 15.4	Average no. of working yrs. since graduation.
1.50 1.72 4.0 3.0 9.5 14.0	Average no. of yrs. employed in present organization
T 3 4 5 T	No. of individuals in age group
1.0 4.0 11.66 20.0	Average no. of working > yrs. since graduation
1.0 2.66 18.0	Average no. of yrs. employed in present organization
T. S.	No. of individuals in age group
·	Average no. of working byrs. since graduation
BEST OF THE STATE	Average no. of yrs. employed in present organization
10 M	Passy County Cou

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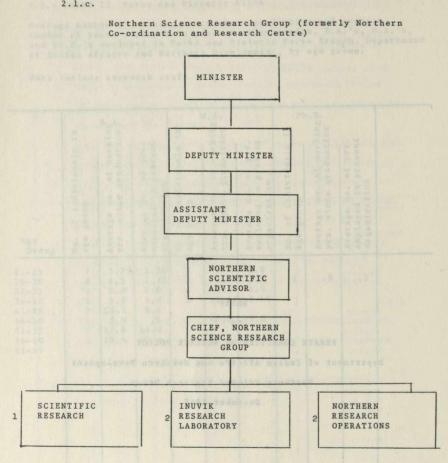
SENATE COMMITTEE ON SCIENCE POLICY

Department of Indian Affairs and Northern Development

Northern Science Research Group

December 1968

2.1.c.



The Northern Science Research Group conducts and coordinates research on Arctic and sub-Arctic areas. It has formal and informal ties with the other branches in the Department, with other Departments, and with Universities and private institutions throughout Canada.

- 1. Substantial Scientific Research 2. Scientific Support

NORTHERN SCIENCE RESEARCH GROUP

Part II:

- II. 2. Content of Submissions

 2.1 Organizations N/A

 2.2 Organizational Functions
- a) The Department of Northern Affairs and National Resources
- Act of 1953 in Section 6, Subsection (c) charged the b) Minister of Northern Affairs and National Resources with responsibility for "fostering, through scientific investigation and technology, knowledge of the Canadian north and of the means of dealing with conditions related to its further development." As one response to this charge, the Northern Co-ordination and Research Centre was established. In the Government Re-organization Act of 1966, this responsibility remained unchanged, but in January, 1968, the functions of the Northern Co-ordination and Research Centre were separated, and its principal scientific research responsibilities were assigned to the Northern Science Research Group, which operates under the direction of a Northern Scientific Adviser, who has been appointed to advise on scientific and technological matters, and to direct these activities within the department. The Northern Scientific Adviser, assisted by the Northern Science Research Group provides scientific information and advice to the department and elsewhere, conducts or arranges for the conduct of research programs to meet departmental requirements, assists scientific research by other institutions and individuals in the north, and co-ordinates northern research throughout the government.
- c) (i) The department does not attempt to carry out research in a discipline where there is a well-established government agency already active in the field. For instance, the Geological Survey carries out northern geological research, the Hydrographic Survey carries out northern hydrographic surveys, the National Museum and Department of Agriculture carry out northern research in botany, etc. The departmental role lies in the co-ordination and support of these activities. The main machinery

11. 2.2

for co-ordination is the Scientific Research Sub-Committee on

Northern Development. The Northern Scientific Adviser is chairman

of this sub-committee which has representatives from government agencies

carrying out research in the north. Assistance to research programmes

of other Departments is given through the provision of northern facil
ities, especially those of the Inuvik Research Laboratory;

- (ii) advice is given to industry on northern conditions and scientific matters, or the inquiries are directed to the appropriate specialized agency. Industrial research also uses the facilities of the Inuvik Research Laboratory;
- (iii) advice on northern conditions and scientific matters is given to universities and other educational institutions intending to work in the north. University staff and graduate students are employed on research projects for the department either as seasonal employees or under contract. A program of grants for nother research by universities has been established. Support and facilities are provided in the field, particularly through the Inuvik Research Laboratory;
- (iv) liaison is maintained with polar agencies in other countries, and northern development in other northern areas is studied.

 Representatives frequently attend international conferences, but no officers are permanently stationed abroad. The Minister has, however, considered the appointment of a northern specialist from the department to a Canadian Embassy in northern Europe to watch northern development in Scandinavia and the USSR;
- (v) the responsibility for co-ordination of norther scientific activities has led to membership in several national scientific committees, such as the Canadian Co-ordinating Committee for the International Geophysical Year and the International Biophysical Program, N.R.C. Associate Committees, etc.
- d) Operational effectiveness and goals are reviewed and revised through conferences, meetings, the Annual Program and Estimate Reviews and periodic Program Management Evaluation studies.
- e) Not applicable.

- II. 2.2
- f) With such a broad field of responsibilities, current limitations of staff and resources do not allow more than an attempt to cover the most important and most urgent requirements. Most of the research effort has therefore been concentrated on the social problems of the north.
- g) The major hindrances are two-fold. One lies in the current restrictions on establishment and resources, aggravated by the pressing operational commitments of the department which have to be met from the same resources. The other lies in the difficulty of attracting professional staff, especially in social anthropology, in the face of competition from universities for the small number of suitably qualified scientists.

2.3 Personnel Policies

Awareness of the availability of promising young graduates at universities is maintained through both formal and informal contact with members of university departments, who are kept informed of opportunities for employment in this department. No unique criteria have been developed to help to identify those who will be effective researchers.

Provision for the identification of persons with high potential for posts in research administration is made in the department-wide Employee Evaluation Program, which is designed to identify the special potential of all employees. Provision for in-service training, intra-mural and extra-mural, is also a feature of a department-wide program in which promising members of the department are provided with periodic opportunities to gain further training and education.

2.4 Distribution of Activities

The significant aspect in the regional pattern of expenditure on research by this agency is in the distribution of grants to university groups across the country. The purpose of these grants is to offset in some degree the high costs of field training in the north for young scientists, and to encourage the development of scientists with some experience in the north and some commitment to future northern work. The distribution of these grants since the program began is noted below:

GRANIS FOR NORTHERN RESEARCH AND FOR NORTHERN SCIENTIFIC RESEARCH EXPEDITIONS

The proposed and the transport to the same and the same a		Amount of
Northern Research Institutes	Year	Grant
Arctic Studies Group		
(University of Montreal)	1965/66	\$ 3,000
emulacing kungon and av balanda	1966/67	10,000
	1967/68	10,000
	1968/69	8,000
		ston out. 18
Boreal Institute.		
(University of Alberta, Edmonton).	1962/63	4,800
	1963/64	4,800
	1964/65	5,000
	1965/66	6,500
	1966/67	7,000
	1967/68	11,000
	1968/69	13,000
Con Possersh Contro of Anthron-1		
Can. Research Centre of Anthropology. (St. Paul University, Ottawa).	1962/63	1 200
(or. radi bulversity, ottawa).	1963/64	1,200
	1964/65	5,000
	1965/66	5,000
	1966/67	6,500
	1967/68	8,000
	1968/69	9,000
	TOATEN THE	graduate
Centre d'Etudes Nordiques.		
(University of Laval).	1962/63	6,000
	1963/64	7,000
	1964/65	13,000
	1965/66	20,000
	1966/67	25,000
	1967/68	27,000
	1968/69	27,500
Committee on Arctic & Alpine Research.		
(University of B.C., Vancouver).	1962/63	1,500
(University of B.C., Vancouver).	1963/64	4,000
	1964/65	12,000
	1965/66	15,000
	1966/67	22,500
	1967/68	27,000
	1968/69	27,500
	bi want smil ya	qub a dep
Committee on Northern Studies.		
(University of Manitoba)	1962/63	1,500
	1963/64	1,500
	1964/65	5,000
	1965/66	8,000
the state of the s	1966/67	16,000
	1967/68	20,000
	1968/69	22,500
President & Committee on Northern		
Area Studies.	1966/67	3,000
(Lakehead University, Port Arthur).	1967/68	4,000
, and the state of	1968/69	3,500

Tartitute for Northern Ctudios		
Institute for Northern Studies.	1962/63 \$	
(University of Saskatchewan, Saskatoon)	1963/64	7,000
	1964/65	12,000
	1965/66	15,000
	1966/67	
	1967/68	24,000
		27,000
	1968/69	30,000
Institute of Social & Economic Research.	1062/6/	5 000
(Memorial University, St. Johns Nfld.)	1963/64	5,000
		5,000
	1965/66	10,000
	2,00,0,	12,500
	1967/68	17,000
	1968/69	17,000
1968/69 15,000		
McGill Committee for Northern Research.		5 000
(McGill University, Montreal)	1964/65	5,000
000 Cladmingallegave may votanguenavorsound		5,000
	1966/67	10,000
	1967/68	11,000
	1968/69	10,000
OUO-US AND THE PARTY OF THE PAR		
Committee for Arctic & Sub-Arctic		
Research. (University of Toronto).	1967/68	19,500
	1968/69	19,500
Arctic Studies Conference.		
(To be hosted by different universities)	1967/68	5,000
	1968/69	5,000
Bishops University for the Senate Committee		
on Northern Research.	1968/69	1,000
Northern Scientific Expeditions		
Somerset Island Expedition.		
(University of Ottawa)	1963/64	1,000
	1964/65	12,000
	1965/66	16,000
	1966/67	13,500
	1967/68	8,500
	1968/69	2,500
Cape Dyer - Baffin Island Exp.		-
(University of Toronto)	1964/65	7,500
	1965/66	7,500
Jacobsen McGill Expedition.		
(McGill University)	1962/63	16,200
	1963/64	16,000
	1964/65	5,000

Non-Universi	ty	
Northern Sci	entific	Expedition.

Devon Island Expedition.		
(Arctic Institute of North America).	1962/63	\$ 10,800
WALLES THE STANDARD STANDARD	1963/64	10,000
	1964/65	10,000
	1965/66	10,000
	1966/67	15,000
	1967/68	15,000
	1968/69	14,000
Icefield Ranges Research Project.		
(Arctic Institute of North America).	1965/66	7,500
	1966/67	12,000
	1967/68	15,000
	1968/69	15,000
	Andreits / House & or & House	Marchael 31 Con
General Funds.		
(Arctic Institute of North America)	1962/63	12,000
000.01 (A) AARI	1963/64	12,500
	1964/65	
		23,500
	1965/66	16,500
	1966/67	20,000
	1967/68	25,000
	1968/69	25,000
		5 000
Yukon Research & Development Inst.	1966/67	3,000
		or Street Industrial

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000,6 20\4011 001/454 100/455 10,000

Nichart & Charleton on American . 1960/47 1.000

II. 2.4

In-house research, directed toward practical problems in the Northwest Territories and the Yukon, has for the most part been concerned with investigation of the problems of native people resulting from conditions of northern life. Study of human development in the north, within the framework of the social sciences, has been our central research concern, although some research of a technological nature, in support of departmental activities, has been conducted.

2.5 Personnel Associated with Scientific Activities

- a) Administrative and Foreign Service Category

 Administrative Support Category

 Scientific and Professional Category

 Research Scientists under contract -- Ottawa

 Research Scientists under contract -- Inuvik

 Scientific Guest Workers -- Ottawa -- up to 5

 (the number varies throughout the year)

 Scientific Guest Workers -- Inuvik -- up to 200

 (the number varies throughout the year)
- b) Two

2.6 EXPENDITURES ASSOCIATED WITH SCIENTIFIC ACTIVITIES

a Total funds spent on scientific activities broken down into the following categories: FUNCTIONS

	62-63	63-64	64-65	65-66	66-67	67-68
Intra Mural R & D.	150,992	161,804	190,465	294,695	274,545	329,770
Scientific Information	4,255	5,985	4,763	5,966	6,000	6,391
R & D in Universities	37,200	47,500	86,500	111,000	148,000	195,000
R & D in Other Agencies	22,800	22,500	33,500	34,000	82,000	85,000
SCIENTIFIC DISCI	PLINE					
	62-63	63-64	64-65	65-66	66-67	67-68
Social Science	155,247	167,789	132,183	224,916	189,428	241,206
Natural Science			63,045	75,745	91,117	94,955
Grants (Social- Natural and Physical Science	60,000 e)	70,000	120,000	145,000	230,000	280,000

(b) OPERATING AND CAPITAL FUNDS EXPENDED

	62-63	63-64	64-65	65-66	66-67	67-68
Operating	208,470	225,118	300,503	431,991	499,682	606,339
Capital	6,777	12,671	14,725	13,670	10,863	9,822

(c) FUNDS EXPENDED TO FURTHER PROFESSIONAL UNIVERSITY EDUCATION

62-63	63-64	64-65	65-66	66-67
		4.874		80

2.7 Research Policies

- a) Units concerned with intra-mural research activities
 - 1) Research Projects are initiated as a result of needs expressed by operational agencies within the department, and of proposals put forward by the research agency in response. Problems are defined by discussions between senior officials of the department and members of the research group.

 Other government agencies which have northern research interests are kept advised of our program through meetings of committees such as the Scientific Research Sub-Committee of the Advisory Committee on Northern Development, and through less formal exchanges of information between individuals in several departments with related interests.
 - 2) Priorities between programs and projects are established at the annual Program and Estimate Reviews with the Executive Committee of the department, and are implemented in accordance with the availability of professional staff and funds.
 - 3) A Program Evaluation Unit has been organized in this department, as a central service agency, and it will assess the Group's research program together with other departmental programs.
 - 4) The Northern Science Research Group depends in large part on contractual agreements with university scientists for the conduct of individual research studies. Members of the small staff of permanent research personnel in the Group Act in many instances as co-ordinators and research administrators. A case in point is the Mackenzie Delta Research Project, a multi-disciplinary study designed to investigate the problems faced by native people in a changing environment. In 1965, when preliminary investigation began, four studies were made under contractual agreement with university scientists:
 - A basic guide to the economic geography of the Mackenzie Delta.
 - A description and analysis of the technology of the area.
 - iii) An outline of subsistence patterns in the delta.
 - iv) A preliminary analysis of social structure of the new town of Inuvik.

- 5) Reference has already been made to the program of grants to universities within the Northern Science Research Group administers. Grants are made to Institutes or presidential Committees for Northern Studies at twelve universities across Canada, as well as to the Arctic Institute, and to three scientific expeditions. The Grants program was initiated on the recommendation of the Scientific Research Sub-Committee of the Advisory Committee on Northern Development. Its principal objective is to stimulate research on problems of the north in all disciplines, particularly at the graduate level, with a view to encouraging the professional development of more scientists with a special knowledge of the north and a commitment to northern research. The allocation of funds to each of these Institutions or Committees has been based on the recommendations of a Grants Committee for Northern Research appointed by the Minister. The Grants Committee is made up of six senior scientists, of whom three are from government and three are from universities. The recommendations of the Grants Committee are based on a study of the proposed programs of research supplied by applicants. Recipients use the grants to support research in the whole field of the sciences, and the funds awarded are administered by the business offices of the universities. Reports of the previous year's work are also presented by applicants, and are used as a guides in recommending awards. The allocation of funds to individual scientists at the universities is controlled internally by each of the university committees or institutes.
- Decision to shift research resources from one program
 to another is made by the Executive Committee of the
 department.
 - 7) Research results are communicated principally through the publication of reports. In the case of intramural research, reports are widely distributed to Canadian universities and to other agencies in all parts of the world which have special interests in northern research.
- b) Units exclusively concerned with extra-mural research activities.
 Not applicable.

2.8 Research Output

- 1) Not applicable.
- 2) Publications by extramural agencies of research conducted for the Northern Science Research Group.
- Jenness, Diamond Eskimo Administration: I. Alaska a. Montreal; Arctic Institute of North America, Technical Paper No. 10, 1964.
- Jenness, Diamond Eskimo Administration: II. Montreal; Arctic Institute of North America, Technical Paper No. 14, 1964.
- Honigmann, John and Eskimo Townsmen c. Irma Ottawa; Canadian Research Centre for Anthropology, University of Ottawa, 1965.
- Jenness, Diamond Eskimo Administration: III. Labrador d. Montreal; Arctic Institute of North America, Technical Paper No. 16, 1965.
- Slobodin, Richard Metis of the Mackenzie District Ottawa; Canadian Research Centre for Anthropology, Saint-Paul University, 1966.
- Jenness, Diamond Eskimo Administration: IV. Greenland Montreal; Arctic Institute of North America, Technical Paper No. 19, 1967.
- Jenness, Diamond g. Eskimo Administration: V. Analysis and Reflections. Montreal; Arctic Institute of North America, Technical Paper No. 21, 1968.

3) Publications by the Northern Science Research Group

1962

Foodways in a Muskeg Community - NCRC-62-1 Honigmann, J.J.

Vallee, F.G. Kabloona and Eskimo in the Central

Keewatin, NCRC-62-2

Cohen, Ronald An Anthropological Survey of the Communities in the Mackenzie-Slave Lake Region of Canada. NCRC-62-3

Clairmont, D.N. Notes on the Drinking Deligation
Eskimos and Indians in the Aklavik Notes on the Drinking Behaviour of the

Area. NCRC-62-4

Hurlbert, Janice Age as a Factor in the Social Organization of the Hare Indian of Fort Good Hope,

Dunbar, M.J. Second Report on the Bering Strait Dam NCRC-62-6

Johnson, M.D. An Exploratory Study of Ethnic Relations at Great Whale River. (A revised and expanded version of NCRC-61-5).

Vallee, F.G. Sociological Research in the Arctic NCRC-62-8

	6	

Government Research and Surveys in Lotz, J.R. the Canadian North, 1956-61 Ed., NCRC-63-1 Graburn, N.H.H. A General Introduction to Lake Harbour, Baffin Island. NCRC-63-2 Balikci, Asen Vunta Kutchin Social Change NCRC-63-3 Van Stone, James The Snowdrift Chipewyan NCRC-63-4 Parker, V.J. The Planned Non-Permanent Community NCRC-63-5 Yatsushiro, Toshio Frobisher Bay 1958 (restricted for Departmental use only) NCRC-63-6 Territorial Sovereignty in the Canadian Smith, G.W. North NCRC-63-7 Bourne, L.S. Yellowknife, N.W.T. A study of its Urban and Regional Community NCRC-63-8 Clairmont, D.H.J. Deviance Among Indians and Eskimos in Aklavik, N.W.T. NCRC-63-9 Great Slave Lake Fishing Industry Jenness, R.A. NCRC-63-10 Graburn, N.H. Takamiut Eskimo Kinship Terminology NCRC-64-1

1964

Lotz, J.R. Yukon Bibliography Lotz, J.R. The Dawson Area Parsons, G.F. Yukon Travel Survey 1963

1965

Sue, Hiroko Pre-School Children of the Hare Indians NCRC-65-1 Usher, Peter J. Economic Basis and Resource Use of the Coppermine-Holman Region, N.W.T. NCRC-65-2 Cooper, P.F., Jr. Air-Cushion Vehicles in the Canadian North NCRC-65-3 The Chilkoot Trail Today - Dyea to Lotz, J.R. Bennet

1966

Arbess, Saul E. Social Change and the Eskimo Cooperative at George River, Quebec. NCRC-66-1

Social Science Research Abstracts,

1959-1965. NCRC-66-2

Trappers, Hunters and Fishermen -Turner, Adrian Wildlife Utilization in the Yukon Territory.

1967

Hill, R.M. Mackenzie Reindeer Operations

NCRC-67-1

Vallee, Frank G. Povungnituk and It's Co-operative. A Case Study in Community Change

NCRC-67-2

The Mackenzie Delta - Its Economic Wolforth, John R.

Base and Development MDRP-1

Cooper, P.F., Jr. The Mackenzie Delta - Technology MDRP-2

Smith, D.G. The Mackenzie Delta - Domestic Economy of the Native Peoples

MDRP-3

Mailhot, J. MDRP-4 Inuvik Community Structure - Summer 1965

New Northern Townsmen in Inuvik Ervin, A.M.

MDRP-5

Conferences or Other Means used to transfer information 1962-63

- Arctic Institute Conference on Recent Anthropological Research in the Arctic and Sub-Arctic - Montreal, P.Q.
- Annual Conference of Canadian Association of Geographers, McMaster University, Hamilton - 1962.
- Meetings of the Advisory Committee on Northern Development, and its Sub-Committees. The purpose of this Committee is to advise the government on questions of policy relating to civilian and military undertakings in Northern Canada, and to provide for the effective co-ordinations of all government activities in that area.
 - Canadian Conference on Social Work Winnipeg, Man.
 - Various reports as listed in 2.8 (3).

June -4-8, 1962.

1963-64

- Meetings of the Advisory Committee on Northern Development, and its Sub-Committee Ottawa.
 - Various reports as listed in 2.8 (3).

1964-65

- Alaskan Science Conference Fairbanks, Alaska.
- American Anthropological Association Conference,
 Detroit, Mich.
- Canadian Political Science Association Conference Hamilton, Ont. Conference on community development.
- Centre for Community Studies University of Saskatchewan.
- Indian Eskimo Association Conference Toronto.
- Meetings of the A.C.N.D. and its Sub-Committees Ottawa.
- Various reports as listed in 2.8 (3).

1965-66 AN TOP PAR A TREE DIRECTOR MAY SPECIAL RELIGIOUSES

- Alaska Science Conference Whitehorse, Y.T.
- American Anthropological Association Conference Denver, Col.
- American Association of the Advancement of Science -Montreal, P.Q.
- Meetings of the A.C.N.D. and its Sub-Committees Ottawa.
- Various reports as listed in 2.8 (3).

1966-67

- Northeastern Anthropological Association Conference -Montreal, P.Q.
- American Anthropological Association Conference -Pittsburg, Pa.
- Conference on Intermediate Technology St.
 John's, Nfld. Memorial University.
- Indian Eskimo Association Conference Winnipeg, Man.
- -, McGill Conference of Social Research in the North, Montreal, P.Q.
- Meetings of A.C.N.D. and its Sub-Committees Ottawa.
- 5) This research agency shares access to information from abroad with a variety of institutes for northern studies and other such organizations, and has no exclusive channels to such data. Members of these institutes as well as other persons with northern interests share such data in publications, conferences, visits, and informal contacts.

II. 2.8

- 6) The Grants Program has as its principal objective to encourage the training of scientists for northern work.

 In addition, in-house research undertaken over the past five years has utilized the services of 12 to 14 graduate students who have had an opportunity to train themselves in the fields of anthropology, sociology, and other social sciences, and they have gone on to occupy research and teaching positions in government and the universities.
- 7) Several research projects involving a team approach have been initiated since 1962. They have not yet, however, become thoroughly integrated as inter-disciplinary units. Almost all members of these teams have teaching responsibilities during the academic year, and act as research team members during the summer only. Although development of such research teams is thus a slow process, they promise to be very effective in the investigation and analysis of many problem areas.
- 8) The Inuvik Scientific Research Laboratory, which opened in 1964 at Inuvik, N.W.T., was established by this department as a means for encouraging and facilitating research in the north. The Laboratory facilities are open to scientists from the universities, government, and industry: general laboratory and office accommodation, some technological assistance, and basic field camp equipment are provided. Special facilities include an annex for cosmic ray measurement, low temperature rooms, a photographic darkroom, and a seminar room. The manager and a small technical staff provide assistance and support to scientific investigators throughout the year.
- has two separate and distinct areas of responsibility.

 Firstly, it encourages and facilitates northern research in all branches of science through the Grants Program and the Scientific Research Laboratory in Inuvik. Secondly, it conducts a small in-house research program, mainly in the social sciences, directed toward problems related to the adaptation of the native peoples of the north to a changing environment. This in-house research uses the data-gathering techniques and the analytical tools of the social sciences in order to add new dimensions to understanding social problems.

2.9 Projects for which the Northern Science Research Group was responsible.

1962-63

- A socio-economic survey of the Wakeham Bay Eskimo Wakeham Bay, P.Q.
- A study of Air Photo Interpretation in Labrador-Ungava.
- A comparative study of the administration of Eskimos in Canada, Alaska and Greenland.
- A sociological study of the Resolute Bay Eskimo Group.
- A socio-economic study of the community of Makkovik,
 Labrador.
- A study of the living conditions and welfare problems of Indians and Metis at Fort Good Hope, N.W.T.
- A study of the use of alcoholic beverages among
 Eskimo, Metis, Indians in Inuvik, N.W.T.
- A socio-economic survey of settlements on the Mackenzie.
- A study of the adaptation of selected Eskimos to life in Southern Canada - Ottawa, Frobisher Bay.
 - Initiation of a socio-economic study of the Metis of the Mackenzie Valley.
- Initiation of a study of co-operatives in the Eastern
 Arctic Frobisher Bay, Povungnituk, Cape Dorset,
 Fort Chimo.
 - A sociological study of Yellowknife, N.W.T.
- Completion for publication of a report on "Canada's Expansion to the Arctic and Related Problems of Sovereignty" Ottawa.
 - Initiation of a community study of Frobisher Bay

1963-64 Tong avisan and to wabasa Sistesible and to vibite A

- A socio-economic study of the Gjoa Haven Back River Eskimos.
 - A sociological study of Whitehorse community, Yukon.
- A social and psychological study of Eskimo residential school children Mackenzie Delta Area.
 - Completion of the community study of Frobisher Bay.
- Continuation of a comparative study of the administration of Eskimos in Northern Canada, Alaska, Greenland and Labrador.
 - A study of dietary habits of residents of the Candian North.

- A study of economic, social and demographic change among the Eskimos of the southern side of Hudson Strait.
- A socio-economic study of the community of Dawson, Y.T.
- A preliminary study of the tourist industry of the Yukon Territory Whitehorse.
- A linguistic study of Greenland Eskimo.
- Completion of a social and economic study of the Metis of the Mackenzie valley.
- Completion of a study of co-operatives in the Eastern
 Arctic Frobisher Bay, Povungnituk, Cape Dorset,
 Fort Chimo.

1964-65

- A study of the development of the Eskimo co-operative at George River, P.Q.
- Continuation of a comparative study of the administration of Eskimos in Northern Canada, Alaska, Labrador and Greenland.
- A study of the economic, social and demographic change among the Eskimos of the southern side of Hudson Strait.
- A study of the development of the Yukon Government.
- A study of the child-raising practices of the Eskimos living in the Clyde River Area in the N.W.T.
- A socio-economic study of hunters, trappers and fisherman in the Yukon Territory.
- A comparative study of the potential usefulness of air cushion vehicles in Northern transportation Ottawa.

1965-66

- A biological study of sled dogs and their management in the Eastern Arctic.
- A sociological study of the community of Inuvik, N.W.T.
- A study of the domestic economy of the native people of the Mackenzie Delta.
- A study of the economic geography of the Mackenzie Delta.
- A comparative study of the educational arrangements
 for native peoples in Arctic Canada, Alaska and Greenland.
- A continuation of the 1964 study of social and economic change in the Eskimo community of George River, P.Q.
- Continuation of the comparative study of the administration of Eskimos in Northern Canada, Alaska, Labrador, and Greenland.
- A study of technology in the Mackenzie Delta.

- A comparative psychological study of two groups of Eskimos living at Baker Lake and in the Ottawa area,
- A continuation of the 1964 study of the child-raising practices of the Eskimos living in the Clyde River, N.W.T. area.
 - A continuation of the 1964 study on Canada's expansion to the north and related problems of sovereignty Ottawa.

1966-67

- A study to determine significant components of town planning in Mackenzie Delta.
- Sociological study of the non-transient population of Inuvik, N.W.T.
- Continuation of the study of sled dogs management in the Eastern Arctic.
- Continuation of the comparative study of Eskimo Administration in Northern Canada, Alaska, Greenland and Labrador.
- A psychological-anthropological study of motivation,
 values and behaviour determinants among native people
 in the Mackenzie Delta.
- A study of the socio-economic determinants of population change in the Mackenzie Delta.
 - Study of sea-ice movement in Kugmallik Bay, N.W.T.
- Preparation of a bibliography of articles and books dealing with the Mackenzie Delta.

1967-68

- A study of problems of Eskimo relocation for industrial employment.
- A study of Mackenzie Reindeer Project Operations.
- An engineering study of utilidors in northern settlements.
- A study of the attitude of white transients in
 Inuvik toward the native peoples of the area.

d)

	62-63	63-64	64-65	65-66	66-67	67-68	68-69	69-70	70-71	71-72	72-73
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M.A.	3	4	5	4	6	8	9	8	9	10	12
PhD.	2	-1720	1007-102	a-sto		co-tops	1	3	4	4	4

Note: - In addition a number of research staff up to the PhD. level are employed in seasonal positions.

e)

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M.A.	, aplien,	pe le	-593	legis	14%	inesia:	PS- 7545
PhD.	Laced at	20%	1000	WANG-	TEST A	D-RYPE	S Secks

- f) See table
- g) Not applicable
- h) Two students

THE MACKENZIE DELTA RESEARCH PROJECT

A PROGRESS REPORT

Background Anthony Lavor and Assault Mana Aslash Janglias lo

The Mackenzie Delta Research Project was initiated in the spring of 1965. For the previous ten years the Northern Co-ordination and Research Centre had carried out a program of research in the social sciences among northern people. The majority of the research projects undertaken during this period consisted of studies in single communities, conducted mainly during the summer months by scientists from universities employed either seasonally or under contract. The data that were collected covered conditions over a wide geographical area, and varied in depth. A large amount of information was collected and published, but of necessity the approach to research during this time was "piecemeal", largely owing to the scarcity of qualified investigators interested in the North. Since the available scientists were inevitably connected with universities, a compromise between government and academic interests was necessary. However, over the decade a group of well-trained social scientists with research experience in the north was developed, largely through Northern Co-ordination and Research Centre support.

In 1965, it was decided that it would be possible to undertake a research program drawing from a number of scientific disciplines to investigate in depth the problems besetting the people living in a defined geographical area. The area chosen for the first of these "in depth" investigations was the Mackenzie Delta. The reasons for this selection were the variety of social and other environmental elements to be found there. They were considered to be broadly representative of conditions in the Northwest Territories. The availability of a good operations base in the field - the Inuvik Research Laboratory - was an additional argument in favour of this area. A Research Co-ordinator was appointed and the project got under way in April, 1965.

Objectives & Procedures

The project was planned to focus research on those problems of the native peoples which inhibit them from participating in northern development, and to assess the extent to which they are making effective adjustment to the cultural and economic changes that have been brought about by commercial and government expansion in the north. Suggestions about

possible directions which research might take in an attempt to provide useful analyses of the situation were requested from government and other agencies operating in the Delta. These included agencies within the Northern Administration Branch, as well as the Indian Affairs Branch, the Department of National Health and Welfare, the Royal Canadian Mounted Police, the churches, the Hudson's Bay Company, and the Northern Transportation Company. The Commissioner of the Northwest Territories was also consulted.

To attain these research objectives it was recognized that the approach would have to be from several different directions; using the expertise and techniques of several disciplines.

Insofar as proved possible and practical, it was planned to develop a team of specialists whose work would be mutually complementary.

The First Phase

Four studies were undertaken through contractual arrangements in the summer of 1965.

- 1. Reliable and reasonably comprehensive information about the current economic situation in the Delta was not available. In order to provide members of the research team with a basic understanding of the economy, a study which would provide an "outline map" of the economy was undertaken. This was not planned to be a detailed and intensive analysis, but was intended rather as a guide to other researchers when they came to consider future possibilities for the native people of the area.
- The second study undertaken in Phase I was an analysis of the social structure of Inuvik. Studies of fur trade settlements in the north already provided a basic framework for understanding the structure of the smaller communities in the Mackenzie Delta, but the new town of Inuvik was unique and required special attention.
- 3. Previous research in the Delta, by Clairmont and others, had indicated that one of the most serious human problems could be seen in terms of the greater speed at which native people were learning new needs, than that at which they were acquiring the means to satisfy them. A preliminary investigation structured along these lines was initiated.

4. To provide a sound understanding of the present, as well as a limited basis for projecting the future, a fourth study was directed toward the technology of the area. Technology was seen as one of several influences which determine present and future development, and this research was a necessary component of the background studies.

After suitable investigators were found to undertake them, these studies were carried out during the summer of 1965. Preliminary reports of field work were submitted toward the end of that year and a research conference was held on 28 February and 1 March, 1966, in Centennial Tower. Several anthropologists with extensive northern experience, together with representatives from operational agencies within the Department of Indian Affairs and Northern Development, as well as representatives from other government agencies including the Department of National Health and Welfare and the Department of Citizenship and Immigration (Indian Affairs Branch), met with the principal researchers to discuss the work that had been done, and the directions future research should take.

The Second Phase 1966-67

The report on the community structure of Inuvik revealed the presence of what were, in many respects, not one but two communities.

- 5. The first community was in the unserviced area, and consisted of the native people, together with some other permanent residents. The second was in the serviced area of government housing, and was composed almost exclusively of transient members of Federal Government agencies. Since the basic concern of the Mackenzie Delta Research Project was with the adaptation of the native people in the area, further investigation of the social structure in the "unserviced area" was indicated. Preliminary investigation had revealed that the community lacked cohesion, and a study was now directed toward providing some understanding of this.
- 6. It was also apparent that a good many of the attitudes, and a good deal of the behaviour of people who lived in the unserviced area, could be understood as responses to some of the attitudes and actions of the transients in the serviced area. The attitudes of these transients

toward the problems of the native people were therefore

- 7. Also, with the data already available at this time, it could be seen that many of the problems accompanying the change in life-style from living in the bush to living in the relatively urban environment of Inuvik, had important psychological components which it would be necessary to investigate if some important areas of behaviour were to be understood. Included here was the need to identify socio-cultural elements generating psychological disturbance. To collect and analyze data in this category, a study was undertaken by a psychiatrist, who had had previous research experience with other Estimos.
- 8. The need for a detailed study of the changing human ecology of the Delta area became apparent. The impact of the fur trade, followed by missionary activity, the arrival of the whalers, and the introduction of government agencies, could all be seen as developments bearing upon ecological change. Only a small amount of the potentially available data related to this subject was readily available, and it was recognized that a search among original sources in archives and similar places would be necessary, as well as recovery of data which could be obtained from interviewing people.
- 9. Finally, vital information was demonstrably deficient in one other research area. Although a considerable amount of information about the behavior, the ideas, the attitudes, and the life-ways of the native people of the Delta was available, almost all had been observed from the vantage point of the administrator, the teacher, the social worker, the nurse, or the policeman. But much of what the native people did, said, and felt was not open to observation by government agents, who were usually allowed to become aware of only what was deemed appropriate for them to know. In order to understand what native people regarded as the real and legitimate choices when they made decisions to follow a course of action, it was necessary to know what they themselves

listed as the options, and how they weighted them.

This information could be obtained only by a researcher who would not be viewed as a government functionary, but as one whose role was not in any degree seen to involve a directive or instrumental capacity. It would be necessary for this investigator to live as close to them as possible, for a period sufficiently long that he could gain their trust and confidence in his non-manipulative interest in them, as well as in his personal regard for them as people. A continuous year of field work was regarded as the minimum time from which useful analysis could emerge. A suitable anthropologist with sufficient training and experience was available, and he began field work at the end of the summer.

Two other undertakings having a slightly different significance in the project were initiated.

- 10. All the project researchers had been collecting lists of original bibliographic sources and, to avoid duplication of effort, it was planned to consolidate these. When this was done, it was noted that some bibliographic resources had not been explored, and it was decided to produce a modest area bibliography which would be a useful working tool. For reasons of economy and practicality it will not be a comprehensive listing of every obscure source.
- 11. A study of town planning in the north was initiated at the request of the northern Town Planner, whose duties as an official of the northern administration included responsibility for drawing up plans for northern communities. In supporting this request, the Town Planner explained that he felt urgent need for assistance in the development of techniques which would enable him to meet the special requirements of planning for northern communities. Stating that he was now compelled to plan northern communities on the basis of experience gained in the south, where many quite different sets of conditions obtained, he supported the application of a team of two graduate students in Planning who wished to undertake a research project and whose objective was to develop a planning

methodology suitable for the north. The methodology which they proposed to develop would be based upon local human needs and considerations, as well as upon physical and engineering constraints. Because of the volume of data dealing with the people of the area which would be available as a result of other research being done in the Delta, they wished to undertake the study there, and to work with the other researchers. Their field work began in May, 1966.

Following the end of the summer field work period in 1966, a second conference was held on 6 December. Invitations to attend were extended to agencies in the department, including Northern Administration Branch, Indian Affairs Branch, Resources and Economic Development Group, and Canadian Wildlife Service, and to the Commissioner of the Northwest Territories. Preliminary reports of the field work of the previous summer were presented by the investigators, and the findings were discussed.

Although preliminary reports of field work were available at this time, preparation of final reports was delayed. After a season of data-collecting in the field, investigators returned to their university posts and immediately had to involve themselves completely in the preparation of the lecture courses they were to present in the academic year which was about to begin. The analysis of the data collected in the field and its presentation in final form were inevitably delayed. To compound this delay on 1 April, 1967, the Co-ordinator of the project assumed new responsibilities and had less time to devote to the project. The original research plan called for implementation of Phase 3 of the project beginning in the spring of 1967, but it was necessary to delay this until a suitable person could be found to assume specific responsibility for it.

The Third Phase

Emphasis in the final phase of the program will be on feedback to potential users of the findings of the research. Three categories of potential users are considered here:

1. Employees of the Federal and Territorial Governments in policy-making and in operational roles. Feedback to

People in this category can be accomplished, it is hoped, through written reports, formal and informal conferences, and frequent consultation.

- People of the Mackenzie Delta. Since the residents of the area have themselves the capability of making many decisions about their future, they are also considered to be potential users of research findings, which can provide them with an improved understanding of the choices open to them. However, the communication of such findings to a group with such a wide range of literacy poses a problem. Techniques to accomplish this will be exploratory, and it is proposed to undertake this task in co-operation with adult educators in the department. Devices which will be tested for their effectiveness will include specially prepared printed materials and radio broadcasts. In preliminary discussions, the CBC has expressed a willingness to co-operate in such an undertaking both in the field and at headquarters. Another possible feedback device being considered is to hold short residential workshop courses, where a limited number of native opinion-leaders can meet with the researchers and educators. The shope and abreves bessessed ad
- Professional colleagues. They can be kept informed by publication of reports.

A suitable scientist has now been engaged to undertake the duties of Co-ordinator of the project and to assume responsibility for implementation of the third phase. He will begin in the early summer of 1968.

Publications

The publication status of reports, (which correlate with Items 1-11 in the preceding text,) is as follows:

1.	John R. Wolforth	The Mackenzie Delta - Its Economic	
		Base and Development - A	In Print
		Preliminary Study.	
2.	Jose Mailhot	Community Structure - Inuvik,	
		Summer 1965.	In Print
3.	Derek Smith	Mackenzie Delta - Domestic	
		Economy of the Native People.	In Print
4.	P.F. Cooper Jr.	Mackenzie Delta - Technology.	In Print
5.	A.M. Ervin	New Northern Townsmen in	
		Inuvik.	In Print

6.	G.F. Parsons	Attitudes of Inuvik	Final draft
		Transient	in prepar-
		Residents: A Survey	ation
7.	J.M. Lubart	Psycho-dynamic Problems of	Final draft
		Adaptation - Mackenzie Delta	in prepar-
		Eskimos - A Preliminary	ation
		Clinical Study.	
8.	John Wolforth	The Mackenzie Delta: Changes	Draft in
		in Human Ecology.	preparation
9.	Derek Smith	The Mackenzie Delta: A Plural	Draft in
		Community.	preparation
10.		Mackenzie Delta Bibliography.	Near
			completion
11.	C. Aasen and	Comprehensive Settlement	Final draft
	W. Wright	Planning in the Mackenzie	in prepar-
		Delta, N.W.T.: A Proposed	
		Planning Theory and Methodology.	

Following publication of the reports of individual sectors of research listed above, it is planned to produce a compendium in two parts. The first part will present and relate the principal scientific results of all the studies. The second part will be directed towards the needs of northern administrators and policy-makers and will relate the results to specific government programs, including Welfare, Education, Vocational Training and Local Government.

Subsequent studies will be directed towards evaluating the impact of the recommendations that result from the project, and towards assessing the predictive value of the research.

2.5.c CHART I NSRG

B.A.'s and M.A.'s employed in Northern Science Research Group, Department of Indian Affairs and Northern Development, by country of birth and country of training.

Data include research staff only.

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	B.A.		M.A.			
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ntry	4	9	T.	S.A.	e e	
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England		1				
Netherlands					1	
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Canada		5	1		1	
England		1				
M.A.		1				
England						
Canada		4				
U.S.A.		1	1	1	1	
Able to operate						
effectively in						
both languages	_	1 1	_	_	_	

2.5.c CHART II NSRG

Average number of working years since graduation and average number of years employed in present organization, of B.A.'s and M.A.'s employed in Northern Science Research Group, Department of Indian Affairs and Northern Development, by age group.

Data include research staff only.

21-25 26-30 31-35 46-40 51-55 56-60	Age	-
1	No. of individuals in age group	Dara 1
2.0	Average no. of Average no. of Average no. of Average practice are according to the Average no.	THETHE
1.0	Average no. of years employed in present organization	1000
1 11123	No. of individuals in age group	
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1.5 1.25 5.0 9.0 16.0	Average no. of years employed in present organization	
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SENATE COMMITTEE ON SCIENCE POLICY

Department of Indian Affairs and Northern Development

Indian Affairs Branch

December 1968

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BRIEF TO SENATE COMMITTEE ON SCIENCE POLICY Department of Indian Affairs and Northern Development Indian Affairs Branch

II 2.2 Organizational Functions

- a Indian Affairs Branch has no statutory functions and powers regarding scientific activities.
- but seeks research assistance by means of contracts on an ad hoc basis. Initiative arises largely from the Branch. Indicators are that this is changing and more suggestions will be received from academic sources. These are reviewed by a research committee which reports to the Director of Policy and Planning. The Branch sees a need for studies on a project basis dealing with subjects selected by an advisory committee, and possibly conducted by departmental employees on educational leave. Activities in the past have been limited because of the lack of a firm program. A new policy on research is being introduced which will give focus to our scientific activities.

All funds for Research, as such, have been placed in the Policy and Planning Directorate at Headquarters, while leaving to other Directorates and to the Regions the responsibility of financing and planning for Surveys, and Feasibility Studies. The Policy will include coordination of planning for Research and Studies, leaving opportunity for every level of Branch Staff and Indian communities to exercise initiative in indicating matters that require further study.

- c (i) To cooperate with other Federal Agencies in matters of Research. Such Agencies include:

 Dominion Bureau of Statistics Manpower and Immigration
 Secretary of State
 Forestry and Rural Development
 Central Mortgage and Housing
 National Health and Welfare
 - (ii) To cooperate with industry in making studies with a view to development of economic opportunity and in making use of the natural, physical and human resources of the Reserves for the benefit of the Indian Peoples.
 - (iii) To cooperate closely with universities in using their Research and Scientific expertise pertinent to Indian development, having in mind the capacity of a particular University or group of universities to carry out the Research or Studies required.
 - (iv) To use information already gathered by universities in Research and Development.
 - (v) Private Consultant firms are used from time to time particularly for surveys and feasibility studies.
- d A Branch Research Committee has recently been appointed to assess all needs for Research and Studies, to make recommendations to the Policy and Planning Director for the undertaking of same, and to review the reports

and results. The Committee has, in its membership, representatives from all Directorates in the Branch. The factors that might be considered as influencing whether or not research and studies are undertaken:

- (i) The size of the Indian population thus determining the number and extensiveness or intensiveness of certain problems.
 - (ii) The mobility of Indians off Reserve.
- (iii) The resource potential of some Reserves.
 - (iv) The relationships existing between Indians and non-Indians.
 - (v) The availability of funds.
- e Nil,
- f The Branch's responsibilities and powers are derived from the Indian Act and the Appropriation Act and its program is to ensure that Indians have the opportunity to realize their full human potential within the Canadian Society.
- The major hindrance to scientific activities past and present has been inadequate provision of funds and staff. This has partly been because of the lack of coordinated effort and concentration on a definite Research program. The Policy and Planning Directorate will resolve these two factors but the third -- funds -- is dependent on overall Government attitude and policy. The coordination, as indicated, will be external as well as internal. Increased public awareness of Indians will change the initiative for these activities from the Branch to outside individuals and agencies thus adding more varied insight into these matters.

One other hindrance is related to the difficulty of obtaining statistical information from other Departments, because different coding methods are used for data storage. This is now being overcome. The other is the law, which does not permit information to be obtained relative to ethnic origin. This makes it difficult to obtain data relevant to Indian people to use as comparison with the Canadian Society as a whole. It is impossible, because of the Income Tax Regulations, to obtain income data relative to Indians who obtain their work on Reserves, because income earned on reserves is tax exempt.

2.3 Personnel Policies

- a No steps have been taken to identify and hire members of university graduating classes as researchers.
- b No criteria have been developed to identify creative and effective researchers.
- No steps have been taken to identify staff members with high potentiality as research administrators.
- d N/A. The Branch has not been involved in intramural research.
- e Extramural Research is contracted for and financed by the Policy and Planning Directorate on the recommendation of the Branch Research Committee.

 Various other types of studies as previously mentioned may be contracted for from time to time by various

Branch Officers including those in the field, within the appropriate signing authorities.

2.4 Distribution of Activities

a Regional pattern of spending (Extramural) 1968-69 (Estimated)

Yukon	\$3,700
British Columbia	7,635
Alberta	86,000
Saskatchewan	18,000
Manitoba	49,464
Ontario	25,500
Quebec	56,400
Maritimes	3,000

The natural and physical resources may indicate suitability of certain regions for specific projects (salt water fishing in British Columbia and the Maritimes) but those studies related to the human resource are usually applicable across the country. Exceptions arise in smaller studies directly applicable to some local problem.

c N/A

The general development work both social and economic of the Department has made some contribution to regional development in so far as the Indian population is concerned. It would appear, however, that much regional development has by-passed the Indian people. The Branch must play a continuing role of liaison with Indians and agencies both Government and private, and through its own programs and projects to eliminate any gap and allow the Indians to participate fully of this development.

2.5 Personnel Associated with Scientific Activities

Scientific activities, as already indicated, have proceeded on an ad hoc basis with various officers from time to time involved. The only part of the Branch responsible for research is the recently constituted Policy and Planning Directorate. However, over the 2 years of its existence, the freeze and establishment cuts have resulted in no special recruitment of staff to fulfill this responsibility. As a result, this responsibility has been shared by some of the other officers; three officers are professionals while one, the administrator, is not. Regional and other staff at headquarters, as already described, have occasional input only and not on a regular basis.

There are 4 others in the Directorate in addition to those mentioned above. These are not involved in research. This brings to 8 the total personnel in the unit including stenographic help.

b There are no professional staff devoting most of their time to the administration of research.

c Country of birth Canada Secondary education 3
University Bachelor 3
Master 2
Doctorate 0

#1 #2 No. working years since graduation. $\frac{v_{\perp}}{16}$ No. years employed in I.A.N.D. 3 19 3 51 Age 38 52 47 Average Age Percentage to operate effectively in Canada's two official languages 33 1/3%

Professional Staff in Each Degree Category

Only the years 1966-1968 can be relevant since no Policy and Planning Directorate existed before then.

	B.A.	M.A.	PhD.
1966-67	1	2	0
1967-68	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2	0
1968-69	2	3	0

- Percentage of turnover 1966-67 nil.
- Percentage Professional personnel in other areas of work. f
 - (i) in Industry 33 1/3
 (ii) Staff of Universities
 (iii) Provincial Departments or
 - Agencies (iv) Other Federal Agencies
 - (v) Other Agencies 66 2/3
- Number of educational leave Nil
- Functions note a) that our research and development is not intramura, as defined. b) 1968-69 figures include estimates for work still to be done.

		1966/67	1967/68	1968/69
(1)	Research and Development	\$235,386	\$257,027	\$261,519
Scie	ntific Discipline			
(1) (2)	Engineering and technology Natural Sciences		60,745	112,100
(3)	(a) Agricultural Social Sciences	7.000	14,600	4,900
1	(a) Anthropology (c) Economics	43,840	13,110	3,700 115,635
	(d) Political	2,239	1,896	40
	(f) Sociology	13,695	6,791	44,184

Areas of Application

(4)	Agriculture (including fisheries and forestry)	8,000	17,700	
)9)	Industry	16,056	43,637	56,900
(10)	Underdeveloped	131,503	95,275	166,600
(13)	Social	74,827	85,284	15,099
(14)	Educational		1,660	40,420
(15)	Administration		17,863	1,500

b Operating Funds only for Policy and Planning

1966-67 \$128,429 1967-68 132,573 1968-69 279,000 (estimate)

c Nil

2.7 Research Policies

a N/A

b <u>Units Exclusively Concerned with Extramural Research</u> Activities.

- All scientific activities undertaken are related to the Indian Affairs Program of developing the natural, physical and human resources to achieve the objective of giving the Indian people equal opportunity. As previously indicated, these studies are carried out by various individuals and agencies under contract to the Department.
 - In each case their previous record of achievement is considered.
 - (ii) The nature of the project is also related to the capabilities of the individual or agencies proposing to carry out the project.
 - (iii) We do not make grants and only initiate contracts as the situation warrants.
- 2) In the past, it has been part of the estimates process to review broad proposals of managers which they set forth on what they see as their priorities. Once these have been approved, they can then be processed by the manager within his signing authority. Should the total funds required exceed his authority, his superior may become involved or, on some occasions, Treasury Board. In each of these instances of a higher authority being required, the priority can be altered.

In the future, all studies in the research area will be subject to approval of the Director of Policy and Planning. All other studies will proceed as above but on a post audit basis; they will be subject to the action of the Research Committee and the Director of Policy and Planning.

3) Projects are usually within the frame of the terms of reference. A Departmental representative, either with responsibility for the function involved or the area involved, acts in liaison with the contracted person or agency. Results are evaluated by Departmental specialists in the light of the Department's objectives. This is done afterwards and criteria and units of measurement are not, as yet, set up beforehand. The action of the Research Committee and the Policy and Planning Directorates will effect coordination and initiate and develop evaluation methods.

- 4) Since the work is contracted for, the main resource required is money and priorities are determined as described in #2.
- 5) Network methods are not used in this report.
 - 6) See #2.
 - 7) The results are related to the programs of the Branch and, when applicable and feasible, are reflected in the services provided to the Indian people.
 - Percentage of funds available to the Branch to support scientific activities.

	Research only	Research and other studies			
1966-67	.06%	.24%			
1967-68	.06%	.21%			
1968-69	.03%	.19%			

 Percentage of funds granted N/A (no grants). It should be noted, however, that during the past year Research studies totalling \$700,000 were turned down.

2.8 Research Output

This reply deals only with research as such and not feasibility studies and surveys.

- 1) Nil
- 2) Books or Journals arising from research activities:
 - Indians and the Law. The Canadian Corrections Association. The Canadian Welfare Council, August 1967.
- 3) Reports issued by this unit:

There are many reports resulting from studies which are for internal use only. One study was published through the Queen's Printer.

- (i) A survey of the Contemporary Indians of Canada. Parts I & II Editor, H.B. Hawthorn, Part I Oct 66 Part II Oct. 67. Published by Indian Affairs Branch.
- The Indian Band Council is involved through meetings and through distribution of reports.
- 5) Nil.
- 6) Nil.
- 7) Nil.
- 8) Nil.
- 9) The limited scientific activities of this Branch are primarily affecting the programs of the Branch and the lives of the Indian people. The latter's overall development along with that of the Crown lands on which they live will have an increasing effect on the Canadian economy.

10) Nil 2.9 Projects

- 1) Already listed.
- 2) Basic Research

In early 1964, a contract was let to the University of British Columbia to have Dr. H.B. Hawthorn direct a "Study of the Contemporary Indians of Canada". This study reviews social, cultural, economic, political and educational problems of Indians in Canadian Society and of the integration of Indian communities into the provincial, municipal framework within which other communities operate. It cost \$240,000 and Part I of the report was issued in March, 1967. Part II is expected to be released by the end of 1968.

BRIEF

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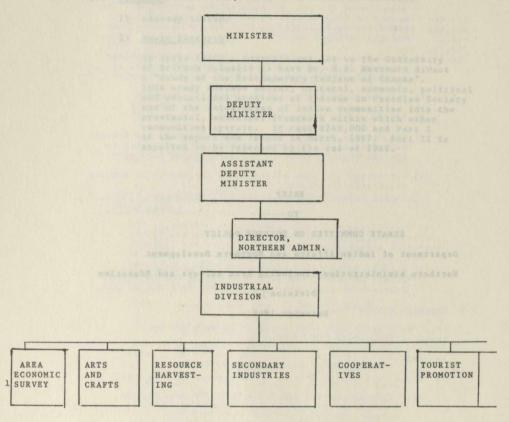
SENATE COMMITTEE ON SCIENCE POLICY

Department of Indian Affairs and Northern Development Northern Administration (Including Area Surveys and Education Division)

December 1968

2.1.c

Industrial Division, Northern Administration Branch



Area Economic Surveys section is responsible for doing research in economic geography in all northern regions.

1. - Incidental Research

PRIEF TO SENATE COMMITTEE ON SCIENCE POLICY
Department of Indian Affairs and Northern Development
Area Surveys

2.2 Organizational Functions argument and experimental damaged (s)

- (a) Area Surveys, a Section of the Industrial Division,
 Northern Administration Branch, Department of Indian
 Affairs and Northern Development, has no statutory
 powers regarding scientific activities.
- (b) The Section does not have a research grants program. Initiative arises from the Industrial Division. This Division is well aware of the various socioeconomic problems associated with resource development and is responsible for projects designed to improve economic conditions in various sectors of the Northwest Territories. The original concept of area surveys arose out of the need for specific information on various areas and their resource potentials. Research by other agencies did not provide the requisite information.
 - (c) i) As a research unit, the Area Surveys Section is continuously involved in liaison with other Federal agencies. Field research is supplemented by the collection of data from Federal agencies operating in the survey areas. There is a mutual exchange of information and Area Survey reports are distributed to pertinent Federal Agencies.
 - ii) The Area Surveys Section staff frequently consults with private industry.
 - iii) Area Survey reports are supplied to educational and research institutions on a complimentary exchange basis.
- iv) Area Survey research officers make use of information already gathered by universities.
 - v) Private consultant firms are not used in the program.
 - (d) The reports are circulated within the Industrial Division and the Northern Administration Branch for a specific review and follow-up of recommendations contained in the reports. There is a limited amount of follow-up by research officers. The implementation of recommendations is undertaken by headquarters and regional staff.

2.3 Personnel Policies

- (a) Suitable personnel have been recruited through open civil service competitions. Research assistants for summer field work are contacted through universities.
- (b) The performance of research officers is subject to review from time to time.
- (c) The completion of research programs and the publications of reports are one of the major criteria as to the ability of staff members. Staff members with higher than average ability are asked to undertake surveys requiring particular competence.

- (d) The Head of the Section receives a larger salary in line with administrative functions vital to the research program.
- (e) Research officers are encouraged to continue with their education and apply for educational leave, if their educational goals fall within the normal spheres of research.

2.4 Distribution of Activities

- (a) The research program has been confined to the Northwest Territories.
- (b) Due to the large total area and the scattered nature of the settlements within the Northwest Territories, area surveys have been carried out in specific areas chosen on the basis of existing settlements, economic needs, and their current and potential resource utilization zones. Considerable attention has been paid to obtaining a complete coverage of the Northwest Territories.
 - (c) The surveys completed during the past five years now form a valuable background for regional development.

2.5 Personnel Associated with Scientific Research

- (a) The current personnel establishment consists of the following:
 - 1. Three D.O.4's (one acting as Head of the unit)
 - 2. One employee hired on a temporary basis.
 - (b) The Acting Head of the unit divides his time between administrative duties and completing an established research program.
- (c) i) Country of Birth: Canada (2); Yugoslavia (1); Indian (1).
- ii) Secondary education 4 Canada (2), Yugoslavia (1),

India (1)

Technical Training 1 Canada (1)

University Bachelor 3 Canada (3)

(d) Professional staff in each degree category

Masters 2 (one pending) Canada (2)

Doctorate 0 (two have commenced studies towards doctorates) associated with program

iv) Number of years employed I.A.N.D. #1 #2 #3 #4

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v) Age

B.A. M.A. PhD.

1966-67 1 3 0

1967-68 2

1968-69 1

- (f) Number of professional personnel
 - i) Employed by private industry 4
 - ii) On staff of universities 2
- iii) Provincial Departments or agencies 2
- iv) Other Federal agencies 2 (g) M.A. (1)
- (h) Number of students given summer employment

 $\frac{1962}{2}$ $\frac{1963}{4}$ $\frac{1964}{2}$ $\frac{1965}{2}$ $\frac{1966}{5}$ $\frac{1967}{6}$ $\frac{1968}{2}$

2.6 Expenditures Associated with Scientific Activities

(b) Operating and capital funds expended

1966-67 1967-68* 1968-69 83,610 86,670 49,250

*Increase due to expansion in program and staff increases.

Estimates 1968-69

Program Cost* Salaries \$ 40,170.00 \$46,500.00

*Program costs include salaries of field assistants, travel, equipment rental and supplies, and publication of reports for three large scale surveys.

2.7 Research Policies

The program is essentially directed towards economic development programs in the Northwest Territories and is designed to meet the requirements of the Industrial Division.

2.8 Research Output

Research output consists of detailed reports including Research output consists of detailed the content of statistical tables, graphs and maps. The content of each report is a detailed analysis of physical and human factors within a specified area. Basically the surveys are intended to:

- 1. Assess the renewable resources as to their ability to sustain the local population.
- 2. Determine the degree of exploitation of these resources and the efficiency of their use.

- Investigate and explain the social and economic factors affecting resource utilization.
 - Recommend ways and means whereby the standard of living of the local people might be improved.

2.9 Projects

- 1962 Southampton Island A report dealing with the Southampton Island and Repulse Bay areas.
- 1962 The Tuktoyaktuk Cape Parry Report This report
 dealt with the socio-economic
 conditions in the Tuktoyaktuk
 and Cape Parry areas and included
 recommendations for broadening the
 economic activities.
- 1962 Western Ungava This report dealt with three
 Eskimo settlements along the
 west side of Ungava Bay and their
 respective resource area. Recommendations were made for an
 expansion of utilization of the
 resource base.
- 1963 The Copper Eskimos This report covered the western sector of the central Arctic and covered six settlements and their resource areas. It provided vital information for the establishment of development projects.
 - 1963 The Keewatin Mainland- The five main communities of the Keewatin District were included in this report. Specific recommendations were made in respect to the development of canneries for processing fish and sea mammals and the development of handicrafts. It was completed following the closing of a nickel mine and an economic depression.
 - 1963 The Yukon Territory
 Littoral This report dealt specifically
 with the potentials for the development of a satellite community at
 Herschel Island to utilize the
 surrounding resource base.
 - 1965 Banks Island This report dealt specifically with Banks Island and the highly developed trapping economy existent on the island.
 - 1965 Northern Foxe Basin Northern Foxe Basin examined the socio-economic conditions existent in the Foxe Basin area and provided valuable information on the Igloolik Eskimos and their activities and the Baffin Land Iron Ore development.
 - 1966 The Lower Mackenzie
 Region This study was a report on six
 communities in the Mackenzie
 Delta areas. The Mackenzie Delta

with a large resident population and a varied resource base offers a major challenge in terms of economic development.

1966 East Coast Baffin Island

This study was carried out by a McGill University research team on contract as summer field assistants and examined the narrow economic base of the east coast of Baffin Island.

1967 South Coast of Baffin Island

This report assessed to potentials for further economic development of two communities, one with a well-established co-operative, the other with unexploited mica and soapstone resources.

1968-69 The following reports are being finalized for publication: Rae - Lac La Martre; South Shore of Great Slave Lake (at press); Central Mackenzie (at press); Frobisher Bay; Central Mackenzie; Keewatir Survey; Central Arctic; Fort Liard - Nahanni Butte.

2.5.c CHART I Area Surveys

B.A.'s and M.A.'s employed in Area Surveys Department of Indian Affairs and Northern Development, by country of birth and country Data include research staff only. of training.

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2.5.c CHART II Area Surveys

Average number of working years since graduation and average number of years employed in present organization, of B.A.'s and M.A.'s employed in Area Surveys, Department of Indian Affairs and Northern Development, by age group.

Data include research staff only.

Age Groups	No. of individuals in age group	Average no. of working years since Peraduation	Average no. of years employed in present organization	No. of individuals in age group	Average no. of working yrs. since graduation.	Average no. of years employed in present organization	
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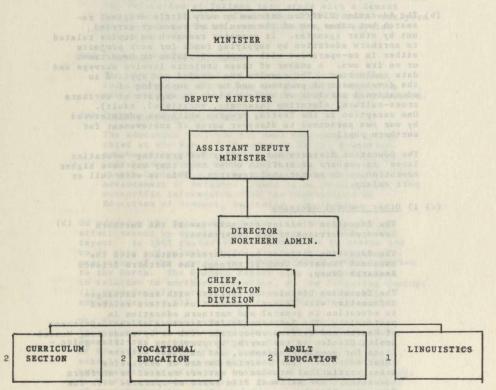
SENATE COMMITTEE ON SCIENCE POLICY

Department of Indian Affairs and Northern Development

Education Division, Northern Administration Branch

2.1.c Block Diagrams of Units Responsible for Scientific Activities (Support services and units solely concerned with extramural research are not included).

Education Division, Northern Administration Branch



Section heads employ a specialist staff to design programs and collect information basic to program design and implementation. Their responsibilities are dual in nature, and include research and applied skills.

1-Incidental Research

2. Only contract studies by outside agencies

2.2 Organizational Functions

- (a) The Education Division is responsible for education in northern Canada. There are no statutes which set out functions and powers regarding scientific activities.
- (b) The Education Division carries on very little original research but makes use of the results of research carried out by other agencies. It promotes research on topics related to northern education by supplying funds for such projects either in co-operation with another Division or Department or on its own. A number of these projects involve surveys and data collection. The results are studied and applied to the development of programs and to the supplying of educational services of various kinds in support of northern cross-cultural education (academic, vocational, adult). One exception is the Testing Program which was administered by our own personnel to discover norms of achievement for northern pupils.

The Education Division has a policy for granting 'education leave' to members of staff in order that they may take higher education or do educational research. This is with full or part salary.

(c) i) Other Federal Agencies

The Education Division can make use of the Northern Research Services of the Department.

The Education Division has indirect contact with the National Research Council through the Northern Science Research Group.

The Education Division co-operates with and exchanges information with Federal agencies on matters related to education in general and northern education in particular. The Northern Health Services of the Department of Health and Welfare co-operate with us by conducting Mental Health Clinics in the north, by providing nutrition guide - lines for people residences, and on other matters referred to it. The Dominion Bureau of Statistics makes statistical studies on matters related to northern education. The National Film Board co-operates with the Education Division on northern film and filmstrip production and the research related to these activities.

Within the Department the Engineering Division provides information from their own and other research on the types of schools and residence suitable for northern construction. The Indian Affairs Branch provides information on studies conducted and programs developed. Activities in the Northwest Territories of the Department of Manpower and Immigration are implemented almost exclusively by officers of this Department. Their facilities and machinery are often used in surveys and data collection by Vocational Education Section of the Education Division.

ii) Industry

In the Education Division the Vocational Education Section promotes and makes use of industrial research.

Major occupational and tourism studies have been completed. Mining and commercial fishing surveys are in progress. A job opportunity survey is planned and will be carried out in co-operation with industry. Industry is also co-operating with researchers to study the relocation of Eskimos into areas with a demand for labour. Studies planned for 1969-70 are: analyses of the transportation, communication, and service industries, etc.

iii) Educational Institutions

The Division maintains liaison with Universities, and Colleges of Technology and Education regarding new developments in adult and cross-cultural education.

iv) International Activities

The Education Division has been represented by its chief at the World Conference in Social Education sponsored by UNESCO, at the Commonwealth Education Conferences in New Delhi and Ottawa, and at the Alaska Conference of the American Association for the Advancement of Science. There is an exchange of scientific information with the Departments of Education of Denmark, Australia, and Alaska.

(d) On occasion the Department surveys its own operational effectiveness by appointing a Commission to assess and report. In 1965 the Carrothers Commission to assess and to do this and to make recommendations as to the implementation of the part of the Glassco Report which referred to the North. The Glassco Report made recommendations in relation to northern education, on the following topics:

(1) transfer of operation of schools to territorial administration, (2) curricula, and (3) adult education

The Carrothers Commission Report went a step further in each case but maintained the same type and tone of comment. It recommended that a Territorial Department of Education take over the transfer of operation of schools. Task Forces which met in 1967 and 1968 made recommendations as to the transfer of education positions to territorial administration (i.e. the number and time of transfer).

In the Education Division itself this process is carried out by program appraisals and statistical studies. Papers on various aspects of the education program are prepared for the Council of the Northwest Territories and debated in Committee or general Council sessions.

Outside consultants examine various aspects of the system and report on their findings, e.g. Katz' study of Pupil Residences in the Mackenzie District.

(f) In 1955 the Department became responsible for Education (academic, vocational, adult) in northern Canada and the Education Division came into being. Since 1955 schools have been constructed in all settlements in the North where school population in sufficient numbers exists. School enrolment has increased from less than 20% to more than 90% of the school age population. The development of vocational education has paralleled the development of academic education. Program development in both fields has been making good progress. Adult Education was late in being started and it is only in the last two years that it has gained momentum. Thus overall the discharge of the responsibility for northern education has been marked by intense activity and progress toward establishment of an efficient educational system in Northern Canada.

- (g) 1) Complex problems of cross-cultural education, including instruction in English rather than the vernacular (Eskimo, Indian) of a large segment of the school population.
 - Socio-economic problems resulting in low motivation and alienation from school and education programs.
 - Lack of a teaching staff trained for the specific type of service required.
 - 4) The Adult youth (generation) gap accentuated by the problems of rapid acculturation.
 - (h) Major changes in organization functions are being planned in relation to the transfer of functions to the Government of the Northwest Territories and the comprehensive re-organization of the Department.

2.3 Personnel Policies

There are no research positions as such in the Education Division.

2.4 Distribution of Activities

- (a) The Education Division's spending on developmental research has been entirely within the Northwest Territories and Arctic Quebec.
 - (b) The entire North provides almost limitless opportunities for worthwhile educational and other research.
 - (c) In the past five years there have been two testing programs to discover norms of achievement for northern pupils. This is done on a biennial, not an annual basis.

Each year a limited number of teachers, some of whom do research, are granted leave for higher education.

(d) The work of the Education Division contributes directly to community development of the N.W.T. and Arctic Quebec. Adult educators are trained in community development.

2.5 Personnel Associated with Scientific Activities

The Education Division is associated with operational research and is not involved with scientific activities. Surveys and data collections are done by contract.

Cost of Research Activities as compared to Total Expenditures

	Total Education Expenditures	Data Collection	Higher Education	Testing	Linguistic Research	Toral Cost of Research
1962-63	\$ 7,763,317	2000	18,000	8-18	NIL	\$18,000
1963-64	7,238,272	2722	20,000	- 50	NIL	20,000
1964-65	7,932,087	11000	26,000	1,000	1,000	28,000
1965-66	10,225,586	1,640	32,500	6,000	1,000	41,140
1966-67	11,501,691	1,000	42,000	6,500	2,000	51,500
1967-68	12,280,498	40,000	65,000	5,000	3,000	113,000
1970-71	19,970,600	50,000		15,000	10,000	75,000
1971-72	19,710,000	50,000		15,000	10,000	75,000
1972-73	18,977,000	50,000		15,000	10,000	75,000
1973-74	18,400,000	50,000		15,000	10,000	75,000

2.7 Research Policies

Research that is required is contracted out.

2.8 Research Output

N/A

2.9 Projects

See Appendix A

2.10 Organizations not currently engaged in scientific activities

- Greater use of computer services will be one change in technology which will affect the agency's operation. The increased use of electronic instructional devices will demand greater resources in this field. It is also possible that a system-wide research information service will be set up for receiving and clearing data.
- 2) (a) Systematic handling of data.
- (b) Information more readily and more quickly available
- (c) Greater use of data and results of research
- (d) More research activities
- (e) Less time lag between development of new technology and implementation in the education process.
- 3) See Appendix A See Appendix A for a listing of studies. See Appendix B for a list of publications prepared for the Education Division for use in northern Schools.

inadequate housing. This will be researched later to see if changes occur and if they can be credited to the new rental housing program for Indians in the Mackenzie District.

(A above) Scientific Discipline (2) f sociology A above

(A above) Area of Application (13) - social policy (behaviour patterns)

(a) Operational

1968/69 \$5,000 (A above) 1969/70 \$5,000 (A above) 1970/71 \$5,000 (A above)

Part II.2 7) Research Policies

There is no stated policy. The newly formed committee has prepared terms of reference which are pending approval - a) 1 - 7 b) 1 - 9

Part II.2 8) Research Output

Nil - 1 - 10

Part II.2 9) Projects

Nil 1 - 2

Appendix A

I General

Below are four areas in which we have research activities and expenditures:

- (a) Data collection and surveys
- (b) Testing
 (c) Higher Education
 - (d) Linguistic Research (Eskimo and Indian)

Data Collection and Surveys are usually carried out by contracting out to capable and experienced researchers or to Senior University Students during the summer months. The following are these activities as shown by our records.

- Professor Joseph Katz Report of 1965 dealing with "Educational Environments of School-Hostel complexes in the Northwest Territorities".
- Professor H. Stevenson Report of 1967 on the "Problems of relocation of Eskimos and Indians of the Northwest Territories". Project was under the auspices of Northern Co-Ordination and Research Centre with the Education Division contributing toward the cost involved.
- 3. R. Jelking in 1967 prepared a functional analysis of the Mining Industry in the Northwest Territories.
- John Murray in 1967 prepared a functional and occupational analysis of the Tourist Industry in the Northwest Territories.
- Labour Force Survey In 1967 in co-operation with the Dominion Bureau of Statistics a survey of the labour force in the Great Slave Lake area of the Northwest Territories.
- 6. Crispin Morris In 1968 carried out a functional analysis of Government operations in northern Canada.
- 7. Gilbert Lance In 1968 carried out a functional and occupational analysis of the fishing industry in the Northwest Territories.
- Jon Nightingale In 1968 carried out an occupational analysis of the mining industry in the Northwest Territories.
- David Preston In 1968 carried out a manpower survey of the Frobisher Region, N.W.T.
- Labour Force Survey In 1968 in co-operation with Resource and Economic Development Group a Labour force survey was carried out in the Keewatin Region, N.W.T.

Testing: Jackson Program

A testing program was first attempted by the late Don Jackson to establish norms for the achievement of pupils in the Northwest Territories. The analysis and reporting was undertaken by Dr. R.S. MacArthur, Professor of Educational Psychology, University of Alberta. Publication of results is dated 1965 on previous testing.

MacArthur Program reported the norms for pupils of the Mackenzie District. The report was printed in 1965, but testing was done previously.

Macdonald Program of 1965-66 - The testing program was carried out in late 1965 and the report printed in 1966. This program took in the Eastern Arctic as well as the Western Arctic.

Testing Program 1967-68 - This program was carried out by our own staff. The expenditure will therefore list only the cost of tests and mailing. Grades II, IV and VI were tested with Metropolitan Achievement Tests as had been done in the two previous programs. Results have been received but have not yet been compiled for publication.

 $\frac{\text{Higher Education}}{\text{paper all expenditures of educational leave come under this terminology.}$

Linguistic Research - The 'New Orthography' has been produced as a result of this research work.

- II The sections of the Education Division which are involved with research activities are:
 - (1) Vocational Education
 - (2) Curriculum Section
 - (3) Linguistics Section

<u>Vocational Education</u> interests lie in the data collection and surveys. These were mainly related to employment and manpower. The survey on 'hostels' and 'effects of housing' are exceptions.

- III The 'Education Research' in which the <u>Curriculum Section</u> participates is listed below.
 - Consultative services to northern teachers preparing Masters Doctoral Theses and to other researchers, advising them on problems relating to the nature of their studies.
- <u>Direction of special research</u> projects such as the development of northern norms for standardized tests, carried out by members of <u>the Curriculum Section</u> or <u>by guest</u> workers on contract.
 - Conducting Action-Research projects such as the development of a <u>system-wide testing program</u>, and <u>the experimental</u> try-out of new school programs and instructional materials.
 - 4. Evaluation Studies in northern schools of new approaches to instruction such as team teaching, programmed learnings, and special reading programs and of new developments in instructional technology such as language laboratories, various kinds of audio-visual materials and other forms of teaching devices.
 - Liaison with <u>Unesco</u>, <u>the Universities</u>, Government Departments, <u>Canadian Coundil for Research in Education</u>, and other bodies interested in research in northern Canada.
 - 6. Preparation of papers to be presented at meetings of National Professional Associations or for publication in Educational Journals.

7. Editing Monographs on research on Northern Education.

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CURRICULUM MATERIALS

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Northern Administration Branch
Department of Indian Affairs & Northern Development
Ottawa, Canada

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	Authorized Books	off marks	7. 80
1.	Authorized Textbooks & Instructional Materials	1966	talf 3
2.	Library Books	1966	
11.	Language Arts		
1.	Curriculum Guide, Language Arts, Grades 1-VI, (Mackenzie District)	1966	
2.	Let's Begin English, A Program for Teaching English as a Second Language, Lesson 1-50	1965	
3.	Let's Begin English, A Program for Teaching English as a Second Language, Lesson 51-85	1967	-
4.	Let's Begin English Picture Book (Being revised)	1965	
5.	Games & Activities for Teaching English as a Second Language	1965	
6.	Language Program, Beg's. to Gr. II (Inuvik)	1962	
7.	Language Program, Grades III to VI (Inuvik)	1962	anA . ,S
8.	Beginning with the Beginners	1962	
9.	An Experiment in Div. 2 Reading (Inuvik)	1962	M.H. A
10.	Junior High School, Remedial Reading Program	1962	ten Ten
11.	Remedial Survey Guide for the Mechanics of Reading	1958	tred to
12.	Verbs in Pictures	1966	**********
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	Northern Readers for	Primary Grades	14	
1. Seal Hunt	what	(English)	1966	
2. The Story of Pa	pik an Eskimo Boy	(English & Eskimo)	1963	n# ba
3. Nicotye and Her	Family	(English & Eskimo)	1963	awarh
4. Nuna		(English)	1963	
5. A Weekend in Ot	tawa	(English)	1963	
6. Mr. Larson's Vi	sit	(English)	1963	
7. My First Book		(English)	1963	
8. Here's Jack	alaina	(English)	1962	1, As
9. Igloolik		(English & Eskimo)	1962	2, L
10. Eskimo Way of L	lving	(English)	1959	
ll, The Seal Book,	An Experimental Pre-Pr	imer	1967	10 al
12. Teaching Notes	or the Seal Book	nd Tanguage, Leanon 1-50	1967	1 E
13. Flash Cards for	the Seal Book	nd Language, Leason 51-85 aglish Picture Book (Being	1967	4, 14
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1. Test Item Constr	uction	ul) - 11 730 us '8. Fen '8004	1962	10
2. Assessing the In at Fort Simp	tellectual Ability of son, Northwest Territ	Indian & Metis Pupils	1962	
3. Mackenzie Distri	ct Norming Project	a remiller and a	1965	300 .00
4. N. W. T. Testing P	rogram, Mackenzie Dist	trict Norms	1965	9. An
5. Tentative Norms	for Metropolitan Achie	evement Tests	1966	, Ju
6. Northwest Territ	ories Testing Program	vey outde for the Sechanics	1967	(E.)

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	Social Studies Studies		
1.	Curriculum Guides and Reports of Curriculum Committees	Middle v	19 J
1.	Report of Social Studies Workshop, Inuvik	1961	gA J
2.	Primary Social Studies, Inuvik	1962	79 .
3,	Social Studies Course Outlines, Grades IV-VI, Inuvik	1962	ura J
4.	Social Studies, Grades I-VI, Aklavik	1962	. cu
5.	Social Studies Program, Grades I-III, Hay River	1962	wo .
6.	Report of Yellowknife Committee on Social Studies	1962	u5 .
7.	Report of Fort Smith Social Studies Curriculum Committee	1962	
8.	Report of Fort Simpson Social Studies Curriculum Committee	1962	00
9.	Proceedings of Mackenzie Education District Social Studies Studies Workshop, Yellowknife	1962	
10.	Curricular Guide, Social Studies Program, Mackenzie Education District, Experimental Edition	1962	140 .
11.	Proceedings of Mackenzie Education District Social Studies Evaluation Committee	1963	New .
12.	Mackenzie Education District Social Studies Program Special Issue of Curriculum Bulletin, Sept./62, Vol. 2 #2	lanoiñ	204
13.	Social Studies Program, Grades I-III, Baker Lake	1963	
14.	Social Studies Program, Grades I-III, Rankin Inlet	1963	sek -
15.	Social Studies Program, Grades I-III, Chesterfield Inlet	1963	00%
16.	Social Studies Program, Grades I-VI, Great Whale River	1963	astika-
17.	Social Studies Program, Grades I-VI, Fort Chimo	1963	989
18.	Social Studies Program, Arctic Education District, Interim Edition	1958	
19.	Curriculum Guide, Social Studies, Arctic Education District, Experimental Edition 1964;	1967	Pla
-	Audio-Visual Services	ndeo I	nast,
1.	Audio-Visual Services Handbook	1966	2014
1.0	Time Golden '1 ont	OFFICE CONTROL	

101	Title		Req'd,
	Special Programs & Reports		
1.	Providing for Individual Differences	1961	
2.	Accelerated Academic Upgrading Program	1962	L Rep
3,	Programmed Learning with Teacher Participation, (A research report)	1965	27 275
4.	Curriculum Guide, Social Studies, Churchill Vocational Centre	1965	3, 800
5.	Curriculum Guide, Science, Churchill Vocational Centre	1965	oes .
6.	Curriculum Guide, Mathematics, Churchill Vocational Centre	1965	0088
7.	Curriculum Guide, Language, Churchill Vocational Centre	1966	mati di
8.	Girls Vocational Curriculum Guide, Ungraded, Churchill Vocational Centre	1966	and t
9.	Boys Vocational Curriculum Guide, Ungraded, Churchill Vocational Centre	1966	and a
10.	Dressmaking & Tailoring 12, 22, 32, Grades 10, 11, 12, Sir John Franklin School	1966	org in
11.	Driver Training, Age 16 and over	1967	o, cur
12.	Northern Survival, Ungraded	1967	I, Fro
13.	Vocational Education Handbook (Deing revised)	1965	2, Mad
	Home Economics	at Sort S. La	T Boot
1.	Northern Cookbook, Grades 7 to 12	1967	A See
2.	Foods for health, Ungraded (Eskimo & English)	1966	100
3.	Foods for Health, Ungraded (English)	1964	no.
4.	Practical Programs in Homemaking & Related Activities, Ungraded	1964	too2
	Industrial Arts	alboye la	leos .
1.	Plastics, Ungraded	1967	e, Curs
2.	Small Oversnow Vehicles, Ungraded	1965	4
3.	Practical Programs in Industrial Arts & Related Activities, Ungraded		
4.	Junior High School Industrial Arts, Grades 7, 8, 9, Curriculum Guide	1964	I DISK 1

	Title	they	Req'd
	Mathematics	Rue son	Sec Spe
1.	Northern Workbook in Mathematics, Caribou Series	1966	ebdo -
2.	Sets and Numbers, A Pre-Number Program	1966	no na
3.	Charts of Sets 1 to 10	1964	10
4.	Modern Mathematics	1964	ISI
	Health & Physical Education	Depart been	The
1.	Health and Physical Education	1962	gen
2.	Physical Education Program for Arctic Schools	1964	rad
3.	Eskimo Games, A supplement to Arctic Physical Education Program 1965;	1967	paz
4.	Northern Physical Education Illustrated, A supplement to Arctic Physical Education Program 1965;	1967	nad nad
	basia for program development and for greater under-	a shir	org.
	Science Science Science Science		The
1.	Colour Slides of Northern Plove and Fauna	1965	Par
2.	Resource Unit on Northern Flore and Fauna (In preparation)		
3.	Northern Science Charts with Explanations	1965	Par
4.	Science Programs of the Provinces of Canada,	1965	
5.	Conserve Our Resources	1957	
	be expended and to be variable a similar amount should be spent in 1959/70 and 1970/71.)		
	erofered; setsivines all Art as eds of ereses (a) (4)	2.	
1.	Initiating an Art Program	1962	
2.	What Can We Use?	1962	
3.	Where Can We Get It?	1962	
	What Shall We Do?	1963	19.75
4.	milat Silati me Dot	1963	

Fift Thousand dollars (\$5,000) are being pent on collecting data on family

Appendix C

Senate of Canada Special Committee on Science Policy Adult Education

In reviewing the terms of reference of the Special Committee on Science Policy of the Senate of Canada, I felt that the Adult Education Section has little to its credit in the field of research. The Adult Education Section is in the initial stages of development. Since the appointment of field staff late in 1967, the program has been exploratory but not on a research basis.

The Department's Northern Co-ordination and Research Centre has been considered as the arm responsible for research. Each year the Education Division is asked for topics in the educational field requiring research. None in the Adult Education area has been accepted in the eight years since I have been here. The reason probably is due to the fact that there has been no time between receiving the request, and the date required to properly document the topics for research. In the past there have been ad hoc committees on research within the Division, and some studies have resulted. The recently named Education Division committee on research is a step towards promoting educational research and data collection which will provide a basis for program development and for greater understanding of human behaviour.

The sections of the terms of reference which were marked for Adult Education to answer were as follows:

Part II 2. 1) Organization (d)

No formal agreements with agencies outside of Canada.

Part II 2. 4) Distribution of Activities

The Adult Education budget does not include money for research, either intramural or extramural It is presumed that the parts of the question relate to expending funds. (A data collection study is currently underway; five thousand dollars will be expended and to be valuable a similar amount should be spent in 1969/70 and 1970/71.)

- 2. 4) (c) refers to the scientific activities, therefore the answer is none.
 - 2. 4) (d) refers to the role of agency (Education Division, Adult Education) in contributing to regional development as related to the scientific activities Not as a participating agency in scientific activities.
 - 2. 5) Personnel Associated with Scientific Activities

None. This covers a - h since it refers to staff doing scientific research.

- 2. 6) Expenditures Associated with Scientific Activities
 - (a) Total funds 1968/69 \$5,000

Function (2)

A Five Thousand dollars (\$5,000) are being spent on collecting data on family behaviour patterns which may be related to inadequate housing. This will be researched later to see if changes occur and if they can be credited to the new rental housing program for Indians in the Mackenzie District.

(A above) <u>Scientific Discipline</u> (2) f sociology - A above

(A above) Area of Application (13) - social policy (behaviour patterns)

(a) Operational

1968/69 \$5,000 (A above) 1969/70 \$5,000 (A above) 1970/71 \$5,000 (A above)

Part II.2 7) Research Policies

There is no stated policy. The newly formed committee has prepared terms of reference which are pending approval - a) 1 - 7 b) 1 - 9

Part II.2 8) Research Output

Nil - 1 - 10

Part II.2 9) Projects

Nil 1 - 2

2.5.c CHART I Education Division

B.A.'s and M.A.'s employed in Education Division, Department of Indian Affairs and Northern Development, by country of birth and country of training.

Data include research staff only.

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2.5.c CHART II Education Division

Number of working years since graduation and number of years employed in present organization of B.A.'s and M.A. employed in Education Division, Department of Indian Affairs and Northern Development, by age group.

Data include research staff only.

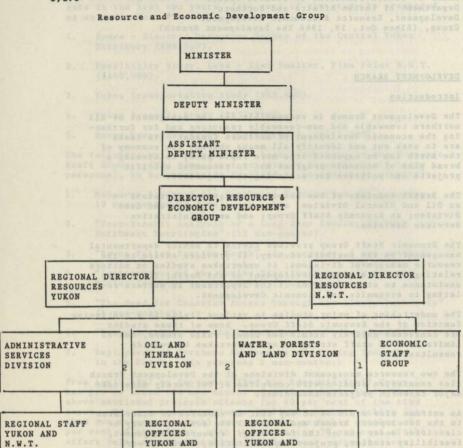
Age Group	No. of individuals in age groups	Average no. of working w years since graduation.	Average no. of yrs. employed in present organization	iduals	Average no. of working years since .	Average no. of years employed in present organization	
21-25 26-30 31-35 36-40 41-45 46-50 51-55 56-60 61-65	1	9.0 14.0	5.0 9.0	1 MARIAN OLVAN	2.0	2.0	DESCRIPTION OF STAFF
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Resource & Economic Development Group

December 1968

2.1.c



The Resource and Economic Development Group is responsible for management of northern renewable resources and for fostering the economic development of the north.

N.W.T.

1. - Substantial Scientific Research

N.W.T.

2. - Only contract studies by outside agencies

BRIEF TO SENATE COMMITTEE ON SCIENCE POLICY
Department of Indian Affairs and Northern
Development, Resource & Economic Development
Group, (Since Oct. 19, 1968 The Development Branch)

DEVELOPMENT BRANCH

Introduction

The Development Branch is responsible for the management of all northern renewable and non-renewable resources and for furthering the economic development of northern Canada. Its tasks are to seek out and identify all means whereby the economy of the north can be expanded at a more rapid pace, to develop a broad plan of economic progress and to recommend specific projects and policies for achieving the objective.

The Branch consists of two resource management divisions -- an Oil and Mineral Division, and a Water, Forests and Land Division; an Economic Staff Group; and an Administrative Services Division.

The Economic Staff Group provides advice to senior departmental management on the northern economy; it provides advice to the resource management divisions; it undertakes studies on matters relating to the economic development of the North; it renders assistance to other Branches of the Department in matters relating to economics and economic development.

The undertaking of major studies in various fields is a continuing function of the Economic Staff Group. Some of these studies are conducted entirely within the Group, while others, due to limitations in staff strength, are undertaken by outside consultants.

The two resource management divisions of the Development Branch also commission studies with consultants, but rarely undertake major research projects themselves.

An extreme view would be to say that no research is undertaken in the Development Branch and that all the activities may be classified under one of the following: resource management, feasibility studies, project implementation, advisory work.

In attempting to define the boundaries of "scientific research" in the Development Branch, the limits have been set at the functions undertaken by the Economic Staff Group as well as all external consultant work. This limit is arbitrary in many respects.

The Development Branch, (formerly the Resource and Economic Development Group) has been effectively in operation since April 1966, having been formed at the time of the major Departmental re-organizations. Staffing of the Economic Staff Group commenced in April 1967 and the Group was effectively in operation by November 1967.

The Economic Staff Group is functionally divided into three sections. A Resources Section is concerned with northern resource development. A Transportation Section undertakes studies in the transportation field, and an Economic Projects Section undertakes projects which do not fall directly under the other two specializations. A Statistical Section acts in a support capacity to the Economic Staff Group as a whole, compiles and processes statistical data on all phases of northern economic activity but is under the control of the Statistics service.

The following major studies were undertaken by outside consultants in the last two years, (the cost of the study is presented as an indicator of scale):

- Hydro Electric Resources Survey of the Central Yukon Territory (\$84,500).
- Feasibility Study, Lead Zinc Smelter, Pine Point N.W.T. (\$160,000).
- 3. Yukon Transportation Study (\$68,800).
- 4. Yukon Economic Study (\$153,250).
- 5. Water Resources Study (in Progress), (\$115,000).

The following major studies have been undertaken by the Economic Staff Group. (The time input to date of Economic Staff Group personnel, in man-months is supplied as an indicator of size):

- Manpower Study of the Northwest Territories (in progress, 19 man-months to date).
- "Cost-Benefit Analysis of a Lead-Zinc Smelter in the Northwest Territories" (12 man-months).
- 3. "Power Policy for the North" (in progress, 6 man-months).
- "Implications of the Carter Taxation Proposals for the Mining Industry in the North" (3 man-months).
- 5. "The Need for Canadian Access Through the Alaska Panhandle" (4 man-months).
- 6. "Transportation for the Coppermine Area" (3 man-months).
- Employment of Northern Natives by the Mining Industry in the North. (in progress 2 man-months.)

From April 1967 to September 1968 the Economic Staff Group has put in about 120 man-months of professional time. The above mentioned projects account for 40 per cent of the time input. Minor research projects (defined as those taking less than two man-months each) accounted for probably another 30 per cent of the effort, with the remaining 30 per cent of the effort being spent at meetings, conferences, consultations, monitoring consultants and miscellaneous memos and tasks which cannot be defined as individual studies or research projects.

Specific Comments in Response to Sections of the Guide

(numbering as in the guide)

2.2 Organizational Functions

2.2 (c) (i)
The Organization's functions and responsibilities (relation to other Federal agencies:

In its resource and economic development role, the Branch has extensive contact with the Departments of Energy, withes and Resources, Transport, and Public Works. Contact is also strong with the Department of Industry. These contacts are primarily via the conference room and joint participation in various task-forces and study groups. In the field the

administration and furthering of mineral development is a responsibility which the Branch carries out in the broader framework of Federal and Territorial regulations.

- 2.2 (c)(ii)
 Industry looks to the Branch for assistance in all matters pertaining to resource development in the areas where the Branch performs its "pseudo-provincial" role, for example, claim recording, lease granting, exploration incentive program, roads assistance program, mine inspection, property examination, map and report distribution, to cite the more salient ones in the field of mineral development. Similar activities may be cited in the fields of forestry, lands and water.
- 2.2 (c)(iii)
 Educational Institutions:

Contact is informal and is primarily in the field of information exchange at conferences. Other links are in the course of personnel recruitment and in research contract allocation.

2.2.(c)(iv)
 International representation and monitoring of scientific
 activities outside of Canada.

No formal role in the field is carried out. Informal ad hoc contact is made at conferences, in conducting of investor orientated meetings (to date only in the United States), by lending resource development films, by following developments in the journals and bulletins.

- 2.2.(d)

 Development Branch, Division Chiefs Meetings; Economic Staff Group meetings.
- 2.3 Personnel Policies
- 2.3 (a)

 No direct contact is made with the graduating classes and all recruiting needs at that level are channeled through the Public Service Commission.
- 2.3(b)

 No unique criteria are in operation for the purpose of identifying creative and effective researchers. Effort is directed to strengthening the effectiveness of the Departmental personnel review procedures.
 - A familiarity in depth with the performance and career goals of individuals is aimed at, thereby permitting early spotting of promising talent. The research role of the Branch is a limited one and a highly applied one. Accordingly, this point as well as points (d) and (e) do not effectively apply, since, with the small "research orientated" personnel there is little scope for independent action in this field. Accordingly, as mentioned previously, effort is directed to strengthening the overall Departmental machinery for spotting promising talent and thereby offering adequate career potential.

2.4 Distribution of activities

2.4(a)

The regional pattern of funds expended for research activities would roughly be an equal division between the Yukon and the Northwest Territories.

2.4 (b)

The regions of the Territories which will receive the greatest attention in terms of research expenditures will be those offering greatest long-term promise for economic development.

2.4(c)

All the research activities which have been itemized by cost and subject matter, together with all overhead expenditures (thereby making up the total budget of the Economic Staff Group) may be considered to have been directed to the "investigation of regional problems or phenomena".

2.4(d)

The recent renaming, to "Development Branch" is indicative of the fact that essentially all the effort of the Branch is directed to regional development.

2.4(e)

The wording of this point is not clear. The Branch is increasingly moving into sophisticate analytical techniques of measuring the costs and benefits of specific programs. In fact, the general objective of most of the applied research projects which are undertaken is to measure the costs and benefits of a specific line of action. The actual choice of distribution of scientific activities is not currently performed on any cost and benefit criteria, but is directed in accordance with development policy.

2.5 Personnel associated with scientific activities.

2.5(a)

The Economic Staff Group was defined as the principal research orientated unit in the Branch. The Personnel breakdown is as follows:

Professional economists: 9
Statistical support (but also under Mr. Maarten): 3
Clerical: 2

2.5(b)

The activities of the Chief of the Group may be defined to lie principally in Group direction, planning and administration.

2.5 (d)

	1968	1969	1970	1971	1972	1973
Bachelor	6	7	9	9	9	9
Master	1	2	5	5	5	5
Doctorate	2 9	3	3	3	3	3

2.5 (g)

No staff is currently on educational leave.

2.5 (h)

Number of university students given summer employment: 1967-2, 1968-1

2.7 Research Policy

As indicated in the preamble, the effective intramural research time of the Economic Staff Group has, to date, been about four man-years. The completeness, (or lack thereof) of the response to the questions, has to be viewed in the light of this limited internal research viewed in the light of this limited internal research
effort, as well as in the light of the few major studies
which were undertaken externally under contract. Project
initiation is in response to a "need". The need may be
defined internally by Branch management or externally
by senior Departmental management. The small scale of
operations during only one year of effective functioning, may be defined as a "shaking down" phase. Sophisticated techniques of setting priorities and maintaining them current, are only now being evolved in the light of an expanded role of the Branch.

Projects

2.9 Projects

The preamble lists the significant studies undertaken. A "best work" example of internal work would be the "Cost-Benefit Analysis of a Lead-Zinc Smelter in the Northwest Territories", and can be defined as applied research.

2.5.c CHART I Economic Development

B.A.'s, M.A.'s, and Ph.D.'s employed in Resource and Economic Development Group, Department of Indian Affairs and Northern Development, by country of birth and country of training.

Data include research staff only.

ry of	В.А.	0.0	alia	M.A.	Indies	i a	Ph.D		
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B.A. Canada Poland Australia South Africa England	2	1	1	1	1	1	1		
M.A. Canada England			1	1	1	1	1	1	
Ph.D. U.S.A. Canada							1	1	
Able to operate effectively in both languages		1	-		-	-	-	1	

2.5.c CHART II Economic Development

Average number of working years since graduation and average number of years employed in present organization, of B.A.'s, M.A.'s, and Ph.D.'s employed in Research and Economic Group, Department of Indian Affairs and Northern Development, by age group.

Data include research staff only. Ph.D. B. A. M.A. Average no. of yrs. employed in present Average no. of yrs. employed in present Average no. of yrs. employed in present Average no. of working yrs. since graduation Average no. of working yrs. since graduation No. of individuals No. of individuals No. of individuals Average no. of employed since in age group in age group organization organization organization group graduation age in Age Groups 21-25 1 1 1 26-30 31-35 7.2 2 4 1.76 1 8 36-40 11 5 41-45 1 21 46-50 1 15 1 51-55 56-60 61-65

BRIEF

SENATE COMMITTEE ON SCIENCE POLICY

Department of Indian Affairs and Northern Development

Financial and Management Adviser

December 1968

BRIEF TO THE SENATE COMMITTEE ON SCIENCE POLICY Department of Indian Affairs and Northern Development, Financial and Management Adviser

The two divisions concerned with research in this group are Computer Services and Central Statistics - no research is conducted by these units but they provide computer and data branch services. The Central Statistics division was only formed in September 1968. Divided information on their activities is included in their brief.

BRIEF TO SENATE COMMITTEE ON SCIENCE POLICY
Department of Indian Affairs and Northern
Development, Computer Information Systems

TERMS OF REFERENCE

The objectives planned for Computer Information Systems are broad in scope and place emphasis on a unified approach to a field concerned with many diversified activities. The unit is expected to initiate, promote and develop modern and advanced techniques of information processing with the Department of Indian Affairs and Northern Development. In conjunction with the various components of the Office of the Financial and Management Adviser, the division will participate in the implementation of the management improvement programme by using the techniques associated with management science and information processing.

Computer Information Systems will provide systems and programming services in both the business and scientific fields in order to improve present methods and to enable officers of the Department to concentrate on their own disciplines. It will further be expected to co-ordinate all automatic data processing activity within the Department in order to maintain a high standard of work; to ensure a comprehensive approach to interrelated activities; and most importantly, to create a professional environment in the area of information processing.

The detailed activities of this division are as follows:

- identifying, promoting, designing and implementing information systems.
- utilizing sophisticated data processing equipment to implement the various activities.
- advising Branch Directors of the administrative aspects of programmes to ensure unified and stream-lined procedural policies.
- applying new developments in the systems field, developing new techniques, and assessing the Department's long and short term requirements.
- developing conceptual systems involving advanced mathematical procedures such as model building, simulation studies, recursion formulae, linear programming and regression analyses.
- scientific systems analysis and programming.
- negotiating and co-ordinating all operational requirements of information processing between the Department and suppliers or consultants.
 - providing detailed machine coding using such computer languages as COBOL and FORTRAN.
 - investigating and making recommendations on new programming techniques and machine developments.
 - developing generalized utility routines specific to the Department.

Attached are statistical data on staff projects and expenditures.

2.5 Personnel Associated with Scientific
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- Personnel Establishment 15 a)
- One

d)		Bachelon			
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	1970	Lotter 8 III	1 0 2	A slamenan	
	1971	12	3	las jasuel qu	
	1972	12		2	
	1973	15	4	3	

- Not Applicable e) f) i) 80%
 ii) 0
 iii) 0
 iv) 50%

 - The decelled activities of this division are as lin'l (go:
 - h) Two

FUN	CTIONS:	66/67	67/68	68/69	69/70	70/71	71/72	72/73	73/74
1)	Intramural R & D	50.4	54.8	80.8	85.2	91.2	99.2	104.0	110.
2)	Data Collection	25.2	27.4	40.4	42.6	45.6	49.6	52.0	55.
3)	Scientific Information	50.4	54.8	80.8	85.2	91.2	99.2	104.0	110.
	then one out of	126.0	137.0	202.0	213.0	228.0	248.0	260.0	275.
	ENTIFIC CIPLINE	66/67	67/68	68/69	69/70	70/71	71/72	72/73	73/74
1)	Engineering & Technology	16.0	17.0	25.0	26.0	28.0	31.0	32.0	34.0
	Agricultur- al Sciences	5.0	6.0	9.0	10.0	11.0	12.0	12.0	13.0
	Biological Sciences	21.0	23.0	34.0	36.0	38.0	41.0	44.0	46.0
2f)	Mathematics	16.0	17.0	25.0	26.0	28.0	31.0	32.0	34.0
	Solid Earth Sciences	10.0	11.0	16.0	17.0	19.0	20.0	20.0	22.0
3Ъ)	Demography	21.0	23.0	34.0	36.0	38.0	41.0	44.0	46.0
	Economics	21.0	23.0	34.0	36.0	38.0	41.0	44.0	46.0
3f)	Sociology -	16.0	17.0	25.0	26.0	28.0	31.0	32.0	34.0
	The calledon	data,	oneu c	ompiled Depart	and (w	her asc	2670 pt)	Ann True	Date
	AS OF LICATION	66/67	67/68	68/69	69/70	70/71	71/72	72/73	73/74
	Economic & Fiscal Policy	18.9	20.5	30.3	32.0	34.2		39.0	41.3
	Regional Development	25.2	27.4	40.4	42.6	45.6	49.6	52.0	55.0
	Social Wel- fare & Soc- ial Policy	31.5	34.2	50.5	53.2	57.0	62.0		68.7
()	Educational Techniques &	10000	to pro	and tim	33.2	37.0	02.0		liol
	Policies	25.2	27.4	40.4	42.6	45.6	49.6	52.0	55.0
	Administrat- ion	6.3	6.8	10.1	10.6	11.4	12.4	13.0	13.7
6)	Other (Con- servation)	18.9	20.6	30.3	32.0	34.2	37.2	39.0	41.3

2.6 b) Refer to a) - Nil capital funds

CENTRAL STATISTICS

A Statistical Program

for the Department of Indian Affairs and Northern Development

Purpose and Scope of the Program

The purpose of the program is to develop, design and implement a statistical program which will provide the basis for planning, and for relating achievements to plans, for the entire Department.

Objectives of the Program

The objectives of the program are to create a comprehensive statistical data inventory which will:

- 1. Accommodate the development of policies and plans.
- Facilitate the consideration of alternatives during planning and execution.
- 3. Measure program effectiveness.
- 4. Measure operational efficiency.
- 5. Meet the data requirements of internal and external agencies and provide other supplementary data as required.

The existing systems, i.e., personnel, financial management, manpower budgeting, equipment cost and utilization, together with the statistical data inventory, will provide a fully integrated management information system.

The program emphasis will be on <u>orientation towards specific objectives</u>, as stated by Branches rather than on needs for statistical data as anticipated by the Statistical Division.

Data Classification

For the purposes of classification, the data required by Departmental management may be catagorized into four major groups:

- 1. Human
- 2. Natural.
- 3. Physical
- 4. Financial

All of the data to be collected on behalf of the Department can be channelled into one of the major data catagories, which in turn may be further divided into sub-catagories, for example as follows:

- 1. Human
 - vital statistics, education, employment ability, occupations, recreation, status
 - 2. Natural
 - agriculture, forestry, fisheries, minerals, game,

wild crops

- 3. Physical
 - schools, hospitals, businesses, induscries, farms, machinery, roads, utilities
- 4. Financial (non-government only)
 - capital revenue, operating revenue, commercial activities, grants and subsidies, interest

Total System Concept

To provide management with balanced data, information from more than one category must usually be consolidated to give the complete picture of a particular situation. For example, the proposed development of a new industry might require information on population, labour availability, educational standards, roads and access. In addition, it might be necessary to relate the potential of the industry to the national economic picture, the current and future market demands and the local economic scene. To achieve a total system approach, information will therefore be drawn from all four major data categories, which derive their data from various sources such as our own Department, provincial government agencies, other federal government depart-ments and private agencies. It is expected that much of this information will be computerized to speed the flow and to reduce the clerical work load. Wherever possible, such data will be fed directly into a central information source and then processed for transmission to the various levels of the Department from the operating field units to the Deputy Minister level, providing each level with information tailored to its needs.

Data Storage and Retrieval

The many sources of information will be catalougued and maintained in a master statistical data source index in the Central Statistics Division. Data itself will be stored in a central location by a method determined to be most suitable for the particular type of information, whether it be in conventional files, on computer tape or on microfilm. The data will be retired and disposed of when no longer needed according to the requirements of the originating branches.

Data Presentation

The collected data, once compiled and (when necessary) analysed, will be distributed to the Department in three major forms:

- 1. Regular reports, monthly, quarterly and annually.
- 2. Ad hoc reports.
- On request for any statistical information stored in the data bank.

Impact of the Program

The major impact of the program will be to make available to operating units an appropriate combination of professional statistical knowledge which can be focused on any Departmental activity. These resources can be concentrated according to demand and priority to provide information which is accurate, meaningful, comprehensive and timely.

Overall Approach to New System

At present the data requirements of the Department are:

- Being met by research-oriented groups and the data may or may not need refinement of approach.
- Being partially met by established methods capable of integration with new and better methods.
- Not being met because of vagueness of objectives, absence of standards, staff shortages, lack of system design, etc.

To establish the new system, it is intended to develop a framework which can be used as an infrastructure for the total statistical data system. At the present time the availability of data may be indicated by listing the four major categories in descending order: human, financial, physical, natural. Because of the ready availability of much of the required human resource data, it is proposed to begin implementation of the program by developing basic human resource information in the areas of education and vital statistics. Other data will then be integrated with the system, according to priorities to be established, until full coverage is obtained. The limited availability of specialist staff is a major factor in taking a selective approach at present.

Detailed Approach

To determine the human resource data requirements, the Central Statistics Division will conduct a series of meetings with the Education Divisions of the Department and all divisions having a direct interest in data relating to vital statistics.

The objectives of these meetings are:

- To review statistical requirements in relation to set objectives.
- To determine the existing information flow and to determine what, of the present flow, is needed and what can be disposed of.
- 3. To determine any new data required.

System development will then begin, in co-operation with the headquarters and field units concerned, to:

- 1. Combine the old and new information flows.
- 2. Develop an information flow system.
 - 3. Set data priorities.
 - 4. Develop collection, compilation and analysis procedures.
 - 5. Determine manpower and material requirements.
 - 6. Conduct thorough field testing.
 - 7. Implement the system.

Determination of Priorities - The "Users" Committee days won by ab

While the total statistical system is being developed, involving all four major categories, Departmental policies are likely to demand emphasis on specific resource areas. The setting of such priorities and of the overall Departmental Statistical Policy Objectives must be the responsibility of a Departmental Users Committee, with referral to the Executive Committee where necessary.

Statistical Organization

To develop this Statistical Program, the Department has established a Central Statistics Division in the Office of the Financial and Management Adviser. The Division is headed by a Chief Statistician, Mr. P.C. Marten, and contains three sections with the following major responsibilities:

Section

Analytical Services

Major Responsibilities

Development analysis of the socioeconomic aspects of:

Education Community Development Welfare and Social Matters Cultural Affairs Resource Development Industrial Development Land Management Tourism and Recreation

Statistical Services

- 1. General statistical design.
- 2. Integration and preparation of data for analysis.
 - 3. Provision of technical support to analysts. Provision of statistical research advice. Operations evaluation.

Operations

- 1. Operational design and testing of data systems.
- 2. Data flow control:
 - a) Receiving
 - b) Indexing and storage
 - c) Retrieval
 - d) Disposal
- 3. Publication and release of statistical data and reports.
- 4. Liaison and co-ordination with field operational units.
- 5. Field training of operational staff.
- Statistical forms control and design.
 Provision of administrative services.

Implementation

Implementation of the new program will begin early in September with initial concentration on education and vital statistics. The opening of the September 1969 school year was set as the target date for the introduction of the combined vital statistics and education data system as part of the human resource category.

Other resource data, that is those involving natural, physical and financial resources, will be fed into the system as the program is developed, starting with the classification of all

data now available in the Department and adding additional information as required, depending upon priorities mined in conjunction with the Branches and the availability information as required, depending upon priorities to be deterof specialist staff.

Some time will elapse before all Branch requirements are known and being served. Until that time, existing services must be maintained. Only with the utmost co-operation of all concerned can a system be built to serve today's needs and to phase out the requirements of yesterday without disrupting present services.

CENTRAL STATISTICS DIVISION

- 2.5 a) Personnel establishment -- Scientific 2
- d) Masters one

Ph.D one				
Estimates for:				
	Bachelors	Masters	Ph.D.	
	Doming Del ave Liabil	dev at		
1969	6	2	100	
AL Present, STEERS OF THE	nalva	-		
1970	usass q	2	1	
Beralled Assertationson laved lates		-	*	
1971		2	2	
To de transfer the medicine made decar at	10		-	
1972	1101 0000	2	2	
division . Sogress Lautrelinia dama	ments of an all all all a	the bear all	Jan Talan	
1973	12	2	2	
19/3		3	4	

- e) Not applicable to enalysis, the contract of collection to and
 - f) i) 0
 - ii) 50%
 - iii) 0
 - iv) 50%
- g) none
 h) none

M.A. Canada England

tpoppagam, bor lattopall,		69/70		71/72 000's)	72/73	73/74
Data Collection	250	300	360	400	440	480
Scientific Infor- mation	10	12	14	15	15	15
Biological	40	40	45	45	50	50
Demography	30	30	35	35	40	40
Economics	120	155	175	200	215	240
Sociological	70	85	110	135	150	165
Regional Development	70	97	109	125	125	140
Social Welfare & policy	60	75	100	125	140	165
Education techniques & policy	40	40	50	50		60
Administration	50	60	70	70		80
Wildlife	40	40	45	45	50	50 1,405,000
b) not known at this						
c) none						

b) not known at this time

none

2.5.c CHART I Financial and Management Adviser

B.A.'s, M.A.'s, and Ph.D.'s employed in Financial and Management Adviser's Office, Department of Indian Affairs and Northern Development, by country of birth and country of training.

Data include research staff only.

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CHANGE STATISTIC	В.,	Α.	M.	Α.	Ph.D.	Hological
A DA STORY OF SE		b.lglga to	spu		benes	Demography 5 - 21
of translation (500	to d	and	rlaı	pu	120	Economics
Country	Canada	Scotland	Netherlands	England	India	Sociological
Country of Training	Tori	601	Y		70	Regional Development
Secondary Schooling	11	100	5		20312 I	Social Welfare, 6
Canada Scotland	2	1	. 0		0.4	Education rechaiques & policy
Netherlands England India		7.0	1	1	08	Administration
B. A.		45	0		94	2 affigith
Canada Britain England	2	1	1	1	and .	b) Snot known at this
India	inblu	Desirate and the second			1	c) none
M.A. Canada England			1	1		
Ph.D. U.S.A.					1	
Able to oper- ate effectively in both lang-						
uages.	1		1	-	-	

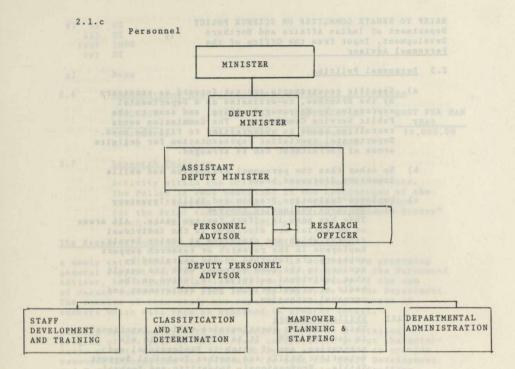
2.5.c CHART II Financial and Management Adviser

Average number of working years since graduation and average number of years employed in present organization, of B.A.'s, M.A.'s, and Ph.D.'s employed in Financial and Management Adviser's Office, Department of Indian Affairs and Northern Development, by age group.

Data include research staff only.

					Part land b	D'S.				
	п	в. А.		м.	Α.		Ph.	D.		
Age Groups	No. of individuals in age group	Average no. of work- ing years since graduation	Average no. of years employed in present organization	No. of individuals in age group	Average no. of working yrs. since graduation.	Average no. of years employed in present organization	No. of individuals in age group	Average no. of work- ing years since graduation	Average no. of years employed in present organization	
21-25	1	3.0	2.0	ENCE	32 80	SEPTE	MOD X	TANES		
26-30 31-35	1 9	11.0	2.0	1 1	10.0	2.0	mar 5	0.000		
36-40 41-45 46-50 51-55 56-60	1	10.0	2.0	1	6.0	2.0	1	16.0	1.0	MINISTRAL MINISTRAL
61-65	-	el de	en pou	oible	TOT	and a second	-	-	2	
	alasio a reso	ercas	Plant .	the d	epertm	levels pag-			-	
			es visa			1, 4, 5				
	2-5	abstract	hat 3	cleut	tic K	recon	elle.			

BRIEF TO SENATE COMMITTEE ON SCIENCE POLICY Department of Indian Affairs and Northern Development Personnel Adviser December 1968



Personnel is responsible for manpower development and the formulation of policy designed to develop most effectively human resources within the department.

1. - Substantial Scientific Recearch

BRIEF TO SENATE COMMITTEE ON SCIENCE POLICY Department of Indian Affairs and Northern Development, Input from the Office of the Personnel Adviser

2.3 Personnel Policies

- a) Specific requirements are put forward as necessary by the Branches, co-ordinated as a Departmental expression by Manpower Staffing, and sent to the Public Service Commission. The Commission sends recruiting teams to universities to fill the need. Departmental specialist representation for definite areas of recruitment can be arranged.
- b) No other than the personnel evaluation and skills inventory discussed below.
- c) Employee Evaluation Program and Skills Inventory
 i) Employee Evaluation Program
 This has been in effect for two years. All areas of potential are disclosed in the individual reports which are appraised at senior levels.
 Employees in the research or research support category are reported on and appraised by seniors in the same category with the result that individual potential is judged on the basis of organizational goal achievement and personal extension.
- ii) Skills Inventory
 This inventory questionnaire will be functional
 in January 1969. It is broken down to six
 categories, one of which is Professional and
 Scientific Skills and another Technical Support
 Skills. Professional, Scientific and Technological skills, amongst others, will be stored
 in a Data Processing System and will be
 retrievable on a selective basis.
 - d). None, other than existing inter Departmental policies.
 - e) Centres of responsibility estimate annual education and training expenses based on the organizational objectives and the individual needs expressed in the Employee Evaluation Program.

2.5 Personnel Associated with Scientific Activities

- a) One Social Scientist
- b) c) i) Canada
 - ii) Canada
- iii) Canada Bachelor
- iv) Two, one in present organization
- v) 28
- vi) -

				YE	AR							
PEGREE CATEGORY	63	64	65	66-	67	68	69	70	71	72	73	74
BACHELOR		1				1	1	1	1	1	1	1
MASTER								1	1	1	1	1
DOCTORATE												

e) None

f) i) ii) 0% 0% 100% iii) iv)

g)

None

07

Expenditures Associated with Scientific Activities

FUNCTION	DISCIPLINE	APPLICATION	COST PER MAN
			YEAR
Intramural	Sociology	Personnel	\$8,000.00
R & D		Management	

2.7 Research Policies

Activity within the office is developmental to date. The Policy is best described in the description of the research function attached to the form "Information for the Brief to the Senate Committee on Science Policy" which is forwarded with this paper.

The Research Function in Personnel Administration

A newly established research function, in addition to providing general support for the administrative activities of the Personnel Adviser, has begun, as an initial project, a study of the use of casual (uncertified) sick leave by employees of the Department. The results of this study are expected to highlight areas of concern which will then be examined in greater detail.

Running concurrently with this activity will be a detailed program of analysis of the various occupational groups characteristic of this Department. This analysis is expected to provide resource information and guidance for both the Staff Development and Training Division and the Manpower Planning and Staffing Division of Personnel.

The motivating force behind the creation and development of this research function is the desire to promote effective and efficient use of this Department's manpower resources, both now and in the future.

BRIEF TO TO THE RESERVE OF THE RESER SENATE COMMITTEE ON SCIENCE POLICY Department of Indian Affairs and Northern Development Departmental Library December 1968

BRIEF TO SENATE COMMITTEE ON SCIENCE POLICY
Department of Indian Affairs and Northern Development
DEPARTMENTAL LIBRARY

The present departmental library has been formed by the amalgamation of three smaller libraries, namely, the Northern Affairs library, the Parks Branch library, both of the former Department of Northern Affairs and National Resources; and the Indian Affairs holdings of the library of the Department of Citizenship and Immigration. These mergers took place during 1965 and 1966.

At present, the library supplies the need of departmental officers working in such fields as northern research generally, wildlife research, the social sciences, and historical research. The library also provides reference material to graduate students, both Canadian and foreign, who are engaged in research within our departmental areas of interest; for example, we have received requests within recent months from the University of Alberta, University of Calgary, Cornell University, Harvard University, University of Massachusetts, Michigan State University, University of Michigan, Moorhead State College of Minnesota, City University of New York, State University of New York, University of Saskatchewan, University of Western Ontario, York University, University of Wyoming, as well as from European scholars. One can see, therefore, that the library provides support for a wide range of scientific disciplines.

Although the library does not conduct research, it does fall in the scientific support category. Below are the answers to questions of the guideline most relevant to our operations.

2.2 Organizational Functions

- c) i) Reference and bibliographic services, research facilities and working space in the library are extended as required. Bibliographies in the subject field, and photocopies of material retained in the library are supplied on request.
 - ii) and iii) ibid.
 - v) Reference and bibliographic services are also extended to the public.
- d) Duties and goals are reviewed periodically by the chief librarian and the library board.
- f) A notable omission is the exchange of the scientific publications of our research groups with publications of like material produced by scientific institutions (government, university, private research institutes) of other countries. This exchange of information is a normal library function which this library should institute and develop.
- g) Lack of staff has been the basis of the deferral of this programme.
- h) i) Introduction of the exchange function. (noted above)
 - ii) Introduction of automated techniques for information retrieval, ordering and circulation of periodicals, and, probably, other functions amenable to these techniques.

2.3 Personnel Policies

- c) In engaging professional staff, this is taken into account, and confirmation is made by observation of performance effectiveness.
- e) Intramural (language training) and extramural (library science) is available periodically.

2.5 Personnel Associated with Scientific Activities

- As of October 1, 1968, the establishment is as follows:
- 1 Chief librarian.
 - 2 Catalogue librarians (1 not filled)
- 2 Contract librarians (part-time)
 6 Secretarial and clerical workers.
 - b) One.
 - c) Of professional positions currently filled, detail is as follows:

Chief Librarian

- B.A. (English), A.R.C.T. (Violin)
 - B.L.S. (Bachelor of Library Science)
- i) Canada.

 - iii) Canada.
- iv) 14 years; 1 month in present organization.

- Reference librarian B.A. (Modern languages and literatures)
 M.A. (Modern languages French and
 - Spanish and literatures)
 i) Canada.
 ii) Canada.
- iii) Canada.
 iii) Canada.
 iv) 14 years; 2 1/2 years in present
 organization

Cataloguing Librarian

- B.A. (French and Art History) i) Canada.

- iii) Canada.
- iv) 1 1/2 years; 1 month in present organization.

- Contract Librarian B.A. (English)
- B.A. (English)

 B.L.S. (Bachelor of Library Science)

 i) Canada.

 ii) Canada.

 iii) Canada.

 - iv) 8 years; 4 years in present organization.

Contract Librarian Diploma in Library Science.

- i) Canada.ii) Canada.
- iii) Canada.
 iv) 40 years; 5 years in present organization.
- v) Average age of above 50
- vi) Percentage able to operate effectively in Canada's two official languages 40%.
- d) This library was instituted in 1965. Total number of professional staff:

	Years		B.A.	or equiv	alent	M.A.	Ph.	D.
	1965			3		0	0	
	1966			3		12000	O Develo	
	1967			5		1	0	
	1968			4		1	0	
Es	timated	for						
Canada								
	1969			5		1	0	
	1970			5		1	0	
	1971			5		1 1 1 1	0	
	1972			5		0	0	
	1973			5		0	0	
e)	1965			33 1	137			
٠,	1966			33 1	. / 3/0	etropal in	milita be	
	1967			60%				
	1907			00%				
	ii)			66 2	13%			
	iv)			66 2				
					7			

Expenditures Associated with Scientific Activities

2.6 b)	Years	Operating and capital funds
	1962-63 1963-64	N/A
	1964-65	N/A
	1965-66 1966-67	rigures not available
	1967-68	\$ 82,000

Committee on Science Policy

Bibliographies on the subjects listed below have been prepared, at the request of researchers, by the Departmental Library:

Abnaki Indians

The Alcohol problem and the Indian

L'Anse aux Meadows

Athabasca oil sands

The Canadian North

Community Development

Coppermine Region

Cree Indians

Eskimo arts and crafts

Eskimo dictionaries and grammars

Eskimos - general bibliography

Franklin, Sir John

Guaranteed minimum income

Huron Indians

Iceland

Indian arts and crafts

Indian language material

Indians of Canada - Education

Indians of Canada - General bibliography for junior high school students

Indians of Canada - General bibliography for senior high school students.

Management and personnel administration

Micmac Indians

Montagnais - Nascapee Indians

Northern Saskatchewan

Nutrition of Eskimos and Indians

Ojibwa (Chippewa) Indians

Personnel management and personnel psychology

Records management

Recreation and parks

Sociological, economic, anthropological, psychological studies of northern peoples

2.5.c CHART I Library CTATGLE IN TEARS S.C. A.

B.A.'s and M.A.'s employed in the Library, Department of Indian Affairs and Northern Development, by country of birth and country of training.

Data include research staff only.

Secondary Schooling Canada 4 1 B.A. Canada 4 1 M.A. Canada 1		Canada y	Canada .w.			
B.A. Canada 4 1 M.A. Canada 1 Able to operate effectively in	Training Secondary Schooling	Toked	Krus Asan			
Canada 4 1 M.A. Canada 1 Able to operate effectively in	Canada		The second			
M.A. Canada 1 Able to operate effectively in		4	1			
Able to operate effectively in			1			
effectively in		2.5	0824)			
	effectively in	1	1			

2.5.c CHART II Library

Average number of working years since graduation and average number of years employed in present organization, of B.A.'s and M.A.'s employed in the Library, Department of Indian Affairs and Northern Development, by age group.

Data include research staff only.

Data :	include	resea	arch st	aff o	nly.		700.303 0.00
Age Group	No. of individuals in age group	Average no. of working years since graduation	Average no. of years employed in present organization	No. of individuals in age group	Average no. of working years since graduation	Average no. of years employed in present organization	
21-25 26-30	1	1.5	. 5				B.A. Canada
31-35 36-40	1	14.0	.5				
41-45 46-50 51-55	1	8.0	4.0		1 2		
56-60 61-65 65	1	40.0	5.0	1	14.0	2.5	
						1	
	July - 1						
-1-1		AND THE	ningla	Name of	tot made	112,000	
MARKET AND		Secretary and	ming	PER N	100	110	
		their gar	EL COLOR	Albert .			
		Phipps					
				-	907		

THE RE-ORGANIZATION - A CREERAL REVIEW

The Government Organization Act of 1966 Arought about basic changes thinks responsibilities of this Department. The water Resources Branch and the Resources Development Branch and the Resources Development Branch and the Department of Musicy, Mines and were transferred to the Department of Musicy, Mines and Resources and the Indian Affects Aranchivas transferred to us from the Popartment of Claimanhip and Indianation.

As a resold to these transfers, the Department grew from an actable the Montage of 151 o million to 151 the 191 to 191 t

APPENDIX A

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DEPARTMENTAL

ORGANIZATION

covar demant of the Northwest Territories intleded Eastleffelds Commission at larger to Street and Monuments Board or there Canada Power Commission or there Transportation Company Limited to the functions to the

restriction in the endemn bere to take piece, selficient time had elepade to enable both elements (e.g. devolution of nettern punitions and absorption of indian program functions to be surveyed profitably.

A hash-force was established in June 1963 was review legionalistics, objectives, policy, activities and entertes needs.

and to all extensions of the case of the seasons with process of the seasons were further discounted with Iresoury Board (uppelos Public Service Commissions)

The new framework recatos the organizational pattern in line with three specific and distinct departmental programmes with a strong apport fervices organization to serve them,

They are se whown on page 5.

The Social Affairs Programms
The Economic Development Programms
The Conservation Programms
The Conserv

THE RE-ORGANIZATION - A GENERAL REVIEW

The Government Organization Act of 1966 brought about basic changes in the responsibilities of this Department. The Water Resources Branch and the Resources Development Branch were transferred to the Department of Energy, Mines and Resources and the Indian Affairs Branch was transferred to us from the Department of Citizenship and Immigration.

As a result of these transfers, the Department grew from an establishment of 4,252 man years to 7,536 man years, and from an annual budget of \$157.6 million to \$195.5 million. The merger demonstrated that, in so far as the Indian Affairs and the Northern Administration Branches were concerned, somewhat similar objectives were being pursued with respect to the indigenous people of Canada and that consideration should be given to the consolidation of common activities.

Temporarily, the organization structure shown on chart page 4 was adopted after the merger, in 1966, to replace the previous structure shown on page 2. This organization chart, except for a very few changes, still exist today. In this framework, the program responsibilities of the Department were as follows:

Indian Program
Northern Program
Conservation Program
Departmental Administration

These charts do not reflect certain other organizational responsibilities but it is important to mention them here. These include:

Yukon Government Government of the Northwest Territories National Battlefields Commission Historic Sites and Monuments Board Northern Canada Power Commission Northern Transportation Company Limited

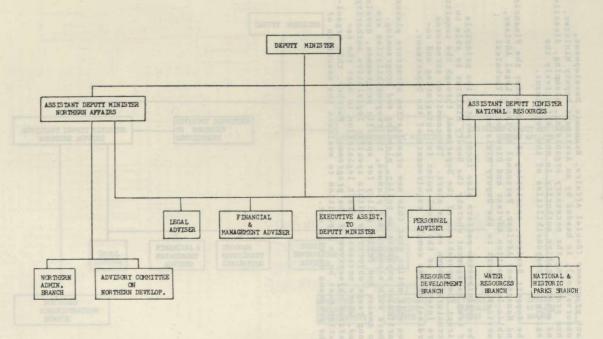
By the time the further devolution of functions to the Territorial government were to take place, sufficient time had elapsed to enable both elements (e.g. devolution of northern functions and absorption of Indian program functions) to be surveyed profitably.

A task-force was established in June 1967 to review legislation, objectives, policy, activities and existing organizational structures. As well, the task-force held discussions with Branch Directorates and the Executive Committee of the Department. Proposals presented by the task-force were further discussed with Treasury Board and the Public Service Commission.

The new framework recasts the organizational pattern in line with three specific and distinct departmental programmes with a strong support Services organization to serve them.

They are as shown on page 5.

The Social Affairs Programme
The Economic Development Programme
The Conservation Programme
and Departmental Administration, embodying
all Support Services.



Each programme (Social Affairs, Economic Development, Conservation), is headed by an Assistant Deputy Minister, thus providing the necessary organizing, planning, directing and administrative authority to meet effectively the legislative responsibilities of the Department.

The Support Sevices, consisting of those under the Financial and Management Adviser, Personnel Adviser, Legal Adviser, Public Information Adviser and Director of Technical Services, report to the Deputy Minister.

The organization pattern also incorporates the principle of team management whereby the Deputy Minister is able to direct the operations of the Department through the committee structures shown on the chart. The committee structures are intended as the focal point for integrating and coordinating the complex requirements of the Department.

You will notice that this new organization structure places particular emphasis on policy, planning and programming. Where such elements are planned, the responsibilities are to review and define policy for specific programmes, develop long range objectives within specific legislative authority, and, where necessary, draft legislation to meet the redefined objectives of the programme. Further, this organization must be in a position to evaluate the execution of the programs carried out.

ASSISTANT DEPUTY MINISTER

NATIONAL &

HISTORIC "

PARKS

INDIAN AFFAIRS

INDIAN

AFFA IRS

BRANCH

DEPUTY MINISTER

PUBLIC

INFORMATION

ADVISER

RESOURCE &

DEVELOPMENT

ECONOMIC

SENIOR

PERSONNEL

ADVISER

CANADIAN

WILDLIFE

SERVICE

ASSISTANT DEPUTY MINISTER

ADVISORY COMMITTEE ON NORTHERN

PROGRAM

MANAGEMENT

EVALUATION

DEVELOPMENT

FIRANCIAL &

MANAGEMENT

ADVISER

ASSISTANT DEPUTY MINISTER

LEGAL

ADVISER

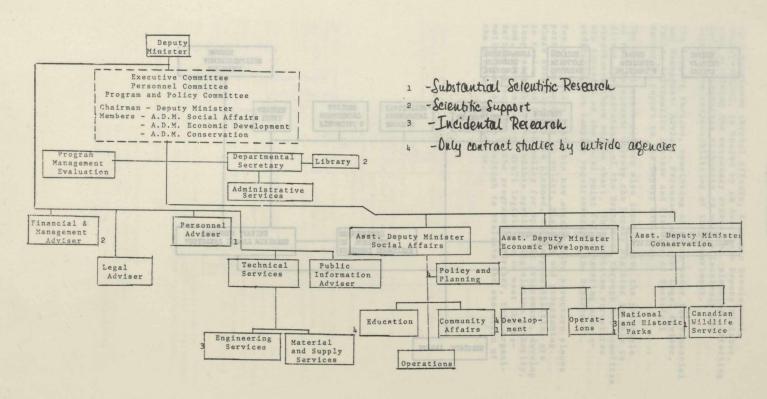
NORTHERN AFFAIRS

NORTHERN

BRANCH

ADMINISTRATION





SOCIAL AFFAIRS PROGRAMME

The objective and functions of this programme covers education, community development, welfare, social affairs, cultural affairs and Indian trust administration. (See chart page 8.)

The Programme will be directed by an Assistant Deputy Minister who will report directly to the Deputy Minister. The Assistant Deputy Minister will be responsible for planning, organizing, directing and administering the Social Affairs Programme. Organizationally, three branches will report to this Assistant Deputy Minister, each one headed by a director: education, operations, and community affairs. The Assistant Deputy Minister will also be seconded by a Policy Planning Programming organization formed by the group of the same name now part of Indian Affairs Branch.

The director of operations is responsible to the Assistant Deputy Minister for the effective and efficient direction of Social Affairs operations through the Regional Directors who report to him. In addition, the Indian and Eskimo Bureau will also report to him. The directors of the other two branches, Education and Community Affairs, provide advice and assistance of a specialist nature as well as providing functional direction to their respective staffs at Regional headquarters.

Education Branch Branch

The Director of Education is responsible for educational research and development and school services. The Branch will merge the Education divisions of both Indian Affairs and Northern Administration Branches. Two new organizational elements will report to this director:

a) Educational Research and Development

This group will generally be responsible for carrying out the educational research studies in order that the Branch will be informed on all developments in this professional field. It will also be responsible for developing plans for the improvement and up-grading of the educational programme for the benefit of the indigenous people.

b) School Services

This group will be responsible for formulating and promulgating operational procedures for the direction and guidance of the educationalists in the regional, district and local schools. In addition, the group will review the school programmes and inspect the school operations to develop the understanding necessary to formulate effective operational procedures. It will also be responsible for the administration of scholarships and grants.

Community Affairs Branch

The Community Affairs Branch is responsible for the development of municipal government and for the development of programs which will ensure political, economic and social self-determination for the indigenous people of Canada.

The Director is assigned specific responsibility for co-ordinating and providing functional direction to the operational elements at regional, district and local offices. In so far as possible, responsibility and accountability are decentralized to the lowest level in the organization where effective operational decisions can be made.

The Branch will be a merger of the Social Affairs Division from Indian Affairs Branch and the Welfare Division from Northern Administration Branch. Two new organizational elements will report to the director: Welfare and Community Development:

a) Welfare

The Welfare organization is concerned with professional staff services. It is responsible for maintaining a close liaison with other federal departments and provincial governments on welfare matters. They will also maintain close contact with regional and field operations and be responsible for formulating and promulgating operational procedures for the direction and guidance of field staff.

b) Community Development

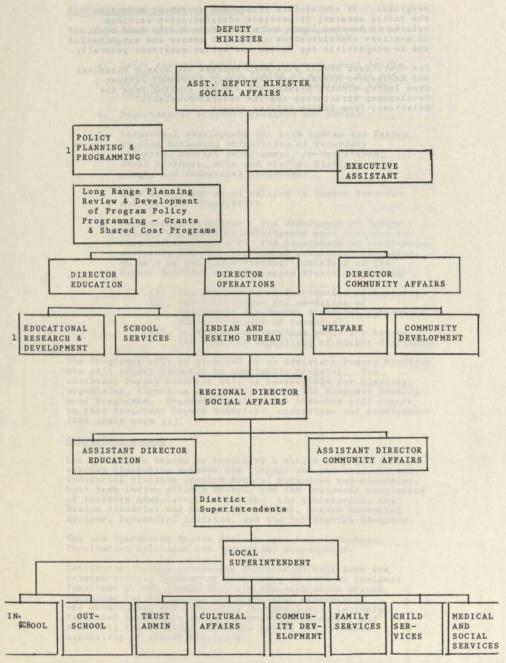
The organizational elements identified under Community Development include those professional staff services responsible for conducting research in all fields of human endeavour related research in all fields of numan endeavour to leadership, municipal government, selfdetermination, motivation, etc. Further, they will be responsible for developing plans and objectives for the Community Affairs Program in collaboration with representative groups of the indigenous people of Canada. It will also be their responsibility to maintain a close liaison with the Operations Branch, and the Policy, Planning, and Programming organization. This organization will also maintain close contact with the field operations and will formulate and promulgate operational procedures for the direction and guidance of staff on all matters relating to Community Development.

Operations Branch

As already mentioned, the Director of operations is responsible to the Assistant Deputy Minister for the effective and efficient direction of Social Affairs operations through the Regional Directors who report to him.

The Director of Operations is also responsible for the Indian and Eskimo Bureau. This Bureau will be formed by the Administration Directorate from Indian Affairs Branch, at the exception of Land Administration, Survey and Titles.

It provides administrative support and advisory services to Indian and Eskimo people and general guidance and direction in administrative field throughout the Social Affairs

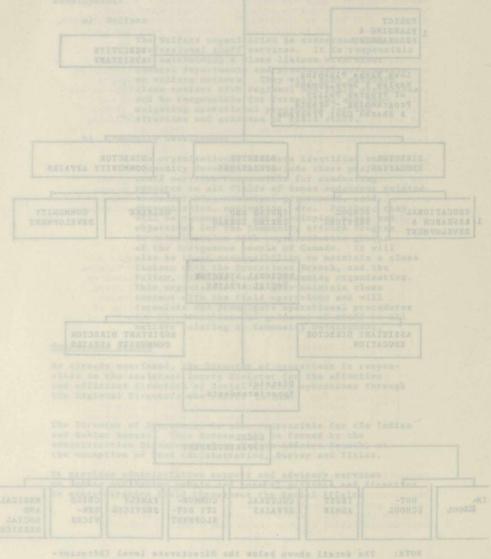


NOTE: The detail shown below the Directorate level (Director-Education, Operations & Community Affairs) identifies functions & activities to be carried out and is not intended as a definite organizational structure.

1-Only contract studies by outside agencies

Programme. It administers trusts and treaties; maintains the Indian estates; it provides administrative services related to Reserve lands and administers Indian Band Funds. It monitors administration of Federal grants and subsidies, and is responsible for Indian and Eskimo questions generally.

The Operations Branch will also include the Branch Financial and Management Adviser and the Branch Personnel Adviser from Indian Affairs Branch; the Finance section from the Development Directorate and the Federal-Provincial Relations, from Indian Affairs Branch.



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ECONOMIC DEVELOPMENT PROGRAMME

The objectives and functions of this Programme cover the following.

- A. Major resource development and management in the Canadian North in the fields of mining, oil and gas, water, forests, roads and airstrips, and incentive programs.
- B. Departmental economic research and advice.
- C. Industrial development for both Indian and Eskimo peoples including stimulation of secondary industry, tourist development, co-operatives, small business, arts and crafts, fishing, wild crops, and industrial promotion.
 - D. Land management as it relates to Indian Reserves and wet land acquisition.
 - E. Territorial relations The Department of Indian Affairs and Northern Development will continue to have responsibility for the management of territorial resources and related federal government functions, as well as for those residual functions of the former Northern Administration Branch, including:
 - (1) the monitoring of Territorial agreements,
 - (2) the development and up-dating of agreements (including financial agreements and development of formulae),
 - (3) providing for services which are beyond the resource capability of either Territory.

The Programme will be directed by an Assistant Deputy Minister who will report directly to the Deputy Minister. The Assistant Deputy Minister will be responsible for planning, organizing, directing and administering the Economic Development Programme. Organizationally, two branches will report to this Assistant Deputy Minister: operations and development (See chart page 12).

Operations Branch

The Operations Branch is formed by a merger of Lands Administration (including Surveys and Titles) and the Resource and Industrial Division (except Natural Resources and Minerals), both from Indian Affairs Branch, and the following components of Northern Administration Branch: the Secretariat, the Branch Financial and Management Adviser, Branch Personnel Adviser, Industrial Division, and the Territorial Division.

The new Operations Branch divides into two components: Territorial Relations and Industrial Development.

Territorial Relations manages Territorial relations and related Federal Government functions, as well as residual functions of the former Northern Administration Branch, including (a) monitoring of territorial agreements, (b) development and up-grading of agreements, including financial agreements and development of formulae, and (c) providing for services which are beyond the resource capability of either Territory.

Industrial Development is responsible for the stimulation of secondary industry, tourist development, co-operatives, small business, arts and crafts, fishing wild crops, and industrial promotion. As well, it has responsibility for land management, including Indian reserves and wet land acquisition.

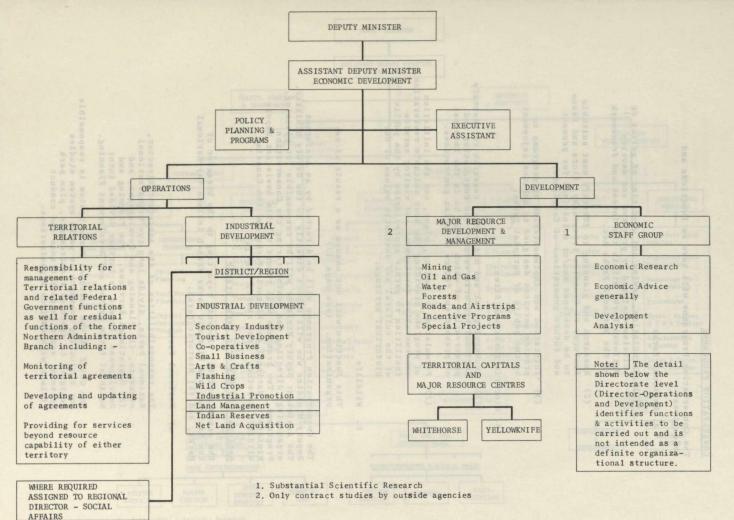
The Assistant Director in charge of Industrial Development will, through his regional staff, provide the specialist capabilities at the regional, district and local offices to assist the local communities on all problems concerned with industrial development, land management and resource management. The regional staff of his Assistant Director will be assigned to the Regional Director of Social Affairs for purposes of program co-ordination and policy direction. The specialist staff at headquarters in Ottawa will maintain close contact with the field offices and will assist these field offices through the formulation and promulgation of procedures for the guidance and direction of field staff.

Development Branch

The Development Branch is formed by the Natural Resources and Minerals from the Resources and Industrial Division of Indian Affairs Branch and the following components of the Resource and Economic Development Group: Administrative Services, Economic Staff Group and Resource Management.

The Development Branch divides into two organizational components, (a) Major Resource Development and Management, and (b) Economic Staff Group. Both organizations are staffed by specialists.

The Assistant Director responsible for Major Resource Development and Management will be involved with major resources in the Canadian North, including mining, oil and gas, water, forests, roads and airstrips, and incentive programs. He will direct these programs through the Territorial capitals and major resource centres.



CONSERVATION PROGRAMME

The Conservation Programme will have as functions and objectives:

A. National Parks

- (1) Formulation, review and up-dating of policy or policies designed to preserve and develop National Parks within the intent and framework of the National Parks Act.
- (2) Research and planning to identify most suitable features of Canadian topography, flora and fauna to be developed and/or maintained for present and future generations of Canadians.
- (3) Initiation and implementation of programs to provide services designed to enhance enjoyment by the public of National Parks.

B. Historic Parks and Sites

- (1) Archaeological and historical research to identify national historic values, the restoration and preservation of which would be in the interest of present and future Canadian generations.
- (2) Formulation of policy, plans, and the initiation of programs providing the most suitable restoration, commemorative development and visitor service facilities to permit appreciation by the public of the cultural and aesthetic values of our historical heritage.

C. Wildlife

This function will not change as a result of reorganization. (see page 15)

The Conservation Programme will be directed by an Assistant Deputy-Minister who will report directly to the Deputy Minister. The Assistant Deputy Minister will be responsible for planning, organizing, directing and administering the Conservation Programme. Two branches will report to this Assistant Deputy Minister: National and Historic Parks and the Canadian Wildlife Service. (See chart, page 14)

National and Historic Parks Branch

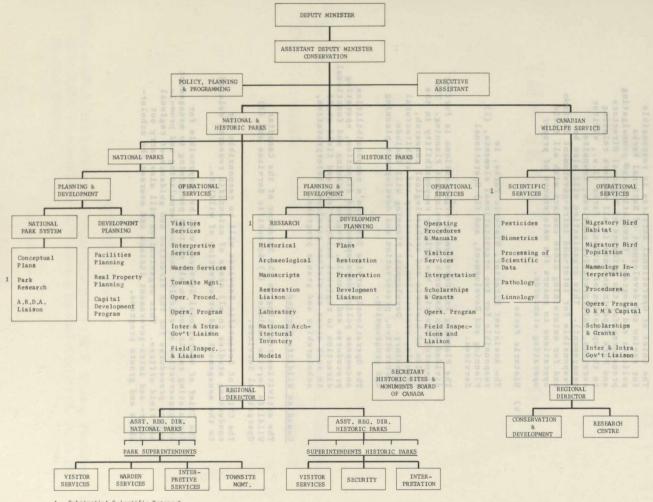
The organizational elements reporting to the Director of the National and Historic Parks Branch include (a) National Parks, and (b) Historic Parks.

a) National Parks

The responsibilities of the Assistant Director, National Parks, divide into two organizational elements, (1) Planning and Development, and (2) Operational Services. The Planning and Development element is further divided into: National Parks System and Development Planning.

The Chief of the National Parks System is responsible for conducting research on parks system studies designed to appraise requirements, plan park systems, appraise park trends and conduct liaison with various organizations.





1. Substantial Scientific Research.

The Chief of Operational Services is responsible for review and development of National Parks policies and programs, formulating and promulgating procedures for the guidance of Regional Directors and Park Superintendents in all matters relating to the operation of National Parks (i.e., visitor services, interpretative services, townsite management). This organization will also be responsible for inter-and intra-government liaison and for maintaining close contact with all field operations to ensure the maintenance of proper operating standards.

b) Historic Parks

The Assistant Director, Historic Parks, is responsible for two organizational elements, (1) Planning and Development, and (2) Operational Services.

The Planning and Development organizations is further divided into Research and Development Planning. The Research Division has primary responsibility in the fields of historic and archaeological research, manuals, restoration, laboratory and architectural inventory. Development Planning will include restoration, preservation and development planning and programming.

The Operational Service Division's responsibilities encompass policy development and direction, operating procedures and manuals, program planning and functional direction to regional headquarters and field staff in such areas as visitor services, interpretation, scholarships and grants programs.

Canadian Wildlife Service

The activities reporting to the Director of the Canadian Wildlife Service include: (1) Scientific Services and (2) Operational Services.

The Chief of Scientific Services will be responsible for conducting studies in all areas of scientific research related to the management and preservation of wildlife.

The Chief of Operational Services will be responsible for formulating regulations on all matters pertaining to management and preservation of wildlife and for formulating and promulating procedures for the direction and guidance of regional and field offices. This organization will also carry out inter— and intra-government liaison and oversee the scholar—ships and grants programs.



First Session—Twenty-eighth Parliament

THE SENATE OF CANADA

PROCESSOUNGS OF THE PECIAL COMMENTER

SCHOOLS

The Honourine DONALD CAMERON, Vice-Chairman

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TEURSDAY PERRUARS 5 1999

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The Casmilian International Development Agency: M. F. Strong, Presidents G. P. Kidd, Vice President, S. S. Peters, Special Advisor; L. A. E. Doe, Special Advisor.

APPINDIE:

22 Brief submitted by the Carolina International Development Agency.

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First Session—Twenty-eighth Parliament 1968-69

THE SENATE OF CANADA

PROCEEDINGS
OF THE
SPECIAL COMMITTEE
ON

SCIENCE POLICY

The Honourable MAURICE LAMONTAGNE, P.C., Chairman
The Honourable DONALD CAMERON, Vice-Chairman

No. 32

THURSDAY, FEBRUARY 27, 1969

WITNESSES:

The Canadian International Development Agency: M. F. Strong, President; G. P. Kidd, Vice President, S. S. Peters, Special Advisor; L. A. E. Doe, Special Advisor.

APPENDIX:

33.—Brief submitted by the Canadian International Development Agency.

MEMBERS OF THE SPECIAL COMMITTEE ON SCIENCE POLICY

The Honourable Maurice Lamontagne, *Chairman*The Honourable Donald Cameron, *Vice-Chairman*

The Honourable Senators:

Aird Grosart Nichol Belisle O'Leary (Carleton) Haig Blois Hays Phillips (Prince) Robichaud Bourget Kinnear Cameron Sullivan Lamontagne Carter Thompson Lang Desruisseaux Leonard Yuzyk Giguère McGrand

Patrick J. Savoie,

Clerk of the Committee.

No. 32

THURSDAY, FEBRUARY 27, 1969

WITNESSES:

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APPENDIX:

55.—brief submitted by the Canadian international Developi

THE QUIEN'S PRINTER, OTTAWA, 1909

1-01005

ORDERS OF REFERENCE

Extract from the Minutes of the Proceedings of the Senate, Tuesday, September 17th, 1968:

"The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That a Special Committee of the Senate be appointed to consider and report on the science policy of the Federal Government with the object of appraising its priorities, its budget and its efficiency in the light of the experience of other industrialized countries and of the requirements of the new scientific age and, without restricting the generality of the foregoing, to inquire into and report upon the following:

- (a) recent trends in research and development expenditures in Canada as compared with those in other industrialized countries;
- (b) research and development activities carried out by the Federal Government in the fields of physical, life and human sciences;
 - (c) federal assistance to research and development activities carried out by individuals, universities, industry and other groups in the three scientific fields mentioned above; and
 - (d) the broad principles, the long-term financial requirements and the structural organization of a dynamic and efficient science policy for Canada.

That the Committee have power to engage the services of such counsel, staff and technical advisers as may be necessary for the purpose of the inquiry;

That the Committee have power to send for persons, papers and records, to examine witnesses, to report from time to time, to print such papers and evidence from day to day as may be ordered by the Committee, to sit during sittings and adjournments of the Senate, and to adjourn from place to place;

That the papers and evidence received and taken on the subject in the preceding session be referred to the Committee; and

That the Committee be composed of the Honourable Senators Aird, Argue, Bélisle, Bourget, Cameron, Desruisseaux, Grosart, Hays, Kinnear, Lamontagne, Lang, Leonard, MacKenzie, O'Leary (Carleton), Phillips (Prince), Sullivan, Thompson and Yuzyk.

After debate, and—
The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Thursday, September 19th, 1968:

"With leave of the Senate,

The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That the name of the Honourable Senator Robichaud be substituted for that of the Honourable Senator Argue on the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Wednesday, February 5th, 1969:

With leave of the Senate.

The Honourable Senator McDonald moved, seconded by the Honourable Senator Macdonald (Cape Breton):

That the names of the Honourable Senators Blois, Carter, Giguère, Haig, McGrand and Nichol be added to the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.

ROBERT FORTIER,
Clerk of the Senate.

MINUTES OF PROCEEDINGS

Thursday, February 27, 1969.

Pursuant to adjournment and notice the Special Committee on Science Policy met this day at 10:00 a.m.

Present: The Honourable Senators Lamontagne (Chairman), Carter, Grosart, Haig, Hays, Kinnear, and Robichaud.-7

In attendance:

Philip J. Pocock, Director of Research (Physical Science).

The following witnesses were heard:

THE CANADIAN INTERNATIONAL DEVELOPMENT AGENCY

M. F. Strong, President;

G. P. Kidd, Vice President;

S. S. Peters, Special Advisor; and

L. A. E. Doe, Special Advisor.

(A curriculum vitae of each witness follows these Minutes).

The following is printed as Appendix No. 33:

-Brief submitted by the Canadian International Development Agency.

At 12:20 p.m. the Committee adjourned to the call of the Chairman.

ATTEST:

Patrick J. Savoie, Clerk of the Committee.

CURRICULUM VITAE

Strong, M. F., Mr. Strong was born in Oak Lake, Manitoba, April 29, 1929. He received his education in Oak Lake, Manitoba, and holds Honorary Doctorates from Sir George Williams University, Brandon University, the University of Calgary, the University of Guelph and the University of Ottawa. Mr. Strong is married and has four children. He is Past President of the National Council of YMCA's of Canada. He is a member of the Advisory Board, York University School of Business Administration; a member of the Advisory Committee, Institute of Northern Studies, University of Saskatchewan; a member of the Advisory Committee, Canada's National Hockey Team, Eastern Division; and a member of the Joint Committee on Society, Development and Peace (World Council of Churches, Geneva, and Pontifical Commission, Justice and Peace, Vatican City). He is also a Director of the Ottawa Roughriders Football Club. Prior to joining the Government in October, 1966, Mr. Strong's entire career had been spent in the business world, except for a brief period with the Secretariat of the United Nations in New York in 1947-48. He has held a number of positions in the field of finance, particularly related to the petroleum and mining industries. In 1962 he joined Power Corporation of Canada, Limited, firstly as Executive Vice President and Managing Director, and then as President. He also served as an Officer and/or Director of a number of other Canadian, U.S. and international corporations. On October 1, 1966, Mr. Strong became the Director General of the External Aid Office. Government of Canada, and resigned all former business positions. In September, 1968, the name of the organization and his title were changed so that he is now President of the Canadian International Development Agency and also serves as Chairman of the Canadian International Development Board.

Kidd, George P., Mr. Kidd was born in Glasgow, Scotland in 1917. He received his education in British Columbia; first at Brentwood College, Victoria, B.C. and then at the University of Victoria and the University of British Columbia, from which he graduated with a B.A. and later obtained an M.A. He subsequently received a Fellowship in Economics from the University of Illinois for further post-graduate studies. During World War II he served in the Canadian Army with the Cameron Highlanders of Winnipeg, Manitoba, and saw service in the United Kingdom and France. In 1946 he joined the Department of External Affairs and has served in Ottawa, as well as at Canadian Missions abroad in Warsaw, Paris and Tel Aviv. He has attended the course at the National Defence College in Kingston, Ontario, and from 1959 to 1961 was Foreign Service Member on the Directing Staff of the College. In 1961 he was appointed Ambassador to Cuba and concurrently Ambassador to Haiti. In 1964 he became Minister at the Canadian Embassy in Washington. On October 1, 1967 he was appointed Deputy Director General of the External Aid Office in Ottawa. In September, 1968, the name of the organization and his title were changed so that he is now Vice-President (Operations) of the Canadian International Development Agency.

Peters, Stuart Sanford, Ph.D., Dr. Peters was born on July 8, 1924 at Kingston, Ontario. He received his primary and secondary education in Kingston. During 1942 he joined the R.C.A.F. and served as a pilot in the European Theatre until hostilities ceased. Following his release from the Air Force, he attended Kingston Business College and joined as partner manager in the W. P. Peters Seed Company at Kingston. In 1952 he left the business to attend Cornell University and graduated in 1955 with a Bachelor of Science degree from the New York State Agricultural College at Cornell University. In 1955 he accepted a position with the Newfoundland Government as a biologist and where he conducted his post-graduate research for his Master of Science and Doctor of Philosophy degrees. In 1957 he was appointed chief biologist with the Newfoundland Government and in 1960 was appointed Deputy Minister of Resources with the administrative responsibility of Newfoundland's Forestry, Wildlife, Provincial Parks, and fresh water resources. He held this position until 1967 when he was appointed Director General of Planning for Newfoundland's Rural Economic Development Programmes. In 1968 he resigned to join the Government of Canada in his present position as Special Advisor to the President of the Canadian International Development Agency on energy and resources and on the development and coordination of activities with respect to the proposed establishment of the International Development Centre.

Doe, L. A. Earlston, Ph.D., Dr. Doe was born in Bermuda in 1916 and emigrated to Canada with his parents in 1923. He grew up in Ontario and graduated from the University of Toronto in 1938 with a B.A. degree in Philosophy and History. After teaching school for four years, he joined the Navy and served at sea until the end of World War II. In 1949 he obtained the degree of M.A. in Physics at the University of Toronto and joined the staff of the Fisheries Research Board of Canada as an Oceanographer at Nanaimo, B.C., where he did research on coastal and offshore waters of the Pacific. In 1952 he studied for his Ph.D. in Oceanography at New York University and received the degree with a Founders Day Award in 1963. During the years 1955-60 Dr. Doe was employed as an Oceanographer by Creole Petroleum Corporation in Maracaibo, Venezuela, where he conducted studies of Lake Maracaibo as related to the petroleum operations in the Lake. Returning to North America in 1960, he spent two years at Woods Hole Oceanographic Institution and joined the staff of the new Bedford Institute of Oceanography, Department of Mines and Technical Surveys, at Dartmouth, N.S. There, he was variously in charge of Research on Air-Sea Interaction problems, Head of the Oceanographic Research Section, and Acting Director. He also lectured in Physical Oceanography at Dalhousie University. In 1964 he obtained leave of absence and taught a course in Oceanography for UNESCO in Karachi, Pakistan. Since January, 1968, he has been Senior Scientific Advisor (Mines and Geosciences) in the Department of Energy, Mines and Resources. He is to be loaned by the Department to the Canadian International Development Agency for one year starting March 1, 1969, to assist in the establishment of the proposed International Development Centre.

College and joined as partner manager in the W. P. Peters Seed Company at Kingston.

THE SENATE

SPECIAL COMMITTEE ON SCIENCE POLICY

EVIDENCE

Ottawa, Thursday, February 27, 1969.

The Special Committee on Science Policy met this day at 10.00 a.m.

Senator Maurice Lamontagne (Chairman) in the Chair.

The Chairman: Honourable Senators, I am very happy to introduce to you this morning Mr. Maurice Strong, President of the Canadian International Development Agency, which is the new name, I understand, for the former External Aid Office.

As you know, Canada is getting more and more involved in foreign assistance and in behind this new drive I think we have to recognize the efforts and the inspiration of Mr. Strong.

He is this morning accompanied by some of his colleagues; I do not have all the names here, but I would ask him before he makes his opening statement to introduce them to the members of the committee.

Mr. M. F. Strong, President, the Canadian International Development Agency: Thank you. Mr. Chairman and honourable senators, it is a very great pleasure for me to appear before this body today. I have followed the progress of this committee with a great deal of interest and I hope through the course of this morning to be able to outline the reasons for that interest.

I would like, in accordance with the suggestion of the chairman, to introduce to you at this point the members of my staff who are accompanying me here this morning:

Mr. George Kidd, Vice-President, Dr. Stuart Peters, Special Advisor on Science and Technology Matters; Mr. Lionel Bonnell, Director General of Administration and Finance; Dr. Fergus Chambers, Director of Planning and Economics Division, and Dr. Earlston Doe, who has been Special Advisor to the Department of Energy, Mines and Resources and who by their courtesy has been made available to act as a

special consultant to me in conjuction with Dr. Peters on science and technology matters.

The chairman has suggested that I continue at this point; inasmuch as the honourable senators have received a copy of my presentation I am advised by the chairman that I may proceed on the assumption that this need not be presented by myself at this point in detail.

I will confine my opening remarks to a relatively brief statement of the role of the agency within government and the role of science and technology within the agency.

As the brief points out in more detail, the Canadian International Development Agency is the agency through which the Canadian government conducts its programs of assistance to the developing countries of the world.

As president of the agency I report to the Secretary of State for External Affairs and subject to his direction am responsible for the administration of the program. The program consists of three main components, or two main components really, that are directly part of the program. The first is our program of bilateral assistance, whereby Canada provides direct assistance to developing countries. That assistance flows to a total of something in the order of 60 individual nations or territories, but something over three quarters of it goes to about 12 main countries or areas.

Considering the Caribbean as a single unit, the number would be 12, so in that sense our program, while reaching a large number of countries, is in fact concentrated in a relatively few places.

The other component is the multi-lateral program through which Canada makes its contributions to the various agencies that are primarily part of the United Nations system, the World Bank, the United Nations Development Program, the Asian Development Bank, are those which figure most prominently in the development assistance business, although important contributions are also made to and through other United Nations agencies as well.

These programs, of course, are not operated by us, but are included in our overall aid budget and are generally responsible for the coordination of Canada's contributions to these various agencies from the development assistance point of view.

The third component that is included in the figures that are normally quoted when people are referring to the total aid flows are the figures for export credits. The export credits are not considered as part of our aid program; they are administred by the Export Credits Insurance Corporation, which is a completely separate entity, a Crown corporation that is part of the structure of the Department of Industry, Trade and Commerce. The export credits, to the extent those credits go to developing countries are, however, counted in the international figures prepared by the development assistance committee of the OECD, showing the relative performance of each of the donor countries in their provision of assistance, and for this reason export credits are normally included in the totals that I would refer to as being part of our aid program, but I wanted to make it clear that the administration of that program is quite separate from that of our main aid program.

Those, then, are our three main programs. I have been asked to indicate the level of our assistance programs and I will do that without going at this stage into a great deal of detail.

The bilateral programs in the 1968-69 fiscal year totalled \$233.7 million of which \$127.7 million was given in the form of grants and \$106 million in the form of development loans.

Under our multi-lateral program we allocated a total of \$57 million so \$26 million was in the form of grants and \$31 million in the form of loans or advances. This amounts in total to \$290.7 million, which is the amount that you can say was allocated for what we regard as really development assistance.

The other \$60 million which is included for the purposes of arriving at the overall figure that permits comparison with the figures of other countries is \$60 million for export credits, which would bring the total for 1968-1969 fiscal year to \$350.7 million.

During the year too there is an allowance for repayments of \$19.7 million under the category of export credit which, if those were deducted, would bring you to a net figure of \$331 million.

As to the role of our agency in the field of science and technology, we are not, as is pointed out in the brief, specifically designated as a scientific agency for purposes of government administration but I think it is apparent from any analysis of our program or any analysis of the problems of the developing countries that science and technology must and do figure very prominently in the requirements of the developing countries for assistance at this point in their history.

They also figure very prominently in our attempts to provide that assistance. While we have not had up to this point a program within our total operation which we could segment out as being specifically a scientific and technological program, almost every aspect of our program in one form or another does draw upon Canadian scientific and technological resources and capabilities.

In the past two years we have been undertaking a very intensive special series of studies on the specific role of science and technology in the developing world generally and more particularly as it affects the role that Canada might play in meeting the needs of the developing countries.

We have had as part of this process the benefit of advice from a very great many sources, a large number of individuals who are leaders in their field in Canada and elsewhere. We have also had the benefit of very detailed consultations with many of the international agencies, governmental agencies like the World Bank and the UN system, as well as private agencies, universities, such organizations as the Rand Corporation, the Brookings Institute, the Ford and Rockefeller foundations, the centre for democratic studies in California and various European agencies. So we have made a rather substantial effort to come up with some form of inventory of the needs of the developing countries and made some kind of an appraisal of the extent which Canada might, especially through mobilizing its own scientific and technological community, make a special contribution to the developing countries.

We have included in our presentation copies of two of the special papers prepared to us as part of the series of studies that I have referred to: One of them is a paper by Dr. Irving Brecher, Director of the Centre for Developing area studies at McGill University; the other is a paper by Dr. Geoffrey Oldham, who is one of the key people in the science policy institute of Sussex University in the United Kingdom and who has acted as a consultant to us on these matters.

These papers are presented because they do cover the subject in a rather broad way and do indicate to you some of the directions in which our thinking is being influenced.

I would point out that they are papers prepared by the authors and are included here with their permission; they do not necessarily represent our views, but this is the kind of thinking to which we have been exposed in the process of formulating our views.

The Chairman: You do not accept the general Parliamentary rule that when you quote a document you have to prove it.

Chairman.

Senator Grosart: Mr. Chairman, I think the rule is that you have to table it and I think it is tabled.

Mr. Strong: We felt though that they would shed some light on the kinds of activities that I have been referring to. Many of these things are not very provable, as you well know from your own interest in the subject and the intensity and amount of exposure you have had to these things in recent weeks. Some of these matters are controversial domestically; they are no less controversial internationally, I assure you.

I think, Mr. Chairman, I should not take any more time of the committee with my initial presentation; I would much prefer to respond to the particular requirements of the members of the committee.

The Chairman: Thank you very much, Mr. Strong; now we will have Senator Grosart to initiate the discussion.

Senator Grosart: Thank you, Mr. Chairman.

Mr. Strong, I should say we are confronted this morning with a Morris and a Maurice, for both of whom I have a high regard and both of whom I have known for quite a while. It is a pleasure to welcome you here Mr. Strong, and may I personally congratulate you on what you have done since you took over what was then the External Aid Department.

I think I can say that Canadians generally, those that I know who are particularly interested in this aspect of our foreign affairs, are very proud of what you have done and what your department has done, not only from the beginning, but also since you took over. I will try to keep my questions related specifically to the science policy aspect although, of course, I know there are many other aspects of the CIDA's operation that interest us all greatly.

I would be particularly interested, Mr. Strong, if you could somehow separate out specifically your expenditures and operational activities in the area of what I will call inhouse research on your own operating efficiency in the science policy area?

I am aware that there are really two aspects of this. One is the actual, what Professor Brecher calls "transplanting" and what Professor Oldham calls "transfer" of science and technology resources from Canada to the other countries.

You have documented that very fully in your brief, but there is not too much documentation on your own self-inventory.

To what extent are you analyzing the transfer of our scientific and technological resources to these countries in terms of the need of these countries or, field of Indian agriculture, of the kind of things

Mr. Strong: I was not familiar with that rule, Mr. if I may put it another way, how are you matching your science policy to the science policy of the recipient countries?

> Mr. Strong: Senator, first of all let me thank you for your very kind remarks; I hope in future we can try and justify this kind of confidence.

> The Chairman: This is probably a precedent which has been established by Senator Grosart this morn-

> Mr. Strong: A comment like that is always a prelude to a very penetrating question and the Senator has asked a very penetrating question.

> The general answer to the question, Senator, is that in the past and at the present moment all of our assistance to developing countries is provided at their request and is only provided in respect of programs which they themselves want to undertake.

> However, it has to be admitted that neither the receiving countries nor the donor countries have had a great deal of experience or have developed a high degree of sophistication in the evaluation of the conditions under which assistance from outside can make its optimum contribution to internal develop-

> We have had, as you know, something like 18 years or 19 years since the inception of the Colombo Plan. Really we are just beginning now to have the kind of experience that is susceptible to meaningful research and we have provided in our new organization for special evaluation procedures; we have instituted within our agency a very much more strenuous planning process, which involves much more in-depth study of any proposition, whether it be one which involves science and technology, most of them do to some degree, or a more simple operating type of proposition. We have been employing outside experts to send them into the field to do detailed studies and investigations of projects before we have undertaken them; we have engaged in a much greater degree of consultation, not only on the official, administrative level, but much more on the technical and scientific level, preceding decisions to implement particular programs.

I think a good example of this might well be in the task force that we sent to India last year. We recognized, of course, as the total world development community recognizes, that the problems of Indian agriculture are very crucial to the future development of that subcontinent.

We had been emphasizing agriculture in many aspects of our program up to that time but we were not really satisfied that we had a sufficiently clear understanding of the recent developments in the other people were doing in India, of the real gaps that had been identified by the intensive work in the areas of science and technology in the last few years, particularly those which related to development of the new high yield varieties of wheat and rice and the problems which surround the implementation of that development.

We formed a task force of leading Canadian agricultural scientists as well as some marketing people; we sent it out under the direction of Dean Bentley, Dean of the Department of Agriculture of the University of Alberta. They did a very intensive study of the state of Indian agriculture, particularly related to the state of Indian science and technology in the agricultural field. They had detailed discussions. This was not just a very quick mission, there was intensive preparation and they were there for several weeks and had detailed discussions with their counterparts in the various areas of Indian agriculture.

They came back; they made detailed recommendations to us which we have since worked out with the Indians and have formed the basis for an agreed program, or at least the framework for an agreed program through which Canadian resources can be focused specifically on high priority development needs within the Indian agricultural sector.

This we are doing in a number of other fields, but this perhaps illustrates the increased degree to which we are accentuating the need for in-house research in respect to our own programs before they proceed.

Senator Grosart: Is the consortium arrangement between the donor countries zeroing in on this problem of the technical audit of science and technological requirements of the recipient countries?

Mr. Strong: Various institutions are concerned with this; there is a special United Nations committee set up on this and it has done a considerable amount of work. We are quite familiar with that work.

I would like to ask, if I may, Dr. Stuart Peters, who is familiar with this in considerable detail, to answer the question.

Dr. S. S. Peters, Special Advisor, the Canadian International Development Agency: Senator, in this again we are working closely with Geoff Oldham, who we consider a leading world expert in science policy and in the manner of the approach, the methodology of bringing the target area to recognize their needs, to upgrade their science and technology capabilities so that they in fact can look at the world and know what they can do and how better they can help themselves.

It is one of Mr. Strong's policies, of course, to improve this capability and one of the proposals of the International Development Centre.

Mr. Strong: I wonder, Dr. Peters, if you would specifically refer to the new United Nations Committee on Science and Technology.

Dr. Peters: This is where they have in fact identified protein as one of the world needs and have proposed, subject to further review, a world plan of action. This is the type of program identification that we are paying very close attention to in connection with our own proposed programs. One really need not run out of proposed projects or ideas from such sources for probably twenty years if their work stopped now.

This group (under the Economic and Social Council of the UN) has addressed themselves to world problems very vigorously.

Mr. Guy Gresford, who is an Australian gentleman, is director of this committee, and we have had meetings with him to be brought up to date because we wanted to be sure that due to the scarcity of expertise in this whole field we do not spend a lot of time duplicating or reinventing ideas that have already been well analysed by such people as are in his committee at the United Nations in this field identifying worthwhile programs for countries such as Canada to address themselves to.

Senator Grosart: I see two real problems here: One you have already mentioned, Mr. Strong, the limitation of the response factor in our philosophy of external aid; the other one would appear to be the multiplicity of donor countries.

How limiting is the response factor and should we maintain it as part of our policy? Perhaps I can just go a little farther than that and say that the problem there as I see it is that, I will not say Canada has no science policy, but we have not one that is too visible at the moment. It seems obviously that many of these countries have not...

The Chairman: The vision is blurred.

Senator Grosart: ... have not a science policy of their own. Now, if we reply on the request from a country that has really no conception of its own science and technological needs, how can we hope to fit our science and technological transfers viably into these economies?

Mr. Strong: With regard to the matter of whether we should change our policy, I am sure the senator would realize that this is not something on which I can comment. However, if I may answer the question in this way, I think it is certainly apparent

that the old adage that if you know the question you are already well on the way to the answer certainly applies in the aid and development business.

It is true that if we were to sit back inertly and simply wait for everybody to identify their needs and respond only on a mail order basis to the requests that we receive, the quality of our program could well be relatively low. We do not interpret responsiveness quite in that way; we interpret it in this way—that we should create a very active dialogue with the receiving country—with the cooperating country—and that out of that dialogue our input is basically our ideas and our assessments of the kind of resources that we might be able to make available to them.

Their input is their understanding of their own particular problems, of their own particular needs and, of course, of their environment, the cultural, physical, political and social environment in which the resources must be brought to bear on the needs.

Now, our whole process of evaluating any kind of project or proposal that we make, arises out of this dialogue. In the field of science and technology, however, there is another possible and I would think desirable motification to the way in which this policy is carried out.

This would require us to have the power of initiation in at least one sense, in at least the sense that we might well identify, let us say, as Dr. Peters has referred to it, the protein problem, or some aspect of the protein problem.

Let us say we were to follow the lead of the United Nations Committee on Science and Technological Development and identify the protein problem as a significant problem to which we might address our attention. I could conceive that it would be, it could be very desirable and not necessarily be offensive to the policy of responsiveness, that we might do a considerable amount of work on that problem here before anybody had asked us to do it.

We might then decide that in Canada we had in fact certain resources and special capabilities in this field that would permit us to do some very useful things in the developing countries.

Having got to that point, having got to the point that we now say, okay, this is a special area of interest to us and we do have special capabilities in this field, the next step would be to apply these within the developing country's setting.

At that point, of course, it is pretty apparent that you could not hope to carry on a program of that kind effectively except in any country that wanted you to do it. You could let it be known that you had these capabilities, that you were interested in

making them available and out of this process it is extremely likely that one or more of the countries with which we have a cooperative aid relationship would be quite happy to see us initiate a program.

If it were done in this way it would not seem to me at least to violate the spirit of the policy of responsiveness.

Senator Grosart: How close are we to having an international inventory of technological requirements in recipient countries? For example, how close are we to knowing what the technological requirements are of Lesoto or Grenada?

The reason I ask this question is that in this committee, Mr. Strong, we seem to be faced with the evidence that even in Canada, with all the planning resources we have had, we have now an obvious imbalance in our input of funding into science and technology.

How can we avoid having the same thing happen in these recipient countries?

Mr. Strong: Senator, I can only give you a general answer to that. I think in part this answer is underscored by the knowledge that 95% of all expenditures in the field of science and technology are still made in the wealthy countries of the developed world and only 5% approximately in the developing countries, so it is pretty apparent that many problems which we have are being experienced to a much greater extent in the developing countries.

Offsetting that, of course, is the fact that they do not have in many instances the same kind of established institutionalism and established difficulties. Like in many other field, the fact that they start from so close to zero has a certain advantage, which does not entirely offset the disadvantage, but does perhaps create a more receptive environment to new forms of approach, new approaches that may be apart from the conventional approaches that we have adopted in our own society.

Another partial answer to that question, Senator, lies in the fact that our own view, not my view—I am expressing a view which has emerged from this process that I described and not necessarily one which originates with me—is that our approach to the developing countries has got to be based on identifying problem areas and then determining the ways in which existing knowledge can be best brought to bear in solving those problems.

A very good example of this is the Ford and Rockefeller foundations' approach to the grain problem. As they described it to me it went something like this: They simply sat first and said what is the principal problem of the developing world and the answer was to feed them. Okay, what is the principal

food in these countries? Well, obviously food grains were very great.

In the case of south east Asia, if I may use that as a particular example, the principal food was rice.

The next question was, well, how do we increase the production of rice? Can we do it by expanding the acreage? That obviously offered very limited possibilities. How do we expand the yields?

Once you got to that point, as they described the process to me, they said, okay, let us find out what technology is available in this whole field of rice production; what has been done and what is being done now which might be useful in finding a key to the problem of increasing rice production?

So they got an inventory of the existing technology in that particular area; then they found out that while there was indeed a great deal going on in this field there was no single institutional entity that had the task of focusing existing resources on the specific problems of increasing rice production on a large scale.

So in 1961 they created a new institution called the International Rice Research Institute which, with the agreement of everybody concerned, were into the business of increasing rice production. Its function was very clearly to take the existing technology and to supplement it with new technology and to bring that technology to bear in a very specific way on the problem of increasing rice production.

I think, as you may know, that the results have been very spectacular with a relatively small expenditure of money on the high yield grain program, including the wheat program. They tell me that the total expenditures are something less than \$30 million, some 10% of what we allocate in our aid program in a year.

The Chairman: By how much was the yield increased?

Mr. Strong: Over many areas the production has been doubled, so the multipliers from this process have been tremendous.

Now, of course, if they had started the other way, by taking a general survey of all scientific knowledge and a general survey of all scientific needs, it might have been years before they might have isolated a particular problem, but by looking at the problem first and saying that that is a priority problem and then looking at the resources that could be brought to bear on the problem and setting up a mechanism for relating those resources to the problem they made an important impact in a fairly short time scale.

Senator Grosart: On the other hand, this may be to some extent begging my question, because problem orientation is fine, but it begs the question of what is the problem.

For example, in this area we went along for years, everybody seemed to believe that the answer for developing countries was to step up industrial output.

The concept of suddenly zeroing in on agriculture is comparatively new, so obviously the whole principle of aid to these developing countries was wrong for many years.

The Chairman: I would not say that.

Senator Grosart: I am merely saying that this is the view I get from fairly extensive reading.

The Chairman: Because I believe it is just a comment, Senator Grosart, but I believe that Mr. Strong is very right. When you start increasing the productivity in the field of agriculture at that level, then you certainly create a problem of unemployment in those regions, which brings you back to your industrial structure.

Senator Grosart: I agree that we may be right in zeroing in now on agriculture. The evidence is probably that we are, but this does not discount the fact that this concept is comparatively new. All the studies that went on in the early days of international aid did focus, if my facts are right, on stepping up the industrial output.

This zeroing in on agriculture is a comparatively new thing, so I say to some extent you are begging the question when you say we just look around and everybody agrees this is the problem. The scientific approach is to say, are we sure that this is the problem?

Mr. Strong: Senator, I did not mean to imply that this was the basis on which everyone agreed. This was not the case; I was describing a process which the Ford and Rockefeller foundations, private institutions, went through on this problem. They did not have to get agreement from a great many governments. That was one of the advantages that they brought to the situation.

Senator Grosart: Should I then not be alarmed when I read on page 3 of your brief this statement:

... there has been no framework within which we have been able to plan our programs to ensure that the most effective use is made of these resources.

There has been no program; now, should I not be alarmed at this statement?

Mr. Strong: I think it is a genuine basis for concern and this is one of the reasons why we included it; it is true that there is no reliable framework of total information.

The Chairman: And research.

Mr. Strong: And research.

The Chairman: In other words, what Canada has been doing up to now and more and more of it recently fortunately has been to more or less have in your office or in your service scientific advisors who are not doing research but they are using their knowledge in advising you, or a developing country, on projects.

They are also using the scientific and technological knowledge in Canada to help in carrying out projects abroad, but there has been up to now really no research on all these projects, very little at least.

Mr. Strong: We have been able to tap sources of research that are available to us internationally and through other institutions. We have not had our own inhouse research program, but this is not so much the lack that I understood that you were referring to, Senator, but rather the framework.

The total framework that we are referring to here is the framework which basically consists of the information within the developing countries, as well as the mechanisms for evaluating that information internally.

The whole development process, not just for us, but for the entire international community, is so new that one of the real problems of research is to get reliable data accumulation over any meaningful period of time to permit you to do what is really a scientific research job.

It is the absence of that kind of framework that has concerned us.

Senator Grosart: Are we going to get this kind of framework? For example, in this field it seems to me that everybody has been misled by perhaps the finest commentator on the field, Barbara Ward. However, she worked along for years on the theory that the way to upgrade the economy of the developing countries was to follow the pattern of western European development. Everybody was fooled by this, I think, because she made out such a very good case.

I am concerned about the lack of a framework because in this area of science and technological development within a country and particularly in the transfer aspect, the danger of waste and wrong starts and so on is so great that I wonder if we are going to get a reasonably good framework internationally?

I am not suggesting that Canada should do the whole job, but are we going to be able to do it?

You say, for example, that you have nobody on your staff who is specifically engaged in scientific activity.

Mr. Strong: Scientific research as such.

Senator Grosart: Scientific research activity; does this mean that nobody is researching your own policies?

Mr. Strong: No, sir. I want to give Dr. Peters a chance in a moment, but on that particular subject though, I was trying earlier to describe the process by which we do make a detailed analysis of our own programs, what you might call operational research, but I make quite a distinction between that and what I call fundamental scientific research.

We do not engage in what you might call basic or fundamental research. We do engage to a significant degree in what you might call operational research. In that sense we do have a framework.

The Chairman: It is a kind of scientific appraisal of projects.

Mr. Strong: Yes.

Senator Grosart: I say this because we so often hear this statement made, and I am not saying it is true, that in the whole international aid program we are so often doing the right thing in the wrong way. This is a comment that one comes across all the time; I am not saying it is true.

Mr. Strong: If I may venture to say, Senator, I think it is at least equally true that we are very often doing the wrong thing in the right way.

Senator Grosart: Yes.

Dr. Peters: There was just a point that I thought might be useful while listening to the dialogue between you two gentlemen, and that is that there is a growing awareness from the recipient area of aid of their needs.

No longer do the developing countries want a dialogue on economic principles. They have many competent staff members, some of whom are extremely well qualified and able to challenge many of the principles and theories of industrial development and so on, but I think we are also becoming sensitive, or tuned in on these sensitivities and I feel we are now responding to this new awareness.

This is quite evident in sitting in on discussions on science policy. Now, that is a big term and has a huge umbrella of meaning. I have recently been an

observer during discussions on some of these developmental topics at the Development Centre of Chairman, in another context, knowing the questions OECD and at UNESCO, where capable scientists are getting down to meaningful discussions, and from an inter-disciplinary approach are realizing that some of the past development principles are no longer valid.

We are establishing a dialogue with people from these target or recipient areas, and I think this business of a new sensitivity to science policy is to in fact work with these people in a quiet and effective way, to assist them in bringing their capability for dialogue up so that they can talk to us on a better level.

Not understanding the need for early discussion is probably why some of the performance of western technology has failed. They do not want us to carry on a discussion on economic principles; they want to know why some of the industrial activity built on western technology is not working. Is it too sophisticated?

Then you can get into another field of discussion sir, ranging in the subject of intermediate technology which is the special interest of Schumacher and his group in England.

This area of interest is sometimes criticized because it is too unsophisticated, but I think eventually all these viewpoints will meld into good policy, and already many developed countries are getting their heads together in concert with underdeveloped areas.

Senator Grosart: Mr. Chairman, I would hope that perhaps before the end of the session one of our witnesses might just run down Professor's Oldham's very, very interesting list of requirements, which appears at page 6, where he asks the specific questions: How should science planning be related to economic planning; How can the most appropriate technology be identified; How much of the technology should be imported; What is the best organizational framework for science; How can the effectiveness of the recipient country's science system be improved, and so on.

To me at least it would be very interesting if on the record there were some comments as to the Canadian reaction to these very interesting specific questions concerning the scientific approach to the continuing technical audit of our own efficiency in these transfers of science and technological resources.

I am sorry, Mr. Chairman, that I will have to go to another Committee. I do not like to eat and run, or as you might put it, to hit and run.

The Chairman: Would you care to make some comments on these general points?

Mr. Strong: As I made a comment earlier, Mr. is at least part way along towards the answers.

At this point we have been concentrating more on knowing the right questions than we have on getting all the answers. I think it has to be said that in many of these areas nobody really has all of the answers; there has been a growing and I think a very healthy awareness of the fact that the old simplistic ideas of aid, the simple transfer of resources and the simple transfer of skills, is just wholly inadequate. They have given rise in many instances to negative results, even to relaxation of essential disciplines in the recipient countries themselves. The whole process of helping another society creatively and constructively is far more complicated and raises far more questions than was ever realized in the old simplistic days, when some ambassador sent a telegram saying that the foreign minister of so-and-so wanted to know if Canada could build a bridge somewhere.

If we were capable of building bridges and had a budget for that area and everything else was fine and we could get the miscellaneous approvals required within the government, we would build a bridge.

Now, we realize that that kind of simple transfer, while it does have its place, is not the real answer, that these countries, these societies are seeking to endow themselves with the innate capabilities that we have found, that have permitted us to produce the kind of wealth required to provide a decent standard of life for our people.

It is really the secret of how they can provide themselves with these tools in ways which do not compromise the cultural and social values which they hold to be important, which we have got to help them with.

There are a lot of other things we can do that are more simple and it may be that we will have to continue for many years to do some of the things the effect of which we may even doubt at this point, because I think it is going to be a long time before we get ultimate answers to all these questions.

Many of these ultimate answers will simply arise from a process of experimentation, trial and error.

With all the best will in the world, with all the pre-project research and evaluation that you do, you are never going to be able to anticipate all of the conditions under which success or failure may take place.

The important thing about this is that it represents the attempt to become realistic about what we can do and what we cannot do; the attempt to use all of the knowledge; the attempt to use all of the brain

power that we can bring to bear on these problems in our attempts to help them to solve them.

It is a very new field and I would think we will still be debating these things many decades from now, but I think we have by the very fact that policymakers are beginning to recognize that aid and development is not this simplistic give-away type of thing that everybody thought it could be, the very fact that they are recognizing this and that this recognition is now expressing itself in terms of the policies of agencies around the world charged with administering aid programs, is itself a very constructive and forward looking development, which I think will yield answers to questions of this kind.

The Chairman: As far as I am concerned I am very glad to see that at least somebody and a greater and greater number of people are beginning to ask questions. That is an improvement, but it seems to me also that we should have the proper institutions as we go along to provide the answers, at least to provide provisional and tentative answers.

Do we have those research institutions now at the international level? How are they coordinated and what have we been doing in Canada within you own area of responsibility to begin to provide answers?

Mr. Strong: Mr. Chairman, what we have been doing, of course, is to be making the inventory that I referred to earlier of what is really going on in the rest of the world and we have found, and Dr. Peters will elaborate on this, that there is a great deal going on; there are a great many international institutions.

I think that is the total number of research institutions of some kind or another, some are pretty rudimentary, that are registered with the OECD and participate in its annual conferences on research centres in the developing countries even, there is much activity.

Dr. Peters: Yes, those however actually put emphasis on training, rather than research in that context.

The Chairman: How many are dealing mainly with research, because training, of course, is important, but this is an operation?

Dr. Peters: That is right and, Senator, this definition is not clear in the literature available to make this assessment. This is part of what we are now doing but have not got very far into it. It is very difficult to get published information on these institutions regarding what is research and what is education from the applied point of view. I believe this is what you are asking?

The Chairman: Yes, applied development and research, not only in problems related to improbing

technology, but also related to another field which I am quite sure is very, very important in those countries too, how to improve the social environment for growth.

Dr. Peters: The problem of identifying institutions engaged in program oriented type research directed to the development needs is very difficult at this stage. The information I have at the present time makes it impossible to determine how many institutions there are.

The Chairman: There is no study being done by the United Nations, or by any other organization, or OECD, in an attempt to see, given that kind of situation and multiplicity of so-called research institutions, what are the duplications and the gaps and all this?

Mr. Strong: Yes, there has been and there is going on at an accelerated rate, fortunately, a good deal of international work in this area.

Probably the highest level policy group that has dealt with this is the United Nations Special Committee on Science and Technology. In effect it is the committee on the application of science and technology to development problems. They have met for a couple of years; they had hearings; they had presentations; they concentrated more on identifying the kinds of things that were needed than they did on an inventory of existing resources.

There is no place at which there is a central inventory of resources; I would say probably we have, as a result of studies that we have done in the last two years in this area, as much information on this subject now, Mr. Chairman, as really anyone in the world and we find others are coming to us now.

So it is pretty obvious that a great deal more work must be done; a lot of work has been going on at the development centre and the development centre of OECD. We have the Vice-president of that organization coming here in the next few days on this subject. We have been making frequent visits back and forth and we are coordinating our efforts very closely with them.

I think we are in touch now with pretty well every group that is doing anything of consequence in this area.

One of the decisions that is going to have to be made by the international community before too long is where some of this work should be concentrated. It is obvious to everybody that proliferation of institutions and overlapping and duplication of work is the last thing we need.

The Chairman: Coordination especially and concentration so far as gaps are concerned, but I do not

think that you might convince some of these institutions just to disappear.

Mr. Strong: No, I do not think there is any question of that; there is such a vast need in this area that some of the institutions are going to disappear because they are not adequate to meet these needs of a much more complex and demanding period that we are entering, but there is no question that new institutions are necessary. Just as Ford and Rockefeller found, there were many institutions dealing with problems of rice production, there were really none that had the capability and the resources to focus specifically on the problems of applying the technology to increasing rice production in south east Asia.

I think we are going to find this to an increasing extent, that it will be necessary to create new institutions, but my hope is that there will be a sufficient degree of consultation amongst those who allocate resources to ensure that new institutions that are created do jobs that are specialized, jobs that are not being duplicated elsewhere, so that all of us with our obviously inadequate capabilities in relation to the need are doing those things that we are most capable of doing and we are doing them within an overall framework—the framework that we point out is now missing—an overall framework which permits each party that has resources, to use those resources in the most effective way.

I think that the best that can be said then is, that while it is true that there is not any adequate framework internationally at this point in time, there is a very strong awareness of the need for it and that the people involved in the various international institutions and agencies who have the general responsibilities in this area are aware of this need and are now in the process of trying to decide how best to meet it.

The Chairman: It seems to me that the inquiry we are conducting now within Canada should be done by someone else, at the United Nations level, or OECD level, in order to try to find out the kind of situation which exists now and to what extent it is confused and provides for duplications and gaps.

Mr. Strong: I think, Mr. Chairman, that you will find a great deal of interest in the international community in the hearings that you are conducting here and in the results of those hearings.

The Chairman: Well, I may want to come back later to this, but Senator Carter has a question.

Senator Carter: I would just like to follow up a little stage further the question raised by Senator Grosart about when Mr. Strong spoke about the concentration on the rice problem in south east Asia.

Now, we have been having hearings in the foreign affairs committee and our inquiry has been focused mainly on the Caribbean countries, where there is a lot of poverty and they are underdeveloped.

We have been told that when these countries get to the point where they become politically independent and begin to have some say in the management of their own affairs, recognizing their own poverty they immediately turn to industrialization as the short cut to riches. That has been more or less the trend in all developing countries; once they become independent they seem to regard industrialization, and to concentrate on that as the best way to raise their standard of living and to narrow the gap between them and other countries.

Is this trend a new trend that you are talking about, this concentration on a specific problem, or is this something that just applies only to this particular area, or this particular problem? Is this a general trend now in all the developing countries, that they are beginning to see that industrialization is not the answer and they have got to concentrate more on the use of their own resources?

The Chairman: I hope that they do not come to that conclusion too soon. I am sure, for instance, that Mr. Strong is aware of the situation which is developing in Kenya, where they have improved the yield in the field of agriculture.

This has not improved the standard of living; the population has gone out and now they have less employment on farms, so people are moving to the cities and they have nothing to do there.

Mr. Strong: Senator, I used an example in reply to Senator Grosart's question that happened to be in the field of agriculture and indeed it is in this field where the most dramatic changes have taken place in the last couple of years or so. This has come about as the result of the fact that it has been generally recognized, both in the more developed countries that are providing assistance, and in the developing countries themselves, that agriculture had been in the past somewhat neglected. It is now getting a great deal of attention.

I think it would be just as wrong to forget about industrialization and I did not mean to imply in any of my remarks that the same kinds of techniques, the same kinds of scientific and technological resources and techniques, should not be applied to the process of industrialization.

I think that while it is true that perhaps industrialization was over-emphasized, it is equally true that a higher degree of industrialization is going to be necessary in these countries; the two things just go hand in hand and the two are going to require immense application of technological scientific resources.

The Chairman: In other words, you say that we need a global approach within which this kind of specific and problem-oriented approach should be applied?

Mr. Strong: Yes, because we have limited resources; there is no question about that. We cannot do everything.

When I say 'we' I mean 'we' collectively, including the donors and recipients, collectively have to decide what the priority problems are and bring their resources to bear on the problems. Some of those problems, some of the more urgent ones, have been in the field of agriculture and will continue to be in that field; some will be in the field of industry and there will be a lot of other ones too in the general fields of education, but one of the very things that perhaps these countries might learn from our experience, is that science and technology if it is applied in an unplanned way can lead to many very serious imbalances within a society.

This is already happening to some extent in the developing countries; it is happening, of course, at home here as well.

Senator Carter: In the developing countries as well.

Mr. Strong: Exactly; this is why it seems to me at least to be extremely important that in the developing countries, both from the point of view of limited resources and from the point of view of ultimate results, we have to look very, very carefully at planning our approach, not to the point of imposing ridiculous bureaucratic rigidities on what we are doing, but rather of constructing a broad framework within which each of the participants understands what the objectives are, what the possibilities are and what the limitations are.

Senator Carter: I would like to carry this just one stage further before I come to the other questions: Yesterday in the Banking and Commerce Committee we had a witness, Mr. Vandenberg, I think his name was, of Massey-Ferguson who, as you know, make agricultural machinery.

In the course of the examination it came out that down in south east Asia, in this very place you are talking about the rice problem, his company had developed what he called a primitive plough. It had to be primitive because it could not be sophisticated; they would not know how to operate it.

So that raised a question to me, to what extent is your agency trying to involve private business in solving that type of problem?

Obviously this company saw this problem itself and just out of sheer enterprise, they could make

money I suppose, they went and produced this sort of primitive plough.

That is an example of what can be done I think on a much larger scale if you gear private enterprise into these problems, and I am wondering just what are you doing along that line?

Mr. Strong: It is our policy and our practice now to involve private enterprise to a much larger extent in our overall operations.

We have provided in our new organization for the setting up of a special division for this purpose.

However, I would have to say that specifically in the area of research, and the application of scientific and technological knowledge we do not have a specific program, because what we have been doing in the last two years is undertaking a study of how this could be done, undertaking a study of what the needs are, what the resources in Canada are and what the institutions are internationally to which we must relate and with which we must coordinate.

In the course of this we have consulted very widely with private enterprise and it was my hope that if the government decides, I think as it has said in relation to this international development centre, to set up a special program under which we would be permitted to use some of our resources specifically for application in the fields of science and technology. I would hope that such a program—and I think that very largely it would be fully consistent with existing policies—would include a very strong element of participation on the part of private business.

Senator Carter: Thank you.

I come now to your brief. On page 10 you outline a field in which Canada has a special know-how:

Canada is in the midst of a rural-urban-industrial transition and therefore Canadians are fast gaining experience in the problems of 'development' . . .

Of all these fields this is where we are or should be expert.

Now, does it turn out in the experiences we have had so far that we are actually expert in transferring our know-how in these particular fields? Are these the fields in which we have been most successful in other countries in technical transfer?

Mr. Strong: This is true generally; whether you could say from that that we are experts in transferring our know-how is another question.

I would say that Canadians have done a notable job internationally in transferring their know-how under very difficult circumstances. Very few people

29912-21/2

could consider themselves, I think, experts in the transferring of know-how.

It is in this area that a great many of the doubts and questions are now arising, this whole area of the transferability of know-how.

While I think Canadians do an extremely good job on this, there is all too little known at this point about the factors that affect the transferability of know-how. The man who knows how to conduct himself as a human being in his relationships with the people with whom he is working in a donor country can do a tremendous amount to accomplish a job without necessarily evoking a lot of conflict, but that does not necessarily mean that what he has accomplished, although it has gone smoothly, has been th best thing.

It may well be that the man who gets into conflict with the local people, who does not do as well in terms of his human relations, may nevertheless have a more lasting impact. We just have not had as much experience as we need to have to be able to say that we are experts on transferring know-how, but we have had a lot of experience.

I think that in each of these fields there are a number of Canadians that probably can qualify as much as experts as anyone else could in the world.

Senator Carter: Do you see any shortage of Canadian personnel, or do you go outside of Canada for personnel in projects like these, when they are not available in Canada?

Mr. Strong: Our policy is to use Canadian resources; in using Canadian resources we use Canadian personnel. That is not to say that on occasion a contractor may not have on his staff someone who is a non-Canadian, or even that on occasion we would not provide, under direct contract without our agencies, the services of a person who is not a Canadian citizen, but normally that would be a very exceptional case and the person involved would normally be one that was very much needed for a particular priority project and in the case of a direct contract would have to be a person who was at least a landed immigrant and had the intention of becoming a Canadian.

Senator Carter: I think Dr. Peters will probably understand; I may not be able to make myself clear to all of you, but I am sure Dr. Peters will understand what I am driving at.

The Chairman: I hope we will join you at some stage.

Senator Carter: You talk about when you are working out programs you have got away from the old concept where somebody says we want a bridge, and you will go and build it and we are trying to do something more basic to the development of the country itself, but you obviously have got to try to work out with the government concerned of that country, and you get your idea of what is needed, I suppose, from them, your first concept of what the problem is, you get that probably from the government of the country concerned.

Now, to be successful you have got somehow to make it work with the people, the people who are going to benefit.

I think Dr. Brecher lays great stress on this, the necessity for social economic analysis, particularly the social scientific analysis of the problem.

Now, that means somehow making the people themselves, not only the government, aware of the problem, or aware of the need, but the people themselves and why I said Dr. Peters would understand this is because in Newfoundland where we have a lot of undeveloped regions there is a tendency for government or somebody to initiate a program, or a university or an extension program, and say here is a program and out we go and plant it somewhere, but the people themselves are not aware of the need; it never comes to fruition.

How do you overcome that problem? How do you make your program effective by getting down to the grass roots, where your efforts have got to take hold in order to bear fruit?

Mr. Strong: This is a very real problem and it is one of the problems that I would hope that a special program in the field of science and technology would help us to deal with, because as a government agency we must work through the government on the other side.

We cannot as a government necessarily insist on going beyond the point in an investigation where the cooperating government is willing to permit us.

We can always turn down a project, but there are problems of normal diplomacy in our relationships with them that do make it difficult sometimes for us to get down to the grass roots.

We get around this to a considerable extent by sending out special experts who are not government employees, but who are out there as experts to research the particular problem and the particular project, and they are able to operate to a much greater extent on a grass roots level and to identify what you might call the grass roots issues.

But there is no question that this is a difficulty; it is a difficulty abroad just as it is a difficulty at home, but it is a difficulty that we are attempting to deal with.

I think the general quality of our program is improving in this respect; I think the extent to

which projects have been researched in the way I suggested is growing. More and more projects are being undertaken on the basis of this kind of research and, of course, with the best will in the world the research cannot put you in a position where you have foreseen every difficulty, but at least we are doing this kind of research in advance of undertaking projects and this is addressing itself to the problems which you describe, but I cannot say that the problem has been resolved satisfactorily; it is a continuing one.

The Chairman: Before I ask Senator Hays to ask his next question, I would like to comment on this specific field, because I feel that we would need very badly in Canada the studies of technological transfer.

We were told, for instance, by the department formerly headed by Senator Hays, the Department of Agriculture, that they had not made yet any study, or at least, any serious study of the transfer of the results of research in the Department of Agriculture from the Department of Agriculture from the Department of Agriculture to the farming community, and I think it would be very interesting if they were to do this, because perhaps the research effort which they are making, which is tremendous, might have a much greater impact on the Canadian community and in your own field that it has at present.

Senator Hays: Mr. Strong, first I can think of no one more qualified to do the job that you are doing; first you went over there and saw the problem as an ordinary citizen and you know these problems of developing countries probably better than anyone else.

Each time I visit these countries I become more completely confused as to the problems in so far as how we are to handle these problems and I often wonder if your department would not be one of the main departments of government that could help with the science policy in so far as suggesting the things in the field of research where we should be playing a larger part.

I think of electricity, and the field of insecticides, of pesticides, transportation, which seem to me to be great problems in our own country and great problems in these particular countries.

I think in the field of agriculture of course today's solutions are always tomorrow's problems, and when you think that India hoped to be, in so far as food is concerned, self-sustaining by 1972, and Kenya, which was mentioned this morning, which now has a surplus of a couple of million bushels of wheat that they cannot sell and they cannot use, are there other fields of research that we should be doing, or that you can suggest to the National Research Council or the Secretariat that we should be spending more time on?

The Chairman: Or the Department of Agriculture.

Senator Hays: When I think about Dr. L. H. Shebeski, if he does as well in the next eight years as he has done in the last eight years, we are not going to be exporting any grain, that is for sure, it will be kaput, it will be out.

I do not know whether people realize this or not, but these are some of the fields; of course, your problems in these developing countries are probably the climate more than anything else.

I am sure if you put a good amount of Canadians in Kenya, they would all be the same as the Kenyans in 15 years; I know I would. I would not want to do any work, nor would I have to. I would have eight wives and that sort of thing. At one time it would have appealed to me.

The Chairman: But you do not have to either at present, even in Canada.

Senator Hays: But I wonder in the field of research if your department is not better able to suggest some of the things that we should be concentrating on in so far as priorities and that sort of thing are concerned?

Mr. Strong: Senator Hays, I certainly appreciate your remarks and your confidence; I think we really have a limited, very limited capability in the field of science ourselves.

Our agency is primarily charged with knowing what the problems are and developing mechanisms for identifying Canadian resources, identifying the needs of the developing countries and bringing the two together.

Now, in that sense I think we can and are playing a part in the shaping of Canadian science policy, because as the science council indicated in its report, it feels that the provision of assistance in the field of science and technology to the developing countries is a priority and we are very pleased that they feel this way.

I can tell you that the other organizations within the government, the Department of Agriculture, the Department of Energy, Mines and Resources, the Science Secretariat, the National Research Council and others concerned generally with science have cooperated very closely with us. Some of them have made people available to us in some instances.

The Science Secretariat is engaged very, very closely with us right now in the whole matter of providing an inventory of capabilities in Canada and relating this to capabilities that exist in international institutions and to the gaps that exist in the developing countries.

We get a great deal of cooperation and help and we need that cooperation and help because we are not ourselves a scientific agency. We are, as you can see from some of the people in this room and some others who are not here, endowing ourselves more and more with scientific capability, but this capability within our agency will not likely make us into a scientific agency; it will simply give us the ability to relate more effectively to these other agencies.

The Chairman: To be a better user.

Mr. Strong: Exactly, and that is really what we are.

Now, however, the development centre that the government has indicated it intends to establish would be a separate institution and it is very likely that any such institution would have specific responsibilities in terms of utilization of scientific and technological resources in the developing world.

The Chairman: Without revealing any secrets, could you explain further this project as it stands now, without getting into trouble?

Mr. Strong: I find myself under a handicap here. The matter is not yet before Parliament; I think I would have to confine myself to the kind of observations that have already been made by ministers about this project. They have indicated that it would be a separate institution, that it would be international in the scope of its activities, but Canadian in its basic sponsorship. They have indicated that it would have resources available to it under our aid program to permit it to focus specifically on the application and adaptation of science and technology to the problems of the developing countries.

I do not really believe I can go beyond that, although it is pretty apparent from the things we have said I think in our brief and the general thrust and direction which we envisage as an agency for any program in the field of science and technology, I would think that the govnerment in deciding specifically on the setting up of the International Development Centre would take these considerations into account.

Senator Hays: Do you have any, or could you suggest any priorities, knowing the problems and knowing even as it would affect Canada industrially in the future and I think of electricity as one, whereby it seems to me that without a great deal more electricity in many of these developing countries they are completely hopeless in the field of storage and all this sort of thing, that we should be concentrating more on more research in the field of electricity and know-how, air conditioning, and all of these sort of things.

The Chairman: Are you referring more specifically to nuclear energy?

Senator Hays: Maybe; in this whole field.

Mr. Strong: A question such as electricity, of course, is an important one; however, it is not so much in the study that we have done today looming large in the requirements of new technology. It is mainly the requirements of the developing countries that in this area as we see them at this point seem more to be in just the acquisition of new capital facilities that are already feasible with existing technology.

However, in such fields as water resources where we, of course, have big problems and also, of course, significant capabilities, this is a profound problem in many parts of the world.

The Chairman: But are not the two connected, nuclear energy and the dissemination of water?

Mr. Strong: Yes, there are connecting points, but in terms of ground water resources, for example, in India, one of the problems identified during the visit of the task force was the whole problem of ground water and its relation to the utilization of the new high yielding varieties of wheat and rice, because they need irrigation.

The existing information on water tables led to indiscriminate drilling of wells, for example; there is not an adequate amount of information in many parts of India.

Senator Hays: They would lower the table, dissipate it?

Mr. Strong: Yes, and the spacing of wells, all these kinds of things. There are certain elementary things that really have to be known if you are going to make effective use of ground water resources and, as I understand it, Dr. Doe might wish to comment on this, I am very much a layman.

The Chairman: But before going into this, what do you think about the future of nuclear energy in those areas related to the process of providing water, the dissemination of water?

It seems to me if these projects are technologically sound that they would offer what we call in our own jargon as economists, the greatest multiplier effect for these countries; it would provide water, which they need very much. It would also supply a source of cheap electricity, I hope, which would prepare the groundwork for further industrialization in balance with their growth in agriculture.

So it would seem to me that with the Canadian experience in that field this would be a field in

which we could invest a lot of money with great advantage to these countries.

Mr. Strong: My only impression, and Dr. Doe might wish to comment further on this one, is that while the desalination of water using nuclear energy is now technoligically feasible, it is still, except in areas of extreme density, very unlikely to become economic.

The Chairman: In the United Stated we are told it is becoming more and more competitive.

Mr. Strong: I agree; I understand this too, but I had a discussion the other day with the president of our own atomic energy corporation and we delt this very subject. He indicated that because the Canadian process generates a lot of heat our reactor is a pretty good reactor to be used in this area but that because, of course, we in Canada do not have much need for producing water by this process, we have not got much beyond that.

The Chairman: But we could have a lot of reactors to sell, or perhaps to give; the only ones we have exported up to now, we have given.

Senator Hays: In these developing countries is electricity not, if you are going to even change their culture, a very important part of it?

It seems to me that it is between transportation and electricity, which are two of the great problems of these countries.

Mr. Strong: Absolutely, Senator, but I distinguish here though between programs which are designed to improve existing capabilities using existing technology and those which are designed to do something new, to solve an old problem in a new way.

Our present program emphasizes to a very major degree hydro electric power and nuclear power. We are building a nuclear power plant for power generation now. We have provided one in India.

The Chairman: And Pakistan.

Mr. Strong: Yes, and some of the major projects that we have carried out have been in the electrical field and we will continue to do this.

These in fact do use technology, but what I am trying to get at is to the extent that our studies have made this information available to me there is not too much suggestion at this point that we need a lot of new research in this area.

Is it true that some small package units in villages,

much new that is not possible to do on an operational basis in these places; it is really a matter of capital.

Senator Hays: You think the technology is there if we could apply it?

Mr. Strong: In the field of electric power transmission, generation and distribution as I understand it, and I am not an expert in this field, is an area in which improvements can be made, but where the application of existing technology will resolve most of the problems.

I do not mean to say that there is no problem at all in the area, but the kind of thing where we can see special interest in this area is use of nuclear methods of radiation for food.

Here is one of the great problems of these countries; it is not just to grow the food, but to store it and to use it properly.

Senator Hays: This goes back again to power, does

Mr. Strong: Power is a factor in everything here; without power we cannot do many of these things.

The Chairman: You are powerless.

Mr. Strong: That is right. No, there is no question about the importance of power, but our research program is designed really to look at the gaps and to look at the areas where we need new technology, where existing technology is not good enough to solve a problem, but in the field of power the technology and especially Canadian technology is very highly developed at this point and existing technology is able, from what I understand from the experts, to cope with most of the problems that arise.

Senator Hays: Just recently now, taking Canada for instance, with 250 million bushels of damp grain, we know now that during the winter when we have temperatures below 40 degrees or something, if it does not get warmer than 40 degrees we can store it now with 20% moisture. This is a storage problem, then we do not have to use insecticides; they just do not grow at that sort of temperature and these are the great problems in the developing countries, the storage, and I am wondering if further in the field of research in so far as electricity is concerned that you go on to storage in that sort of thing and the application that you can use with electricity.

In the fields of Kenya you are not going to get a this kind of thing, have some promise, but the native there to drive a tractor until you air-condition existing technology makes that possible; there is not it, because it is a lot easier to sit under a palm tree. Mr. Strong: This is quite right.

Senator Hays: It seems to me that maybe in the vast area of energy we are doing enough work, but we are not doing enough research in the smaller field of doing these sort of things.

Mr. Strong: I could not agree with you more, Senator, in terms of the application and identifying specific problems, but again I come back to what I call the problem solving approach.

We just cannot afford the money or the resources to look at all the things that we might do, or to get all the people who might want to do something to do the things that interest them most.

The kind of program we envisage is a kind of program that says the problem in Kenya is that the natives will not drive tractors and because they are not driving tractors Kenyan agriculture is suffering. That is the problem, so we work back from there and say what is the answer? The answer may well be to air-condition the tractors, but this is the direction from which we would approach the problem I would think in any program of this sort.

The Chairman: But do you not think that you have really two basically different types of programs, programs which apply or are aimed at improving the situation and the productive capacity of individuals?

Mr. Strong: Yes.

The Chairman: That is the first category; of course, you will always face at some time at least a kind of unfavourable sociological social environment, so that all these programs will be quite difficult to implement until the social environment changes.

Then you have the second category of programs which deal with the basic economic infrastructure like, for instance, energy programs in order to improve the basic structure of the economy, where you do not really deal with the individual.

The individual will eventually get the benefits of this and then through this process the social environment will change and improve.

So that it would seem to me that we should not neglect this second category of programs because they might be more expensive to implement, but on the other hand they will have great impact and they will be much more easily applied in the kind of social framework that exists at the moment.

Mr. Strong: Yes, Senator, I agree with this and perhaps I make too much of a distinction between operational research and the kind of research I envisage in a specific scientific and technological program.

In the field of the latter example that you mentioned, what I call operational research, if we are going to build a dam in an area, we should know not only how to build the dam, but we should look at the society in which the dam is being built, the impact on the people in the area, the kind of social hazards that are going to develop as a result of this, the way in which these problems might be dealt with.

All of this is a matter of doing very good research of a nature involving social and cultural considerations as well as economic and technical considerations, but this should be part of running a good aid program.

In other words, even in doing the standard things, the things that you have the technology to do, you have got to do a much better job than we perhaps have done in the past of taking all these other factors into account.

I make some distiction between that though as the kind of problem that looms as a very major problem that does not seem to have an answer, or does not have a good answer, where you are saying how do we solve that kind of a problem; how do we get the people on to the land or how do we prevent them from going into the cities; or how do we get them onto the tractors?

The kind of problem that is fairly general; you might look at it in a specific instance, but it would have to be a fairly significant problem to justify a determined effort to solve it.

Senator Hays: Do you feel then that in this field Canada is doing enough research, in the field of electricity?

Mr. Strong: Oh, no.

Senator Hays: Or is this one we should give high priority to?

Mr. Strong: I think the use of electricity has got to be a fundamental part of anything that we do, but I have a fair amount of confidence from what I have seen; that our problem is not one of developing new technology, but of developing new applications for the technology we have.

The Chairman: I am not too sure that you are right there. Perhaps I am talking too much this morning, but the members of the committee can always protest.

Coming back to this problem of nuclear stations related to the production of electricity and also the production of water, in so far as I can recall the atomic energy people when they were before us did not seem to be very much interested in this.

Mr. Strong: No, that is right.

The Chairman: On the other hand, and I was just given the figure a moment ago saying, I suppose that is an estimate of the American costs at the moment, 20 cents per thousand gallons, which is competitive I am sure with the cost of water in the areas which are reasonably provided with fresh water at the moment.

Dr. Peters: This could only be economic from a potable point of view, from human use; it is not cheap enough for industrial use.

The Chairman: But in any case it seems to me that we should certainly as a country, since we have that much uranium to export and we have developed this kind of special vocation in the field of nuclear technology, in connection with our aid program, do much more research in this field so as to arrive at a solution before the Americans.

Mr. Strong: Senator, this, of course, is a fundamental policy which I can only comment on in a more or less generalized way.

I think that this poses the question of whether we should concentrate on doing those things that arise out of our own experience, whether internationally we should be doing those things which have some basis in our own experience at home and where that experience perhaps has greater application than the experience some other country might have in the same field.

As I understand it, we have, of course, tremendous experience in many aspects of the use of nuclear energy and one of these aspects is the provision of reactors and our particular kind of reactor, as I understand it, generates a lot of usable heat and usable heat is the thing that is needed for the desalination of water.

For that reason the provision of the basic heat for desalination is something that we can do.

Now, beyond that, the actual technology of the desalination process is, as I understand it from the Atomic Energy Corporation something they really have not done very much in because we have no need in Canada for the desalination of water and it does not make great sense for us to be developing a special capability in an area where we do not have any domestic need.

The Chairman: We are told that our nuclear energy programs may not be too successful as the years go by if we do not export that technology.

Mr. Strong: Frankly from the point of view of the developing countries I would say that because we have limited resources our task is to make the most effective use of those resources as far as the developing countries are concerned.

Now, for us to spend an awful lot of money developing a technology which we do not need for ourselves really, and which the developing countries can get from somebody else, I would question whether that would make good use of our resources.

I would much rather think, for example, in some field where our experience arose out of a domestic need as well as any international need that there would be a greater combined incentive to concentrate in an area of that kind than there would be to concentrate in the other area, but that is just a personal view.

Senator Hays: In this area what about the field of insecticides, for instance; should Canada be doing more work in the field of insecticides, and I cite another example in Kenya, where they burn off their grass to do away with the ticks.

It seems to be these vast areas where we could use insecticides without having to burn them; they burn off enough to feed their nation, I suppose, once or twice a year.

Really what we are trying to find out in this committee is should Canada be spending more in research in certain areas that they are good at that might have some economic impact back at home, and still do a job? Not that you should be doing it, but should we in in the scientific policy?

Mr. Strong: We have had to develop certain premises which are not policies at this stage, but for the purpose of taking a rational look at this field we have have had to make certain assumptions. Whether or not those assumptions will be translated into policy is not for us to say.

One of those assumptions is that in looking internationally at what we might be doing in the developing countries we should be looking especially at those areas where we either have capabilities now or where we are going to need to develop capabilities domestically. These are the areas in which we should be concentrating internationally.

That does not preclude us from doing something or considering something that might have no application at all at home, but it seemed to us just sensible that a combined incentive of a need that we could see in Canada plus a need in a developing country would permit you to allocate more total resources and therefore make it more likely that the Canadian contribution would have a somewhat unique aspect to it than if you tried to duplicate something that the United States or some other country can do better than you because it simply has a greater need for it and is therefore able to employ more resources.

It seemed to us that with our limited resources we could do those things which we are uniquely capable of doing well. You might really redefine that and say better than anybody else.

Senator Hays: In that field have you any suggestions, with your experience, that we should be doing more of where we do have this usage and this technology and that sort of thing?

Mr. Strong: I cannot say, because I am not an expert in this; that is one of the reasons for employing all these experts, to do that.

Some of the things that they have come up with are very much in line with what you have been saying.

In the field of transportation there are a number of areas in which our own experience and our own needs give us a special interest.

The field of water resources I have already mentioned; the field of insecticides and pesticides, insect control. Even though the insects are different in the other countries, I gather that the basic science or the technology is similar.

The field of multilingualism and the difficulties of living together in a bilingual bicultural environment.

The Chairman: We may have something to learn from them.

Mr. Strong: Indeed, but let me give a specific example here: I touched on it earlier when I mentioned radiation of food. The food industry in Canada has shown a great deal of enterprise and I think a great deal of statesmanship in its attitude towards the developing countries.

The food industry has sponsored several programs that are designed to bring the secrets of food preservation, food distribution and food technology to developing countries.

Canada has therefore developed something of a special expertise in this area and the fact that the food industry, the companies themselves, have seen fit to support this kind of activity has meant that we are developing some experience in translating our knowledge in this field in Canada into developing country environments.

When it is estimated that something like half the food that is grown in many of these countries is wasted somewhere between the field and the customer, it is obvious that there is a tremendous amount of need for new research and new applications of technology in this field.

I would think because of the fact that we have a willing and cooperative industry, we have the knowledge, we have made a start in this area, we find there is a tremendous need for this kind of thing,

that this could well be one of the areas in which we might proceed.

Senator Hays: Packaging, and that sort of thing?

Mr. Strong: Yes, everything, preserving, packaging, even such things as utilizing local products, putting them into a form in which they are marketable and acceptable and protein enriching of products.

For example, you may have heard that in Hong Kong the largest selling soft drink now is a protein soya bean type of drink. Everyone knew basically how to make a drink like this, as I understand it, but the secret was that some person with the marketing background learned how to package it and put it up and sell it in a way which made it attractive. It now outsells coca-cola and it meets a tremendous problem, the need for more protein and it makes good utilization of a local product.

So there are lots of instances where the technical problems and the marketing problems have got to be looked at together; it is not good enough just to provide a new source of food, you have got to make people want to eat it.

This is an area where, as I say, Canadians have shown a special interest and they certainly have a high degree of experience and we have found a high degree of acceptability to Canadian activity in this field abroad.

Senator Hays: And we have the resources and that sort of thing to make it possible for Canadians to compete with other countries in the world in the merchandising of this sort of product?

Mr. Strong: That is right; mind you, the programs to date have not been programs designed to, while they have been financed by funds raised under the sponsorship largely of the food industry in Canada, they have not necessarily been directed to expanding Canadian markets in these areas. They have been mainly related to expanding the possibilities of utilizing local products.

The Chairman: Are there any other questions?

Senator Haig: What are your relations with CUSO?

Mr. Strong: CUSO is an independent organization, but it receives a very high percentage, a little over 90%, of its actual cash requirements from us under our aid program. We have a very close cooperative relationship with them.

As you know, while the government provides, as I mentioned, a little over 90% of its actual budget, the total contribution of CUSO cannot be measured by the cash resources alone.

Senator Haig: Who decides what country the teachers go to?

Mr. Strong: The CUSO board of directors, since it is an independent board of directors, decides this; we are not represented on the board of directors, but we do consult with them, obviously, very frequently. We would have the right to provide our funds to them on a basis that would require them to use those funds in certain specific countries. We would have no right to interfere with the funds they get from other sources to do whatever they want to do. In fact, the problem has not really arisen; we have been kept fully informed of their various activities and our relationship is a very harmonious one.

Senator Haig: In connection with this trainee program, how are the trainees picked to come here to Canada?

Mr. Strong: I would like Mr. Kidd, our Vicepresident, to explain how this program is carried out under the operating branch of our organization, for which Mr. Kidd is responsible.

Mr. G. P. Kidd, Vice-President, The Canadian International Development Agency: Senator, we try to work out with each developing country the number of trainees required in various fields on an annual allocation basis. Then they nominate people who we vet, to ensure that they have the right sort of qualifications. When nominated we arrange to place them in a Canadian educational institution which would seem to meet the training requirements for which they are being put forward. Trainees must, however, be accepted by the institution before they are brought under CIDA sponsorship.

Senator Haig: Do you pay their living cost here?

Mr. Kidd:: We pay their transportation here, their tuition fees, and we give them a monthly stipend and several miscellaneous allowances.

Senator Haig: Well, the next time you bring anyone from Saba make sure they get enough rice. I met a couple of chaps over there and one of the complaints they had about living in Ottawa, the cold weather was one, but the second was the lack of rice.

So that is just a tip I hand to you, sir.

Is there any increase in the demand for telecommunications, radio, TV or phones in these developing countries?

Mr. Strong: Yes; radio telephones, did you say, Senator?

Senator Haig: No, radio, television or telephones?

Mr. Strong: I do not have figures on this, but my understanding is quite clearly that there are; in the telephone field we know specifically of significant demands.

In the field of radio and television I assume that there are demands but not as much knowledge.

Senator Haig: Would you explain the difference between a loan and a grant?

Mr. Strong: Yes; the grant is an outright gift; the loan is a loan. The terms of our loans generally are a 50 year term, zero interest and 10 year grace period on repayment.

The Chairman: So-called soft loans.

Mr. Strong: They are very soft loans. I might say, though, that the soft loan program has been increased as the grant part of our allocations has been decreased, so while it might be said that these loans are and they indeed are, very, very soft, they nevertheless do carry with them an expectation and a commitment of payment which is not true of grants.

Senator Haig: Mr. Strong, when your organization decides on an aid program to a developing country, say Uganda or Malaysia, what supervision do you have over that program?

Mr. Strong: There are two kinds of supervision, Senator: Firstly, if it is a project which requires a building or construction of a capital structure of some kind, we would engage a Canadian contractor or a Canadian engineering firm and that firm would be responsible for the actual completion of the project.

In terms of the overall supervision of our program, the administration of the program in the field, which would include the overseeing of a multiplicity of projects that are going on in a given country, this is done on our behalf by the Canadian Mission, under the high commissioner or the ambassador in the country concerned, and for that purpose the Mission reports to our office on matters of aid administration in the country.

Senator Haig: In addition to the science disciplines you have mentioned in appendix A, Table III, are there any other studies being made by the native population in government management, the civil service personnel?

I met several when I was overseas in which they had come to Canada for government management; is that increasing or decreasing?

Mr. Strong: I might ask Mr. Kidd to comment on this in more detail, but we place a great deal of emphasis on this area. We do bring people from the developing countries to Canada for training in this area. We also have provided experts from Canada in various programs of this kind that are carried out in the developing countries themselves.

Mr. Kidd: I just might add, Mr. Senator, we actually have public administration courses both at the senior and the junior level and both in the English language and the French language.

At the present time the English language one is operated through Carleton University and the French language one through the University of Ottawa.

The Chairman: I would like to ask a question of Mr. Kidd, if I may, as a result of the answer he gave a moment ago:

The students that are coming from developing countries to Canadian universities, they have to pass a series of tests I understand before they come here?

Mr. Kidd: Yes, we must be satisfied that their educational qualifications will be recognized by the university; in fact the university has to accept them before we can place them.

The Chairman: Is it true that these tests that we are using now are American tests developed by the college board in the United States, because to my knowledge there is no such system of tests in Canada?

Mr. Kidd: I think this would depend actually on whether the Canadian university would accept the educational qualifications of institutions in another country.

The Chairman: They use American tests at the moment, I think.

Mr. Strong: I had occasion to look at this at one point; we do not impose these requirements. Our requirement is that they be accepted by the Canadian university for the course for which we have agreed to provide the assistance.

The other requirement is that they be nominated by their government.

The Chairman: Who pays for the test, the student or Canada?

Mr. Strong: I must say I do not know who pays for the test; I have never had occasion to look into that question, Senator. I would certainly be very glad to provide you with an answer. The Chairman: Finally, so far as I am concerned at least you were saying at the beginning that there were about 60 institutions in the world at the moment devoting their energies at least partly to the research problems of developing countries.

Dr. Peters: That figure is available.

The Chairman: The number of 60 is not too important for me at the moment.

Is there among this group a Canadian institution?

Mr. Strong: No, the 60 that I referred to, Senator, are 60 from developing countries.

Now, there are a great deal more institutions than 60 involved in some fashion or another in research that would relate to developing countries. There is no single institution, however, to my knowledge that is directed specifically and solely at the application of science and technology to developing countries.

The Chairman: There is no specific institution in the world?

Mr. Strong: In the education field UNESCO perhaps; you might call the Development Centre ar DAC as close to this as possible, but it operates mainly in the field of economic research.

Dr. Peters: I wonder, Mr. Strong, if an example of what the Senator is referring would be the Delpht University at The Hague in connection with its technical training in aerial photography interpretation, which is heralded as being an outstanding institute of this training type with application to the developing nations.

The Chairman: What I am getting at is whether or not there is at the moment in any other country in the world an institution which would correspond more or less to the international centre that you are contemplating?

Mr. Strong: No, really there is nothing like this anywhere in the world. As a matter of fact the thought that led to the suggestions of the creation of this institution arose out of the process of looking at our own situation and arriving at the conclusion that it was pretty obvious that we had to produce something for our own purposes and then try to find out what other people were doing. In the process of trying to find out what other people were doing we discovered that here was, a great gap that really nobody was filling.

Now, that is not to say that a good deal is not being done; a great deal is being done here, there and everywhere.

The Chairman: But without any kind of global approach.

Mr. Strong: That is right. Now, in certain fields there are specialized institutions; I know we mentioned the rice institute, which was recently created for the purpose of increasing rice production.

The Chairman: In spite of Senator Haig's remark you will not go for research in rice in this agency?

Senator Haig: That is an Ottawa problem, Mr. Chairman.

Mr. Strong: I would think we would have a great deal of interest in what is going on; a good deal of expertise is in fact involved in this rice program, not because we have expertise in rice per se, but because we have expertise in the various sciences that are required in the improvement and production of rice.

I might also mention there are specialized institutions like the Tropical Products Institute in the United Kingdom, which arose out of their colonial experience and which now does a good deal of work in the field of tropital products.

I would say probably the Rockefeller and Ford Foundations more than almost any other organizations certainly that I am acquainted with have focused their attention and a good deal of their resources on this particular problem.

The Chairman: But how is it that OECD or the United Nations have not been more interested in that field?

Mr. Strong: I would suggest, Senator, it is not so much a lack of interest.

The Chairman: Apparently they have not done very much.

Mr. Strong: One of the problems that is encountered internationally is the problem which we have domestically, with which you will be much more familiar than I am, that is that the institutional structures within the international community, like the ones domestically, have not necessarily been based on a multi-disciplinary approach to problem solving.

They have tended to look at agriculture, they have tended to look at energy, mines, etc. and the institutions are set up in a rather segmented way which has meant that it has been very difficult for people to agree on what is the central institution that should be looking at the whole problem.

It is also a matter of resources; there have been a lot of people working hard on this problem and a lot of people that are extremely interested in it, but they just have not yet, as we have not domestically, devised

the right kind of institutions that could cut through all the existing established, what you might call vested interests in the field, and start to look at the totality of the problem and have nay particular jurisdiction over allocation of resources.

The Chairman: I am told this project has been welcomed by many countries which have promised their support and their cooperation; is that true?

Mr. Strong: As a matter of fact, Senator, I think one of the things that has led to our own interest in this matter is the realization that while we were looking into the problem for ourselves other people were very anxious to see us take some sort of lead.

We have been encouraged from all directions, the World Bank, the United Nations Development Program; Mr. McNamara at the World Bank particularly has taken an interest in this.

I have to say that in the process of consulting on this around the world we have found a great deal of enthusiasm for this idea and I do think that at this point it looks like a Canadian lead in this area would be welcomed by everybody, certainly everybody we have talked to in the international community.

The Chairman: Would the delay in announcing this project, not in announcing, but coming to a final government decision in regard to it, be explained partly by what Mr. Pearson is doing in terms of his study for the World Bank?

Mr. Strong: No, I think the setting up of a new institution of this kind has to be submitted to and approved by Parliament.

The government has indicated its intention to do this, which suggests that the next step in the procedure will be to lay legislation before Parliament.

This is not up to us to determine, as to when this is done or as to in what form it might be done. However, I can say that it is within our existing terms of reference and within our existing authorities to continue to pursue the studies and the inquiries that we have been making in the last two years.

We do not have the power to set up a new institution, but within our existing mandate there is a great deal of work that we can do and that we are doing in this field.

There will come a point, of course, where any decision to delay the creation or non-creation of the special institution that is proposed would work to our disadvantage; I cannot say at this point that we have reached the point where we are feeling too limited.

Dr. L. A. E. Doe, Special Advisor, The Canadian International Development Agency: Mr. Chairman, I have a comment that bears more on the earlier part of the discussion than on the latter part. I sensed that there was a little ambiguity in the use of the term research as it has been used this morning and possibly some confusion.

The Chairman: We always speak in this committee of research and development.

Dr. Doe: Yes; let us set aside for the moment research on natural science and technology, the development of atomic energy and so on.

In the social economic field we have used the term research where I think we might have been a little clearer if we had used the term analysis. A new program is undertaken, let us say, in the field; one of the major functions undertaken at the present time is an evaluation of the total situation in which that is going to take place.

We have referred to that; Mr. Strong especially referred to this operations research and so forth. I think if he had used the term analysis of the situation if might have been a little less confusing, because basically what is involved here is the use of essentially accepted procedures and criteria, systems of values, if you like,

in order to make decisions that have to be made in order to get on with the job.

The Chairman: It is an evaluation.

Dr. Doe: It is an evaluation, right. The new International Development Centre that has been discussed more recently will be concerned presumably with research in a slightly more isolated sense. It is research in the sense of let us go back and evaluate the criteria, let us look at the systems of analysis that we are using, what are the fundamental values that are involved in making these decisions?

Now, there is a broad grey area that lies between the two, but I think the distinction may have been a little bit confused in your discussion.

The Chairman: Thank you. On behalf of the members of the committee I want to thank you very much. I am quite certain though that once the government has reached its decision about this research centre and brings legislation before Parliament that you will be back with us, because we will certainly want to have a close look and a very interested look into your proposals.

The committee adjourned.

APPENDIX 33

THE SENATE

SPECIAL COMMITTEE

ON

SCIENCE POLICY

BRIEF

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Prepared by

THE CANADIAN INTERNATIONAL DEVELOPMENT AGENCY

TABLE OF CONTENTS

Presentation

'Canadian International Development Agency -Appendix A -Organization and program administration Annex I -Table I -Organization Chart Technical Assistance - Teachers, teacher trainers and professors Table II -Technical Assistance - Advisers

Table III - Technical Assistance - Trainees Table IV - Capital Assistance

- Appendix B -Working Paper on Proposed Program of Social-Science Research by Professor Irving Brecher, Director, Centre for Developing-Area Studies, McGill University
- Report on Science Policy Studies and a Appendix C -Canadian Program of International Development by Dr. C. H. G. Oldham, Senior Research Fellow, Science Policy Research Unit, University of Sussex, Brighton, England

PRESENTATION

As the body responsible for administering

Canada's international development assistance program,

the Canadian International Development Agency is concerned

with Canadian Science Policy in two principal respects:

- 1) The availability of Canadian resources in the field of science and technology for use in our assistance programs;
- 2) The optimum utilization of these resources both from the point of view of the developed nations and of Canada.
- 2. Background information concerning the organization of our Agency and its programs is annexed as appendix A to this presentation.
- and extensive and growing use of Canadian scientific and technological resources in its programs. A substantial proportion (or approximately 23%) of the personnel who have been sent to developing countries under our bilateral programs since its commencement have been people qualified in one of the sciences or technical vocations. They serve as teachers and advisors in a great variety of ways, all of which are designed to help the people of the countries in which they serve to develop their own skills and capabilities. The very term "technical assistance" which is used to describe programs of this type implies application and transference of technical skills and knowhow.

- 4. Another form of assistance we provide under our bilateral program is education and training in Canada of personnel from the less developed countries. Of the total of 7,800 persons that have been brought to Canada under this program since its commencement approximately 52% received education or training in one of the sciences or in a field which we regarded as technical. Thus the capacities of Canadian universities and other institutions where training is available have been used for this purpose. To an increasing extent many of these institutions are also becoming directly involved in the planning and implementation of projects which involve both sending of personnel overseas and training of counterpart personnel from the cooperating country in Canada.
- Capital Assistance has been another major element in the Canadian program which involves the use of Canadian scientific and technical personnel and capabilities. Since the inception of our program to the end of fiscal year 1967-68, we have spent some \$282.3 million on projects of a capital nature - dams, hydro-electric power plants, irrigation projects, atomic energy plants, schools, universities, and other installations. We have also conducted resource studies, aerial surveys, transportation studies and many other engineering and technical surveys. All of these projects are carried out on a contract basis by Canadian organizations, both business and governmental. They invariably require the use of Canadian technical personnel and of course are based on utilization of Canadian scientific and technological capabilities. The substantial number of personnel employed directly overseas by these contractors are not included in the figures referred to above.

- programs. In addition Canada has contributed a total of approximately \$359 million to multilateral agencies engaged in the development field since 1951. Many of these agencies also draw on Canadian scientific and technological personnel and Canadian institutional capabilities in the planning and implementation of their programs.
- 7. The Canadian government has indicated that it intends to continue to increase its allocations for international development assistance to the point where they will reach the internationally accepted target of 1% of gross national income by the early 1970's. This means that there will be a corresponding increase in the extent to which we will be drawing on the resources of Canadian science and technology in the foreseeable future. In fact, for reasons which I will elaborate later in this presentation it is likely that our use of Canadian scientific and technological capabilities will increase at a somewhat greater rate than the growth of our expenditures.
- 8. In the past, we have used these resources in response to individual requests for assistance. The overall program as reflected in the figures referred to in appendix A simply represents the sum total of the vast number of individual projects resulting from this process of request and response. While each individual project is based on matching a particular Canadian capability to a specific need in the developing country concerned there has been no framework within which we have been able to plan our programs to ensure that the most effective use is made of these resources.

- This is one of the reasons why the work of this Committee is of such importance to us. Our planning requires the best possible knowledge of Canadian science priorities. It is important that we know present and projected future Canadian capabilities in the fields applicable to the needs of the developing countries and the extent to which these capabilities may be available to us. It is equally important for those involved in Canadian science and policy and planning to take into account the extent to which our programs are going to be drawing on these capabilities. As our programs will be growing at a significant rate and are likely to be a continuing feature of our national life for the foreseeable future, I believe that they must be taken fully into account in establishing our national science policies and priorities. This requires much closer cooperation between our Agency and the Canadian science community.
- 10. I referred to the use made in our program of Canadian scientific and technological resources. I would like to point out that this by no means represents a net drain on those resources. It equally represents a vitally important extension of Canadian experience into the international field which can bring significant benefits to Canada. In another sense our expenditures in this field represent an addition to the total expenditures being made for the advancement of Canadian science and technology even though, of course, their principal purpose is to assist the developing countries.

- 11. Let me now make some more general comments about the role of science and technology in meeting the problems of the developing countries and the special opportunities available to Canada in this field.
- 12. The majority of people in the Western world today enjoy material conditions of life that are unparalleled in the annals of human experience. Moreover, the prospects are for continuing progress towards significantly higher levels of affluence. To a large extent this has been made possible by the development of science and technology and its application to the processes of industrialization.
- 13. If the changes which have taken place in response to advances in science and technology have on balance been beneficial it is not because they were designed that way. Generally, economic and social change has occurred as a by-product of scientific and technological change. And while the immediate benefits of the technological revolution are apparent to all, it is becoming ever more evident that it has created some massive and growing imbalances which threaten in time to negate all the progress that has been made. Within our own societies there are imbalances in the degree to which various groups and individuals share in the benefits of this progress. There are the imbalances in our ecological environment resulting from the pollution of water and air and the vast concentrations of population in a relatively few urban areas.

- l4. But the greatest imbalance with which we must deal is the vast disparity which exists today between the privileged minority who live in the industrialized nations and the unprivileged majority who live in the less developed nations of the world. On the one hand we have been able to multiply our own economic growth so that the income of the average Canadian increases each year by an amount equal to the total annual income of the average person in the less developed countries. On the other hand we have introduced to these countries measures for the improvement of health which have reduced their death rates drastically and produced dramatic increases in population which are offsetting their efforts to bring a better life to their peoples. We may simply have saved them from one fate only to subject them to another.
- 15. There is an urgent need for us to relate our utilization of the fruits of science and technology more directly to their economic and social consequences. Today, with the systems' approach to the identification of problems and the search for solutions, it has become feasible to use consciously our scientific and technological resources to induce and accelerate economic and social change. The very science and technology which has helped to create the imbalances which threaten our society can be and must be invoked to bring a better life to the many as it has already done for the few.
- 16. Much of the basic technology of our age has been developed under the stimulus of the two World Wars and since then of the space race and the nuclear arms race.

 The rewards inherent in the market economy have provided

powerful commercial incentives for the adaptations of this technology to the development of new consumer products.

There is no similar immediate incentive for the application of this technology to the economic and social problems of the developing countries. This gap can be filled through assistance programs which are especially designed to provide the impetus required to bring these resources to bear on fundamental development needs. Only in this way can the necessary multipliers be introduced into the development process.

17. But there is no easy or auotmatic way in which the benefits of science and technology can be quickly transferred to the developing nations. We must do more than simply transfer to them part of the wealth which we have been able to produce through our mastery of science and technology. We must help them to develop their own capabilities so that they may adapt and apply to the resolution of their own development problems, the new knowledge and techniques which can be made available to them out of our experience. But in doing this some difficult problems must be faced - inadequate educational systems, cultural and social traditions which are often allien to the scientific method and a dearth of the kind and quality of institutions required to nurture scientific and technological development. It will require a good deal of new thinking and research and the allocation of much greater resources if this problem is to be faced and the developing countries helped to acquire the capabilities in the field of science and technology that they require to deal successfully with their development problems.

- 18. Successful industries in North America allocate some five to six per cent of their total annual sales to research and development. Although economic and social development of the less developed countries is, if anything, more complex than industrial development, there has been no similar emphasis in international development aid programs. In fact the best estimates available indicate that less than ½ to 1% of overall aid expenditures have been for research related to the effectiveness of the development process.
- engaged in detailed investigations on the role of research, science and technology in meeting the development needs of the less developed countries and of the ways in which the nature, quality and direction of Canada's external aid program might be improved by placing greater emphasis in the field of research and the application of science and technology to the development process.
- 20. Our investigations have shown that there are substantial gaps in the efforts now being made in the international community to meet this problem. It is now widely recognized that far too few resources have been deployed in concerted attempts to bring the resources of science and technology to bear directly on the fundamental problems of underdevelopment.
- 21. The instances in which this has been done have provided some dramatic examples of what can be achieved.

 Perhaps the best examples are the programs pioneered by the Ford and Rockefeller Foundations for the development of new high yielding varieties of wheat and rice and their

introduction into the countries of South East Asia. As a result the entire outlook for food production in South East Asia has been dramatically altered. The production of wheat and rice has already increased substantially and it is now fully within the range of practicality to foresee that India and Pakistan may achieve self-sufficiency in food grains within the next decade, a feat which would have seemed virtually impossible three or four years ago. 22. In education, the development of electronic devices and satellite communications now brings it within the range of the possibility to make basic education available to the vast numbers of people in the developing countries more rapidly than could be done by traditional methods and, at least potentially, at lower unit cost. Nuclear power holds out the possibility of making the deserts bloom through the establishment of massive agro-industrial complexes based on desalination of water and the production of low cost fertilizers. Even modern marketing and public relations techniques offer great potential for helping to cope with what are perhaps the most stubborn of all barriers to development - the deeply ingrained attitudes, habits and prejudices of people. In almost every field there is available, either actually or potentially, basic scientific and technological capacity which can be brought to bear directly on the fundamental problems of under-development. 23. Our investigations indicated that key people in this field, both in Canada and internationally, consider that Canada can play an important part in this process through its international development assistance program. A number of reasons are given for this. Amongst the points stressed are:

-Canada is in the midst of a rural-urban-industrial transition and therefore Canadians are fast gaining experience in the problems of "development" in the face of great distances, diverse regions, intractable resources, etc.; -Many of the fields in which Canadians are particularly experienced through the development of their own natural resources, i.e., water, power, minerals, agriculture, forests and fisheries are especially relevant to the priority needs of the less developed nations; -Canadians also have experience in the development of political independence; -Canadians are not suspect either because they have been empire-builders or colonial exploiters in the past or because of great-power ambitions in the present and future; -Canadians are, nevertheless, fully abreast of the most up-to-date developments in world science and technology and in a specially good position to apply and adapt this knowledge to the needs of developing countries; -Canadians' experience of bilingualism, bi-culturalism, multiracialism and federalism can give them an insight into the problems of many other developing countries.

In carrying out the investigations I have referred to, we had the benefit of the services of a number of experts from Canada and abroad. These experts identified a substantial number of specific areas in which Canadian capabilities

were particularly relevant to the needs of developing country's needs. They provide the basis for the addition of an important new dimension to our international development assistance program.

- 25. Copies of two of the papers prepared for us in the course of the investigations to which I have referred are annexed as appendices B and C respectively to this presentation. As both of these papers deal with the more general aspects of this matter from two particularly interesting perspectives, I thought they might be of interest to the Committee. They are included with the approval of the authors. Appendix B is a report by Professor Irving Brecher, Director of the Centre for Developing Area Studies at McGill University and Appendix C is a report by Dr. C. H. G. Oldham of the Science Policy Research Unit, University of Sussex, Brighton, England.
- 26. In the speech from the Throne on Thursday,
 September the 12th the government indicated its intention
 to bring before Parliament, legislation establishing an
 International Development Centre. Such a Centre could
 provide a significant new instrumentality through which
 many of the opportunities revealed in our investigations
 could be met. We hope that in establishing priorities and
 making plans for the future of Canadian science, full
 recognition will be given to the greatly increased role
 it will be expected to play in meeting the basic needs
 of the less developed nations of the world.

APPENDIX "A"

CANADIAN INTERNATIONAL DEVELOPMENT AGENCY ORGANIZATION AND ADMINISTRATION

ORGANIZATION AND MANAGEMENT OF INTERNATIONAL ASSISTANCE PROGRAMS

The management of international assistance programs at the official level is conducted by:

- (a) the <u>Canadian International Development</u>

 <u>Agency</u> (CIDA) which has overall responsibility

 for the management and operation of these

 programs;
- (b) the <u>Canadian International Development</u>

 <u>Board</u> which advises the Secretary of State for

 External Affairs on major policy issues related
 to international Development and constitutes the
 formal machinery for interdepartmental
 consultation on international development
 assistance policy in general; and
- (c) <u>Canadian Missions</u> abroad which carry out, on behalf of the Agency, field administration of development assistance activities.
- 2. By Order of the Governor General in Council, dated
 September 12, 1968, the titles "External Aid Office" and
 "External Aid Board" were changed to "Canadian International
 Development Agency" and "Canadian International Development
 Board" respectively to better reflect the true nature and purpose
 of Canada's international assistance programs.
- 3. The External Aid Office, predecessor of CIDA, was created as a consequence of a Government decision made on August 24, 1960, to place under one Minister (Secretary of State for External Affairs) responsibility for supervision and control of aid programs which previously had been shared by the Departments of External Affairs, Trade and Commerce, and Finance.

- is administered by a President reporting to the Minister and acting in consultation with the Canadian International Development Board. The main responsibilities for the President are summarized as follows:
- (a) the operation and administration of Canada's economic assistance programs;
- (b) to ensure co-ordination in operations of other Departments concerned with various aspects of these programs;
- (c) to consult and co-operate as appropriate
 with international organizations and
 agencies, and with Canadian voluntary
 agencies active in under-developed countries;
 - (d) to co-ordinate Canadian efforts to provide emergency assistance; and
 - (e) to administer the Canadian International

 Development Agency.
 - was established as a result of the same Cabinet decision as the one which created the External Aid Office and replaced the former Interdepartmental Committee on External Aid Policy. The Board's membership consists of the President of CIDA (designated as Chairman), the Deputy Ministers of the Departments of Finance, Trade and Commerce, External Affairs, and the Governor of the Bank of Canada.

 Representatives from other departments and agencies with a direct interest in economic assistance attend as appropriate.

The Board advises the Secretary of State for External

Affairs through the President of CIDA on all major policy
matters. More detailed interdepartmental consultation is
carried out through a committee which is composed of
representatives from the same departments as those
represented on the Board itself and from other departments
with a significant interest in particular matters which
are being considered.

- 6. The <u>Canadian Missions</u> abroad from the inception of Canada's development assistance programmes have been responsible for the field administration of development assistance in the recipient countries, and in respect to their development assistance responsibilities report directly to the Canadian International Development Agency. The principal functions of the missions in development administration include:
 - (a) compilation of information on economies
 and development plans of the countries to
 which they are accredited;
 - (b) receipt of and advice to CIDA on project requests;
 - (c) liaison with local authorities;
 - (d) assistance and advice on project implementation and evaluation.

STATUS OF CANADIAN INTERNATIONAL DEVELOPMENT AGENCY

7. The Canadian International Development Agency has been designated as a department for purposes of the Public Service Employment Act, the Public Service Staff Relations Act and the Financial Administration Act.

RE-ORGANIZATION OF THE CANADIAN INTERNATIONAL DEVELOPMENT AGENCY

- 8. To ensure that CIDA had an appropriate organization designed to meet the increasing demands arising from expansion and changes in programs, the Public Service Commission, in February, 1967, was invited to conduct a complete study of the Agency organization. The study report was received in June, reviewed by Agency management early in July, and approved in principle by the Treasury Board at its meeting of September 28, 1967. The Agency commenced operations within the framework of the new organization on October 1, 1967.
- 9. The significant changes embodied in the new organization, which are reflected in the Organization Chart Annex 1, are:
 - (a) a clear distribution of responsibilities among three main branches, namely,
 - (i) Planning and Economics
 - (ii) Operations
 - (iii) Support Services
 - (b) the creation of a new and separate Personnel Division;
 - (c) attachment of a small staff group to the President;
 - (d) provision for Special Advisers in those fields in which CIDA undertakes significant programs; e.g., Agriculture, Forestry, Transportation, Education, Social Welfare, Fisheries and Energy;
 - (e) creation of a Multilateral Aid Division, Voluntary
 Agencies Division, and a Business and Industry
 Division;
 - (f) provision for improved co-ordination in project development implementation; and
 - (g) provision for internal management services.

PERSONNEL

- 10. The approved strength level has grown from 300 positions in 1966-67 to 456 in the current year. While primarily due to expansion in the program itself, this increase also takes into account the broadening scope of CIDA's responsibilities and the recognized need for a more professional approach to aid administration.
- 11. Present strength consists of 405 staff members and
 10 officers seconded from other departments, mainly from the
 Department of External Affairs. In addition, there are 16
 persons currently employed on a contract basis to do special
 studies.

ORGANIZATIONAL FUNCTIONS RELATED TO SCIENTIFIC ACTIVITIES

12. The Agency has no statutory function or specific powers in respect of scientific activities. However, in providing assistance to developing countries, a distinct contribution is made to scientific activities both in Canada and in these countries. The contribution is reflected in a stream of activities representing capital and technical assistance extended to French and English-speaking countries of South and South-East Asia (Colombo Plan)), to Commonwealth African countries (Special Commonwealth Africa Assistance Plan (SCAAP)), to Independent French-speaking African States IFAS)), to the Commonwealth countries of the Caribbean (Commonwealth Caribbean Assistance Plan (CCAP)) and to Latin America through the Inter-American Development Bank. Much of the technical aid directly involves Canadian universities, technical institutes, and other post-secondary institutions and may be considered in terms of two broad categories.

The first involves the sending of advisers and teachers to developing countries; the second, the bringing of trainees from these coutries to Canada for the purpose of providing training unavailable or difficult to obtain in their home countries. Capital assistance which, in terms of dollars, represents the largest proportion of Canadian aid to developing countries and constitutes approximately 85% of the total allocations, involves the supplying of industrial and basic commodities from Canada and other types of goods in the form of equipment and building materials. In some cases the supplying of such goods can be related to the support of scientific activities and to the extent that it has been possible to determine this relationship, such expenditures have been included in the statistics presented under Capital Assistance.

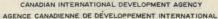
PERSONNEL POLICIES

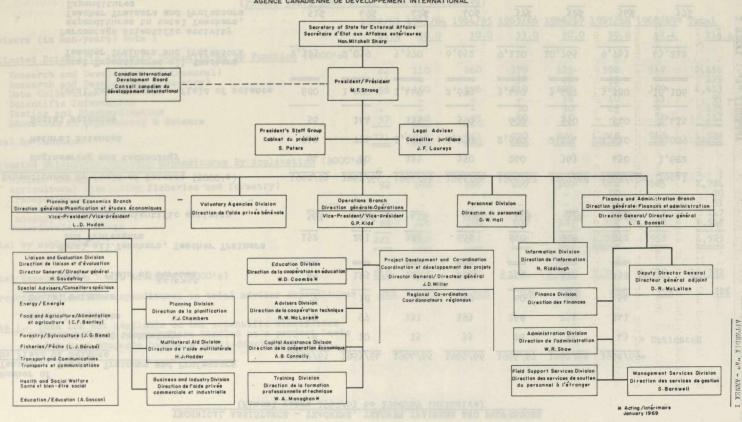
The development assistance activities are provided within a framework which is both co-operative and responsive in nature in that the recipient country establishes its development priorities and, after discussion with Canada concerning sectors in which Canadian resources can be effectively utilized to promote economic development, requests Canada's assistance in the implementation of specific projects. It is increasingly evident that scientific research will play an important part in the carrying out of international development programs. It is in assisting the developing countries to achieve their goals in respect of scientific activities and aspirations in the fields of science that the Canadian International Development Agency would give emphasis to the recruitment, secondment or placing under contract scientific personnel for the purpose of carrying out Canada's commitment in assistance to the countries concerned. There are no individuals on the immediate strength of the Agency who might be deemed to be specifically engaged in scientific activities. As indicated above, the support for scientific activities in terms of people is provided through the technical assistance program involving teachers, advisers, trainees and persons under contract.

... 5

EXPENDITURES AND MANPOWER RELATED TO SCIENTIFIC ACTIVITIES

14. Funds and numbers of personnel estimated to have been deployed under CIDA programs for the fiscal years 1962/63 to 1968/69 inclusive on scientific activities, are set out in Tables I and IV attached. In view of the responsive nature and changing character of Canada's international development assistance program, no attempt has been made to forecast expenditures on scientific activities as it is believed that such projections may well be misleading.





APPENDIX "A" TABLE I

TECHNICAL ASSISTANCE - TEACHERS, TEACHER TRAINERS AND PROFESSORS (Fiscal years 1962/63 to 1968/69 inclusive)

ber of								
chers, Teacher Trainers and Professors Field of Science	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69*	
Engineering and technology	8	10	15	35	26	33	43	
Natural sciences	70	97	131	193	258	234	241	
Social sciences	7	18	15	39	60	50	54	
Total - field of Service	85	125	161	267	344	317	338	
Total all Teachers, Teacher Trainers and Professors	152	241	388	665	850	948	952	
Percentage scientific activity	<u>56</u> %	52%	41%	40%	40%	33%	35%	
penditures by Field of Science (\$000's)	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69*	Tota
Engineering and technology	64	80	135	350	260	363	430	1,68
Natural sciences	560	776	1,179	1,930	2,580	2,574	2,410	12,00
Social sciences	56	144	135	390	600	550	540	2,4
Total Expenditures - field of science	e 680	1,000	1,449	2,670	3,440	3-,487	3,380	16,10
Total Expenditures all Teachers, Teacher Trainers and Professors	1,323	2,039	3,570	6,652	9,110	10,765	9,753	43,2
Percentage scientific activity			exteriors.					
expenditures to total Teachers, Teacher Trainers and Professors Expenditures	51%	49%	42%	40%	37%	32%	34%	

^{*} Estimated

APPENDIX "A" TABLE II

TECHNICAL ASSISTANCE - ADVISERS (Fiscal years 1962/63 to 1968/69 inclusive)

	1962/63	1963/64	1964/65	1965/66	1966/67	1967/68	1968/69*	Total
Advisers (in man-years) Note 1	13.4	26.0	30.0	33.0	30.0	39.6	42.4	214.4
Estimated Scientific Activity Expenditures By Function (\$000's)								
Research and Development (Intramural) Research and Development (Industry) Data Collection Scientific Information Testing and Standardization Education in Engineering & Science Total by function	82 26 56 - 57 221	110 100 - 30 240	260 196 - 95 551	370 30 210 30 80 720	525 20 202 38 30 10 825	592 53 260 40 65 - 1,010	517 389 13 39 958	2,456 129 1,413 91 125 311 4,525
Estimated Scientific Activity Expenditures By Application (\$000	s)							
Nuclear Energy Agricultural (including fisheries and forestry) Transportation Telecommunications Industry Underdeveloped Areas	92 16 25 88	100	365	400 - 20 300	500 - 20 300	662 20 35 39 254	665 - 13 280	2,784 20 51 117 1,548
Total by application	221	240	551	720	825	1,010	958	4,525
Total Expenditures - All Advisers (\$000's)	840	998	1,624	2,394	3,686	3,761	3,019	16,322
Percentage scientific expenditures to total adviser expenditures	26%	24%	34%	30%	22%	26%	31%	28%

Note 1. Data one not available on the scientific disciplines involved since programs are handled on a project basis with many projects having a multi-disciplinary mix.

* Estimated

TECHNICAL ASSISTANCE - TRAINEES* (Fiscal Years 1962-63 to 1968-69 Inclusive)

	1962-63	1963-64	1964-65	1965-66	1966-67	1967-68	1968-69	
Number of Trainees in Canada by Scientific Discipline								
Engineering and Technology	100	120	194	532	602	591	628	
Natural Sciences	210	256	310	458	604	630	725	
Social Sciences	89	111	241	263	304	269	282	
	175 800							
Total	399	487	745	1,253	1,510	1,490	1,635	
Total trainees	770	1,121	1,499	2,053	2,633	3,071	2,826	
% to total trainees	51%	43%	50%	61%	57%	48%	57%	
	1962-63	1963-64	1964-65	1965-66	1966-67	1967-68	1968-69	Total
Expenditure by Scientific Discipline (\$000's)								
Engineering and Technology	230	342	492	1,449	1,929	2,349	1,773	8,564
Natural Sciences Marting of Reviews	483	720	776	1,242	1,928	2,466	2,053	9,668
Social Sciences	204	316	624	759	1,087	1,058	841	4,889
	000 20 1	4700	196	3 510				
Total Total (Inclumnation	917	1,378	1,892	3,450	4,944	5,873	4,667**	23,121
Total expenditures - all trainees	1,911	2,939	3,785	5,308	7,063	8,396	7,180	36,582
% scientific activity expenditures to total expenditures	47%	46%	50%	65%	69%	70%	65%	63%
W D bassacht to County to a sign of the sign of t								

Persons brought to Canada to receive education or training
Estimated 2/2 2/2

TABLE III

APPENDIX "A"

APPENDIX "A"
TABLE IV

Estimate of capital funds expended relating to scientific development (\$000's)

Category to which support given	Fiscal years 1962-63 to 1967-68	Fiscal year * 1968-69	Total
Data Collection	16,654	1,487	18,141
Research & Development	610	559	1,169
Scientific Information	16	30	46
Education	4,043	1,583	5,626
Total expenditures related to scientific activity	21,323	3,659	24,982
Total expenditures for capital assistance	128,933	30,288	159,221
Percentage scientific activity expenditures to total capital assistance expenditures	16.5%	12.1%	15.7%

^{*} Estimated

APPENDIX B

Proposed Program of Social-Science Research

A Working Paper

by

Irving Brecher

Director, Centre for Developing-Area Studies

McGill University

PROPOSED SOCIAL-SCIENCE RESEARCH

"Problems of economic underdevelopment, development, and planning for development ... cannot be studied in isolation but only in their demographic, social, and political setting."*

The direct task at hand is to suggest the most fruitful avenues of socio-economic and political research to be followed by the Canadian programme of assistance to developing countries. However, it is well to pause at the outset and explain the rationale underlying the proposed focus of research effort in this field.

THE BASIC RATIONALE

The Transfer of Technology

There is great merit, of course, in providing a "conceptual umbrella" for the entire range of topics to come under investigation. Given the excitement of the "development" challenge, it would be all too easy to stray from the main road and thereby seriously blunt the cutting edge of a Canadian research programme. In this

^{*} Gunnar Myrdal, Asian Drama: An Inquiry into the Poverty of Nations, 3 vols. (New York: The Twentieth Century Fund, 1968), Vol. I, pp. ix & 42.

context, a double purpose is served by the theme, "applying science and technology in the industrialized countries to accelerate growth in the developing countries:" it is aimed at a crucial need in the poor two-thirds of the world; and it specifies a role which Canada, in terms of its own development, is highly qualified to play.

Having gone this far, however, it is necessary to emphasize that the "transfer of technology" is itself a complex and many-sided process. To be sure, a cheap paper-making machine geared to local raw materials, a new strain of wheat resistant to the extremes of tropical climate, a labour-saving device for refining mineral ores, storage and refrigeration equipment especially suited to frequent handling of food cargo during long-distance transport — all such technical innovations, involving both design and application, make up a vital part of the "transfer" process. But this does not tell the full story. And to be exclusively preoccupied with these matters is to ignore the equally-vital problems of speeding up the transfer, gauging its impact on the less-developed country or region, and ensuring that it takes root in a healthy institutional and cultural setting.

The transfer mechanism must, in fact, be approached on at least five levels: understanding the socio-economic-political structures of the receiving countries; identifying their major barriers to change and key paths along which change occurs; strengthening the poor countries' overall capacity for "self-help," that is, for generating and sustaining their own forward momentum; "transplanting" the most productivity-oriented scientific and educational techniques of the industrialized countries; and engaging in a continuing review of experience with actual transfers so as to achieve maximum effectiveness

how should be contemplated without an accompanying programme of social-science analysis. A Canadian programme could hardly be expected to proceed simultaneously, and in equal depth, on all fronts. In any event, many instances are bound to arise in which the vigorous application of an adapted technique — and nothing more — would probably bring rapid and substantial results. What remains true, however, is that the growth puzzle of the "tiers monde" cannot be unravelled without an understanding of basic social, economic and political forces promoting and impeding change in those countries;

and that "transfer of technology" must therefore be given operational content which goes well beyond the physical and biological sciences.

As already implied, there are obvious dangers in such a flexible approach. It can lead to diffuse, unfocused effort; and it requires special care to maintain that substantial uniqueness without which a Canadian programme could not be readily justified. In fact, a vast array of organizations -- international agencies, government and private institutes, university programmes -- presently occupies the field of social-science research on development problems. From them has come a formidable stream of literature that severely taxes even the most intelligent reader's powers of coordination and understanding. Admittedly, the problems are very complicated; and the search for fundamental solutions will necessarily involve intensive, sometimes-overlapping study covering a long of broad range of issues. No solid research institution can entirely escape this responsibility. But by the same token, no new research venture can stake a claim in this field unless it carves out its own niche by demonstrating a considerable capacity for doing new things, or doing old things better than they have been done before.

Canadian Capacity

The idea of "Canadian capacity" merits some elaboration here, since, properly defined, it unlocks most of the doors that bar clear-cut decisions on research emphasis for the proposed.

Centre. A basic ingredient is, of course, the special skills rooted in Canada's own experience and therefore set apart from the talents developed elsewhere. This is the most straightforward expression of "comparative advantage;" and it provides a very solid case for research effort spanning such diverse fields as mining technology, communications, urban growth and culture-language relations.

But comparative advantage has other dimensions,

particularly in the Canadian context. For one thing, it applies not
only to the development of new skills and new knowledge, but -no less importantly -- to the adaptation and extension of Western
scientific advances to Canadian needs. In substantial measure,
this country has grown rich through a process of adaptive innovation
built on the inflow of capital and technical know-how from abroad.
There is every reason to presume that Canadian ingenuity can bring
this innovative process to bear heavily on the problems of the underdeveloped world, often with positive "feedback" effects on Canada
itself.

Secondly, it is essential to distinguish between "actual" and "potential" comparative advantage. Canadian research involvement is most clearly indicated in those fields where strong skills and expertise are already in being -- whether in government or the private sector, or both. However, to ignore creas of potential strength is to take an unduly-static view of capacity, to deprive the poor countries of real opportunities for solving major problems, and to damp down Canada's own economic and social development. It goes without saying that concern with potential "growth points" cannot be an open-ended matter; not even the most affluent nation should waste resources in undiscriminating support of research activity. The better part of Canadian wisdom is to encourage incipient research on international development only where the evidence shows both a keen interest in the particular field and an appreciable commitment of human resources to its growth. But once given such evidence, it is just as important for Canada to be generous and imaginative in providing the necessary research support; for this may well be the cheapest and most productive of all possible Canadian contributions to world progress.

"Capacity" has still another, more general, dimension for Canada. It has become commonplace to cite this country's favourable image in the world at large and particularly in its underdeveloped regions. One can fairly question whether the image is fully deserved and whether it remains untarnished in the face of recurring international crises in recent years. For our purposes, it is a sufficient answer to point out that in terms of seeking economic development in the poor countries, Canadian foreign aid takes second place to no other bilateral programme; that Canada's aid programme is one of the very few to have undergone rapid and sustained expansion during the 1960's; and that Canadian "aid" prestige is now probably at an all-time peak in the councils of international organizations and of national governments in the less-developed world. This gives Canada an enormous comparative advantage in pressing forward with its own search for viable solutions to problems of international development; and, equally significant, in helping to focus the industrialized countries' vast scientific and technical knowledge on these special problems of the "tiers monde." From this perspective, it matters little that Canadian aid has yet to reach the United Nations target of one per cent of national income; or that Canada's international prestige is more a function of its modest size and influence than of any intrinsic quality of "Canadianism." The crucial point is that, in the light of such prestige, this country now enjoys a dramatically-unique opportunity to combine Canadian and other Western skills in an intensive attack on the social-science problems of international development.

The Compelling Problems

There are, obviously, limits to the scope for effective Canada-sponsored research, even in this major field. It is not merely a question of financial constraints; these are always real, and they always require a clear showing of expected "payoff" before proposed research gets under way. Scarce human resources are likely to pose far more serious difficulties -- especially within Canada, to be sure, but also in the wider international market for research skills. This being so, there can be no refuting the proposition that only the most compelling development problems should be selected for study by the new Centre.

It is no easy task to identify the prime areas of concern in social-science terms. Much "research water" has flowed under

the bridge, and one can hardly see the forest for the trees. None—theless, it is not impossible to strip away the excess verbiage and produce a meaningful set of socio-economic prerequisites to accelerated growth in the poor countries. Certain to be at the top of any such list are the following:

- (1) broad, steady and rapid development of agriculture;
- (2) labour, managerial and technical skills adequate to sustain continuing industrialization;
- (3) effective control of population growth;
- ization and unemployment;
- (5) high-level productive efficiency -- with special regard for rapidly-rising exports to, and heavy capital flows from, the developed countries;
 - (6) close regional integration along the most profitable lines of trade and investment; and
- (7) solid institutional growth designed to increase the mobilization of domestic resources and to broaden local participation in the development process.

For many of the under-developed nations, poor performance on all

these fronts provides a stark measure of stunted growth and incrediblylow standards of living; nor is the result much softened by recognizing that the burden of responsibility is by no means theirs alone.

Some Research Guidelines

It is not enough, however, to identify and underscore the key problem areas. Considerations of manageability dictate further refinement of the research aims of a Canadian programme in the socio-economic-political field. The earlier emphasis on "Canadian capacity" and "comparative advantage" fills a substantial part of this need. There the case is made for uniquely-Canadian approaches generated by Canadian skills, but also for Western-based research that Canada's world posture equips it particularly well to undertake or sponsor. A number of important guidelines fit logically into this framework:

- (1) the research should be "remedy-oriented" -- so that its impact in the "tiers monde" may be maximized by rigorous policies implemented there and in the rich countries as well;
 - (2) other things equal, priority should be given to research topics which lend themselves most readily to inter-disciplinary treatment -- since, in the long run, this is bound to be the

- more successful route to an understanding of internationaldevelopment problems;
- where Canada's foreign aid is most heavily concentrated -so that Canadian aid-giving experience may be directly
 tapped and influenced by the ongoing studies;
- rather than confined to a single country -- since, for most poor countries, real progress may well be less firmly tied to national growth than to the development of the region of which each forms a part;
- (5) preference should also be given to projects raising issues

 which extend beyond the region under study -- so that research

 findings may have the widest-possible application within the

 under-developed world;
- (6) the list of top-priority studies should be short and the overall research programme flexible -- since extreme selectivity is the only way to produce substantial results during the new programme's formative phase, while rigidity is the surest way to foreclose exciting new projects which the selection process may have missed.

Two of these guidelines -- "remedy orientation" and "interdisciplinary treatment" -- deserve special emphasis. The distinction between "pure" and "applied" research is arbitrary at best, and today's pure research is not infrequently the applied research of tomorrow. It seems axiomatic, nevertheless, that if the proposed programme is to make its mark quickly and pointedly, it must enforce a ruthless selfdiscipline which confines research initiatives to problem-solving projects with a strong capacity for early "payoff" in remedial action. The other side of this particular coin is that, however delicate the task, such a programme must be prepared to exert substained pressures for the implementation of its research findings by the relevant authorities in developing and developed countries alike. Tardiness or inaction on known solutions to serious problems is, indeed, often at the heart of failure in this field; and it is worth repeating that Canada is very well placed to assume a major role in softening this bottleneck to international development.

As for the inter-disciplinary approach, its adoption requires much more than uttering platitudes of the kind which praise mother-hood and condemn sin. The real challenge here is that if the root causes of under-development are ever to be thoroughly understood,

they will yield only to a combined assault by a variety of scientific disciplines, particularly the social sciences — and this, paradox—do ically enough, in an age when specialization within individual disciplines has become increasingly strong. No one, of course, could reasonably presume that a new Canadian programme could or should seek all the answers. What does make practical sense, however, is to give a special impetus to "team" projects which permit an interlock—ing of research effort by scholars from different disciplines. The results are likely to justify the added planning burden; and they are certain to strengthen the element of uniqueness in the programme's sponsored research.

THE RESEARCH PROJECTS

Turning now to specific research projects, it is apparent that they pose both the easiest and the hardest problems for this Paper. The underlying rationale having been described, no great skill is required to list topics worthy of investigation. On the other hand, the length of the list and the rank-ordering of topics are matters of considerable discretion; the choice is much facilitated, but not definitively settled, by the foregoing discussion. Still more difficult

ology for each project; these cannot, in the nature of things, get a full airing until detailed plans are drawn up by the researchers who are to be intimately associated with particular projects.

Subject to such constraints, a list of suggested socialscience projects is offered below. Where appropriate and feasible,
comments will be made on substantive issues raised by the projects,
preferred geographic focus, Canadian capability, and possible links
with research programmes outside Canada.

The list is divided into two parts -- seven top-priority projects in the first group and five important projects in the second. There is, of course, no sharp line of separation: what is "top priority" for one observer may be "important" for another, and vice versa; moreover, subsequent investigation might call for a revised system of priorities. But this is not intended simply as a division of convenience. It reflects the judgment that a weighting of projects is essential in the context of any new research centre; and that while both groups are of real significance, the first is somewhat-more directly aimed at the compelling problems of international development.

The Top-Priority Projects

Here. then. are the top-priority projects in the social sciences:

(1) The New Agricultural Revolution,

There has been an unfortunate tendency to equate the process of industrialization in poor countries with the development of manufacturing industries in the rich-country image. This has produced, among other things, a widespread neglect of agriculture's role in economic, social and political change throughout the "tiers monde." Only now is it coming to be well recognized that for many of these countries, given their resource base, there is no alternative to continuing reliance on the agricultural sector as a prime motive force in national development.

Meanwhile, technology -- in characteristic fashion -has left social understanding far behind. A new agricultural revolution
has been under way during the past decade, and production breakthroughs in some of the poor countries have already begun to make
the difference between economic stagnation and rapid growth. The
overwhelming need is to probe the sources and impact of recent agricultural advance, with a view to suggesting the kinds of socio-economic

development which will prolong and accelerate that trend. 1

Clearly, there are many facets of the problem to be explored. The following rank especially high: (a) the effects of the new seed and fertilizer technology on agricultural employment and output; (b) farmers' production responses to favourable price shifts and other economic incentives; (c) the changing pattern of expenditure flows between the agricultural and industrial sectors; (d) the efficacy of cooperative-type institutions as a device for mobilizing farmers' savings and productive energies; (e) the implications of heavy land taxation for the growth of output in the farm sector; and (f) the role of rural communities in political decision-making at the local and national levels. Each of these sub-topics could, indeed, consume the whole project, and considerable "whittling-down to size" will be necessary. In this connection, it is worth emphasizing that

^{1 &}quot;The world is on the brink of an unprecedented opportunity," says William S. Gaud, Administrator of the United States Agency for International Development. "New inputs and infrastructure, new attitudes, adequate farm credit and sound policies are the active ingredients of this Green Revolution. And they are paying off. ...

[But] the question is whether this promising state of affairs will continue -- whether ... this burgeoning agricultural revolution will become a part of the permanent order of things." Address to the Tenth Annual Conference of the Society for International Development, Washington, D.C., March 8, 1968.

and that India and Pakistan, the two largest recipients of Canadian aid, provide the richest testing ground for social-science research along such lines.

It is also very significant that there can be no doubting Canada's capability in this field -- through the University of Guelph and the Prairie Universities, for example, as well as the federal and provincial Departments of Agriculture. Nor is there any question as to the promising opportunities for Canadian research collaboration with knowledgeable agencies like the Ford and Rockefeller Foundations and the United Nations Food and Agriculture Organization.

(2) Education and Manpower Planning.

Canadians have become painfully aware of the restraints imposed on the nation's growth by poor educational planning and inadequate use of available manpower. But if the problem is serious for Canada, it is desperate for the many under-developed countries which have indulged in the luxury of wasteful human-resources policy.

"To put the matter bluntly, the educational systems of developing nations have been overtaken by a profound crisis, whose basic nature and causes are much the same all across the world. It is in essence a 'crisis of maladjustment,' between educational systems and their environments, brought

about by the failure of educational systems to transform themselves rapidly enough to match the changing needs and burgeoning demands of their swiftly changing environments. ... The cure — if there is one — will at best be a long and complicated affair. ... Still, a cure <u>must</u> be found, for without it the whole crucial business of nation—building and of social and economic development can be tragically retarded for generations to come."²

Planning authorities in much of the "tiers monde" have, in fact, chosen to face up squarely to these harsh realities, and educational growth over the past fifteen years has been quite remarkable. However, the critical problems remain largely unresolved, for several reasons. First, policy-makers are chasing constantly-moving and rapidly-expanding manpower targets. Second, highly-innovative and therefore elusive, strategies are required to produce a sustained flow of appropriate technical and managerial skills in a grossly-"undermanned" economy. Third, and by no means least important, the educational systems of developing countries have often spawned powerful vested interests that have prevented fundamental reform.

It would be foolish to expect that a Canadian programme would plug all of this massive breach. A number of international

² Philip H. Coombs, "The Challenge to Educational Planning," International Development Review, June 1968, pp. 7 & 8.

organizations are already engaged in substantial research efforts towards that end -- notably OECD, the UNESCO-affiliated International Institute for Educational Planning, and UNESCO itself. At the same time, it must be pointed out -- in all frankness -- that these efforts have barely scratched the surface in terms of providing operational guidelines for human-resources policy, and even less so in terms of securing or speeding up policy implementation in the poor countries. Furthermore, Canada has a research potential in this field which will bear comparison with that of any programme elsewhere: concrete evidence of this can readily be found in the ongoing activities of the Economic Council of Canada and the federal Department of Manpower and Immigration; and there are more than a few Canadian universities, like McGill and the University of Montreal, which timely encouragement could launch on sizable programmes of manpower research and planning.

For a start, then, a new programme might select a reasonably-homogeneous region in the less-developed world; and might sponsor a comparative study analyzing its systems of education and training, and making strong recommendations for policy changes that meet the demands of modernization. Probably looming large

among the topics for research would be (a) the techniques used for matching manpower supplies against needs, (b) relative pricing and other inducements for the more skilled human resources, (c) ways and means of increasing the productivity of industrial labour, and (d) problems of curriculum orientation and teaching methods in the schools and universities. The selected region should be one of Canadian-aid concentration; and preferably an area with the type of ethnic setting which could relate to Canada's bicultural experience. Algeria, Morocco and Tunisia -- with their French-Muslim heritage -- would seem to fit smoothly into this regional framework.

Such a study (or series of studies) might benefit greatly from research collaboration with interested non-Canadian agencies.

It would, in any event, make a significant contribution to Canadian expertise on human-resources development. And it would set the stage for a vigorous Canadian effort aimed at the adoption of proposed remedies by the countries under review. Looking further ahead, one can envisage the possibility of a programme for multi-region research on manpower problems in poor nations.

"Industrialization typically leads to a concentration of investments upon one or two areas, while much of the

remaining national territory becomes locationally obsolete.

A dualistic structure is thus imprinted upon the ...
economy, comprising a 'center' of rapid, intensive development and a 'periphery' whose economy, imperfectly related to this center, is either stagnant or declining."

This is an authoritative, if rather jargonese, statement of the well-known proposition that swift industrial advance breeds heavy flows of people and capital into the cities -- with consequent dynamic development there at the expense of the neglected country-side. In the present context, however, such a statement is incomplete on several counts: (a) it does not stress that while this phenomenon characterizes the development of rich countries as well as poor, the latter generally experience far greater extremes of regional imbalance; (b) it does not mention that, particularly in the poor countries, these urban concentrations tend to grow and persist long after this is justified by considerations of economic gain; and (c) hidden by the scientific language is the fact that the severe resulting poverty, unemployment and social tensions carry the seeds of deep political unrest and violent revolution.

John Friedmann, Regional Development Policy: A Case Study of Venezuela (Cambridge, Mass.: The M.I.T. Press, 1966), p. 9.

Let there be no mistake about the gravity of the problem, nor about its dimensions. In every part of the under-developed
world, governments are struggling to cope with this "urbanization"
crisis. Success, in general, has been either fleeting or conspicuous
by its absence. And it takes no more than a Calcutta, or a Lagos, or
a Rio de Janeiro to substantiate the judgment that many of the difficulties may well be intractable.

Why, then, should a Canadian programme jump into this socio-economic and political "hornet's nest" — bearing in mind, also, that North Americans are already plagued with their own "crisis of the cities?" In the broadest terms, the answer is that no sizable "tiers monde"—oriented research organization can afford to ignore it.

More specifically, it seems clear that the Canadian programme could play an important catalytic role in marshalling the relevant social—science interests now to be found in various Canadian universities; marrying them with the appropriate skills of Canadian architects, engineers and town planners; and sponsoring carefully—defined research on urban development, possibly in association with expert non-Canadian agencies like the Joint Center for Urban Studies of Harvard University and the Massachusetts Institute of Technology.

Again, and especially in this vast field, there will be real limits on what a Canadian programme can profitably do. Perhaps the wisest initial course to follow would be to set up a "pilot project" aimed at a few of the newer areas of urban concentration -- where the problems, though serious enough, have not yet been thickly encrusted with chronic suffering and frequent failures in remedial policy. Nairobi (Kenya) and Dar-es-Salaam (Tanzania) appear well suited for selection on these grounds, and in the light of such other criteria as Canadian-aid emphasis and region-oriented research. Each city would receive an in-depth treatment probing (a) the causes of urban concentration, (b) the scale and pattern of unemployment, (c) the impact of school-leavers on the labour force, (d) the transport system, (e) the channels of commodity distribution, and (f) the development of housing and real estate -- all with a view to maximizing orderly urban growth and minimizing the socio-economic hardships of the unemployed.

The University of Toronto and, to some extent, McGill
University and Loyola College have already begun to build socialscience expertise on East Africa. This could provide the nucleus for
a viable sponsored research project on "urbanization and

unemployment." Moreover, it seems not too much to hope that,
with cautious expansion, a city-by-city approach along these lines
could materially strengthen parallel research efforts under way
outside Canada.

(4) Promoting Exports and Private Foreign Investment.

The poor countries' drive towards industrialization has also had major implications for their competitive position in the world economy. To a considerable degree, these have taken a negative form.

In point of fact, the burden of responsibility is a shared one. The rich nations have paid long and loud lip service to the idea that their markets must be opened wide to the exports of the "tiers monde." For the most part, however, the actions have fallen, and continue to fall, far short of the words — and this despite the glaring lack of logic in any policy which combines foreign aid with tight restrictions on imports. What is more, total flows of aid have become disturbingly weak in recent years — so much so as to give the poor countries good cause for skepticism about competition and specialization along the broadest international lines.

whole development strategy: first, the conviction that deteriorating commodity terms of trade have drastically reduced their living standards and have stunted their economic growth; and second, the belief that large-scale inflows of private capital might be incompatible with national independence. Armed with these fears, and with those on aid and market access, the developing countries have often embarked on programmes of import substitution and foreign-capital restraint that go much further than economic self-interest would warrant.

It is not for a new programme to tackle all these problems or to set all the irrational fears at rest. For one thing, increased foreign aid and wider access to markets are not primarily the business of research, but matters of governmental negotiation and action; it is for the Government of Canada, with its relatively clean hands, to exert the greatest possible pressures towards this end. Secondly, the political aspects of private foreign investment raise a host of issues which are very difficult to define and even more difficult to assess; Canadians have had enough trouble trying to understand the politics of foreign investment in their own economy. As for the terms

of trade, this field has already been well tilled, if not "over-tilled," and the research findings remain, in large measure, inconclusive; it is time to take a deep breath and await the development of fresh insights and new approaches to the problem.

For present purposes, it seems sufficient to emphasize that rapidly-rising exports and substantial private-investment inflows are necessary conditions for self-sustained growth in the underdeveloped world; and that many poor countries have submerged this truth in a sea of inward-looking economic policies which are frequently inconsistent with the growth objective. It follows that there is an important place for research designed to stimulate exports from, and private foreign investment in, the less-developed nations.

The information gaps are especially wide in relation to their potential for manufactured exports, and to the types of foreign-investment incentives and ventures best suited to particular regions.

Once again, the current research landscape is by no means empty.

There is UNCTAD, with its direct interest in "tiers monde" trade; there is the International Trade Centre, jointly operated by UNCTAD and GATT to encourage export growth; there is UNIDO, with its programme for industrial development; there is the United Nations

itself, with its continuing efforts to increase private-investment flows to the under-developed countries.⁴ But most of these initiatives are quite new, the problems are many, and the research has yet to be sharply focused. Given Canada's rich trade and foreign-investment experience, a Canadian programme should easily be able to find its niche.

Perhaps the most promising start would be to take a route already opened -- in the Caribbean, which has the triple advantage of limited size, close aid and historical ties with Canada, and relative neglect by research agencies outside this country. McGill University and the Private Planning Association of Canada have undertaken general studies in the trade field; while the External Aid Office has begun to explore Canadian investment prospects in Caribbean countries. Then, too, Canadian economists have served there with official study missions; and Canadian businessmen and civil

⁴ See the latest U.N. study, <u>Foreign Investment in Developing</u> Countries (New York, 1968).

See, for instance, Kari Levitt and Alister McIntyre, Canada-West Indies Economic Relations (Ottawa: Mutual Press Limited, 1967).

⁶ A notable recent example is the Canadian-U.K.-U.S. economic mission; see Ministry of Overseas Development, Report of the Tripartite Economic Survey of the Eastern Caribbean, January-April 1966 (London: H.M.S.O., 1967).

and development problems. The time is ripe for a careful "team"

examination of barriers to effective export performance and foreign

investment in selected Caribbean areas -- with a view to

suggesting concrete remedies and actively seeking their adoption.

There is every reason to believe that, with appropriate links to

related research elsewhere, there can be important extensions of

this group approach throughout the Caribbean and beyond.

(5) Problems of Regional Integration.

The "integration" issue is really cut out of the same research cloth as the question of "export-investment promotion."

That is to say, economic integration can here be viewed as a pooling device for bringing the same benefits more efficiently to the several countries comprising a specified region.

A huge literature has grown up around this subject in recent years. It ranges all the way from philosophical discussion of alternative forms of integration to the most technical analysis of economic effects within and outside the union. There has also developed a kind of folklore which sometimes verges on proclaiming integration as the greatest human advance since the printing press --

the panacea for most or all of the ills now plaguing the underdeveloped countries.

But this is not the place to plunge into such deep waters or to set the balance right. Suffice it to put forward the following central propositions: first, that regionally-integrated trade and investment activity can produce very substantial economic, and perhaps political, gains in the "tiers monde;" second, that for a variety of reasons often difficult to comprehend, the developing countries have as yet come nowhere-near to fully tapping this potential; third, that inclusion of one or more developed countries within an integrated unit may significantly enlarge the scope for gain on both sides; fourth, that integration experience and prospects in the less-developed world have to be judged more in terms of new industries and new skills than of the existing economic structure; fifth, that such judgment need not, and should not, be an "open sesame" to indiscriminate justification of integration schemes and policies; and finally, that no economic union is immune to the danger of inward-looking policies so extreme as to nullify the prodigious gains accruing from international competition and division of labour. These hypotheses, it is suggested, can provide the conceptual framework for a selective, sponsored research programme on "problems of regional integration." Once more, it is necessary to acknowledge that other organizations, like UNCTAD and the Inter-American Development Bank, are now active in this field.

And once again, it is necessary to emphasize that there is plenty of room for a properly-focused Canadian effort -- particularly in the Caribbean, which has already attracted considerable Canadian social-science talent; and where the University of the West Indies has fostered impressive, indigenous research on economic integration.

Special interest surrounds the events leading up to the establishment and early dissolution of the West Indies Federation. In large measure, the economics, the politics and the sociology of this complicated story remain to be told. They are bound to shed strong light on the high-potential sectors for integrated Caribbean

⁷ In the latter connection, see Havelock Brewster and Clive Y. Thomas, <u>The Dynamics of West Indian Economic Integration</u> (Jamaica: Institute of Social and Economic Research, 1967).

Sir Arthur Lewis, former Vice-Chancellor of the University of the West Indies and currently Professor of International Affairs at Princeton University, has apparently been probing these events for some time. His findings should prove very useful indeed.

development, and on the institutional arrangements best calculated to achieve it. In fact, all three areas — Federation history, "growth poles" and new institutions — constitute a viable and challenging research target for the proposed programme. It would be surprising if such a project did not give a new "policy" dimension to the existing literature on Caribbean integration; and if it did not facilitate further research initiatives on integration in other less—developed regions. 9

(6) Family-Planning Experience.

Population growth in the poor countries has long been like the weather: everyone talks about it, and virtually no one does anything to control it. The damaging effects of this "population apathy" have cumulated over many decades, and the opportunities foregone can never be restored. But if the past is tragic, the future is heavy with the uncertainty of harsher things to come.

"Recent years have been witnessing a veritable of demographic revolution, the pace and dimensions of which

⁹ The McGill Centre for Developing-Area Studies is about to launch a study of the regional economic implications of selected national development plans in Latin America; Dr. Jaleel Ahmad, presently a Senior Research Associate at Harvard University, will be the author. See, also, the McGill study by Nicolas G. Plessz, Problems and Prospects of Economic Integration in West Africa (Montreal: McGill University Press, 1968).

are without precedent anywhere in the world.... The mechanism of this new ... trend is simple. Mortality rates have declined sharply, while fertility rates have remained, on the whole, at the very high levels that seem to have prevailed as far back as any reliable estimates exist. The rates of natural population increase — and of reproduction — have therefore gone up sudden—ly and rapidly, reflecting to the full the decline in mortality." 10

The crisis is probably most acute in South Asia, China,

North Africa and the Caribbean. Particularly in India and Pakistan,

surging population-growth rates -- far in excess of those anticipated

-- have forced drastic revisions in planning strategy, have severely

constrained the rise in per capita income, and have set the stage for

problems of unemployment even more serious than those already

undermining national stability.

Solid remedial efforts are under way, to be sure.

Western science is well on the road to developing cheap, safe and simple contraceptive devices that are usable everywhere in the underdeveloped world. Family-planning programmes have begun to overcome mass hostility and suspicion in a number of countries; and foreign agencies -- notably the Population Council, the Ford Founda-

¹⁰ Gunnar Myrdal, Asian Drama, Vol. II, pp. 1390 & 1391.

Organization — are now working actively to increase the effectiveness of birth-control policies in the "tiers monde." However, it is
one thing to produce the technical device, and even to arouse local
sympathy towards its use, but quite another thing to produce the
mass enthusiasm and the dynamic administration that are vital to
success. It is primarily in these fields of motivation and administration that an enormous job remains to be done; and there is ample
scope for Canadian initiative.

evaluating family-planning experience in selected areas of India and Pakistan — and perhaps Ceylon, a substantial recipient of Canadian aid and unique in South Asia for the high quality of its public-health facilities. Among the key topics to explore for each region would be (a) the pattern of change in population size and structure, (b) links between the birth rate and rising standards of living, (c) attitudes and responses to new birth-control measures, and (d) ways and means to improve and invigorate family-planning administration.

Whatever the "population payoff" -- sharply-declining
birth rates -- lacks in immediacy, it gains in the certainty that
effective family planning now will promote increased economic welfare in the decades ahead. And there is the important fact that

Canada possesses considerable research potential for this task -in the demography-oriented Department of Sociology at the University
of Western Ontario, for example; 11 also in the federal-government

Bureau of Statistics, and the Department of Demography at the

University of Montreal. A modest investment in such resources,
and in appropriate links with research agencies outside Canada,
would give promise of large dividends on the crucial population front.

(7) "Racialism" and Economic Development.

It would be comforting to believe that new nations will be typically "defuse" their own internal tensions in order to meet the overriding challenge of economic development. But it would also be unrealistic, and indeed dangerous, to assume that preoccupation with the growth problem guarantees the triumph of reason over passion

Prior to becoming Department Chairman, Dr. John F. Kantner and make served for some years as a demographic specialist in the Population Council.

will come only when the development process is sufficiently advanced to create a favourable economic climate for resolving social conflicts; and in any event, it will not come easily or quickly, as Germany in the 1930's and the United States in the 1960's illustrate in such vivid fashion.

A distinguished West Indian has put the issue in proper historical perspective:

"Every society has to learn to rise above its divisions, whether of class, race, religion, language or tribe. ... What in the end does the trick is economic development, which abolishes both the vertical and the horizontal divisions. ... The developed societies are much further along this road, and have had the advantage of being able to take their problems one by one. ... We in the new states suffer more because we have to fight on all these fronts simultaneously. Our different tribes, classes, religions, languages and races have decided to fight each other all at the same time in this one short moment of history. This is why our countries seem so angry: they are full of leaders shouting at each other all the time about so many different things. ... The end of [all] this [may well be] the class-less detribalised society, where nobody cares what race or religion you belong to. ... But in the meantime, the ethical and cultural values which we seek to preserve are like a thin veneer, easily rubbed off by mass hatreds and ignorance."12

¹² Sir Arthur Lewis, Chancellor's Installation Address at the University of Guyana, Georgetown, January 25, 1967, pp. 10, 12, 13.

Nigeria is only the latest tragic example of the enormous social costs imposed by rampant "racialism" in the under-developed world.

This problem runs deep, and it is not going to vanish overnight like the rain-clouds in a hot summer sky. But without an early forward momentum, there can be little ground for optimism about long-term progress in the "tiers monde." Apart from economic growth itself, the prime need is clear insight into the basic forces at work, and remedial policies attuned to the special circumstances of each region. To some extent, of course, the tensions and conflicts are themselves an economic phenomenon -- gross income disparities among various groups, differential access to the most lucrative and most prestigious jobs, discriminatory tax and tariff treatment, and so on. But there is a great deal more -- unequal educational opportunity, restrictive language policy, lop-sided group participation in political decision-making, culture-based denial of civil and religious rights. And there is the acute problem of harmonizing diverse group attitudes and skills during the critical years when a more balanced development is being fostered through public policy.

In these topics are the makings of a significant research venture on the interplay of racial and cultural forces in selected poor countries. It seems altogether fitting that a new Canadian programme — given Canada's history and the lessons Canadians are learning from their own mistakes — should assume a key role in this vital field. Indeed, much of the raw material for such research should soon be readily available in the massive documentation of the Royal Commission on Bilingualism and Biculturalism.

As usual, it will be necessary to refine the project down to manageable size, and particularly to settle the question of geographic scope. In the latter context, a variety of places would be logical choices for Canadian emphasis, but perhaps none more so than the following: Guyana and Trinidad-Tobago, whose problems of race and national origin are possibly the most serious in the entire Caribbean; Ceylon, where recent language restraints have severely aggravated an already-tenuous relationship between the Buddhist-Sinhalese majority and the Hindu Tamils; and Nigeria, where an early truce in the civil war now appears likely, but where the persistence of bitter inter-group strife would be fraught with the gravest dangers for political stability throughout Africa. As for the refined

choice of research topics and techniques, it is well to keep in mind
the real benefits that can derive from close collaboration
with non-Canadian agencies; a notable case in point is the Centre
for Multi-Racial Studies, jointly operated in Barbados by the
University of the West Indies and the University of Sussex (England).

Other Important Projects

A supplementary listing of research projects for a Canadian programme is now in order. Here again, there can be no magic number of important studies, and no system of logic can completely rid this choice of arbitrary elements. What is offered, in fact, is an illustrative short list of projects -- very briefly discussed -- which appear to be broadly consistent with the guidelines set out above.

(1) The Role of the Military in Developing Countries.

This is surely one of the more fascinating aspects of nation-building in the "tiers monde." The armed forces have played, and continue to play, a multitude of parts there -- sometimes heavily positive, sometimes largely negative, nearly always in sharp contrast to the role of the military in developed states. There is much

after independence in selected new nations of South and Southeast

Asia as well as West and East Africa -- and perhaps, also, the

military in the older political setting of Latin America. McGill

University is currently preparing to sponsor a study along these

lines. 13

(2) Development Planning and Economic Growth.

tral fact of life throughout the less-developed world. This being so, it is not surprising that a voluminous literature has grown up around the techniques of planning in the poor countries. The curious thing, however, is that so little is yet known about actual planning experience in the new states — the planning process, the problems of plan implementation, the impact of planning on economic performance, the lessons to be drawn from errors in plan formulation and execution.

Countries like India, Pakistan, Ghana, Tanzania and Brazil immediately suggest themselves for special attention. There are substantial

¹³ It is expected that the study will be conducted over a two-year period by General J.N. Chaudhuri, presently India's High Commissioner to Canada and a former Chief of Staff of the Indian Army.

and in such universities as Toronto, Western Ontario, McGill,

Montreal and British Columbia. Furthermore, it is not at all in
conceivable that the research would have strong "feedback" effects

on Canadian economic planning.

(3) The Role of Bureaucracy in the Development Process.

For various reasons, national policy-making has rested on a very narrow base in many of the less-developed countries. In particular, stunted educational growth and intensive concern with subsistence needs have conspired to deprive the masses of the best opportunities for effective participation in the political process. The civil service has filled this gap to a striking degree — and much more so than in the developed world. For good or ill, it is the government bureaucracy which has often held the life-and-death power over socio-economic and political change in the poor nations. How the bureaucracy has developed, how biographical and social factors have shaped the innovative capacity of its leading members, how far they are likely to build the domestic institutions essential to solid progress—these are among the core questions to be answered, in comparative terms, for selected countries in the Caribbean, South Asia and West

Africa. Canadian research beginnings have already been made in this direction, notably at Queen's University; 14 the new programme would do well to strengthen and expand such important initiatives.

(4) Criteria for Aid-Giving.

There is something to be said for delaying a frontal attack on problems of foreign-aid policy and programming in the developed and developing countries. The major issues are no less complex than they are significant. But be that as it may, there is good reason to suggest a sponsored study of criteria for donor decisions on amounts, types and geographic allocations of economic assistance to the "tiers monde." Until now, this topic has suffered from an over-supply of loose, poorly-articulated and mutually-inconsistent ideas. It may be that there is no logical system of criteria; and that no satisfactory tests of economic performance in the aid-receiving country can be devised. However, even if this turns out to be so there will have been at least provided a systematic airing of problems in a confused sphere of public policy.

¹⁴ Dr. Khalid B. Sayeed, Professor of Political Studies, is working out a general framework for comparative research on the role of bureaucracy in modern and modernizing states.

Alternatively, there could emerge -- with modest expense and relative speed -- a comprehensive and authoritative guide to more rational decision-making by aid-giving countries and international agencies.

(5) Political Systems and Economic Development.

An intriguing question about development has to do with the types of political structure best calculated to induce rapid and sustained socio-economic change in the poor countries. Perhaps the only clear starting premise is that Western-style representative government cannot be effectively transplanted in the "tiers monde" without substantial adaptation to local circumstances. The above comments on the special role of the military and the bureaucracy serve to reinforce this basic point. But they do not bear fully on two prime concrete issues: how well particular systems of law-making and law enforcement in poor countries promote their overall development goals; and what forms of adaptation are most likely to produce a reasonable balance among political stability, economic performance and broad participation in the development process. Canadian federalism may have much to offer -- all the more so in relation to parliamentary systems like India, Malaysia, Nigeria and the Caribbean countries

formerly linked to Great Britain. And a Canadian programme would be able to draw on a wealth of Canadian-university research skills in law, political science and the other relevant disciplines.

CONCLUDING REMARKS

It remains only to make a few concluding observations.

These amount, essentially, to an underscoring of certain key points that are implicit throughout the Paper.

research blueprint nor a call for simultaneous launching of all the studies. Changes in research emphasis — and in choice of topics — are very likely to emerge from continuing discussion and actual experience. Moreover, given the severe scarcity of skilled human resources, even the most liberal financing would not permit a new programme to proceed at once on all social—science fronts. What is submitted here is, rather, a tentative "research menu" which will have to be carefully adjusted and sampled in order to avoid "project indigestion."

Second, each project will typically prove to be a com-

is considerably more varied than the formal list suggests. But it also means that it will be possible to link studies under a number of central themes. And this -- together with concentration on major recipients of Canadian foreign aid -- will enhance both the logic and the manageability of the new research programme.

Inkages. That is to say, the twelve proposed research projects raise a substantial number of interlocking issues -- for example, problems of labour productivity, under "education and manpower planning" as well as "urbanization and unemployment;" also, problems of nation-building, under "the role of the military" and "political systems and economic development." Then, too, there are important research links to be exploited by the social-science projects and other main areas of Canadian interest -- as between "transportation" and "regional integration," for example; between "communications" and "racialism;" and between "agriculture" and "the green revolution."

Fourth, in the present context successful research requires two kinds of intensive "follow-up" effort. It will be necessary to engage in periodic re-evaluation of project

techniques and findings -- so as to ensure steady improvement in the quality of its studies. It will be equally necessary to make an ongoing appraisal of research achievement in the form of remedial action taken by the appropriate authorities -- so as to ensure maximum impact on problems of international development.

Finally, and perhaps most important, a new Canadian programme will have to contend with deep sensitivities in the social-science field.

Topics dealing with socio-economic and political change can, and sometimes do, arouse serious concern in developing countries anxious to create a positive image abroad. It is, therefore, vital that the closest liaison be maintained with host governments and educational institutions — not only on the administrative formalities of visits by programme supported scholars, but also in terms of seeking advice and collaboration in the host countries. Needless to add, such ties would make Canada's research programme far more meaningful and relevant than it could possibly be otherwise.

APPENDIX "C"

SCIENCE POLICY STUDIES AND A CANADIAN PROGRAM

OF INTERNATIONAL DEVELOPMENT

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Science Policy Studies and a Canadian

Program for International Development

Contents

Science Policy and Science Aid

- A Science Policy Research Program for the International Development Centre
- (a) The Problems
- (b) Methods of attack
- (c) Organization

Science Policy Studies and a Canadian Program for International Development

One of the most important developments in the industrialized countries since the Second World War has been the recognition by governments that science and technology are powerful tools in solving national problems. This recognition has led to vast increases in government expenditures on science. But despite the sums of money spent, there are still more problems and ideas for their solution than there is money available. A second development, of only a few years duration, has been the recognition that there must be policies which guide the allocation of funds for science. These policies should seek to optimize the economic, health, welfare, cultural, political, and military returns to the country from the investments in science. Collectively these policies, which determine priorities and aim to improve the productivity of both the creation and use of knowledge, have become known as a nation's science policy.

Similarly at the level of the firm, managements are seeking to understand the ways in which research and development contribute to the success of the firm in domestic and world markets. They too must formulate rational policies to guide their expenditures on science.

At both levels, the nation and the firm, the success of the science policies depends on the level of understanding of how science and technology contribute to the attainment of goals, and on how this understanding is converted into specific policies. This situation has led to the beginning of a third development, and this is the recognition that research is needed to improve both

the level of understanding and the methodology for formulating policies. Science policy research is now carried out in several universities, international organizations, government departments, and in private institutions.

The recognition that large sums of government money should be spent on science, that it should be spent rationally, and that there is a need for research on how to define rational policies, have all taken place in the more industrialized countries. For the most part the developing countries have neglected science. Ninety-five per cent of all the world's annual expenditures on science take place in the thirty most industrialized countries.

The rest of the world accounts for the remaining five per cent.

The potential contributions of science and technology to the solutions of the problems of the developing countries are, however, enormous. For many problems appropriate technologies exist in other parts of the world, and what is required is a transfer and diffusion. For other problems there are no existing solutions, and only research can provide the answer. But whether research is required or absorption of foreign know-how is sufficient the developing country must have its own indigenous scientific and technological capabilities.

Just as the governments of the industrialized countries have had to finance most of the nation's scientific activities, so in developing countries the governments must provide the bulk of the finance. And just as a science policy is required in the industrialized countries, so too must the developing countries build up their scientific institutions and determine priorities according to

a well defined policy. The alternative is an ad hoc growth of science which in the past has been governed mainly by the state and requirements of science in the advanced nations rather than by what the developing country 'needs'. A part of the science policy process must be to define these needs.

Science Policy and Science Aid

Technical assistance has always been an important component of most donor countries aid programs. Some extremely valuable contributions to development have resulted from this type of aid, but for the most part the results have fallen short of expectations. There are many reasons for this, but one of them is undoubtedly because most of the recipient countries have no clear idea about what types of science and technology are required. The aid projects tend to be ad hoc; their impact on development is slight and frequently there is no continuing program after the technical assistance is finished.

If the recipient country had its own science policy which indicated priorities and showed how the scientific institutions were to grow, then science aid could be provided to help implement the policy. In this way the aid would be relevant to needs and would be likely to be more effective.

The sort of aid which is required falls into
two categories. The first is the transfer of technologies
of a type which are appropriate to the needs and requirements of the developing country; requirements which should
be defined in the science policy studies. The second is
aid to help establish an indigenous scientific capability
in the developing country. This is necessary because

without its own science a country must always be dependent on foreign assistance. An indigenous scientific capability will help the country to define and solve its own problems, help provide the 'receiving stations' for foreign technology, and will help to provide the social milieu which is so essential for modernization and development.

Aid to provide appropriate technologies is itself of two kinds. First there is the transfer of existing technology. Second there is aid to create new technologies, which can be either adaptations and modifications of existing techniques, or can involve research and development to produce radically new technologies. But whether the transfer involves prior research or not, it is vitally important that the technologies be appropriate for the needs. All too often in the past the transfer has been of technologies designed for industrialized societies in temperate regions, rather than for agricultural societies in the tropics.

The science policy of the developing country, by defining the country's scientific and technical 'needs' should thus provide the basis for a donor country's science aid policies.

The science aid policies of donor countries themselves could have a significant impact on the science policy of their own country. If a major science aid effort is mounted then many scientists and engineers will be required over and beyond what the country requires for its domestic science programs. This requirement must be catered for in its own science policy and manpower plans.

A Science Policy Research Program for a Canadian International Development Program

(a) The Problems

A balanced science policy research program should have at least two components. In the first place it should have a basic component which is aimed at obtaining a better understanding of the complex inter-relationship between science, and economic and social change. This understanding will help in the formulation of better science policies, but like basic research its pay off is uncertain and relatively long range. Secondly, the research program should have more limited objectives aimed at providing the knowledge and tools which the science policy maker uses in the formulation of policy. This type of study is akin to applied research.

A third possible component might be a pilot plant stage where the insights gained from the other stages are tried out under field conditions in a specific developing country. In this way help could be provided to a developing country to formulate its science policy.

The first, or basic component, is particularly important in the context of the developing countries.

Research is required to identify the factors which are conducive to innovation, and those which oppose and resist innovations. This will require a careful analysis of a number of successful and unsuccessful innovations in different sectors of the economy and in different societies.

Most of the basic work that has been done on the economics of innovation and the sociology of science has been done in the context of the industrialized societies. This work needs to be extended and adapted to the context of the developing societies.

For example, it has been suggested that science is an extremely important catalyst in helping to overcome tradition and superstition. Without a general mass understanding of science, scientific research and innovation may have little impact on the society. It is important that this phenomenon be better understood, because on its validity rest policy decisions on how much of a country's resources should be devoted to popularizing science.

At the more applied level the objective would be to help provide the methodological tools and information required by science policy makers. The following are some of the more important problems which require solution:

- (1) How should science planning be related to economic planning. How can those sectors of the economy be identified which are in most urgent need of technological change.
- (2) How can the technology most appropriate for local needs be identified.
- (3) What factors should be considered in the decision of whether to import a technology from abroad or to carry out domestic research and development.
- (4) What is the best organizational framework for science given the local economic, social, and political structure.
- (5) How can the effectiveness of the country's science system be measured - and improved. What are the conditions which enable a good scientist to do creative work in the environment of a developing country.
- (6) How can the country's scientific and technical manpower requirements be estimated and how should they be met.
- (7) What are the best ways of popularizing science and integrating the science system with the economic and social system in the country.
 - (8) What are the most effective ways of diffusing new technologies throughout the society.
 - (9) How much basic research should be carried out in a developing country.

(b) Methods of Attack

Several different lines of attack will be required to solve the problems identified above.

Some of the problems are theoretical and will require the development of analytical techniques and the application of operation research and systems analysis to the problems of planning and cost benefit studies.

Other projects will involve the analysis of data gathered on part of the Canadian program, such program should therefore aim to collect statistics about scientific manpower and expenditures from all developed countries and to keep this recorded in a data bank.

Other information about the structure, composition and effectiveness of science councils, and research organizations, should be collected, so that it will be available for comparison and analysis. In fact, whenever possible information relevant to the innovation process should be quantified and stored.

A third set of problems will require field investigation. One such research program should be to assess the waysin which technology is currently transferred from developed to developing countries. The first phase of this study should be a detailed analysis of the experience of Canadian firms in transferring their technology and know-how to enterprises in developing countries. This should be done industry by industry, and will require investigation in both Canada and the appropriate countries overseas. The objective will be to learn from past experience and to find ways to promote the effective transfer of more appropriate technologies, and at the same time to ensure that there are mutual benefits for both the Canadian and foreign enterprises.

Field investigations and case studies must also be made to find solutions to many of the other problems. These problems were stated in general terms, but their solution will require very specific investigations. For example, field studies will be required to identify the relevant factors which must be considered in the definition of "appropriate technologies", and in the analysis of factors encouraging and hindering innovation.

A fourth approach will be to make analyses of the science policies of selected countries with the objective of evaluating the development lessons to be learned from these countries. In some instances the studies may be historically oriented so that the lessons from the past can also be evaluated. Countries which warrant such studies include; Japan, China, India, and Mexico.

(c) Organization

The details of the organizational arrangements for science policy studies will depend on the organization of the program as a whole. However, certain elements of a science policy program can be suggested:

- (1) There would be a group based at the program headquarters which might have the following functions:
 - (i) Compilation of data
 - (ii) Analysis of data, and theoretical studies
 - 'iii) Identification of both problems and suitable individuals and organizations for placing contract research.

- (iv) Evaluation of contracted research
- (v) Disseminating the results of the research
- (vi) Organizing conferences. Some would be research conferences and others would have a wider education function.
- (vii) Carrying out special feasibility studies of large inter-disciplinary projects such as large river basin development projects.
- (viii) Evaluating the science policy implication of other research programs supported by the program headquarters.
- (2) Research programs could be contracted out to
 University groups and other organizations.

 Wherever possible investigations which require
 field studies should be done jointly by teams
 from both developed and developing countries.

 It is also important that many of the projects
 be contracted with Universities, since the
 training of new talent for science policy investigations should receive high priority.



First Session—Twenty-eighth Parliament

THE SENATE OF CANADA

PROCEEDINGS OF THE

SPECIAL COMMITTEE

ON

SCIENCE POLICY

The Honourable MAURICE LAMONTAGNE, P.C., Chairman
The Honourable DONALD CAMERON, Vice-Chairman

No. 33

THURSDAY, FEBRUARY 27, 1969

WITNESSES:

Central Mortgage and Housing Corporation: H. W. Hignett, President; A. J. Hazeland, Chairman of the Advisory Group; R. T. Adamson, Executive Director and Chief Economist, and A. E. Coll, Executive Director.

APPENDIX:

34.—Brief submitted by Central Mortgage and Housing Corporation.

MEMBERS OF THE SPECIAL COMMITTEE

ON

SCIENCE POLICY

The Honourable Maurice Lamontagne, *Chairman*The Honourable Donald Cameron, *Vice-Chairman*

The Honourable Senators:

Aird Grosart Belisle Haig Blois Havs Bourget Kinnear Cameron Lamontagne Carter Lang Desruisseaux Leonard Giguère McGrand

> Patrick J. Savoie, Clerk of the Committee.

Nichol

O'Leary (Carleton)

Phillips (Prince)

Robichaud

Thompson

Sullivan

Yuzyk

ORDERS OF REFERENCE

Extract from the Minutes of the Proceedings of the Senate, Tuesday, September 17th, 1968:

"The Honourable Senator Lamontagne, P.C. moved, seconded by the Honourable Senator Benidickson, P.C.:

That a Special Committee of the Senate be appointed to consider and report on the science policy of the Federal Government with the object of appraising its priorities, its budget and its efficiency in the light of the experience of other industrialized countries and of the requirements of the new scientific age and, without restricting the generality of the foregoing, to inquire into and report upon the following:

- (a) recent trends in research and development expenditures in Canada as compared with those in other industrialized countries;
- (b) research and development activities carried out by the Federal Government in the fields of physical, life and human sciences;
- (c) federal assistance to research and development activities carried out by individuals, universities, industry and other groups in the three scientific fields mentioned above; and
- (d) the broad principles, the long-term financial requirements and the structural organization of a dynamic and efficient science policy for Canada.

That the Committee have power to engage the services of such counsel, staff and technical advisers as may be necessary for the purpose of the inquiry;

That the Committee have power to send for persons, papers and records, to examine witnesses, to report from time to time, to print such papers and evidence from day to day as may be ordered by the Committee, to sit during sittings and adjournments of the Senate, and to adjourn from place to place;

That the papers and evidence received and taken on the subject in the preceding session be referred to the Committee; and

That the Committee be composed of the Honourable Senators Aird, Argue, Bélisle, Bourget, Cameron, Desruisseaux, Grosart, Hays, Kinnear, Lamontagne, Lang, Leonard, MacKenzie, O'Leary (Carleton), Phillips (Prince), Sullivan, Thompson and Yuzyk.

After debate, and—
The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Thursday, September 19th, 1968:

"With leave of the Senate,

The Honourable Senator Lamontagne, P.C. moved, seconded by the Honourable Senator Benidickson, P.C.:

That the name of the Honourable Senator Robichaud be substituted for that of the Honourable Senator Argue on the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceeding of the Senate, Wednesday, February 5th, 1969:

"With leave of the Senate,

The Honourable Senator McDonald moved, seconded by the Honourable Senator Macdonald (Cape Breton):

That the names of the Honourable Senators Blois, Carter, Giguère, Haig, McGrand and Nichol be added to the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative."

ROBERT FORTIER,

Clerk of the Senate.

MINUTES OF PROCEEDINGS

Thursday, February 27, 1969.

Pursuant to adjournment and notice the Special Committee on Science Policy met this day at 3:30 p.m.

Present: The Honourable Senators Lamontagne (Chairman), Blois, Bourget, Carter, Giguère, Grosart, Haig, Kinnear, and Robichaud.—(9).

In attendance:

Philip J. Pocock, Director of Research (Physical Science).

The following witnesses were heard:

CENTRAL MORTGAGE AND HOUSING CORPORATION:

H. W. Hignett, President;

A. J. Hazeland, Chairman of the Advisory Group;

R. T. Adamson, Executive Director and Chief Economist, and

A. E. Coll, Executive Director.

(A curriculum vitae of each witness follows these Minutes:)

The following is printed as Appendix No. 34:

-Brief submitted by Central Mortgage and Housing Corporation.

At 5:30 p.m. the Committee adjourned to the call of the Chairman.

ATTEST:

Patrick J. Savoie,

Clerk of the Committee.

CURRICULUM VITAE

Hignett, Herbert William, M.B.E.-H.W. Hignett, M.B.E., joined Central Mortgage and Housing Corporation at its inception in 1946 taking over the post of branch manager at Winnipeg. Three years later, he was appointed Prairie Regional Supervisor and served in that capacity until assuming the position of Ontario Regional Supervisor in 1953. He was appointed an Executive Director at head office in Ottawa in 1957, the position he occupied until his appointment, in October 1963, as Vice-President. He became President in July 1964. Mr. Hignett was born on January 20, 1913. He received his education in Winnipeg and was graduated from the University of Manitoba in 1936 with a Bachelor of Science degree in Civil Engineering. After his graduation, Mr. Hignett received an appointment with the Engineering Department of Winnipeg and worked with their construction division for the next four years. In 1940 he enlisted with the Royal Canadian Engineers and attained the rank of Major prior to his retirement from the service in 1946. He was made a Member of the Order of the British Empire in recognition of his Army Service. He is a member of the Professional Engineers' Association of Ontario, the Engineering Institute of Canada and the Military Engineers' Association.

Hazeland, Andrew John Manning, widely experienced in the architectural field, A. Hazeland has been with Central Mortgage and Housing Corporation since it commenced operations in January, 1946. Born in Hong Kong on November 30, 1908, Mr. Hazeland received his early education at the Chefoo School in China and then came to Canada to attend the University of Toronto in 1927. Receiving his Bachelor of Architecture degree in 1931, he joined Mathers and Haldenby Architects in Toronto. A year later, Mr. Hazeland went to the Far East to take up the position of Chief Architect with Hazeland and Gonella Civil Engineers in Hong Kong. In 1935, he returned to Canada and accepted a position with Connaught Laboratories, University of Toronto, as architectural designer. After two years with the University of Toronto, Mr. Hazeland set up a private practice in Toronto. In 1940 he joined the Engineering Department of the Aluminum Company of Canada at Montreal. He remained with that company until 1942 when he was appointed to the Canadian Division of the War Production Board in Washington and carried out his duties there for three years. In 1946 he joined Central Mortgage and Housing Corporation as Assistant General Supervisor, Construction Division. In 1950 he was appointed an assistant secretary. In 1955 he was named Advisor on House Design. In 1968 he became Chairman of the Advisory Group.

Adamson Robert T.—Robert T. Adamson, Executive Director and Chief Economist, was born in Winnipeg, Manitoba. He is a graduate of the University of Manitoba (Bachelor of Arts—1943) and the University of Toronto (Master of Arts—1946). Prior to joining Central Mortgage and Housing Corporation in 1947, Mr. Adamson was on the staff of the University of Toronto as research assistant with the Toronto Metropolitan Housing Research Project. Mr. Adamson joined the Corporation as assistant statistician, Economic

Research Department, Head Office, and in 1950 was appointed Supervisor of the Department. He was named Chief Economist for CMHC in 1955 and that same year became a member of the newly created Advisory Group. In 1960, when the Economic Research and Statistical Departments were combined to form the Economics and Statistics Division, the new Division was placed under the Direction of Mr. Adamson. In July 1965, he was appointed an Executive Director of the Corporation, assisting the President on policy matters and special activities, while continuing as a member of the advisory group and Chief Economist.

Coll Alfred E.—A. E. Coll came to Canada for the first time in 1941 as a member of the Royal Air Force. On retirement from the air force, with the rank of Squadron Leader at the end of the war, he returned to Canada to take up permanent residence. A native of Gibraltar, Mr. Coll is a Law graduate from Middle Temple, London, England. Mr. Coll joined CMHC in 1947. In 1949, he was appointed regional property manager for British Columbia Region. In 1950 Mr. Coll was appointed assistant general supervisor, Real Estate Division, head office. He became supervisor, Mortgage Administration Department, in 1953. In 1955, he was named advisor on public housing and on March 13, 1959, he was named director, Urban Renewal and Public Housing Division. He was named supervisor of the Prairie Region in November, 1964. After a year at Laval University in Quebec City, participating in the government's special bilingual program, he was appointed as an Executive Director in July, 1968.

Research Department, Head Office, and in 1950 was appointed Supervisor of the Department, He was named Chief Economist for CMHC in 1955 and that saine year became a member of the newly created Advisory Group. In 1960, when the Economic Research and Statistical Departments were confiding the John Mr. Adamson. In July 1965, he was the new Division was diaced under the Direction of Mr. Adamson. In July 1965, he was appointed in Executive Director of the Direction of Mr. Adamson. In July 1965, he was night a population of the Section of the Control of the Con

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THE SENATE

SPECIAL COMMITTEE ON SCIENCE POLICY

EVIDENCE

Ottawa, Thursday, February 27, 1969.

The Special committee on Science Policy met this day at 3.30 p.m.

Senator Maurice Lamontagne (Chairman) in the Chair.

The Chairman: Honourable senators, we have the pleasure of receiving this afternoon the representatives from Central Mortgage and Housing Corporation. This delegation is headed, as it should be, by its President, Mr. H. W. Hignett. He is accompanied by Mr. A. J. Hazeland, Chairman of the Advisory Group, and by Mr. R. T. Adamson and Mr. A. E. Coll, Executive Directors.

I understand that Mr. Hignett will follow well established precedence and will give us first an opening statement which will be followed by our usual discussion period.

Mr. H. W. Hignett, President, Central Mortgage and Housing Corporation: Thank you, Mr. Chairman. Mr. Chairman and honourable senators, I am honoured to be invited to appear here today and I am consoled by the fact that sitting immediately in front of me is a former eminent director of Central Mortgage and Housing Corporation, who has recently undertaken some new tasks.

The Chairman: He has been elevated.

Mr. Hignett: Yes, indeed. If I may, I would like to add some remarks to the material we have already sent to the committee. I would like to review in a general way what has been done and comment briefly on the possibilities and needs of the moment.

If I may break in here, Mr. Adamson, who is an Executive Director of the Corporation and a member of the advisory group, has just joined us.

There are two acts under which we operate in the area in which you have an interest. These are Part V, sections 31-33 of the National Housing Act 1954 and section 26 of the Central Mortgage and Housing Corporation Act.

The NHA when introduced in 1944 recognized that investigation, information and development were a necessary part of a housing act. The preamble of Part V section 31 of the act makes this clear and states:

It is the responsibility of the Corporation to cause investigations to be made into housing conditions and the adequacy of existing housing accommodation in Canada or in any part of Canada and to cause steps to be taken for the distribution of information leading to the construction or provision of more adequate and improved housing accommodation and the understanding and adoption of community plans in Canada.

Sections 32 and 33 of the act set out a wide range of research, information and developmental activities for which funds can be used. It can be said that in one way or another some action has taken place along this wide front and perhaps somewhat beyond even what was contemplated originally. We have, in our brief to the committee, reported those activities which were relevant to your questionnaire. They form a relatively small proportion of assistance under Part V of the act. I think it useful if I describe to you the support given under Part V in a rather wider field of endeavour. This includes assistance for advanced educational training and study, institutional support, and the distribution of information. Some of these activities may be classified as art rather than science but many of them involve some scientific procedures and some scientific personnel. I hasten to add that within the whole universe of concern for the building of cities and housing what might be done is so great and what can be done has been and still is limited to a degree by the resources of skilled people.

Honourable senators, you have a catalogue of all of the Part V grants which shows what has taken place. We delayed giving you this sooner as we had hoped to have copies in French for you. I am sorry our Translation Department has not been able to complete the work for this. It might be of interest to tell you of some points of special concentration of the work done. These are in four main categories.

In Community Planning special efforts were first made in improving subdivision layout. This was followed by strengthening and developing planning schools to meet the storage of qualified planners. As urban problems increased emphasis was placed on developing skilled people to work in this field. Since 1966 there has been introduced a large fellowship program. This program offers support for full time graduate study leading to masters and doctoral degrees within a broad group of fields related to housing and urban affairs. It is here we are trying to fill a gap in human resources. In Housing Design, although the single family house (the small house designs scheme) has received most attention, there have been special steps taken to widen the vocabulary of housing, particularly in multi-family vertical and horizontal housing. Also there have been endeavours to encourage improvement of existing dwellings or residential areas by rehabilitation. It is here we are working with the design professions, the building industry and the public. In Building Technology there has been a particular attempt to solve the problems of waste disposal and a search for the use of new materials and innovations in construction by building experimental houses. Much of this is entirely within the scientific field. It is here we work closely with the Division of Building Research of the National Research Council and together have developed programs of technical research development and building. There is, however, a substantial area of assistance in this category to projects employing skills rather than scientific procedures.

In the general category of Housing and Urban Affairs a broad spectrum of problems has been looked at. It is here where we find programs and proposals that are more diverse and perhaps less central to the National Housing Act. This is one of the reasons for establishing and supporting the Canadian Council of Urban and Regional Research. It seems appropriate that another research organization should pick up the many problems in the wider field of urban and regional affairs.

What we have done has been due partly to the initiative of the Corporation and partly it has been in response to applications for financial aid.

The Corporation has also been instrumental in taking the initiative in the activities which can be described as institutional support. The CCURR which I have just mentioned is in this category. Under each of the four main categories, Community Planning, Housing Design, Building Technology and Housing and Urban Affairs, there has been developed some broad continuing framework within which people have been invited, encouraged and enabled to meet and join together to pursue the objectives of better housing, planning, building and urban growth. The Community Planning Association of Canada, The Canadian Housing Design Council, the Canadian Council on Urban and Regional Research and the relationships with the National House Builders Association and the

Division of Building Research of the National Research Council are all of this kind. Progress in these fields comes about from a continuing process of dialogue and communications and the consequent development of ideas, studies and action. Perhaps the most important use of Part V funds has been in building these institutional frameworks within which new ideas can be generated and new people come together to see problems and discover ways of advance. More recently universities have been encouraged to establish interdisciplinary groups and centres to focus on research and development in the areas of our interest.

It can be said, I think, that there has been a plan for developing a program of institutional support and training support. Beyond this there has not been a preconceived overall program plan. But special efforts have been made for finding and encouraging people to work on topics that interest them and have significance within the very wide range of our interests in housing and planning affairs. On the whole people's interests tend to converge upon matters of current public concern. For this reason the work that has been done under Part V funds has generally proved to be relevant and useful and entirely eccentric proposals have been rare.

The work done and being done, while rapidly expanding, is modest in relation to the vast scale of money and manpower being invested in Canadian urban growth. Nevertheless, it represents a considerable body of work on a wide range of subjects, carried out by a large number of people in all parts of the country, in discussion, in thinking, in writing, in experiment and study, in teaching and learning, in publications, books and reports. Furthermore, it represents the beginning of a new period in Canada, in laying the foundation for public understanding and study of housing and urban affairs. There now are far more people to work in these fields and more opportunities to give direction and purpose to what they do.

Perhaps some figures will give an indication of the increasing level of activity. In the nine years from 1946 to 1954 expenditures of Part V funds outside the Corporation amounted to about \$1 million.

From 1955 to date (December 31, 1968) approvals for extramural projects have been almost \$10 million. As a further indication of the acceleration in the last few years approvals have been \$.7 million in 1965; \$1.3 million in 1966; \$1.5 million in 1967 and \$2.4 million in 1968.

This means that over the last four years of the 1955-68 period, not only has there been a significant increment from year to year in the programs but something better than 60 per cent of the approvals occurred during the last four years.

In detail approvals from 1955 to date are: Institutional Support nearly \$3 million; Training and Education more than \$3 million; Research and

Development more than \$3-3/4 million; and Special grants nearly \$400,000.

The foregoing figures also disclose that about 42 per cent of all funds have been made for institutional support; 31 per cent for training and education (including conferences and exhibitions) and the remaining 27 per cent for the support of research and development. These percentages show, to a degree, what has been a policy—the emphasis on establishing and continuing support to institutions which draw together numbers of people who interest themselves in housing and urban matters; also an emphasis on training people to develop special skills in the field of housing and urban affairs. These two programs are now costing more than \$1 million a year and they should continue to be supported by funds from Part V of the National Housing Act.

A new development has been the emergence of interdisciplinary groups in centres of research at some of the universities (Montreal, Toronto, Waterloo and Manitoba). These centres are receiving support and encouragement from Central Mortgage and Housing Corporation. It is expected that there will be an increase in this kind of organization at a number of universities. Before funds are given, the Corporation makes sure that the university authorities fully support the structure and aims of the centre and are willing themselves to carry their part in the financing of it.

It has only been comparatively recently that a closer relationship has developed with other government departments doing research relating to areas of interest to Central Mortgage and Housing Corporation. For many years there has been a close relationship with the Division of Building Research of the National Research Council. There is now increasing consultation with such departments as Transport, Manpower and Immigration, Department of Industry, National Health and Welfare, Energy, Mines and Resources, and Indian Affairs and Northern Development. We share the support of research projects with some of these departments. There is also a liaison with the Canada Council and there are shared projects with that organization. These are all attempts to complement and integrate with the research activities of other federal government departments who have mutual interests with Central Mortgage and Housing Corporation.

The research prospects for housing and urban affairs have improved considerably over the last few years. The time is coming when a more directed and carefully integrated program can be developed to take advantage of skills, interests and resources and to direct these to the needs of the moment. As a first step in this direction an inventory of work done here and in other countries is needed. This is a large task.

A further step being considered is to identify priority subjects for research. These may be blocked out in

large subject areas such as-new cities-pollution-new forms of housing-urban transportation-conservation and rehabilitation, et cetera. In fact, many of the proposals coming forward fall within these areas as they are naturally the current subjects of interest. While they do have importance, they are accidental and there still exists a need to separate out the most significant micro problems for research within the large subject areas. On the large subject of pollution of water (I think Dr. Solandt told you there were 228 committees dealing with the water problem) we would consider the development of a self-contained nondischarging system of sewage an important area to research. Within the large area of new forms of housing a study directed towards solutions to high density and high rise housing with special regard for family living and multiple use building would be valuable.

There is now an opportunity to develop a more selective and structured program of research, experiment and development in the fields of housing and urban growth.

In closing I would like to say that government has two roles in research. First, it needs to do and sponsor research focusing primarily on public policy. Research is required for the intelligent formulation of policy and for monitoring the impact of policy on people's lives.

Second, the private incentives to conduct research are not commensurate with the overall benefits, it can bring. Research, in general, requires a patron, either in the form of private foundation or public funds. Governments in general, including the federal government, have a strong justification in the public interest to generate research activities beyond those activities which stem directly out of policy considerations.

Thank you.

The Chairman: Thank you very much, Mr. Hignett. You already at the beginning of your remarks recognized the member of the committee who is a former collaborator of yours and who has been designated today to initiate the discussion, Senator Giguere.

Senator Giguere: Mr. Chairman, I am very pleased to have this opportunity of meeting Mr. Hignett and the officials of CMHC again. I have been associated with CMHC as a director and member of the executive committee for five years. During that period I have learned much, but I still have a lot to learn, so if the Chairman will allow me, I would like to start the ball rolling by asking Mr. Hignett a few questions.

Does Part V of the Act set limitations on the total amount of funds the Corporation can devote to research?

Mr. Hignett: Yes; this is done in two ways. Part V of the National Housing Act has a statutory provision for \$10 million for research operations. The Chairman: Is that \$10 million annually?

Mr. Hignett: No, it is a statutory allocation of \$10 million, and it has been customary for the Corporation in each year to seek in the minister's estimates the reimbursement of funds that have been used under Part B for research purposes.

So theoretically at the beginning of each year the fund is restored to \$10 million. Theoretically as well it would be possible to spend \$10 million in a 12-month period, but this kind of expenditure by CMHC is not a capital expenditure, it is a budgetary expenditure and so is subject to the scrutiny of the Treasury Board.

I must say that the Treasury Board have been kind to Central Mortgage and Housing Corporation; I can think of no occasion when there has been any inhibitions on the part of the Treasury Board in allowing the Corporation to generate such programs as it wished to generate in any 12-month period, so they have been generous to us in that respect.

The Chairman: You should not admit that in public.

Mr. Hignett: At the moment, as the senators have perhaps learned, there is some restraint on research funds, particularly the growth in research expenditures and we have been asked, not to stop growth in research expenditures, but to exercise some control over the rate of growth.

Senator Giguere: And the control is exercised by the advisory group and the Board of Directors?

Mr. Hignett: That is right.

Senator Giguere: Who are the advisers on the advisory group, apart from those representing the board? What is their background? We know there are seven of them, but who are they?

Mr. Hignett: I can name them for you, but since Mr. Hazeland is the chairman of the advisory group I think it would be a good thing if he dealt with that question.

M. A. J. Hazeland, Chairman of the Advisory Group, Central Mortgage and Housing Corporation: We have two Executive Directors, Mr. Adamson an economist and Mr. Coll with legal training, who are both here; Mr. Gitterman, an architect-planner, who works in the technical field; Mr. Knight, an economist, who is Director of our Economic Division; and in the field of planning Mr. John Fowlie who is an architect-planner. I am an architect and cover the housing design area. We also have Monsieur Nantel, a planner with legal training, who at the moment is seconded to our Quebec region to work with the government of Quebec on housing matters. He attends all our regular meeting.

We have as a consultant Dean G. Carrothers, who was recently with us as an adviser, and who now is Dean of the Faculty of Environmental Studies, York University. He attends our meetings and gives us valuable advice and help.

Senator Giguere: How are they appointed?

Mr. Hignett: They are appointed by the management of the Corporation; the advisory group is a rather special group of highly skilled men in the various fields of housing and urban development. They have no operational function in the sense that they are engaged in the day-to-day operations of the Corporation; it is a group of seven or eight men who devote their time to iooking at what the Corporation is doing and to looking at what is happening in Canada.

They have performed outstanding services in recommending to the Corporation's management from time to time and to its Board of Directors the direction in which legislation should be taken and what new legislation would be helpful.

They also encourage institutions, universities and individuals to undertake research in areas of our interest. It is a group of people that one does not find in many business organizations, but a very useful one.

Senator Bourget: How often do they meet?

Mr. Hazeland: We have regular meetings every two weeks and we stagger these with our executive committee meetings.

Mr. R. T. Adamson, Executive Director, Central Mortgage and Housing Corporation: And irregular ones about every three days.

Mr. Hazeland: We meet almost continuously; in fact, we generally start every day with a short meeting.

Mr. Hignett: We have devoted ourselves, as I have mentioned, for a number of years in developing housing and urban skills in this country. I think one of the biggest problems we have had over the past has been the absolute shortage of men who are skilled in the planning field. If any of you are familiar with Canadian municipalities and, indeed, provincial governments you will know that a great deal of the planning for instance that has been done in Canada in the last 15 or 20 years has been done by people who have come from France and England.

We began by encouraging universities to develop schools of planning and we supported them very strongly with bursaries and scholarships. Then when most municipalities were really able to take care of the problem of community planning as such we widened our training program into the board field of urban affairs, involving many disciplines. Our fellowship

program has grown to the extent where this year it will be \$700,000 for 90 fellowships.

Mr. Hazeland: 75 fellowships in universities in Canada and 15 in universities outside Canada.

The Chairman: Would you have some kind of rough breakdown by disciplines or professions?

Mr. Hazeland: The professional fields it includes, are of a very wide range: urban and regional planning; urban, civic and landscaping design; housing and housing design; urban renewal; community facilities planning; urban engineering and urban transportation; law of planning and development; urban and regional administration and finance; urban real estate; finance and management; community organization and planning; urban environmental health, and other related subject areas.

Mr. Hignett: You do not happen to have last year's breakdown of who received them?

Mr. Hazeland: No, I have not.

Mr. Hignett: The 1969 fellowships for the year beginning in September will be selected in the next two months, but we can give you the breakdown of those who received fellowships last year. They range all the way from lawyers to sanitary engineers.

Senator Bourget: In the universities today are they taking more interest in your field of research?

Mr. Hignett: Indeed; there are now five planning schools in Canada, These are still not turning out enough planners, but there is a good supply of planners relative to the past. A new interest at the universities is the development of interdisciplinary groups and centres of urban study. These we'are beginning to support and encourage.

Senator Bourget: Is this outside the architectural faculty?

Mr. Hignett: Yes, indeed.

Senator Bourget: Completely?

Mr. Hignett: Completely.

Senator Giguere: Apart from the scarcity of skilled people, you mention in your brief on page 6 that forces exerting limitations on your research program are space and financing.

The Chairman: Do you have a housing problem?

Senator Giguere: Physical limitation of space; is that because you lack space at the headquaters, or is it space in the universities? Page 6, that is (f).

Mr. Hignett: The staff of the Corporation has not grown in numbers in the last 15 years, but the composition of the staff has changed very substantially. The professional content of the stall is greater than it was 15 years ago and the clerical content is relatively smaller. Although we are no more in numbers it has created space problems for us that are very acute.

Senator Giguere: Now, what about the financial restrictions? If you have \$10 million to play with, how are you restricted? Is it by Treasury Board?

Mr. Hignett: Yes. I mentioned last year that we increased research activity from \$1.5 million to \$2.4 million. I except that in 1969 we will be allowed to increase this by 10 per cent to 15 per cent, notwithstanding a general exhortation not to have these funds grow at a greater rate than 5 per cent.

So there are practical limits; I would think that if we were given \$3 million for this program in 1969 this would be regarded by the Treasury Board people as being quite generous.

The Chairman: But from your own point of view, judging the potential of research and the urgency of problems, do you feel that you would be able to spend more efficiently?

Mr. Hignett: Very much more; I mentioned the new centres that are being developed at four universities. While the universities are quite prepared to bear a substantial portion of the continuing costs of these interdisciplinary centres, they do require starter funds, and they do require as well continuing support and, indeed, they may require teaching support. These four universities are by no means the total potential; our problem is going to be in the selection of universities where work of this kind can best take place. I do not know how many have now been identified but there are certainly more than these four.

Mr. Adamson: Yes, I think almost all universities are potentially interested, but the ones to whom we have made substantial research grants now are, in fact, Manitoba, Montreal, Waterloo and Toronto. There have been ad hoc grants made at other institutions to people, but not program grants in the sense that they are made at these four institutions.

Mr. Hignett: This kind of program for support for urban centres in universities could very quickly develop into something that would require up to \$2 million per annum in itself.

Senator Giguere: For that alone?

Mr. Hignett: For that alone.

Senator Bourget: Coming back to my colleague's question about the limitations of space, when you

mentioned it, did you relate it to the research program you could do inside the Corporation, or is it because you have not enough space for powers and responsibilities that you could have?

Mr. Hignett: It relates directly to what we can do inside The Corporation. For instance, our economic division, which as an in-house research unit is very important to us. We just have to know about the demand for housing over the next 15 to 20 years. We have to know about the demographic needs as they relate to housing needs; we have to know about the probable flow of capital funds into housing.

If I had to hire tomorrow morning another fully qualified economist, we have literally nowhere to put him.

The Chairman: Do not sent him to the Senate.

Senator Giguere: We have the same problem.

Senator Bourget: How do you establish priorities about research, generating projects of research with universities or with institutions? How do you establish your priorities?

Mr. Hignett: First of all, the priorities of our inhouse research relate entirely to the developing housing program in Canada and the research that we need to do to formulate policy in the form of both housing policy and legislation from year to year. This goes on and is continuous. We have felt the need to devote a large measure of other support to training people skilled in urban affairs in Canada and we have devoted, as you know, a substantial part of our effort to this.

In terms of outside research, up to the moment, we have tended to respond to demands made upon us; we have encouraged people to talk to us, but by and large we have left it to them to approach us and by and large we have left it to them to select the areas that they would like to research.

We think that perhaps we have now reached the stage where the skilled manpower resources of the country are such that much greater attention can be paid to directed research, to research areas in urban matters that we ourselves believe to be important.

Senator Bourget: On that particular point, when you give grants to universities, or some associations, are these programs for specific purposes or specific projects? Are the institutions or the universities free to undertake any kind of research, let us say technology or in some other spheres regarding housing?

Mr. Hignett: No. Until recently it was on a projectby-project basis. In discussing a research project with a person interested in conducting the work it has been necessary for us sometimes to reshape his project so that it fell more squarely within the realm in which the National Housing Act gives us authority, or we have had to scale down the research grant to that portion of the project that we thought was related directly to housing.

Generally speaking, it has been very much on this project-by-project basis. However, the field that we are now entering, the development and support of centres of urban studies at universities, has elements of both kinds of research grants. Funds for developing the most appropriate centres of study and funds for work done at these centres on a project-by-project basis.

Senator Bourget: How do you make sure then that there is no duplication in the research projects that are going on? Have you got information for you to be sure that there is no duplication in research work being done by universities or the provinces or municipalities? Have you got a centre where there is somebody, either the advisory group or some other organization in your Corporation, that would look into it so that there are no moneys spent for nothing, let me say it like this?

Mr. Hignett: There have been some rather modest steps taken in this direction. For example, the Canadian Council of Urban and Regional Research, as one of its first tasks developed a catalogue of all of the urban and regional research that had been carried out in Canada and beyond Canada to the extent that the work related to Canada. This catalogue I think for Canada is fairly complete, but on a wider basis it is not.

I think mention was made in my opening remarks of the need for further development of an organization that was aware of what was going on both in North America and the rest of the world in research in housing and urban affairs. I mentioned the Canadian Council of Urban and Regional Research because it is an organization that is perhaps regarded much more highly outside of this country than in it; it has a world-wide reputation. It is one of the first of its kind and perhaps you know was supported strongly by the Ford Foundation and was considered to be so successful that Ford have granted funds now for the creation of similar organizations in the UK and in the United States.

Mr. Adamson and I serve on the United Nations Committee on Housing, Building and Planning; they are aware of the Canadian institution in this field. They too are aware of the need for developing a single centre for the exchange of urban information and there is a proposal, if it can ever be financed, that there be a world institution of this type set up in New Delhi, in India.

So there are prospects for sharpening up the information service in this field, but not all research is public. There is research carried out by the federal government in Canada, by the ten provincial governments

and, indeed, by municipalities, that is regarded as confidential research. A year ago ten provincial governments and the federal government at the official level and as a result of the Federal-Provincial Conference on Housing and Urban Development agreed to set up an interprovincial, interdepartmental committee of information on urban research where all of the research on a confidential basis being carried out by municipalities, by the federal government, by provincial governments, would be not only freely exchanged so that duplication did not occur more than necessary.

Senator Bourget: How long has it been set up?

Mr. Hignett: Last September.

Mr. Adamson: Formally it was set up last September; the structure was set up last september, but I believe it just hired a man quite recently.

Senator Bourget: Are all the provinces interested in being represented?

Mr. Hignett: Yes.

Senator Giguere: The federal government is paying for it.

Mr. Hignett: Although the federal government is paying for it, one of the provinces has suggested, and quite rightly, that they do not want the federal government to pay for all of it.

Senator Haig: That is a switch.

The Chairman: They want to get more tax revenue from the provinces in order to make their contribution to this interdepartmental committee.

Mr. Hignett: So although the federal government is paying the cost of setting up the secretariat it has been made plain to us that this is not a federal institution, that it is very much a joint federal-provincial venture and they propose to not only play their full part in it, but pay part of the costs. I think they feared that if the costs were borne entirely by the federal government it would look too much like a federal institution.

Senator Giguere: Does the research by private industry or the labour unions amount to much in Canada?

Mr. Hignett: The research by private industry, of course, is consumer oriented. There is a lot of research goes into new materials and new equipment, the use of new materials, the use of old materials in new ways, but the type of research they do tends to be the type of research that has a quick pay-off and in terms of the problem it is really very small.

Senator Bourget: So there are very few private organizations who are interested in researching housing?

Mr. Hignett: The National House Builders Association, for example, has a research committee. The National House Builders Association is made up of members who generally are the people who build housing in Canada. The total housing program is of the order of \$3 billion a year, and the input by the National House Builders Association would be perhaps \$30,000 and CMHC puts in another \$30,000 to match it.

Senator Bourget: That is very little when you consider the amount of money that is spent in housing.

Mr. Hignett: But it is being done in highly experimental work. It has been done in new forms of construction that are considered by them and by us to provide safe shelter but that does not meet the requirements of any building code in Canada.

Senator Bourget: The only research they will probably do will be to find new methods of construction; that will be it, I suppose, and for the rest they rely mostly either on the CMHC or National Research or the researches that are made in the universities; would that be it?

Mr. Hignett: Yes.

Mr. Adamson: I think the supplying industries to the construction industry, of course, must do an enormous amount of product development research, because as we all know the components that go into the building of a house today are very much different from what they were 30 years ago. I think many of these changes rest upon research and development work done by industry, but which does not appear explicitly in their accounts as such; it is product development work.

I do not know how to get good figures on that, but when one looks at the transformation that takes place in the equipment and materials that go into a house today, we know a great deal of work is done by industry in this field.

The Chairman: It may have been done in the United States though.

Mr. Adamson: It may have been done in any part of the world.

Senator Bourget: Surely when we are spending billions of dollars for the benefit of this association somebody should talk to them and say you should put a little more money into this; when a billion dollars is spent and they are only putting in \$30,000 for research, this is very, very little.

Senator Carter: In the CMHC do you have a priority list of projects of your own? I kind of gather that you work both ways: universities have students who 'are interested and they contact you and if that fits into your program you start with the project in the university, but is there any planning, do you have a list of priorities and then go shopping around to where you can get these projects carried out?

Mr. Adamson: I would think the answer to that is no, we do not. That is an area which I think is one of the most promising lines of development, the mere fact that we do not have space in our own building to house researchers that might help us with particularly important research problems does not really prevent us from farming out projects that are more or less designed; we have not done that I think nearly to the degree that we could.

The Chairman: To what extent have you done this up to now, since last year? Do you have any specific figures about this, about contractual work?

Mr. Adamson: I suppose you could call the Ontario Research Foundation proposal on water & sewerage that we talked about this morning, as a farm-out project which states specific questions and invites people to go to work on them.

Mr. Hignett: It has seemed to us for a very long time that the provision of water and the disposal of sewage is still being done the way the Romans did it. It seemed to us that there must be better ways of dealing with this most important problem.

It is a fact that the sewage treatment system of an urban area and its pipes more than any other thing determine the shape of the city and the kind of city that it is. We have been encouraging and directing research in this area for quite a long time.

We have patented a system of an individual sewage disposal system for a single house where, theoretically at least, you fill the tanks with water, then you need no more water and there is no discharge from the building except by evaporation.

We are just now embarking on a similar project with the Ontario Research Foundation on a similar system for very large buildings. We know enough about this subject now to know that it should be possible to have completely enclosed systems of water supply and disposal in buildings of very large size. We are just beginning this exercise.

Senator Carter: In urban areas, or just for rural areas?

Mr. Hignett: Urban areas: If we could release ourselves from the umbilical cord of sewers, we could do a lot for urban development that is not possible now.

Senator Carter: That is why I ask about the priority; in my simple mind I see a Crown corporation to which a large sum of public money is allocated to try and solve housing problems and one of the main factors in that problem is housing costs. I just wondered if you had a priority where we will concentrate on some research to get around the cost of housing, or do you think that should be not in your realm, but in the realm of the builder?

Mr. Hignett: I think it is quite properly in our realm. There are three costs to housing: there is the cost of the land on which the housing is built, which is perhaps the one thing in Canada that has got more out of hand than any other; there is the cost of money, and some people think that is getting out of hand as well; then the cost of the structure itself.

Senator Giguere: And labour.

Mr. Hignett: And the cost of labour going into the structure. The materials and labour determine the cost of the structure.

In this third one, the cost of actually building, the increase in cost has been at a much slower rate than either the cost of land or the cost of money. This is an area in which a great deal has been done in modest ways to decrease construction costs. The area of possible reduction in costs is much smaller than you might think. If you could find ways of building the shell of a house in such a way that you save 50 per cent of the material costs involved, you are dealing in 2 per cent or 3 per cent of the cost of the structure.

Senator Giguere: Is that right, that the shell is about 5 per cent of the total cost?

Senator Carter: What per cent would the labour be?

Mr. Hignett: About twenty five per cent.

Senator Robichaud: That does not include labour on material and equipment.

Mr. Adamson: No, if you push that back it is all labour.

The Chairman: In your brief on page 9, trying to follow up these questions, you say that you have now 29 professional people on your staff.

Mr. Hignett: These are professional people I think who can properly be described as being in research.

The Chairman: Yes, that is what I mean.

Mr. Hignett: We have many more professionals than that.

The Chairman: Yes; who are performing administrative duties.

Mr. Hignett: That is right.

The Chairman: But you have 29 people on your staff doing research?

Mr. Hignett: That is right.

The Chairman: How many of those would come, for instance, from the social science disciplines?

Mr. Adamson: The bulk of them.

The Chairman: From looking at this I would say about 20 then come from the social sciences?

Mr. Adamson: Yes.

The Chairman: And nine from the architects, engineers, and so on?

Mr. Adamson: Yes.

The Chairman: When I see that there is no space available for more I am a little bit worried.

But how can you explain on the same page the rapid increase in 1968, the turnover of 48?

Mr. Hignett: That is one that bothers me; we have found economists in strong demand. We have had a department of economic research for 20 years and a very good one, but in the last two or three years all departments of the federal government have been creating economic units and we are fair game. It happens that we are just not able to match the advantages being offered by departments of the federal government and we are losing our economists to the federal government.

The Chairman: Why is that? You are free to set up your own salary structure.

Mr. Hignett: Within limits.

The Chairman: Do not tell me that the departments which are much more closely scrutinized by Treasury Board can offer higher salaries than you can?

Mr. Hignett: Yes, they can.

The Chairman: Why?

Senator Robichaud: Those economists that you are losing, in what range of salary are they?

Mr. Hignett: They would be paid by us on an average of \$10,000, to \$15,000.

And are going to federal departments at perhaps \$18,000 to \$20,000.

Senator Bourget: With how many years of experience at that range of salary?

Mr. Hignett: We have not lost people at that range of salary; we have generally not lost many people who have been long term employees. We have lost one or two, but we have lost a great many that have been with us for three or four years and, of course, we have invested a lot of money in these people. Perhaps we have reacted a little too slowly.

Mr. Chairman, you did say that the Corporation can, if it wants to, deal with this situation. This is something that we have had to do and I do not think that our turnover in economists in the next 12 months will be as great, but nevertheless we have to always consider the relationship between our economists, engineers, architects, lawyers. If one gets out of line too far, the others notice it very quickly, so that this is a problem of all professionals, not just the economists.

Senator Bourget: Let me give you an example: if you had an engineer, for instance, who had five years' experience and an economist with five years' experience, what will be their salary?

Mr. Hignett: We would tend to pay them the same, or very close to it; that is not the way the market is working.

The Chairman: And yet we have a surplus of engineers.

Mr. Hignett: That is not the way the market is working, but when you get a situation like ours that is full of professionals, this is the way it works.

Senator Bourget: When you take a young man just graduating from university as an economist, how much would you offer him as initial salary?

Mr. Hignett: \$7,500; is that right, Mr. Adamson?

Mr. Adamson: You could not get a doctor, but a person with a master or bachelor degree.

Senator Bourget: Would you offer him \$7,000 or \$8,000; would that be in that range?

Mr. Hignett: Yes.

Senator Bourget: I think it is normal in the market today for a young man who comes out of university a bachelor to get \$7,000 or \$8,000; am I right in saying that?

Mr. Hignett: That is right, but the demand for economists is generally with some experience and with a higher degree of education than a bachelor degree. The way the federal service deals with them, although they have salary ranges that are fairly tight, they have some fairly wide discretion as to what category or classification they put them in; it is this reclassification that affects us.

Senator Bourget: Exactly, that is the problem I think, because they get a good salary when they enter the service, but after five or six years they say well, there is no advancement for us. That is the reason, probably there are others also, but I think that is one of the main reasons, because they say we have no future in there, we are just limited by what you said before.

Mr. Hignett: Yes, and it has been necessary for us in the last six weeks to review the salary ranges of all our economists.

The Chairman: With this very limited number of people, let us say 20 economists, I am sure that your intramural research program must be very limited to your almost day-to-day problems.

Mr. Hignett: Exactly.

The Chairman: On the other hand, you have another program with the universities where you have no direction at all, or no influence; they choose, or they pick up their own fields of research which, of course, may be useful, but to come back to Senator Bourget's and Senator Carter's question, there is it seems to me a tremendous gap there between the two, where we would need at this time, when we hear that there is a housing crisis, to fill that gap very quickly.

I do not see how it can be filled very quickly if Central Mortgage does not come in and try to fill it up.

Senator Bourget: That is it and particularly in the circumstances.

Mr. Hignett: That has been more in the field of sociology, has it not?

Mr. Adamson: It has been in every field.

The Chairman: Yes, in sociology.

Mr. Adamson: But I think you are quite right, Senator; there has been an opportunity to direct more of it to our own policy requirements and needs. In view of the growth and the scale of the extramural research in relation to our own intramural research I think, as I said to Senator Carter, this is an opportunity that we have not exploited sufficiently in the past and will be able to explore more effectively.

Senator Carter: I was fascinated about that story you told us about the water supply and disposal; is that a product of your own research and have you got any more results like that you can show us for the money you have spent?

Mr. Hignett: It was research that was in every sense directed; we discovered years ago that not only was very little known about this subject, but little work had been done in it.

The Chairman: Was it done by yourself, by the Corporation, or by NRC?

Mr. Hignett: No, it was done by the Ontario Research Foundation, but it was done in very close cooperation with us. One of our advisers, Mr. Gitterman, had spent much of his time working on the idea. It has great possibilities; we have, for example, a school up in Dorset in the far north.

The Chairman: That is better than working in sewers.

Mr. Hignett: That is right; that has had this system operating now for how many years?

Mr. Hazeland: About six years; it is a closed system and they have to replace some water about once a year, a little bit of water. They reuse the bulk of it. The water is not pure looking, it is discoloured, but that is only oxidization. For the north this closed reuse system is very valuable.

Mr. Hignett: It is not quite so unattractive as it sounds; Mr. Adamson and I were in England two summers ago and we were told by the London authorities that by the time the Thames River reaches London Bridge every cubic foot of it has been used eight times.

Senator Grosart: May I direct your attention to page 16 of your report. In the second paragraph you say the Corporation has not established a fixed system of monitoring. Then, in the next paragraph you say you have not used the critical path network or a program of evaluating review techniques.

Do you have any kind of continuing technical audit of these projects?

Mr. Hazeland: On all our university projects we have an agreement with the university; this is a legal agreement where we arrange how the payments are to be made, the reports that are to come forward, the interim reports and the final report. We generally have a date attached to these. I may say it does not always work out that way, but we do have it tied up quite tighter. Our payments are not made to the researchers; they are always made to the university and they dispense it to the department concerned, or the individual concerned.

We do monitor, in the sense that we do receive and revise reports; we do have meetings with people as they go along with their work and we do invariably, in our agreement, say we will review the research work at its completion and decide whether it is worth publishing. This we do as a separate operation.

Senator Grosart: Do you do any kind of cost benefit analysis?

Mr. Hazeland: No, we do not, not in a precise way. We use a judgment and assessment technique as we go along.

Senator Grosart: I am rather suprised that you say that this kind of thing is impracticable because of the large scale of your extramural activities. This would seem to me to be a place where it is most necessary when your projects are widely scattered. This would seem to be the place where you would need some kind of technical audit.

The Chairman: I suppose that the university professors and the academic community would find this an unbearable interference?

Senator Grosart: There are several departments that insist on it; they may find it unbearable, but so long as they are getting the money there are some burdens that they have to bear. But the way, I should perhaps say, Mr. Chairman, that Mr. Hazeland and I have something in common, in that 45 years ago we sat together in school in a place called Chefoo, North China.

I notice what almost seems to me to be a contradiction to an impression that I have received about the extent of your research in the concluding pages of the statement you made where you seem to make the point that there is a tremendous amount of research needed in this area. You stress also that most of the funding appears to have to come from government.

I wonder is there anything being done in Canada to require industry, particularly developers, to provide the necessary research for the political bodies to make good decisions about plants? It is done in some countries; are we doing it here?

Let me make that clear: Do we say to developers, before we look at your plant we want the following research information as the basis of our decision. Are we doing that in Canada?

Mr. Hignett: I do not think so. First of all, using the term developer I assume that you mean a man who builds a piece of a city, who assembles land, subdivides land, builds housing, commerce or industry on it?

Senator Grosart: I used it in the generic sense, to take in the entrepreneur, not the single, small builder, but my point here is that here is a very profitable industry and I am wondering if it is bearing its proper

cost of the research necessary to make the kind of social decisions that must be made about urbanization?

Mr. Hignett: No, I would think not. To begin with, Central Mortgage and Housing Corporation is removed many times from this person or these persons. The decisions about the development of any urban community are by and large local decisions that we find that we cannot only not change, but exercise very little influence over. Then, of course, the municipalities are themselves responsible to the provinces.

The development of cities is done mainly in a negative way, rather than in a positive way. It is done in a series of thou shalt nots, rather than thou shalts.

The Chairman: And we get the cities by accident.

Mr. Hignett: That is right.

The Chairman: The way we get a science policy by accident.

Senator Grosart: This, I think, is the social complaint that we hear very often and I was not asking you whether Central Housing and Mortgage was exercising responsibility in this area; I was asking is it being done and would got a step farther and ask if not, why not?

These people can afford to do this; why should it not be public policy to insist that they do it?

Mr. Hignett: I would think that perhaps the most urgent problem facing urban Canada is the fact that in most of the ten provinces urban communities are governed by municipal acts that are a hundred years old. The municipal acts of this country are related to another age and not to the present age. Perhaps the greatest need in urban Canada is for a complete restructuring of the municipal organization. The urban place is now not a municipality; it is a conglomeration of municipalities and is going beyond this into an agglomeration of cities.

The congregation of municipalities are giving way to the urban region. There is at the moment no structure that will permit the planning of an urban region as a unit. It still is made up of a large number of municipalities, each with its own struggles for assessment, each with its own responsibilities for planning, and each with its own responsibilities for all municipal problems.

Senator Haig: Each with its own building codes, too.

Mr. Hignett: Each with its own building codes. What we need most in this country is a complete restructuring, particularly in the 40 or 50 larger places of the country, so that authority can be given to the people responsible for the urban region itself, rather than its

parts. If this could be achieved then I think it would old; these tend to be in the big cities and, of course, be possible for such structures to demand more from the people working within the structure, but at the moment it would be difficult indeed for the city of Toronto to demand something of a developer that is not demanded in Etobicoke, or in North York, or in Scarborough, and so on and so on.

There has been some movement in this direction; the regional governments of Ontario and the regional government of the city of Winnipeg have started, but these are only beginnings. The regional government of Ottawa is brand new but none of the powers that are important to the Ottawa region have been given to the regional government; they have been retained by the municipalities.

So in this respect we may be worse off than we were before, not better off, and until we are brave enough to cloak our regional governments with the kind of authorities that they need, we will just not make the progress that has to be made in the next 20 years.

Senator Robichaud: Mr. Chairman, most of the questions I had in mind have been asked by Senator Carter and have been answered, but if I may proceed on the same subject, first I would like to know, or can we be told what percentage of CMHC funds are being directed to urban areas, as opposed to rural regions?

Mr. Hignett: The National Housing Act generally relies on private enterprise. Houses are built by private persons who are building either for themselves or for landlords or for profit. The flow of capital into housing is largely from the lending institutions of Canada. This has developed a certain pattern; the big developers are in the big cities; of course, that is where the action is as well, that is where the growth is. The rural growth in Canada is very, very small, if any.

All of the investment opportunities that the lending institutions require can be found in the 40 largest cities of Canada; they do not need to go into rural Canada.

So there is gradually emerging a tacit agreement that if private enterprise will take care of the Canadian cities in the ordinary provision of housing for home ownership and for rental purposes, that we will devote ourselves to rural Canada. It costs a lot more money to operate in rural Canada than it does in a big city.

The Chairman: You mean on a per capita basis?

Mr. Hignett: On a per capita basis, on a per operation basis or per house basis.

So our mandate has been generally that now all Canadians are entitled to assistance under the National Housing Act so you must take care of the residual area which by and large has been rural Canada.

This is not true of such things as public housing and students' housing, sewage loans and housing for the we have devoted a lot of attention to this as well.

Senator Robichaud: But in the last two years has there not been a trend in small communities to get involved in this type of building?

Mr. Hignett: Oh, yes. These are direct loans wherever they occur. Housing development by non-profit corporations for elderly persons is not financed by the financial institutions of Canada; they are financed by the federal government at preferred interest rates and with very long repayment periods.

There is a tendency for these to show up in the smaller towns; there seems to be a desire among the provi nces to encourage the old folk of the community to stay where they are and not to go to the big city, or to Vancouver, as they get old. Some provinces, like Quebec, New Brunswick, Saskatchewan, have spent a lot of money building elderly persons' accommodations in small places in the provinces.

Senator Robichaud: More so in recent years?

Mr. Hignett: Yes; in Quebec it has been going on for 15 years.

Senator Bourget: Is it through limited dividend?

Mr. Hignett: It is an arrangement very similar to the limited dividend, except that it is entirely non-profit.

Senator Robichaud: In rural areas now the CMHC is dealing with a class of borrowers with limited wages. limited income. How much research is being done in order to provide those borrowers of this class of people with low cost housing, because the main objection as we hear it is that the homes are too expensive. Even if they have to meet the standards which are established they feel that it is too costly; what research is being done in that field in order to provide a home at acceptable cost to this type of borrower?

Mr. Hignett: In terms of research, not a great deal, but in terms of techniques, quite a lot.

First of all, I think it should be said that the standards of the National Housing Act which are those of the building codes are not inhibiting features here. The standards of the National Housing Act are mainly standards of safety and a very modest house indeed can be built that will meet these standards. One should not relate the standards to what is being built in Ottawa, because these are very much above the minimum requirement.

Some provinces, like Nova Scotia for example, through Saint Francis Xavier and the Nova Scotia Housing Commission have encouraged housing cooperatives and the housing cooperatives in Nova Scotia are very active. As you know, Senator Giguere, they have for many years been building houses at a cost which sometimes makes us scratch our heads, a cost of \$7,000 to \$9,000.

Senator Robichaud: It can be done; I tried it, I have done it myself, that is why I asked the question.

Mr. Hignett: We have let individual people try all sorts of experiments; build a house that is finished on the outside so that the weather does not beat it to pieces, but on the inside it is simply insulated and is one large room, then develop it from there.

Senator Robichaud: You can do much better than that with \$7,000 or \$9,000, because I tried it and have personal experience.

The Chairman: I am sure that Senator Robichaud, knowing his family, would not be satisfied with only one room.

Senator Bourget: There is one supplementary question connected with it: What has been your experience with perfabricted housing? Would that be a way to lower the cost?

Mr. Hignett: No. Our experience with prefabricated housing is that generally speaking, at least as it is practised in North America, it produces good housing but there is no saving in cost, none at all.

Senator Bourget: Because I have here Housing Construction, which is published by New York architects, saying that prefabricating housing has doubled since 1960.

Mr. Hignett: Generally speaking, the prefabricated house, such as the Alcan prefab, for example, is a quality product as it is built under controlled conditions and it is a high quality product.

The Chairman: And it is not cheap.

Mr. Hignett: It is a product that can be delivered and erected very quickly, but the real assurance you get from that product is its uniformity; it is a uniform product, but it is not cheap.

Senator Bourget: It is not cheap even in the United States?

Mr. Hignett: No.

Senator Haig: What is the advantage of it then?

Mr. Hignett: The advantage of it is that it is a 12-month operation in the sense that it all takes place indoors, it takes place in large factories and it can operate 12 months a year. There are some savings for the prefabricator in his supply of materials by the quantity buying.

The Chairman: And the cost of labour, surely?

Mr. Hignett: The cost of labour tends to be lower, but the cost of delivery tends to be very high; the cost of delivery of the Alcan house runs about \$3 a mile.

Senator Bourget: And you say there has been no saving in prefabrication.

Mr. Hignett: Not that we have been able to discern yet and there is not much possibility of saving.

Senator Giguere: Are our existing building codes a restraint to technological advance in the industry?

Mr. Hignett: Yes.

Senator Giguere: They are; what is the future of this? Is there a hope some day of having a uniform building code?

Mr. Hignett: Yes. I think perhaps the one area that is being subjected to very close scrutiny by all provincial governments and by most municipalities is the need to adopt the National Building Code in its entirety, without change.

There are many people who pay lip service to the National Building Code and say that it is the code adopted for, say, the city of Toronto, and when you examine the code it has been changed and has included in it a number of things that are thought to be peculiar to the city of Toronto. I am just using this as an example. Of course uniformity of codes is absolutely necessary for industrialized building; it is necessary for prefabrication; it is necessary for developing a uniformity of materials and techniques. For instance, the field of modular co-ordination depends to a degree on the uniformity of building codes.

I think this is one area where encouraging progress is being made. I would expect that when the 1970 code is published, which is the next edition of the National Building Code, that it will be very widely accepted. For instance, some provinces like Ontario will probably require all of their municipalities to adopt this code.

Senator Bourget: Is there much difference between the building code of, let us say, Toronto and Montreal?

Mr. Hignett: I am not aware of the differences, but I do know that up until six months ago there were very substantial differences in the building codes of Toronto, North York, Scarborough and Etobicoke and a builder building in all three of the outer communities had to build three different houses.

The Chairman: If it goes on like this we will need a different building code in Montreal to be more adequately protected against bombings,

Mr. Hignett: There are many communities where the Alcan house, for example, which is a very fine house, is not acceptable.

Senator Bourget: Coming back to research now, how does your program of research compare to the one let us say in the United States? Are they doing more research in the United States than you are doing here in Canada?

Mr. Hignett: Oh, very much more, but this again is a recent development. It follows the creation of the Department of Housing and Urban Development which is about four years old and they have undertaken some very large programs, like their model city programs and their research into urban transportation. They not only are spending vastly increasing amounts on research, but on demonstration as well.

Senator Giguere: Do we have access to that research?

Mr. Hignett: Yes we do.

The Chairman: Most of it would be published.

Senator Bourget: Coming back to Senator Grosart's question and the previous question I asked also, is private industry putting funds into that too?

The Chairman: In the United States?

Senator Bourget: In the United States; are they contributing to research?

Mr. Hignett: I do not know, but I would doubt that in any important way they are.

Mr. Hazeland: I would like to add a footnote; perhaps it might help Senator Grosart. In general I think the entrepreneur is very quick to pick up and operate in a leading edge situation. I think it is true to say that this happens in the use of materials, in the use of components, in the use of techniques and the application of social ideas.

However, overriding all this, the entrepreneur has to see a cost benefit in it; innovation requiring a little risk he is prepared to take, because of competition. Competition works well up to that point, but to try and discern what research is there is very difficult. If you have a conversation with an entrepreneur he has what he calls his trade secrets and it is difficult to extract these but they can be seen in the end product. The competition is so fierce in this field that in fact in a curious way the entrepreneur is always trying to be in a lead position so as to be ahead of his competitor.

In that sense I think he does research. I do not know whether you would call it research, but he does take it is and where it is going, what function it is performaction and innovate to keep in front of his competitors. ing and in what kind of community it rests.

Mr. Hignett: I think a close example is the development of Kanata here on the edge of the greenbelt which is a new kind of complete community development. It is being done by one man and is being done as a competitive operation. There are examples of this in the United States, the new towns of Reston and Columbia. These are sponsored by private entrepreneurs; some people like them and some people do not, but they are new, they are new in their housing forms, they are new in their layouts. This kind of thing goes on continually.

Senator Giguere: Also new in costs?

Mr. Hignett: There has been no break through in costs, no.

Senator Grosart: Of course, this would apply to any industry.

Mr. Hignett: That is right.

Senator Grosart: The innovation and the input of extramural innovation would apply to any industry. My question was directed towards their social obligations, because there are industries in which this is required. The drug industry, for example, is required to do its own research and bring the results into the controlling department for the very obvious reason that there is a social hazard here.

Now, there is just as great a social hazard in unplanned housing development. My suggestion is that it would make a lot of sense for some of the obligation for social research to be done. For example, in the Kanata situation why should not the municipality say to the developer, I am not sure whether this is the right kind of development in this municipality; here are the doubts in my mind, get me a study?

Mr. Hignett: They often ask for feasibility studies.

Senator Grosart: Feasibility is another thing. Presumably anybody who is any developer has done feasibility studies, but the social questions that arise from all of these urbanization problems, and particularly the housing aspect of it, are tremendous.

Mr. Hignett: For example, Senator Grosart, the financial institutions of Canada, the life insurance companies, the trust companies and the chartered banks, their investment in new housing would be over a billion dollars a year.

Mr. Adamson: I would say about \$21/2 billion now.

Mr. Hignett: They tend to put this into the urban places and spend not a dime on what kind of housing Senator Grosart: That is my point and what I am wondering is why the decision they make, the people who have to decide yes or no, will we allow this, why they are not demanding this kind of study. There would be an immediate response from industry. Industry is quite prepared to accept the costs of doing business with various types of controls. I just do not understand why Central Housing and Mortgage Corporation, for example, should be required to do so much of this study for the benefit of the people who are profiting by it.

Mr. Hignett: Part of it is because of the fragmentation involved, the dispersion of operating in a large number of municipalities that often form our urban areas.

There are local debates going on and we are in the midst of one here now. What is the proper form of urban development for downtown Ottawa? The city of Ottawa has produced a report on the form of downtown Ottawa which it does not appear to like very much now it has got it, but it is an attempt to impose on the developer a social conscience of a kind, but again it is thou shalt not, you shall not have a building higher than 110 feet on Wellington and 325 feet on Gloucester. This kind of thing goes on.

Senator Haig: Mr. Hignett, what was your relationship to the task force on housing?

Mr. Hignett: None at all, senator. The task force on housing really was the first time in the 23 years since CMHC was created that there has been a review of housing and urban development in Canada by a group of Canadians completely at arm's length from CMHC.

The Chairman: Including the minister?

Mr. Hignett: Yes, including the minister; we welcome this. You may remember, senator, that what led to the National Housing Act in 1944 and the creation of Central Mortgage and Housing Corporation was a study that later became known as the Curtis Report. Many of the recommendations of the Curtis Report were adopted and found themselves in the National Housing Act and led to the creation of Central Mortgage and Housing Corporation.

In the 23 years since, more than half of all the housing that exists in Canada has been built; half of Canada's housing is less than 23 years old and it seemed to us at CMHC that when the government allowed the minister to go ahead with a study of this kind and select eminent Canadians to carry it out that it would be a good thing if it were done at arm's length of CMHC. They had the opportunity to question us and did so, but our only involvement in it really was in making the physical arrangements for it, in arranging for places where the task force would meet with the public and arranging for transportation locally, and this sort of thing, just so that it ran

Senator Grosart: That is my point and what I am smoothly, but as to its content, we had nothing to do with it; we had nothing to do with the preparation of who have to decide ves or no, will we allow this, why

Senator Robichaud: I would like to ask Mr. Hignett if he is aware of this talk that we hear about an experimental city?

It seems to me that even the minister at times has made reference to what he would call an experimental system or a new development altogether, new cities being created.

Has CMHC been involved in such planning or such discussion?

Mr. Hignett: We have watched with great interest the new towns' activity in the UK and there has not been a new town program in this country in that sense, although there have been many new towns built in Canada in which CMHC played a very large part, towns like Kitimat, like Elliot Lake, like Labrador City, towns that are generally associated with the opening up of resources on the frontier.

The recent discussion relates to not a satellite city, but a new city. This new city is not regarded as a satellite to any existing city, or even an adjunct to an existing urban area, but something entirely new and something that is capable entirely of its own support.

The discussion that is taking place seems to be a city of a million people. This is a pretty exciting proposal. We know that no matter what we do the population of Toronto is going to reach five million people by 1980 or 1985 and the same thing is true of Montreal. Nothing can stop Toronto from growing and nothing can stop Montreal from growing but some of the pressure might be taken off the existing urban places in Canada which mainly were created by accident if a new city were developed.

So if one expected to see a new city you would expect to find it somewhere in the St. Lawrence trench and I would think somewhere between Windsor and Quebec city if there was to be a first one. The idea itself is tremendously interesting. What we are presently trying to do is to reshape, for our present needs, cities that were laid down a hundred years ago for traffic conditions of a hundred years ago. The new city appears to give an opportunity to do all sorts of things that cannot be done in existing urban communities, new relationships between housing and industry, new relationships in the use of land, new relationships between urban transportation and the community, new ways of plugging the community into the system.

The idea is so exciting that I would regard it as being almost inevitable, but this is not to say that it will be conducted by Central Mortgage and Housing Corporation. The new city, to begin with, requires the acquisition of a very large tract of land; the new city will still

be in a province; my guess would be that what is required is some sort of an organization that contains all of the skills necessary to create a new city that is sponsored jointly by the province concerned and the federal government.

Now, that may be a very large joint Crown corporation on its own in which we may have a part to play in its growth, but perhaps not a part to play in the decisions that lead to it. This remains to be seen.

Senator Robichaud: Is this not on a smaller scale what is being planned or discussion has taken place regarding Belledune in New Brunswick where they have this mining development, east coast smelting, and others?

Mr. Hignett: Belledune is more of the order of Labrador City; it is an urban community required to service something that has emerged there.

The Chairman: You would not think of a new city of one million in New Brunswick at this stage.

Senator Robichaud: Not at this time, although it would be a great advantage.

Senator Grosart: Has any research been done on the ancillary costs of housing development as they would be reflected, say, in municipal taxes?

Let me put it another way: if a municipality having before it a request for a building permit, regardless of size, would say we want to know what the cost of this will be in terms of the mill rate?

Mr. Hignett: This is the way the game is played; this is why, for example, metropolitan Toronto is in the trouble that it is in. The break-even point on the municipal tax rolls in Toronto at the moment is a \$30,000 house and the boroughs of metropolitan Toronto do not welcome anything that costs less than \$30,000, or creates an assessment of less than the \$30,000.

This is why we find that in Scarborough you are not allowed to build a house of less than 1,200 square feet when it is known that three bedrooms can be put into 1,000 square feet without any trouble. This is why municipalities do not welcome public housing in their communities, because it is negative on their tax rolls and the whole objective at the moment by the municipalities of Canada is to create the kind of housing accommodation that breaks even on the tax rolls; this is one of our greatest problems.

Senator Grosart: I am aware of the discussions that have gone on, but what I am asking is what research has been done so that a municipality could estimate precisely the effect of any particular housing development on the tax roll?

Let me put it this way: Can somebody produce for them a piece of paper and say here is what it is going to cost in extra sewerage, here is what it is going to cost eventually in extra parking if the municipality has to provide it, here is what it is going to cost in police services, fire services, transportation?

Mr. Hignett: I think the municipalities are pretty sophisticated in this field. They do know these things. That is why municipalities are able to determine the impost that they put on developers. They are able to be rather precise about what education will cost, because of certain actions, what is the additional cost to municipal services; police, fire, garbage collection, et cetera, because of other actions. I think this is a field in which they have developed a high degree of sophistication.

Senator Grosart: Who has done the research and where is it available?

Mr. Hignett: It is available in municipal offices, because it varies amongst communities. The Federation of Mayors and Municipalities is one collecting point for this kind of information, although as I understand it, it is mainly an interchange of information.

Senator Grosart: Is it largely guesswork?

Mr. Hignett: No, I do not think it is: I think it is highly sophisticated.

Senator Grosart: Do you know of any specific research project that has been done in this field?

Mr. Hignett: Outside of the municipalities?

Senator Grosart: I do not care where it is; is there a paper? Are there papers in learned journals? Is there a file in Ottawa?

Mr. A. E. Coll, Executive Director, Central Mortgage and Housing Corporation: I think so, senator; the Federation of Mayors and Municipalities through their central office in the last six months have done a survey of the cost of the major services provided on a per capita basis in several ways and they have this information available.

Senator Grosart: This is done on a very general basis then, and averaging basis by the Association of Mayors and Municipalities?

Mr. Coll: Yes.

Mr. Adamson: I have seen the response to this survey and I think the answer to the question Senator Grosart is asking is that this would not serve the purpose of what he has in mind, which is presumably the aggregated study of the work done at the munici-

palities and trying to put them all together and see how much sense they make?

Senator Grosart: That is exactly it.

Mr. Adamson: Unless there is something of that kind available at, let us say, the Ontario Department of Municipal Affairs, which is entirely possible, no, I would say I do not know of a single aggregative study that looks at the various experiences of different municipalities and tries to make some sense out of them.

Senator Grosart: No, it would be highly desirable that there should be such a study.

Senator Robichaud: You certainly could not take Ottawa as an example.

Mr. Adamson: Ottawa certainly would be one of the contributing sources.

Senator Robichaud: On page 16 of your brief you refer to this patent taken by Converto, which has to do with a sewage disposal unit for an individual household.

Is the government or CMHC taking advantage of this, is it being used in the building of an individual home?

Mr. Hignett: Yes, indeed it is. We have found it necessary to restrict its use in a sense. It took us years to wean the country away from the septic tank. Twelve years ago more than half of all the houses built in Canada were serviced with septic tanks; in Ottawa it was 80 per cent of all houses built. It took us many, many years to get the country away from the septic tank which in some communities caused tremendous problems; the ground pollution in some cities was just fantastic.

The Converto study was one of the steps taken to see if we could not find a device that was a reasonable alternative to the pipe sewer, which we did not regard the septic tank to be, at least on a 50-foot lot.

Senator Robichaud: Ten feet from the well.

Mr. Hignett: Yes, and it has shown a lot of promise but, nevertheless, there is always the danger that if we let the Converto freewheel that the Converto would replace the septic tank and we would go back to the point where half the houses were serviced with Convertos.

This may not be a bad thing, but we do not know enought about it yet to know whether it is good or bad, so what we have been doing is restricting its use in the sense that we have said to the Converto Company and to borrowers, there can be so many in a very large number of communities so that if in some communities they are not working, because they do require servicing, and if they are not properly serviced they fail. So they are still operating with some restrictions.

The Chairman: I would hope so. A final question: On page 7 of your presentation today you say that you have had close relationship over the years with the Division of Building Research of NRC and you go on to say there is now increasing consultation with a number of government departments. Is this recent, and how is it arranged, this kind of consultation?

Mr. Hignett: The consultation with the Division of Building Research goes back to the first year of CMHC when it was decided that CMHC itself would not be a technical research organization. The Division of Building Research was founded in the same year and in the year it was founded its principal purpose was to be the technical research arm of housing in Canada.

So our relation with DBR has been very close and officers of CMHC serve on nearly all the committees of the Division of Building Research. We serve in the development of the building code and this sort of thing. We have sustained it by annual grants these are now of the order of \$150,000 a year.

Our relationships with other departments of government were created by need. For example, with National Health and Welfare, as we got deeper into the problem of housing the elderly, it became evident that "housing" as opposed to an "institution" in the whole range of shelter needs for elderly persons had to be defined. We have worked very closely with Health and Welfare in the field of housing of elderly persons, so that each one of us, CMHC and the department, can, in their own way, take care of the whole range of needs of the old. I think this has been done quite successfully.

Our relationship with Energy, Mines and Resources, for example, came about by their growing interest in pollution. It just happened that CMHC had the only federal legislation that dealt with pollution, the loans and grants for sewage treatment facilities, and since EMO are developing a mandate in this field it has been necessary for us to develop a closer association with them.

We have tried to help Indian Affairs and Northern Development with their Indian and Eskimo problem with some success. Our relationships with Transport are newer and notwithstanding the fact that we share the same minister. They are developing an interest in research into urban transportation. We share this interest.

So with the passage of time we have taken advantage of every opportunity to form an association with departments of the federal government that share an interest with us. The Chairman: You are coming back to Ottawa from Eastview, I want to thank you very much, Mr. Hignett, and your colleagues. It was a very interesting afternoon, a little bit frustrating though, because we have not contributed very much to solving your research problems.

The committee adjourned.

APPENDIX "34"

CENTRAL MORTGAGE AND HOUSING CORPORATION

REPORT TO

SENATE COMMITTEE ON SCIENCE POLICY

1. Organization (your 2.1, page 4)

- (a) & (b) Attached Organization Chart No. 1 shows the Divison and Departments of C.M.H.C. and the Parliamentary reporting channels.
- (c) The attached Organization Chart No. 2 shows the organization of the Economics and Statistics Division which is involved in intramural scientific activites. Page 4 describes the Advisory Group which is responsible for initiating, negotiating and conducting arrangements for extramural research provided for under the National Housing Act.
- (d) & (e) Not applicable.

2. Organizational Functions (your 2.2, page 4)

(a)

C.M.H.C.'s functions and powers regarding scientific activities are set out in Section 26 of the C.M.H.C. Act and in Part V of the National Housing Act 1954. Section 26 of the C.M.H.C. Act reads:

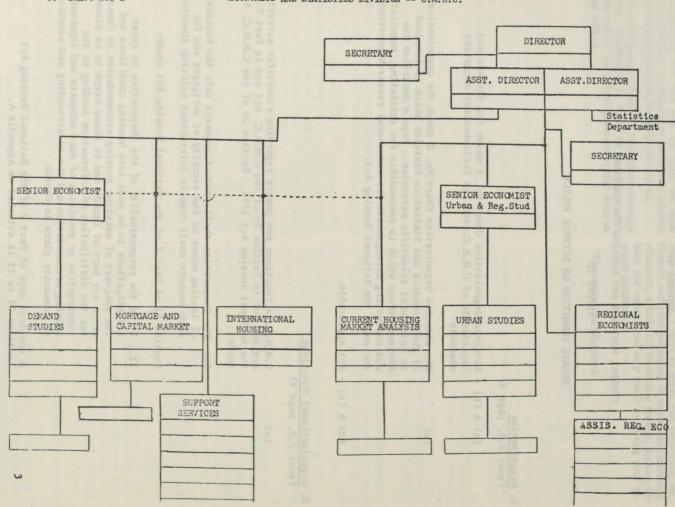
26. The Corporation shall conduct research into the business of lending money on the security of mortgages and for such purpose shall compile information relating thereto.

Section 31 of Part V of the National Housing Act reads:

31. It is the responsibility of the Corporation to cause investigations to be made into housing conditions and the adequacy of existing housing accommodation in Canada or in any part of Canada and to cause steps to be taken for the distribution of information leading to the construction or provision of more adequate and improved housing accommodation and the understanding and adoption of community plans in Canada.

A complete copy of Part V of the National Housing Act Sections 31 to 35 is attached as Appendix A.





ADVISORY GROUP - C.M.H.C.

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(c) The Advisory Group is responsible for examining housing policies and objectives and where appropriate formulating and recommending new policies to management. The Advisers are also responsible both individually and as a Group for initiating negotiating and conducting arrangements for research and development activities within their fields under the terms of Part V of the N.H.A. either within the Corporation or through outside agencies.

The Advisory Group is made up of seven Advisers, including two Executive Directors of the Corporation and the Director, Economics and Statistics Division. There is also a Consultant Adviser. Two Administrators and two Secretaries complete the staff.

(b) What organizational policies have evolved.

The scientific research carried out by the Corporation falls into two categories intramural and extramural. The intramural work is in the field of economics and statistics except for the work of one sociologist. The intramural research is policy-orientated and therefore applied in nature. Basic research is minimal, mainly forming a background to housing policy. All other areas of research are carried out extramurally, in the main, through a process of funding. Extramural activities are described under section 2:8.

- (c) The Intramural research involves demographic projections, mortgage marketing, flow of funds to the mortgage market, construction industry statistics, forecast of investment, behaviour of lending institutions. There is a substantial amount of data collection done basic to this research.
 - i) The nature of these investigations involves constant liaison with many other Federal agencies and departments. There is a virtually continuous interchange of ideas and information with the Bank of Canada, the Department of Finance, the Dominion Bureau of Statistics, the Department of Trade and Commerce (National Accounts) and the Department of Manpower and Immigration. Close contact is maintained with ARDA, ADB, ADA and the Economic Council of Canada.
 - ii) Communications are also maintained with the construction associations, the housebuilding associations, manufacturers of building materials and with financial institutions such as the Canadian Bankers Association, Dominion Mortgage Association, the individual Chartered Banks and credit institutions, and with the economic and research departments of Provincial Governments.
 - iii) The Corporation is involved with educational institutions mainly through its extramural funding activities. Study and research projects carried out in the universities and other educational institutions may receive financial support. This is described more fully in Sections 2.8 to 2.9 of this report.
 - iv) Corporation economists maintain contact with their counterparts in other nations through international conferences, scheduled visits to corresponding agencies in other countries, e.g. H.U.D. in Washington. There is an exchange of ideas and techniques through these channels. The Economics and Statistics Division maintains an international desk through which progress in other countries is studied.

Co-ordination with other institutions and agencies is a continuing process in response to the changing requirements of the management of the Corporation.

It is carried out through personal contact with counterparts in the various institutions and through exchange of reports and information.

- (d) There is a constant assessment of the operational effectiveness of the research processes in relation to the goals and requirements of management. The assessment involves the work content, the techniques used and the effectiveness of the personnel engaged in various facets of research. An annual review and analysis is also carried out by senior personnel.
- (e) There have been no outside studies commissioned (during the last 5 years) to suggest improvement of C.M.H.C.'s operating procedures.
 - (f) The powers and responsibilities given the Corporation under the NHA and the CMHC Act are not exercised to the full extent of the legislation. Limitations are exerted by various forces, the scarcity of skilled people, physical limitations of space, financial restrictions.
 - (g) An immediate constraint is that created by the current (Oct. 1968) financial stringency.
- (h) No forecast of major changes in organization functions can be made until the Task Force on Housing completes its report.

3. Personnel Policies (your 2.3, page 5)

- (a) Recruiting teams visit universities and conduct interviews on-campus. The students who possess the necessary qualifications and potential are interviewed at a later date by our professional men in the various fields.
- (b) No unique criteria. Pertinent questions are asked relating to the different fields of research to determine whether these students are interested in research, as such, and if they have the background and knowledge to undertake research work.
- (c) We have a personnel evaluation programme that probes into the performance and potential of our employees. Their competency in research work is referred to our professional administrators.
- (d) This does not apply, since we have very few administrators of research.

(e) CMHC has an academic assistance programme that provides for "in-company" courses and extramural activities that range from seminars to post-graduate studies in Canadian and American Universities.

4. Distribution of Activities to American dual and a seal and the control of the (your 2.4, page 6)

- (a) Funds expended on scientific activities are not put out on a regional basis per se. The Corporation's intramural and extramural activities are considered essentially national. By its nature the funding of extramural activities may be more heavily concentrated in one region than another, This is the result largely of forces outside the Corporation's immediate control. Where the concentration of universities is greatest and where the academic interest in the Corporation's areas of research has matured the proportion of spending tends to be greater than elsewhere, normanorate NHA and new CMUC.Act are not exercised to the full extent normanorate of the full extent normanorate of the full extent state of the full extent of the f

 - (c,d,e) The research has been largely problem-orientated arising out of specific needs. As such, it does not bear direct relationship to a policy of regional distribution. The Corporation has sponsored or assisted investigations into a number of regional problems e.g. isolated Indian communities. human settlements on resource frontiers and the development of mountain slopes for residential use. It also has a continuing interest in the regional studies of ARDA and ADB.

3. Personnel Associated with Scientific Activities (your 2.5, page 7)

- (a) C.M.H.C. presently has on strength 21 Economists, 4
 Supervisory Staff, 4 members of the Advisory Group total 29. Included in the Advisory Group is one guest
 worker. There are no post-doctorate fellows and no
 personnel on loan.
- (b) Eight of the above (Supervisory Staff and members of the Advisory Group) devote most of their time to administrative duties.
- (c) Tabulated information regarding professional staff for the two units associated with scientific activities:-
 - (i) Country of Birth -Bachelor Degree - Canada, Egypt, England and China Master Degree - New Zealand, Canada, Syria. Doctorate Degree - Hungary, Germany, Pakistan, Canada, India, Yugoslavia, England.
 - (ii) Country in which Secondary Education Taken Bachelor Degree Canada, Egypt and England.
 Masters Degree Canada, New Zealand and Syria.
 Doctorate Degree Hungary, Germany, Pakistan, United States,
 India, Italy and England.
 - (iii) Country in which University Degree Taken -Bachelor Degree - Canada, Egypt, England, Masters Degree - United States, Canada and England, Doctorate Degree - Hungary, Canada, England, United States, Italy.
 - (iv) Number of Working Years Since Graduation Bachelor Degree 1, 3, 3, 2, 11, 12, 13, 4, $\frac{1}{2}$, $\frac{1}{2}$, Doctorate Degree 18, 13, 6, 2, 12, 20, 18, 12.

Number of Years Employed in Present Organization - Bachelor Degree - 5, 4, 2, 2, 1, 4, 1, $\frac{1}{2}$, $\frac{1}{2}$, $\frac{1}{2}$, $\frac{1}{2}$, 22, 22, 16, 22, 8. Masters Degree - 2, 2, 1, $\frac{1}{2}$. Doctorate Degree - 13, 11, 4, 2, 4, 18, 17, 1.

- (v) Average Age Bachelor Degree 43
 Masters Degree 29
 Doctorate Degree- 41
 - (vi) Percentage Able to Operate Effectively in Canada's
 Two Official Language:
 Bachelor Degree 29%
 Masters Degree Nil
 Doctorate Degree 25%

(d) Total numbers of professional staff in each degree category for each of the year 1962 - 1968

As at December 31st -

Year Manager	Tota1	Bachelor Bachelor	Master	Doctorate
1962	24	5	pers(.nnel	.)
1963	21	6	.)	.)
1964	20	ne above (Sm	1 .)	(4.)
1965	21	stovel7 (great	.)	.)
1966	23	9	.)	.)
1967	30	17	5	8
1968 (estimated)	29	17	4	8
1969	37	21	7	9
1970	37	21	7	9
1971	37	21	7	9
1972	37	21	1000 7	9
1973	37	21	7	9

.) not available

(e) Percentage of turnover of professional staff in the three degree categories for each of the years 1962 - 1968

As at December 31st -

Year	Total %	Bachelor %	Master %	Doctorate
1962	0	0	0	0
1963	22	Uman) and and	.)	.)
1964	30	rate Decree -	.)	.)
1965	23	.)	.)	.)
1966	17	.)	.)	.)
1967 - 1967	27	13	11	3
1968	44	20	12	12

(f) Percentage of current professional personnel who since graduation have been employed

1.	by industry at one time	100	45%
2.	oon the staff of universities	ol-i	18%
3.	provincial departments or agencies	-	23%
4.	other federal agencies	an-t	16%

- (g) Number of staff in each category on education leave Nil.
- (h) Number of university students given summer employment in the fields of scientific activities for the years 1962 - 1967.

1962	-	5	
1963	-	6	
1964	-	5	
1965	_	8	
1966	-	12	
1967	-5	9	

6. Expenditures Associated with Scientific Activities (your 2.6)

(a) (i) Funds spent on scientific activities - by function

	(1)	(2)	(4)	(5)	(6)	(7)	
	Intramural R. & D. (those detailed in 5(a))	Data Collection	Testing & Standardiz-aition	Support of (i) R&D in Industry and other	Support of R & D in universities	Support of High Education in En mental Sciences Urban & Regiona	viron- , Planning
1962	216,460	180.580	49,980	34,172	41,461	28,500	
1963	198,380	188,160	49,620	33,576	88,000	27,900	
1964	198,570	203,310	52,370	59,645	86,298	30,600	
1965	240,145	201,339	48,208	149,050	75,410	31,500	
1966	290,836	228,748	53,508	371,104	132,600	146,300	
1967	368,290	254,046	50,622	364,240	364, 465	575,000	
1968	390,387	269,289	53,659	238,766	641,350	705,000	
1969(es		296,218	56,342	274,580	737,547	800,000	

⁽i) Not included is an annual support grant to the Division of Building Research NRC, of \$100,000 in 1962 and in 1963 and \$150,000 in each of the years 1964 - 1968. "Other" includes research organizations, e.g. Ontario Research Foundation and various research teams or committees established for a specific project or on a continuing basis. Not included are support grants to C.P.A.C. & CURR. C.H.D.C. (mentioned in the text) because funds are not directed to specific research.

6. Expenditures Associated with Scientific Activies (Cont'd)

(a) (ii) Funds spent on scientific activities - by discipline (Items 5 and 6 of Table (i))

		Social Sciences					
Year	Engineering and Technology	Natural (1) Sciences	Urban Economics	Inter- (2) Disciplinary	Total Social Sciences		
1962	2,800	23,372	387,388	49,461	49,461		
1963	16,550	17,026	S 347-184	132,600	S PR M M PR PA PA		
1964	27,735	36,676	13,000	68,532	81,532		
1965	24,000	25,000	80,250	95,210	175,460		
1966	339,600	36,470	39,634	88,000	127,634		
1967	260,810	271,310	85,125	372,270	457,395		
1968	112,550	154,000	265,686	347,880	613,566		
1969(est)	224,752	Testing &	** on (1) Supper of	439,484		

(1) Includes biological and chemical and ecological.

(2) Includes projects or programs which normally involve a combination of the social sciences: economics, behavioural and environmental sciences.

Method of allocation does not warrant Projection.

** Total projected only.

6. Expenditures Associated with Scientific Activities (Cont'd)

(a) (iii) Funds spent on scientific activities - by area of application (Items 5 & 6 of Table (i))

Year	Construction	Transportation	Underdeveloped & Regional	Economic Policy	Social Welfare & Social Policy	Educational Techniques	Others
1962	26,172			神奈日表 18	41,461	阿爾斯亞亞亞及於	8,000
1963	33,576	75 75 7-195	STELLER STE	SEPTER	1-17-14-1	444	
1964	64,411	17:14.12		13,000	36,432	22,500	9,600
1965	49,000	18,500	1200000	16,700	67,650	22,500	50,110
1966	386,604		SECTED AND	28,000	62,000	12.000	15,100
1967	242,170	15,000	171,100	11,125	239,770	1,000	48,540
1968	212,550	DE BURE	130.000	168,450	231,140	6,236	131,740
1969(est)	308,485	*	* * * * * * * * * * * * * * * * * * * *	*	195,396	*	*

^{*} Allocation in response to outside initiation does not warrant projection.

7. Operating and Capital Funds Associated with Scientific Activities (your 2.6)

(b) (Economics and Statistics Division and Advisory Group)

1962	\$254,000
1963	241,000
1964	257,000
1965	285,000
1966	336,000
1967	321,000
1968	322,000

(c) Funds expended to further professional university education of staff r each of the fiscal years from 1962 to 1968 (e.g.) costs of educational leave to take higher degree, payments to cover costs of taking courses at local universities has been minimal totalling some \$5,000 for the period 1962-1968.

8. Intramural Research Activities (your 2.7)

(a) (1) The intramural activities of the Corporation provide a service to management to assist in policy making. Projects are selected as directed by management or in anticipation of problems.

Interaction between the Corporation and other Federal Departments or agencies is an important element of research projects. Basic information may be supplied to the Corporation if another department or agency has established procedures in areas of mutual interest or where projects have overlapping implications. Departments or agencies which may be involved include Finance, the Dominion Bureau of Statistics and the Economic Council of Canada. The initiation and monitoring of a project is carried out by the agency undertaking the project if done outside the Corporation.

- (a) (2) There is an established program of intramural research which provides the information needed to support decision making. Requests for special projects or studies are given priority on the basis of the urgency of the request. The priority may be determined by management or by the Director of the Division responsible for the research.
- (a) (3) The critical path network and programme evaluation and review techniques are not used to plan and monitor intramural programmes and projects.
- (a) (4) Contracting out of projects in support of intramural programmes of research has not been used in the past.

Extramural Activities (your 2.7)

(a) (5) The policy of Central Mortgage and Housing Corporation for funding extramural research programs in the university and in industry is established by the terms of the National Housing Act, 1954, Section 31, as quoted at the beginning of this report. Sections 32 and 33 of Part V of the Act set out as matters for investigation a wide range of research, information and developmental activities in the economic, social and physical sciences as they relate to housing and urban affairs. Funds are available for these purposes under the Act and the Corporation's responsibility in this respect is in large measure carried out through grants to research undertaken outside the Corporation. Grants are given to projects with the general purpose of adding to the knowledge and understanding of housing and urban conditions as well as for applied research.

There has been for many years a close relationship with the Division of Building Research of the National Research Council. There is now increasing consultation with such departments and agencies as Transport, Manpower and Immigration, Industry, National Health and Welfare, Energy, Mines and Resources and Indian Affairs and Northern Development and the Canada Council. Close liaison is maintained in an attempt to complement and integrate with the research activities of other Federal government departments and agencies which have mutual interests.

(a) (7) Interchange of knowledge is carried out through publications and through meetings of personnel. Publications include, Canadian Housing Statistics, an annual, and a monthly supplement; Housing Studies (bulletins), a Mortgage News Letter and through replies to direct requests. Corporation personnel attend meetings of various financial, economic and statistical organizations, e.g. the Organization for Economic Co-operation and Development and the International Monetary Fund.

For transfer of extramural results refer 2.7) b.7) and 2.8)

(b) (1) The funding of extramural scientific activities is the concern of the Advisory Group of the Corporation. The Group is composed of specialists in the fields of architecture, house construction, community planning, economics and urban affairs.

The funds for research may be advanced to universities, other educational institutions, research organizations, associations which have research facilities and to individuals working independently or associated with the educational institutions.

The extramural research may be one in which the activity is initiated by the Corporation, one in which the Corporation responds to activities initiated outside the Corporation or one arising from a mutual interest. Members of the Corporation's Advisory Group have been much involved in conferences and discussions where an idea appears from which negociation follows and a project is formulated.

Proposals for projects or programs are submitted to the Advisory Group which evaluates the application. It is judged on conformity to the objectives of Part V of the Act, on the Proponent's ability to sustain and complete the work, and on the estimated cost relative to the resultant benefit. If the subject of a proposed investigation is highly specialized, outside advice in the particular field may be obtained. If the proposal qualifies for support a recommendation for approval and funds is made by the Advisory Group to the Corporation's Executive Committee or Board of Directors. In some cases approval by the Privy Council is also required. When the necessary approvals have been received the terms of reference are incorporated in an agreement between the Corporation and the proponent.

Support is given by the Corporation to projects undertaken by agencies having areas of mutual interest. Typical of this group are the National House Builders Association, the Ontario Research Foundation, the Pulp and Paper Research Institute and the Atlantic Industrial Research Institute. The Corporation's Advisory Group may initiate the program or project or through negotiation reach agreement with the agency on the work to be undertaken. When the terms of reference are satisfactorily established the process of funding is as described above.

The Corporation does not maintain laboratory facilities for research in the physical sciences, but instead recognizes the Division of Building Research of the National Research Council as its agency for conducting scientific research in building materials and systems. The Division of Building Research undertakes, on request, field studies, testing and evaluation of materials and joins with the Corporation in undertaking, sponsoring and supervising experimental work in housing construction. By agreement an annual grant under Part V of the NHA is paid to DBR in recognition of services performed.

A number of organizations have been established outside the Corporation to fill specific purposes in the improvement of conditions in housing and the urban environment. The Corporation may provide support of a continuing nature to these, some of which have within their overall programs areas of information, education and research. Organizations which receive such grants are the Canadian Housing Design Council, the Community Planning Association, and the Canadian Council on Urban and Regional Research, which may itself give research grants. Support funds are provided on an annual basis on consideration of a submission outlining a yearly program. The Advisory Group evaluates the program and if it meets the requirements approval and support funds are recommended as outlined above.

(b) (2) The number of people with advanced knowledge in the areas of research related to housing and the university facilities which could be devoted to these problems have until recently been limited. Indeed, much of the Corporation's effort has been in encouragement to undergraduate and postgraduate students through training and education grants or fellowships to take advanced studies in preparation for independent research in the field of housing. The inherent worth of a proposal

and the ability of a proponent to bring it to a successful conclusion have been deciding criteria in acceptance. There has been, of course, emphasis on the most critical problems of a particular period. For example, community planning education received special attention in the early years. Through the pressures exerted by increasing urbanization there is an urgency to extend research into these areas. With the increase in the number of urban renewal and public housing projects, the inherent social problems became more evident and more resources are being devoted to research of this nature. The housing problems of ethnic groups and those of frontier areas are now receiving greater consideration. The volume of viable application in the past was not so great that priorities were a problem. There is, however, now an opportunity to develop a more selective program and by examination separate out the most significant proposals in the large subject areas.

- (b) (3) The Corporation has not established a fixed system of monitoring. Projects are reviewed by means of progress reports and discussion. A formal agreement sets out the terms of reference and includes an arrangement for disbursements as the project proceeds. In cases in which a university is involved the agreement is made with the university and funds are disbursed through the university.
- (b) (4) N.A.
- (b) (5) The Corporation has not used the Critical Path Network or the Program ((6) Evaluation and Review Technique to monitor programs. This would not be generally practicable with extramural activities in which the day to day operation is not under immediate surveillance. In experimental or developmental projects the agreement between the Corporation and the proponent
- (b) (7) The results of extramural activities are made known by way of published books, reports and articles, which are circulated among interested organizations, publication in journals, response to direct requests and arrangements for the production in those areas involving material items.

may make provision for termination or redirection of effort.

(b) (8) Of the funds spent under Part V NHA in the years 1962-1967 the following percentages were spent on extramural research projects:

 1962 - 18.4%
 1963 - 19.2%
 1964 - 12.9%

 1965 - 22.3%
 1966 - 23.7%
 1967 - 31.9%

(b) (9) N.A. Tabulations of funds requested for projects which have been rejected are not made.

(your 2.8)

(1) A patent has been taken out by Canadian Patents and Development Limited for the "Converto", an aerobic sewage disposal unit for individual households. The developmental work was done by the Ontario Research Foundation over a 10-year period with the assistance of grants from the Corporation. Production has been licenced to the Converto Company of Canada Limited. Patents have been applied for by Reff Plastics Ltd., Weston, for a prefabricated fibreglass bathroom. Development of a prototype and moulds were assisted by a grant. Rights to production have been purchased by Crane of Canada Ltd.

(2) Among publications arising from research projects supported by funds
(3) granted under Part V of the National Housing Act are:

"The Urban Frontier", published by the Lower Mainland Regional Planning Board. New Westminster. B.C.

"Subdivision Casebook", published by the Planning Institute of British Columbia.

"A low cost Housing Study for Winnipeg", University of Winnipeg.

"New Forms of Family Housing", published by the Canadian Housing Design Council.

"Housing Study - Isolated Communities and Indian Reserves Prairie Provinces", published by Kennedy/Smith Associates, Winnipeg.

"The Political Economy of Urban Changes in Canada", published in Queen's Quarterly - Winter 1961.

"The Social Aspects of Urban Renewal", - Community Welfare Planning Council of Winnipeg.

"An Investigation of Individual Household Aerobic Sewage Treatment Units" and "Individual Household Aerobic Sewage Treatment Units", published by the Ontario Research Foundation.

"Treatment and Disposal of Waste Water from Homes", published by Alfred P. Bernhart Associate Professor Dept. of Civil Engineering, University of Toronto.

"Decentralization of Urban People and Manufacturing Activity in Canada", Canadian Journal of Economics and Political Science, February, 1961.

"A Guide to Cooperative Housing" and "Cooperative Housing Administration Manual". Institute of Social Action, St. Patrick's College, Ottawa.

"The Social Implication of Public Housing in Metropolitan Toronto", The Metropolitan Toronto Housing Authority.

"Urban Transportation in Canada", Canadian Federation of Mayors and Municipalities.

(4) Conferences for the exchange of information have been supported by the Corporation. Other means employed for publicizing results are Journals, circulated reports and seminars. The Division of Building Research, NRC, which receives a support grant publishes results of its work in the housing field.

Vising foreign missions associated with housing are briefed by Corporation officials and visits to significant design or experimental projects arranged. Corporation personnel have made similar visits to foreign centres. As an information function the Corporation publishes two magazines, "Habitat" and "Urban Renewal". These may carry articles on the results of research but are in general directed to a non-scientific audience.

- (5) The Corporation maintains a housing library in which a large number of books and periodicals originating outside Canada are available. The Corporation does not at present maintain a formal procedure for the transfer of foreign based works to extramural groups. Studies and discussions are now taking place on the establishment of an information centre where an inventory of work done in Canada and in other countries could be maintained.
- (7) There have been limited resources in both people and expertize and only (8) recently has any substantial program been developing under the funding arrangements which could provide the opportunity for research teams to grow. Supported activities have to a considerable extent been too widely distributed to nurture this growth. A team working in the Ontario Research Foundation on the problem of household waste disposal has acquired a substantial body of knowledge and technical ability in this field. Support has been provided for some years to this program. A new development has been the emergence of interdisciplinary groups in centres of research and some of the universities Montreal, Toronto, Waterloo and Manitoba. These centres, which are receiving support and encouragement from the Corporation, provide the milieu for the development of skilled teams and techniques. The Division of Building Research also provides the continuity for this kind of development. While DBR receives a support grant from the Corporation, such development would be considered an internal achievement.
- (9) The Corporation's funding of extramural work must be regarded as modest when related to the vast scale of money and manpower being invested in Canada on urban growth. Nevertheless it represents a very considerable body of work on a very wide range of subjects carried out by a large number of people in all parts of the country. Much of the work has been exploratory and isolated. There is, however, an increasing movement towards integration and an interdisciplinary approach to the forces underlying the urban complex.

Much of the Corporation's funding has been directed to the training of skilled people through graduate studies. In the last three years a greater proportion of funds spent extramurally has been used for this purpose than for research projects. With the growing number of skilled people there is now an opportunity to develop a more selective and structured program of research in the fields of housing and urban growth.

In building technology there has been a particular attempt to solve the problems of waste disposal and a search for the use of new materials and innovations in construction by building experimental houses. The social problems of disadvantaged people are now receiving more recent attention.

(Your 2.9) resigned taloum lander to my test tous blingle

(1) Among intramural projects conducted have been "Housing requirement projections to 1981", and an "Evaluation of the Mortgage Insurance Fund".

Among extramural projects undertaken during the past five years of a continuing nature are the following:

The Corporation and the Research Committee of the National House Builders' Association collaborated in the construction of a series of experimental houses. These have been in part to study new materials and heating and sanitary systems. The experiments have been observed by scientists of the Division of Building Research, National Research Council, and reports on the results have been circulated among interested builders.

The Ontario Research Foundation has carried out a sequence of developmental investigations under the title "Kinetics of Oxidation". This led to research into the basic processes of sewage treatment and the development of two types of individual household treatment units. This research has been assisted over a ten-year period by an annual grant from the Corporation. The original aim of the investigation was to evolve a system better than septic tank disposal and to deal with problems of sewage disposal in the far north. Two other experimental programs have evolved out of this work in collaboration with the Department of Health and Welfare, one dealing with toxic action of ozone and the other with the kinetics of sewage bio-oxidation. The process of developmental work continues.

A grant supported a further study undertaken by the Ontario Research Foundation to determine the feasibility of developing self-contained sewage, garbage and water treatment apparatus for large building complexes. The results indicate that the apparatus is feasible. Further developmental work is required.

The Pulp and Paper Research Institute undertook an investigation into the adaptation to individual household systems of disposal techniques developed for industrial purposes.

The Atlantic Industrial Research Institute has commenced an extensive study of pollution due to storm water and overflows from combined sanitary and storm sewers.

The development of moulded plastic bathroom units is receiving assistance. Prototypes have passed the preliminary experimental stage and development.

is proceeding under purchased rights to production.

The Province of Saskatchewan, with a supporting grant, undertook an examination of the probable effects of the development of the potash mining industry on housing and community development in the potash region of the Province. A report of the findings serves as a reference for community developmental proposals.

The Ontario Research Foundation has undertaken the development of a new manufacturing process designed to find a better way of making bricks or brick substitutes.

A private firm has received support for a study of the transportation corridor concept to determine whether or not it is possible to establish sound engineering and economic criteria for the design of transportation corridors.

A study on the application of computer techniques to housing design has been undertaken with assistance of a grant.

The Community Chests and Councils of Greater Vancouver carried out a study over three years dealing with social services required by multiproblem families.

The Quebec Welfare Council undertook a comprehensive study of the social circumstances and the community organization of low-income people who might be affected by housing and renewal action in a number of Quebec cities.

The Centre for Urban and Community Studies of the University of Toronto has commenced research into factors of density costs, design practices, building techniques and land uses to determine the benefits of alternate forms of housing.

The Community Welfare Council of Winnipeg carried out a study of "The Social Aspects of Urban Renewal" using a local project area as a base. A report has been published.

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The Community Welfare Connected of developmental work continues.

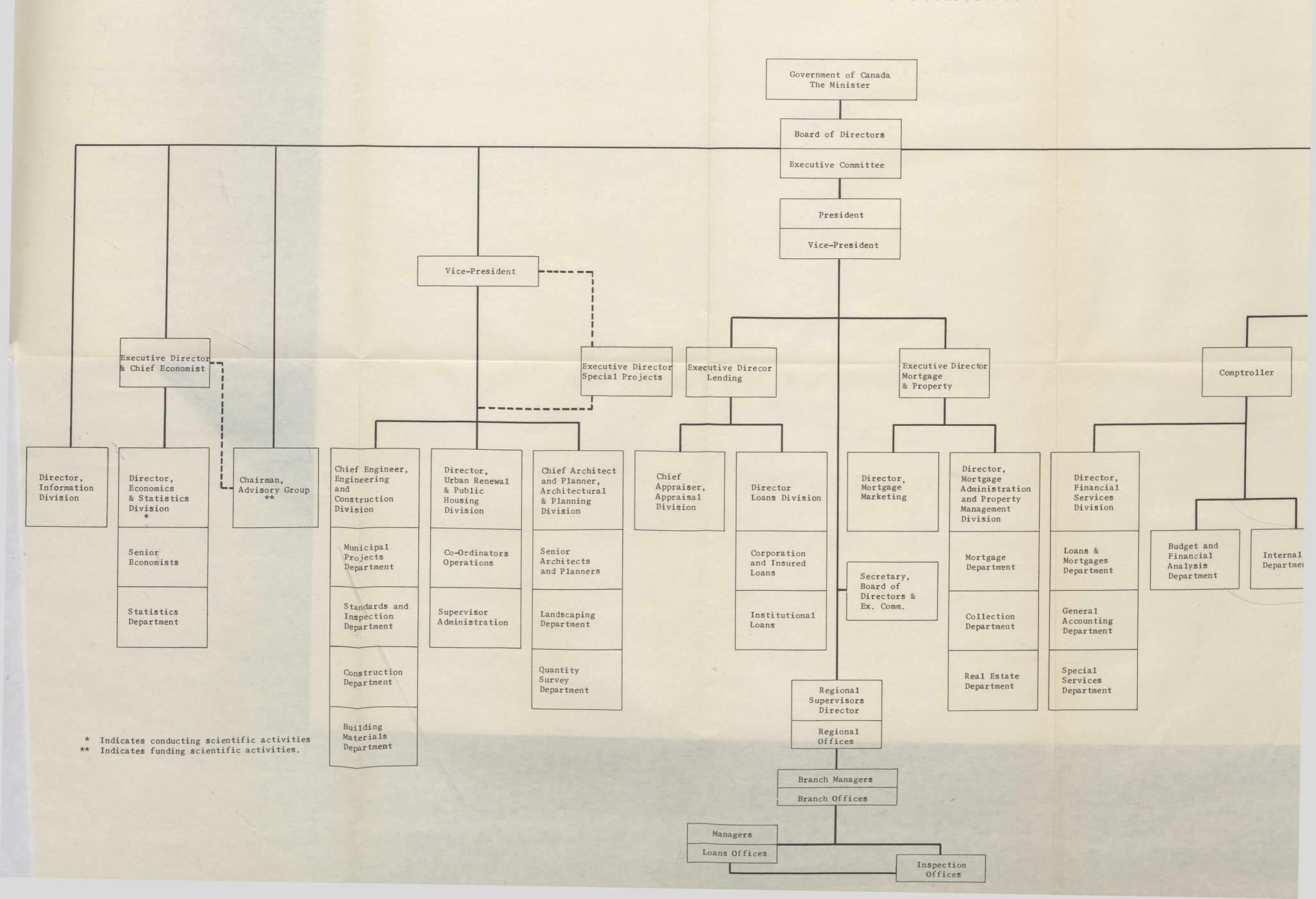
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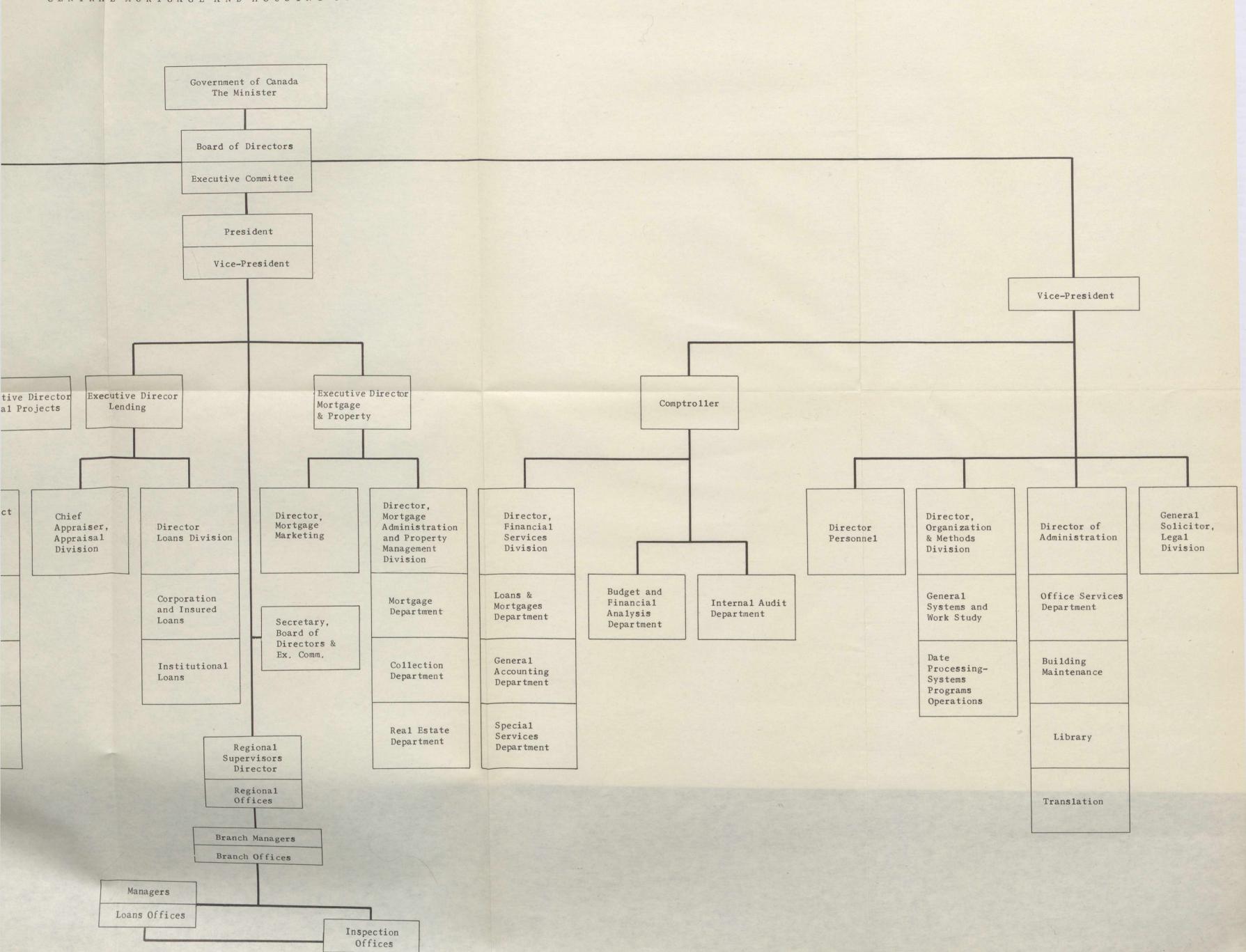
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CENTRAL MORTGAGE AND HOUSING CORPORATION







First Session-Twenty-eighth Parlimann

THE SENATE OF CANADA

PROCEEDINGS OF THE PECIAL COMMITTEE

SCIENCE POLICY

The House side D'Organ D'EMPRON Vin-Coursin

No. 54

WEDNESDAY, MARCH 5, 1969

WITNESSES!

Baratti, Maria Caratta Caratta Minister, Economist, Analysis and Government, France Maria Caratta V. H. Leacey, Head, Economic and Analysis

APPRINCIPLE

35 .- Statement by the Throne Minister of Finance.





First Session—Twenty-eighth Parliament
1968-69

THE SENATE OF CANADA

PROCEEDINGS

MEMBERS OF THE TO AN COMM

SPECIAL COMMITTEE

ON

SCIENCE POLICY

The Honourable MAURICE LAMONTAGNE, P.C., Chairman
The Honourable DONALD CAMERON, Vice-Chairman

No. 34

WEDNESDAY, MARCH 5, 1969

WITNESSES:

DEPARTMENT OF FINANCE: R. B. Bryce, Deputy Minister; A. B. Hockin, Assistant Deputy Minister, Economist, Analysis and Government Finance Branch; F. H. Leacey, Head, Economic and Analysis Division.

APPENDIX:

35.—Statement by the Deputy Minister of Finance.



First Session-Twenty-eighth Parliament

1968-69

THE SENATE OF CANADA

PROCEEDINGS

MEMBERS OF THE SPECIAL COMMITTEE

SPECIAL COMMITTEE

SCIENCE POLICY

The Honourable Maurice Lamontagne, Chairman The Honourable Donald Cameron, Vice-Chairman

The Honourable Senators:

Aird Grosart Nichol

Belisle Haig O'Leary (Carleton)
Blois Hays Phillips (Prince)

Bourget Kinnear Robichaud
Cameron Lamontagne Sullivan

Carter Lang Thompson
Desruisseaux Leonard Yuzyk

Giguère McGrand

Patrick J. Savoie, Clerk of the Committee.

WEDNESDAY, MARCH 5, 1969

WITCHESSES:

DEPARTMENT OF FINANCE: R. B. Bryce, Deputy Minister; A. B. Hockin, Assistant Deputy Minister, Economist, Analysis and Government Finance Branch; F. H. Leacey, Head, Economic and Analysis Division.

APPENDIK:

35.-Statement by the Deputy Minister of Finance.

ORDERS OF REFERENCE

Extract from the Minutes of the Proceedings of the Senate, Tuesday, September 17th, 1968:

"The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That a Special Committee of the Senate be appointed to consider and report on the science policy of the Federal Government with the object of appraising its priorities, its budget and its efficiency in the light of the experience of other industrialized countries and of the requirements of the new scientific age and, without restricting the generality of the foregoing, to inquire into and report upon the following:

- (a) recent trends in research and development expenditures in Canada as compared with those in other industrialized countries;
 - (b) research and development activities carried out by the Federal Government in the fields of physical, life and human sciences;
- (c) federal assistance to research and development activities carried out by individuals, universities, industry and other groups in the three scientific fields mentioned above; and
 - (d) the broad principles, the long-term financial requirements and the structural organization of a dynamic and efficient science policy for Canada.

That the Committee have power to engage the services of such counsel, staff and technical advisers as may be necessary for the purpose of the inquiry.

That the Committee have power to send for persons, papers and records, to examine witnesses, to report from time to time, to print such papers and evidence from day to day as may be ordered by the Committee, to sit during sittings and adjournments of the Senate, and to adjourn from place to place;

That the papers and evidence received and taken on the subject in the preceding session be referred to the Committee; and

That the Committee be composed of the Honourable Senators Aird, Argue, Bélisle, Bourget, Cameron, Desruisseaux, Grosart, Hays, Kinnear, Lamontagne, Lang, Leonard, MacKenzie, O'Leary (Carleton), Phillips (Prince), Sullivan, Thompson and Yuzyk.

After debate, and—
The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Thursday, September 19th, 1968:

"With leave of the Senate,

The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That the name of the Honourable Senator Robichaud be substituted for that of the Honourable Senator Argue on the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Wednesday, February 5th, 1969:

"With leave of the Senate,

The Honourable Senator McDonald moved, seconded by the Honourable Senator Macdonald (Cape Breton):

That the names of the Honourable Senators Blois, Carter, Giguère, Haig, McGrand and Nichol be added to the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative."

ROBERT FORTIER,
Clerk of the Senate.

MINUTES OF PROCEEDINGS

WEDNESDAY, March 5, 1969.

Pursuant to adjournment and notice the Special Committee on Science Policy met this day at 10:00 a.m. page 19 good of 1920 of page 1920

Present: The Honourable Senators Lamontagne (Chairman), Bélisle, Bourget, Grosart, Kinnear, McGrand, Robichaud, and Yuzyk—8.

In attendance:

Philip J. Pocock, Director of Research (Physical Science)

The following witnesses were heard:

DEPARTMENT OF FINANCE:

R. B. Bryce, Deputy Minister;

A. B. Hockin, Assistant Deputy Minister, Economic Analysis and Government Finance Branch; and

F. H. Leacey, Head, Economic and Analysis Division.

(A curriculum vitae of each witness follows these Minutes).

The following is printed as Appendix No. 35:

-Statement by the Deputy Minister of Finance.

At 12:10 p.m. the Committee adjourned to the call of the Chairman. ATTEST: Patrick J. Savoie,

-and auditav to redmem a saw all statism the Clerk of the Committee. has

CURRICULUM VITAE

Bryce, R. B. Mr. R. B. Bryce has held his present position as Deputy Minister of Finance since July, 1963. Mr. Bryce was born in Toronto and graduated from the University of Toronto with a Bachelor of Applied Science degree in Mining Engineering in 1932. He then transferred to Economics, which he studied at Cambridge from 1932 until 1935, taking a B.A. degree, after which he attended Harvard for two years as a Commonwealth Fund Fellow. Mr. Bryce joined the Public Service with the Department of Finance in 1938. During World War II, he was Secretary to the Government's Economic Advisory Committee under the late Dr. W. C. Clark, then Deputy Minister of Finance. This Committee dealt with various matters relating to economic policy and organizations, and was particularly concerned with financial arrangements with our Allies. In 1946, Mr. Bryce became the Executive Director for Canada of the International Bank for Reconstruction and Development in Washington. In 1947, he was appointed as Assistant Deputy Minister of Finance and Secretary of the Treasury Board, which was then part of the Department of Finance. On January 1, 1954, Mr. Bryce became Secretary to the Cabinet. He remained in this position until assuming his present responsibilities in July, 1963. In December, 1967, Mr. Bryce received the 1967 Award for Outstanding Achievement in the Public Service of Canada. In 1968, he was appointed a Companion of the Order of Canada.

Hockin, A. B. Mr. Hockin was born in Winnipeg, Manitoba. He holds a B.A. Honours degree from the University of Manitoba and an M.A. degree from the University of Toronto, both in Economics. Mr. Hockin joined the Department of Finance in 1946. His earliest duties with the Department included work on the entry of Newfoundland into Confederation, agricultural and other resource development matters. He was a member of various Canadian delegations to meetings of FAO and UNESCO. During postings to London and Paris he participated in the formative stages of NATO and OEEC. After his return to Ottawa in 1953 he worked in the then International Economic Relations Division, first on defence matters and then on commercial policy. He was a vice chairman of the Canadian GATT delegation in 1956. In 1957 Mr. Hockin did a two-year tour of duty in Washington as the Canadian Alternate Executive Director of the International Monetary Fund and the International Bank for Reconstruction and Development, and as Financial Counsellor at the Canadian Embassy. In 1959 Mr. Hockin returned to Ottawa to establish a new division in the Department of Finance, that of Economic Analysis. That division was expanded in 1961 to include financial affairs. In 1964 Mr. Hockin was appointed to his present position as Assistant Deputy Minister of the Branch, which includes the Divisions of Economic Analysis, Government Finance and Capital Markets, International Finance and Crown Corporations Financing.

Leacy, F. H. Mr. Leacy was born in England. He holds a B.A. Honours degree from the University of British Columbia and has done extensive post graduate work in Economics at the University of Washington and Columbia University. Mr. Leacy joined the Department of Finance in 1964 as head of Economic Fore-

casting in the Economic Analysis Division. Prior to that date he was senior statistician with the Royal Commission on Taxation (1963) and with the Statistical Office of the United Nations (1961). He was with the Dominion Bureau of Statistics from 1946 to 1961, successively holding the positions of Chief of Prices, Chief of National Accounts and Director of the Research and Development Division. He has contributed a number of articles on national income and prices to various economic journals.

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THE SENATE

SPECIAL COMMITTEE ON SCIENCE POLICY

EVIDENCE

Ottawa, Wednesday, March 5, 1969

The Special Committee on Science Policy met this day at 10.00 a.m.

Senator Maurice Lamontagne (Chairman) in the Chair.

The Chairman: Honourable senators, we have had up to now some agencies which have perhaps claimed to do more than they were actually doing in terms of research. This morning we have a new type of agency. We have a reluctant department, which I believe is really too humble about what they have been doing in terms of research but, knowing Mr. R. B. Bryce and his associates for some time, I am not surprised at this very sincere humility.

I have admired Mr. Bryce for a number of years as a very devoted public servant and I am quite sure that he was very sincere in saying that what they were doing could not be called real research, but again I think it was an understatement.

We are very glad to have you and your associates with us, Mr. Bryce. I understand that you want to make a brief statement to start with, and then we will have the usual question period.

Mr. R. B. Bryce Deputy Minister, Department of Finance: Thank you, Mr. Chairman. I sent over yesterday, or the night before, an opening statement, thinking that it is not really a brief but giving some of the information which the committee has requested, particularly in the appendices about our staff and so on and giving some descriptions of the objectives and the manner of working of the department.

As you indicate, Mr. Chairman, and as I say in this written statement that I sent around, I feel it a bit presumptious to call

do critical work: but we normally publish only the odd budget and white paper.

The Chairman: And budget speech.

Mr. Bryce: And budget speech. The budget speech is essentially the work of the Minister, who has to take responsibility for it; the white paper he tables, but we produce it for him of course, and he goes over it. But we have not put out many publications other than these and press releases, and a few things of this sort-with one possible exception. Some years ago, Mr. Rubinoff and I prepared an economic report on the Canada Pension Plan proposals, which was a fairly lengthy document that was submitted to the committee of the House of Commons dealing with the pension plan and is an example of the sort of work that the department has to do on a major project of that kind.

However, I think that the essential role of the department, if I can claim it, is to help the government in innovating, in the terminology that you have been using and the science council has been using.

We try to take the results of other people's research and investigations and develop proposals or criticize proposals and help the government to emerge with the best measures either to lay before Parliament or to carry out under the powers that it already holds from Parliament. That requires all the effort and intelligence and knowledge that we can bring to bear on it.

In doing this work as I have indicated, we employ some 160-odd officers now who are organized in the way which is set forth in that little yellow sheet that is attached to the statement that I sent around. The statistics about their education and things of that sort are also given in the appendix to that statement.

I will not try to go over all that is in the what we do research. We try to do useful written statement, Mr. Chairman; I thought it work; we try to do analytical work; we try to would be better if I just gave this very brief introduction and leave it to the members of the committee to raise whatever questions they wish.

The Chairman: Thank you very much, Mr. Bryce. I want to add at this moment that the Deputy Minister of Finance is accompanied this morning by Mr. Hockin, Assistant Deputy Minister and Mr. Leacey, who is head of the Economic and Analysis Division.

Mr. Bryce: Mr. Leacey is acting head at present; Mr. Rubinoff is over in Paris, as so many of my staff usually are, attending the OECD, or something of that nature.

The Chairman: Senator Grosart?

Senator Grosart: Thank you Mr. Chairman May I add to the Chairman's welcome my own, Mr. Bryce. I am sure we are delighted that you were able to come before the committee, because we are told at times that the real science policy decision maker seems to be the Treasury Board, which is at least an affinity of yours.

I find some very interesting statements in your brief I would like to ask you, if I may, just a few questions for further information and clarification.

The first statement that I find very interesting is in paragraph 2: "The department has no general statutory definition of its duties"... I am questioning this statement because in this committee we are searching desperately for evidence of control going beyond coordination in federal government funding of science expenditure. Some of us had been under the impression that there might be a very substantial degree of control exercised through Treasury Board and in the final analysis through the Minister of Finance.

I find my text for that in the Financial Administration Act, in section 9, which says—and this is in Part 1 of the Financial Administration Act—is headed Department of Finance. Section 9 reads:

The Minister has the management and the direction of the Department of Finance, the management of the consolidated revenue fund and the supervision, control....

And I emphasize that word—

the financial affairs of Canada not by law assigned to the Treasury Board or to any other minister.

May I ask you, would your department exercise any measure of control of the expenditures on science?

Mr. Bryce: Senator Grosart, there are times when I wish I could exercise a lot of control over all sorts of expenditures, but the essential controls are exercised by ministers having responsibility for various programs. They have got budgets; they have got authorizations by the Treasury Borad under other sections of the Financial Administration Act and by the Cabinet.

When I say control, it stops there. We exercise, I hope, influence and persuasion on those bodies that do exercise authority over the others. We have to have our say, to do what we can, by way of influence and persuasion.

The government does not lack for central control agencies or authorities; the problem is to have them work effectively and have them work sensibly.

The great bulk of our work is to try and participate in the work of the cabinet committees directly. The advice we give our minister and the advice we give to cabinet committees and the Treasury Board is for Consideration in the decisions of the Cabinet and the Board.

We do not, despite that rather wide wording of the Act, which is quite old wording, in fact exercise direct control. I cannot tell the National Research Council what they can spend or the Department of Energy, Mines and Resources. Sometimes when the departments are concerned about their expenditure programs they will express that concern to me or to my officers as well as to the Treasury Board but, frankly, in the interests of good administration we try to have them deal directly with the Treasury Board and those who do exercise control.

We confront them in the cabinet committees and endeavour to debate there with them on those aspects of matters that we are expected to express a view on, but we do not exercise a detailed control or authority ourselves, because if we did there would be just too many authorities from a managerial point of view.

We try to work on the control authorities themselves. Now, as I have indicated there are the odd things where we are the operating department, but those are exceptional. We are the innovating department in a good many others; such as taxes and tariffs where we originate ideas, proposals and our minis-

ter puts them up to the cabinet or to whatever committee of cabinet is appropriate, and the cabinet and ultimately Parliament takes a decision; then somebody else administers it.

Now, we are to blame within the machinery of government if those proposals are not well thought out, if they are not right, but we work through the government on these things. These are major issues of policy, essentially.

Consequently we do not exercise control over others in the words that the Financial Administration Act would contemplate. One must bear in mind that that is a very old statute and a very old provision in there, which has gradually been eroded by the development of highly organized central control agencies such as the Treasury Board and the various cabinet committees and managerial authorities.

The Chairman: Might I ask a supplementary question related to this one: When you say at the bottom of page 8 and the top of page 9 that:

Broadly speaking, it may be said that the Treasury Board department concentrates on managerial matters and departmental budgets while the Department of Finance concentrates on economic matters and the government budget.

You would not include there any kind of special assignment for the Department of Finance in reviewing what we tend to call overall science policy as opposed to science policies by sectors. We have been told by Treasury Board, for instance, that they are looking at science policies by sectors, what is involved, for instance, in the Department of Health and Welfare so far as health research is concerned and so on, but, apparently, the Treasury Board does not look at overall science policy.

I wonder if you would have anything to say about this in so far as the Department of Finance is concerned?

Mr. Bryce: The government looks into some general issues of science policy from time to time and the department has been involved in some consideration of that in years past.

For example, I think it is fair to say that we initiated the shift from the incentives given in the tax statute for research and development expenditures by industry to direct grants to the purpose. First we had some role in getting these provisions into the

tax law. That was before I was there, it was done in 1962 or 1961.

Then, in the change from that to what is now IRDIA, this was made frankly at our initiative to get it out of the tax law where I felt that it worked unevenly, somewhat inefficiently into a straighforward system of grants with the conditions for them laid down by law.

The department took an interest there in both the desirability of having a greater industrial participation in research and secondly in the form in which that was promoted.

Since then, this has been taken over by the Department of Industry and they have worked on it we have not endeavoured to do any more detailed work on it except to review from time to time the scale on which it is being done and any significant changes in it.

We look at it as essentially an economic measure, a means of promoting R & D in industry for its economic purposes. That is one example of how we have been involved. I would like to see us do more in the field of economic values, the economic role of research and development, but we are short-handed and we cannot do everything. I think it is fair to say that no one has yet developed a sophisticated and, if you will, "scientific" way of relating the scale of R & D efforts to economic policy.

The Science Council in their paper on science policy mentions their efforts to try to get some relationship worked out. The same is true of the Economic Council in their chapter on this. We would all like to find some clear-cut relationship that would enable us to get the clue to the interrelation between productivity and research and development. We are all aware that the important thing is that the fruits of research and development should be used and I think that is true in what has been said to you by other witnesses.

We have had no special expertise to bring on this matter; our main participation has been in regard to a number of measures such as that IRDIA one that I have mentioned.

Senator Grosart: As the Chairman said, you are very modest about your own research efforts, but there is considerable evidence in your brief that you do a good deal of research as part of your normal activities.

Perhaps because of your elevated position in the government you may not feel that you are under the same requirement that some other departments are to classify expenditures, and this, of course, is perhaps the reason why you have not done so. However, to put my first question in a broad context, do you see a place for the Department of Finance or perhaps somebody else looking at the total federal expenditures and noting that there is a billion dollars that will be spent this year on science R & D, and asking, "Is this the right amount?"

You mentioned the OECD comment and the Science Council comment that in 1966 R & D expenditures in Canada were 1.3% of GNP. There is a general feeling that perhaps 2% might be a more adequate figure yet the Science Council says it has not been able to find any relationship. Surely somebody in the government has to find a relationship if we are going to be sure this is the right amount to spend.

It would seem to me that it is a function of the Department of Finance, to determine whether we are spending too much or too little on R & D. If the Department of Finance is not going to do it, who should do it?

Mr. Bryce: First let me say a word about the general question of priorities. In the end this has to be a matter for the cabinet, because I think it is fairly well known now that we are a bit short of money and that we do not have enough money, resources, or whatever term you want to use, to meet the desires of the governments or the parts of the governments to do all the things they think are wise, right and desirable.

There is an elaborate machinery for considering these various proposals that come from agencies, that come from departments, that come from ministers, that come from groups of ministers; these have to be reconciled and some priorities applied and some planning done.

We participate in that collective process and to it actively. The central work on priorities now is done by a group of cabinet committees; I do not know how much I am supposed to describe the cabinet committees as an old officer of the Privy Council.

The Chairman: I think most of them have been described in public, except their composition.

Mr. Bryce: In any event, we have various committees that deal with particular aspects.

Then we have now a cabinet committee on priorities and planning, which endeavours to reconcile these priorities. In the central work of appraising or helping the ministers to appraise relative priorities the department takes part as well as the Treasury Board Secretariat and the Cabinet Secretariat, and we all have our inputs.

It falls to my lot to express views to ministers on these things and, of course, in that I am assisted by the staff and I am controlled by my own minister.

The decisions as to whether science should get more or less tend nowadays, as Mr. Reisman has indicated, to be associated with particular projects, particular programs. On the other hand, we do know the general totals that you have seen; we know the scale or orders of magnitude of our scientific effort and the directions it is taking and in the discussion of general priorities those are general considerations that we bear in mind.

I think it is fairly well recognized that various kinds of research and development work will help to contribute to productivity, to economic growth, to the solution of the kinds of problems that are outlined in that report of the Science Council on Science policy. But unfortunately they have got to be weighed up against other priorities for government funds, which are an enormous variety and which have behind them other considerations.

The highest priority I suppose, if you look back in the last dozen years in Canada, has been given to expenditures for the old and the sick and the poor; science does compete with these and this is a very tough kind of comparison to have to make; a multitude of other things, culture, foreign aid, a variety of things of this sort, have also to compete with it.

In the end it is very hard to do such allocation of funds on either a formal basis or a "scientific" in quotes, basis.

But it goes on and we try to reconcile these considerations.

Senator Grosart: Do you see a function for some mechanism of hard research to resolve this kind of problem?

The mechanism that you describe has been going on for a long time yet in the field of science policy we are faced over and over again in this committee with this situation that over the years we have developed a definite imbalance in R & D expenditures.

The OECD pointed out that in this we were out of step with other countries; this seems to have been generally accepted. It has been repeated over and over again; the Science Council, the Science Secretariat and other people have done so, but we have not seen any evidence, or I have not seen any evidence, that this has been examined, that anybody has said implied OECD criticism may be because Canada is a different country in many ways to these others.

Do you see a place for this kind of hard research so that if we decide to move money from inhouse into industry, or into the universities, we know why?

Mr. Bryce: I know that ministers are aware of the views of those with direct knowledge and experience in the scientific research field. It is exemplified best by the Science Council on the importance of getting more done in the universities and in industry.

We have in the Department of Finance backed the importance of getting more of the R & D work done in industry and in universities because our interest, I suppose, is not primarily intellectual; it is economic and we feel that if the scientific work, development work, is to have fruitfulness in increasing Canadian productivity and improving the Canadian standard of living it has got to be translated into behaviour of industry.

We were convinced by the arguments that we read and heard that more work had to be done in industry if industry was going to be able to take the results of R & D work and translate them into changes in technology or products, or whatever it may be.

In that general sense I think the government has been well aware, and certainly many of us advising it, have been well aware, of this desirable trend in policy, and I think that this was brought to bear several years ago at first under the Diefenbaker government in the income tax provisions about research and development expenditures in industry, then under the Pearson government in the various proposals for the Department of Industry programs to support research and development in industry.

Of course, a lot of more of it gets done in addition by specific decisions on specific

I well remember the whole crisis over the Arrow, whether we should go on with it; I was right in the middle of it in those days.

into difficult decisions about other programs from time to time, so that it is not just as a broad, general policy that we aim at X per cent, or something.

However, when money is short you give what emphasis you can to it, but in the end the politicians have to decide, uncomfortably, whether they are going to put more into this, or that, or the other general field.

Senator Grosart: The feeling here in this committee is I think that some entity of government should undertake the responsibility of doing scientific investigation into this problem of the balance between expenditures within the R & D sector.

For example, it appears that the imbalance, if such it was, was the result of a lot of ad hoc decisions in different departments at different times and their responses to different occasions and crises. Now, if this continues is it not possible that five years from now we will have another OECD report which will say that instead of getting into balance we have gone too far, or have not gone far enough. How do we know that we will have a proper balance in terms of the public interest, in terms of our resource capabilities five years from now in this field unless somebody does this hard research?

Mr. Bryce: Are you talking here, Senator, about balance within the R & D program generally, or between the R & D Program and other broad fields?

Senator Grosart: Both.

Mr. Bryce: As regards the balance between the R & D program and other broad programs, this essentially is a question of high policy, if you will, that the government itself has got to focus on and focus on at least annually in deciding how much of the budget that it finds now limited because its revenue fields we feel are limited and its expenditures are growing rapidly in various directions, how much it feels it can decide to give to those programs that contain major R & D features and how much it will devote to other programs.

This is done essentially in the various cabinet committees and the Treasury Board in looking at overall programs annually, in setting program objectives, in dealing with estimates and in dealing with specific programs like regional development, industrial incentives and things like that, that are going to This was a very difficult decision. One gets have a major impact on the financial picture.

In that process I feel myself that no particular new machinery is needed; we want to make the existing machinery work better.

I think there is some further work that could be done on the economic value of R & D. I am not exactly sure where that belongs, because there is the Science secretariat, there is the Treasury Board Secretariat, there is our department and there is the Economic Council, all of which have got some reason to look at it.

Senator Grosart: But nobody has the responsibility.

Mr. Bryce: Nobody has the sole responsibility; I must take the view that the Cabinet Secretariat in the end is the one; if there is some question as to where the responsibility ought to be it is up to them to tell the people concerned.

I tried to do that when I was there.

In any event, I would hope that we can achieve more on that, but I am not too optimistic in believing that it is easy, because a lot of people have been looking for a way of demonstrating what is the right amount of R & D. A lot of very high-priced brains have gone into this and not very impressive answers have come out. That is on the general scale.

On the allocation of it I think our machinery is working better now; I think a good deal more effort is going in now to decide whether our R & D effort should go in this direction or not. I think the report I mentioned of the Science Council has given the government some general guidance on that.

One of the things I remember in many years past is the difficulty of getting scientists to criticize one another's programs. When I was at the Treasury Board, when I was at the Cabinet Office this was a perennial difficulty; we could not get a committee of scientists to say somebody was doing something that did not need to be done.

Through the Science Council and the Science Secretariat we are building up a system by which you can get a more critical appraisal by scientists of scientific programs. I think this is helping the government and I think that there have been some useful ideas come out in the Science Council reports on the direction of our effort.

Again it may be that our machinery can be made to work more effectively in this respect, as in others. Senator Belisle: I have a supplementary question, Mr. Chairman, to Mr. Bryce: He has probably explained this partly, but I would like to know what is the position of the Department of Finance vis-à-vis the Treasury Board?

For example, I know the Department of National Revenue is in a sense a collecting agency; your job is to draft legislation that will produce revenue, but in your department once a department has made or has finalized its estimates is there somebody, a person or persons in your department that goes over these estimates before they go to Treasury Board?

For example, it may be possible, we have been told that it is happening that the Department of Agriculture may be making the same research as the Department of Forestry; is there somebody in your department looking at this?

Mr. Bryce: No, sir. We do look at certain spending proposals but, as I have indicated here, in the sentence which the Chairman read:

Broadly speaking, it may be said that the Treasury Board Department concentrates on managerial matters and departmental budgets, while the Department of Finance concentrates on economic matters and the government budget.

It is the proper function of the Treasury Board to see whether something should be done in this department or that department or if there is duplication or if there is poor management.

On the other hand, if some department is bringing forward a proposal for some kind of economic measure, let us say, for example, trying to get industry to locate in the areas of economic disparity...

The Chairman: My region in the lower St. Lawrence.

Mr. Bryce: That is right. We feel, and we exercise, a responsibility there to examine such a proposal and try to judge its economic impact and whether it is the most sensible way of achieving that objective.

Once the government has decided on it and approved it, scrutiny of how effectively it is being managed really falls on the Treasury Board. So this division of work of the Treasury Board is something which we are having to work out now, to develop as time goes on, bearing in mind that the Treasury Board used

to be part of the Department of Finance until two or three years ago and has now been separated under a separate minister.

We work as allies of the Treasury Board on most things and in a considerable degree of cooperation with them.

Dr. Davidson and later Mr. Reisman and I have all agreed right along that we want to be housed in the same building, we want to have access to the same papers, so that our staffs can cooperate readily and not put departments or others to needless duplication in dealing with two sets of people.

But essentially we would not try to scrutinize the execution of scientific programs or the removal of the duplication there. On the other hand, if the question arises whether Department X is putting too much effort into R & D in terms of its relative importance in the economy as compared with department Y, we would be prepared to try to formulate a view of that question.

Senator Belisle: But only at the request of the Treasury Board.

Mr. Bryce: That is right; or if it occurs to us we will tell the Treasury Board, but we will leave the working out of the decision to the Treasury Board unless the matter comes up in some other cabinet committee where we are asked to appear.

Senator Bourget: Coming back to that machinery that Senator Grosart was talking about, are you aware that in other countries they have that kind of similar organization that could do that kind of work, either in the United States, or Sweden, or the U.K.?

Mr. Bryce: Are you talking, sir, about deciding on the overall scale of the R & D budget, or on its direction?

Senator Bourget: The overall scale.

Mr. Bryce: Yes, I cannot say that I can recall now enough about them to compare them with our own. In the end though these are essentially questions of political priorities, political in a broad sense and we have got to get the decisions taken in a way that fits in with our own domestic internal government workings, so that the fact that there may be a different form of organization in another country would not influence me greatly on what our form is unless it was one that could be fitted in with ours.

We have, of course, developed in recent years two additions to the machinery here of real importance on this in the Economic Council and the Science Council, both of whom are giving the government advice publicly so that the public is quite able to see what advice the government is getting from these distinguished groups on this matter.

This makes it possible to have a much better public debate about the issues than heretofore.

The Chairman: If there are no other questions from other members of the committee I will go back to Senator Grosart and perhaps eventually to me.

Senator Grosart: Why do you not intervene now, Mr. Chairman?

The Chairman: It seems to me from what you have told us this morning that you have not had any continuing interest in the elaboration or implementation of either an overall science policy or science policies by sectors. This is not a criticism of the Department of Finance; other agencies may have that kind of responsibility, including the Treasury Board, but to come back to a more specific field, you say in your brief that you are a user of research mainly and, of course, that means that you are a user mainly of economic research.

Mr. Bryce: Right.

The Chairman: Where would that economic research be done within the government at the moment?

Mr. Bryce: A considerable part of it is done in the operating departments, who are carrying on the kind of programs we are involved in discussing from time to time. Let us say we are talking about the problem of the east coast fisheries.

The Fisheries Department will be, and again there is a question here whether this is really research, but they are studying the situation, getting the facts, trying to form an opinion as to what should be done.

In our discussion for the need of measures to deal with it and the way in which it ought to be dealt with we will, of course, draw a good deal of information, a good deal of analysis from them and then we will look at it and criticize it. This is an example of the kind.

Secondly, in some of our financial fields which the Chairman is familiar with we will

be using the research done in international agencies, the International Monetary Fund, the International Bank, various international committees, on the workings of the international financial system and the institutions in it.

We have had an outstanding example in the past few years of this in the development of the special drawing rights proposals in regard to the International Monetary Fund and this now, of course, has been before Parliament.

Mr. A. B. Hockin, Assistant Deputy Minister, Economic Analysis and Government Finance Branch, Department of Finance: It still is.

Mr. Bryce: It still is before Parliament and here we have used research done centrally and collectively internationally to which we have contributed. Sometimes I would get impatient with the numbers and seniority of the Canadian officials that were attending the meetings on this; I would say, Good heavens, we have so much to do at home; do you all have to go and talk about these things. This is another forum in a sense within the government.

We use in a number of fields the studies that are published by various government agencies, outstandingly of course the Bureau of Statistics; whether this is research or how it is judged, it is fundamentally important material on which we all rely.

We also use published studies by Manpower, Labour and groups like this.

The Chairman: But we have been told by Mr. Rasminsky that perhaps there was no great duplication within the federal government in the field of economic research, but that there might be quite important gaps.

On the other hand, we were also told that at some stage there was a kind of interdepartmental committee on socioeconomic research which was attempting apparently to look at that general situation in government as it was developing, but that this interdepartmental committee was not very successful in its exercise and recently it has been disbanded, so that we have no interdepartmental agency now within the government to look at the total picture of our effort in the field of economic research.

Mr. Bryce: Here you are talking of our national effort.

The Chairman: Within the government.

Mr. Bryce: In some of the fields in which we work, for example, in forecasting there is a good deal of inter-departmental or interagency work.

Mr. Hockin: That is certainly the case, Mr. Chairman; the agencies that are directly themselves involved in working in these areas are in constant touch with each other. I do not know how much time Frank Leacey, for example, just spends across the street in the Bank of Canada in the research department seeing what they are doing, talking to them about a very particular line of research.

It is true, for example, in the forecasting area with Trade and Commerce too, that the three agencies that do the work in this field have a great deal of constant liaison from the very top to the bottom of their organizations, from the newest recruit.

One of the first things we usually do with a new finance officer that we recruit is to take him to the other agencies to see what they are doing so that he will know what is going on there and he will know who to call about certain aspects.

There is another area which is perhaps a little more formalized, which is also very important; that is that for example DBS when it is thinking about developing a new area of analysis and research for the provision of statistics generally establishes an interdepartmental committee of both producers and users to make sure that when they go about this they are getting the views of all the agencies that would have an input or a use of the material.

Now, these tend to be rather specific committees, but any time there is something new this goes on.

I think between the two of them there is a great deal of liaison. Now, I should also perhaps add that it is not always our view that you should completely avoid duplication; there are some areas especially in this field...

The Chairman: No, I am much more worried about gaps than duplications.

Mr. Hockin: That is right, and as a matter of fact in some of these areas, for example, in the forecasting area when we took over the model from the Department of Trade and Commerce as it was then, I had a number of sessions with the responsible officers in the Department of Trade and Commerce at which we discussed the pros and cons of moving the model in this way, but throughout the basic approach was...

The Chairman: And by consequence moving the hidden report too.

Mr. Hockin: The basic approach we followed was that we did not want, whichever way the decision was taken, either agency to reduce its own input into the forecasting field, because we were unhappy at the idea of reducing the number of people who were working in the forecasting field, so that the government would not have to rely on one small group who were doing the forecasting for all its divisions in this area because it is unlike some of the efforts in research in the physical sciences where you cannot be just that sure of your results and you do not want the government to be in the position of having to rely on the judgment of just one or two individuals.

So that in these areas we have tended to say, let us have a bit of research, let us compare our results, let us work together, but let us go on doing so separately so that we will have something to check against.

Senator Yuzyk: Could we get an explanation of that model here and how it is associated with the econometric model of the Bank of Canada? Do you have cooperation here between these two institutions?

Senator Sullivan: That is what you are referring to on page 5, is it not?

Senator Yuzyk: Yes; at the top of page 5.

Mr. F. H. Leacey Head, Economic and Analysis Division, Department of Finance: The model which we have in the finance department is a model designed to forecast the gross national product, the employment rates, the unemployment rates, the price level; it helps to estimate government revenues and the government balances and the level of the foreign exchange reserves, these critical policy variables.

What is a model? It is really a mathematical description of the relationships that exist in the national accounts. I think the senators are familiar enough with the gross national product and the items of expenditure and income. If they want to go into that in more detail later I have an illustration I have twenty or thirty copies of this which I could give out if you want it later on.

What the model tries to do is to formalize these interrelationships for example, you know what a consumption function is; it is a relationship between consumption and

income. If your income goes up 10% this year you may not spend the whole of it this year, perhaps only 90% of that increase, and then the following year you seem to gradually catch up so that your savings are the same as before.

Senator Grosart: If you are a government you probably spend *more*.

Mr. Leacey: We have very good statistics on total consumer spending in Canada based on retail sales and consumer spending surveys. We have very good statistics on total incomes in Canada based on surveys of factories and establishments and government and so on.

So it is possible to build up a realistic picture of total consumption in Canada and total incomes in Canada. Then we subtract the taxes from the incomes, of course, to get disposable income. Here comes the consumption function now. We relate the disposable income, that is income after taxes, to consumption. The simplest possible relationship is to say consumption equals 90% of income; the mathematicians call this an equation C equals 9 of Y.

They develop similar equations for investment, fixed business capital formation in plant and equipment; the relationship I am using says that the change in last year's profits is related to the future change in this year's and next year's investment. There is a lag between the increases in profits and the increases in investment; that is another example of an equation.

Senator Yuzyk: It is based on data that you have been using for years, for quite a number of years; how far back do you go?

Mr. Leacey: Our model goes back to 1926, and it is called an annual real flow model. It is rather a fundamental and basic model. The bank's model is quarterly for the post-war period only and it is a more sensitive model and concentrates more on the financial effects on the economy. Our model concentrates more on the tax effects on the economy.

Senator Sullivan: You cannot rely on it alone, though, the model?

Mr. Leacey: No; as a matter of fact we rely on informed and considered judgment in the department. I advise Mr. Bryce on the results of the forecast but it is up to him and his boss to make the decision about the policy consequences of that advice. I try to keep my advice as objective and scientific as possible and to avoid the policy implications so that they have an objective basis to go on.

Mr. Bryce: As between the model and what you call the considered judgment you use both?

Mr. Leacey: The models are new and there are still considerable possibilities of error in using a model. Therefore I am bringing the single equations from the econometric model into our traditional forecasting procedure one by one as single equations thoroughly tested and reliable. Then I bring them into our regular judgment forecast which is based on more traditional methods.

Senator Grosart: How sophisticated is your program input into this model?

Mr. Leacey: The input is called exogenous variables; these are amounts which we put in from outside the model system. Anything the model does with it is called an indogenous variable.

The exogenous variables that we put in consist of government spending; we regard this as something that is decided from outside the model. We take government expenditure in the budget forecast, for example, as given. Another exogenous variable is our exports to other countries in the world; we have to look very carefully at conditions in the United States, Japan, U.K. and our other customers and make an estimate outside the model of what our exports will be to those countries.

We have to take into account special factors such as the automotive agreement, which will change the level of exports.

So once we make our mind up about the increase in exports we then put that into the model. We also have an annual investment outlook survey; there was one of these surveys conducted last October jointly by the Economic Council and Trade and Commerce in which we have obtained the four and five year plans of the business enterprises.

There is a longer survey with a longer history which the DBS conducts which just asks for the annual forecast of businessmen of their fixed capital intentions.

So we can regard investment as exogenous in this case and we can take the information from the business community; they might tell us that investment will be up 9 per cent next year on the average, so we will put this 9 per cent into the model as another exogenous variable.

That is the list of these exogenous variables; government spending, export spending at all levels and the investment spending. Given these three exogenous variables or the main dynamic elements in the economy we can then put them into the model as data input and the model will calculate total incomes developed, total employment developed from that.

Then it will use this consumption function that I was talking about to estimate how much consumer spending will be out of this total income. It will give us other details, things that are important to us that we call the target variables: The unemployment rate has to be at a satisfactory level; the growth rate has to be at a satisfactory level; the price level has to be watched carefully; and, of course, the government balances and the exchange reserves.

With all of these target variables in mind then my bosses may decide to do something about fiscal or monetary policy to change the forecast that I have given them.

Senator Grosart: The point of my question really was how much scientific research is there behind these exogenous variables? Perhaps I could put it this way: What is the level of validity of our economic series compared to other countries?

The Chairman: The value of our data collection system?

Senator Grosart: What is the degree of validity of the economic series that we come up with from year to year; are they good compared with other countries?

Mr. Leacey: Yes; the accurary of our past forecasts from year to year has been usually within one or two points of the actual increase in GNP.

For example, if we said we expected GNP to increase by 7 per cent, then the average error would be about plus or minus 1 per cent of that. In some years we have not been as good; in 1965 we underestimated the strength of the investment boom that was starting up that year.

For the last two or three years we have been very good; we have been right on almost to the last decimal in the past year.

Then again these big aggregates conceal some larger errors by components; these errors in the components tend to cancel each other out. The scientific basis for it has been developing over a very long period of time. This Trade and Commerce model was first developed by Professor Klein in the Department of Trade and Commerce in 1946 or '47 and it developed over many years. Professor Klein is still working in the United States; he now has a very good model there. There is a giant model at the Brookings Institute in the United States.

What these models really represent is an effort to formulize the econometric relationships.

Mr. Hockin: May I add a word here Senator: The point I would like to make is that the input that has gone into it has, as Mr. Leacey says, started with the model that was first devised by Professor Klein and Professor Brown, who at that time was working in the government and is now at the University of Western Ontario.

Since that time it has been further developed by people working first of all in the Department of Trade and Commerce when it was there, and subsequently in the Department of Finance, in particular, Professor May, who is now on the Faculty of Carleton University.

We have our own staff of econometricians, who are continually revising the old equations which were used. They are testing them against subsequent experience to make sure that they are not getting out of date and adding to them as we try to articulate them in other areas where we think it has been deficient and where we want more detailed information.

This work is essentially carried on by our own staff, but we now have also an advisory group of consultants of the econometricians from the various universities in Canada chosen as individuals for their technical competence who look at our model periodically and make comments on it, suggesting further work that might be done, and criticism of certain equations that may be there.

This is the way that we attempt to put an input in in terms of our methodology in looking at it.

Senator Grosart: Could you look to this kind of model to do the job I was suggesting earlier, that is, to break down our total expenditures by cost benefit categories such as R & D?

Mr. Hockin: Not this model, no.

Mr. Bryce: We would have a hard time, Senator, to get the relationship between R &

This Trade and Commerce model was first D and the economic magnitudes for the readeveloped by Professor Klein in the Departsons we spoke about earlier.

The Chairman: To come back to this problem, I remember that the Economic Council has suggested in their various reports that there were serious gaps in our economic research, and they were suggesting new institutes of research and so on. What is becoming of these recommendations of the Council? Are they totally unjustified, or are we acting on those?

Mr. Bryce: First of all, let me say about the Council, as I mentioned in the written paper here; we benefit very substantially from the research carried out by the Council and the reports and reviews of the Council itself. Occasionally they scold us for something we have done or have not done and sometimes we feel we deserve it; sometimes we differ with them.

However, I think there is no doubt that the Council has added greatly to the flow of useful research material to us as well as to others in Ottawa.

Now, I do not recall the particular places where they pinpoint gaps to which you refer.

The Chairman: In the third annual review; I think that they went back to this again in the fifth.

Mr. Bryce: Are you talking here of an outside organization?

The Chairman: Yes.

Mr. Bryce: On that we have had really one basic suggestion put to us by an outside organization and by several individuals on their behalf over a period of two years, or anyway all too long to follow up on that and I hope that we are going to see such an organization established.

I have tried to emphasize to those interested in it that the further it is from the government the better, because it will be dealing with forecasts, forecasting operations such as we make and the less collusion the better. We would appreciate having a separate expert judgment on this.

Similarly, it will be no doubt criticizing the government, criticizing the Department of Finance, not only for its forecasts but maybe for what it has done in the spheres in which we are interested. It is better that they should be distant from us.

As yet the government has taken no decision to support such an organization, partly

because of this doctrinal view that it is better that they get their support somewhere else if they can.

The amounts of money involved are not huge, part of the problem frankly is that the ministers responsible fear that it is going to be competing with the government and with others for experienced personnel.

This is one of the real resources that is needed to run such a thing, and there is a limited number of them. As I say, there has been no decision as yet to give such an organization support but that does not mean in any sense that the government rejects the value of such an organization.

The Chairman: So it is under active consideration?

Mr. Bryce: That is right; it is still under consideration. We have not included anything in the estimates for this year that have just been tabled.

The Chairman: But again, to come back to my earlier question, there is nobody really now within the government looking at the overall picture of economic research within the government, to see whether there are gaps, especially gaps, or whether there is the desired coordination.

For instance, we have been told by the Department of Labour research people that they never consult with the people in the Department of Immigration and Manpower in defining their research programs.

All this has been confirmed by the experts of the Department of Immigration and Manpower, although they are very, very close together at certain boundary lines.

Mr. Bryce: As I remember, the functions of the old Department of Labour relating to manpower were supposed to be taken over to the new Department of Manpower so there should not necessarily be that degree of need that you imply.

I think it is probably fair to say that there is not at present an organized review of the various economic research functions of the government seeking to establish gaps. Most of us that are working on it in this town know one another and are aware broadly of what has to be done.

There have been gaps in basic data, as well as research. I mention in here how we welcome the fact that the Bureau of Statistics is going to produce input-output tables that we will use and flow of funds tables that we

will use. That is the sort of gap that has existed but, of course, it takes manpower, scarce manpower to produce that sort of thing.

Similarly, on the research side it takes scarce manpower to produce it.

But I think it is fair to say there is not a systematic exploration for discovery of gaps that goes on from year to year.

The Chairman: And manpower training programs, because we were told also by the Public Service Commission when Mr. Carson was before us that the day he was before us he had received from various government departments a total demand for 400 economists and that he did not see where he could find them. That is one assertion that has been made before us.

Last week we saw the people from Central Mortgage and some of the tables they presented before us showed that they had lost about 45% of their personnel in the field of economic research last year to other federal government departments so that now they have only about 20 people looking after the whole problem of urban planning and the housing situation and so on.

So who is looking after this apparent crisis, or this apparent lack of economists in Canada while apparently we may develop a surplus of Ph.D physicists and engineers?

Mr. Bryce: The situation is improving very markedly in regard to graduates. We are finding, I think it is fair to say Mr. Leacey, a good supply now of both immediate graduates and graduates with some post-graduate training. I think I refer to this in the notes here and we have been getting in the Department of Finance good people, but they are not experienced and it takes some years before they can assume the kind of responsibility that we would like to be able to get men to assume.

The real trouble is that there were not enough economists educated ten or twenty years ago. I would not attribute that in any way to the deficiencies of those who were teaching economics ten or twenty years ago, but in any event that is where the deficiency was.

The Chairman: I was not teaching at that time.

Mr. Bryce: We just cannot invent them. We have imported a good number, as you can see from the tables here on our personnel.

We have on our staff a good many people who were born outside of Canada. To look at the numbers here at the bachelor level, out of 74 we have only 58 born in Canada and we recruited people from a variety of places.

Again, if you look at people with Masters and Doctors degrees we got men who were born and educated in other countries.

We have supplemented our resources, but I think the fact of the matter is that there is a shortage, there is a shortage of experienced economists in the country and we are remedying it by recruiting and training and upgrading the younger ones as fast as we can do so. That still does not produce us relatively mature men to whom we can delegate problems and on whose judgment we will feel we can rely.

One of the terrible problems in a department like ours is to know how far you have got to check and review the work of subordinate officers. This is one reason why our senior officers are very overworked, because as we have a higher than normal proportion of younger people now they require more direction; their work requires more review and our overall effort is limited by the number of experienced people that we have available.

This is part of the problem and, of course, it is in part related to the size and growth of the universities, because these are now together with the provincial governments the main competitors for experienced economists.

I have also felt that now the provinces have a very good claim on competent economists, because they have a very real need for them in their work.

The universities are a different matter; the question of the scale on which the universities are expanding is, of course, a national issue in its overall magnitude, but it is one on which the government here and Parliament took action in 1966 or '67.

We have got a five year program under way now in which we are supporting the provinces; the universities are still expanding enormously rapidly and as was evident at the time this was decided on, one of the great bottlenecks in that expansion, one of the great problems has been the supply of staff for the universities.

That has inevitably had to compete with the current use elsewhere of people of the same education and the same age groups as the universities want. The universities too have a much higher proportion than usual, as

I recall, of younger people, particularly in the economics faculties.

Here we have been ploughing some of the scarce resources of economists back into university teaching so as to improve the situation currently, five years from now and ten years from now.

Senator Yuzyk: But it is paying off, is it?

Mr. Bryce: Yes.

Senator Yuzyk: Do you keep a liaison with the various departments?

Mr. Bryce: Yes.

Senator Yuzyk: And the various universities?

Mr. Bryce: That is right; we go there seeking young men.

Senator Yuzyk: And the students are aware of the fact that they have excellent opportunities in the government?

Mr. Bryce: Yes. Perhaps Mr. Hockin might say a word about our summer student program.

Mr. Hockin: We have tried, Senator, to really get in on the ground level by recruiting, not a large number, because of the reasons Mr. Bryce has mentioned. A number of senior and graduate students each, who will come in and work in areas which are related to their own areas of academic interest and work under the direction of experienced people, either in research oriented subjects which are both related to what we need as a user and to what they are interested in doing as students and at the same time to mix in with it some of the practical problems which face a government department such as ours in making recommendations to their minister.

We try to make sure that we give them lots of staff time so that they will be able to profit from their experience. We let them see what it is like to work in the government at that stage and hope that they will be so impressed with their experience that as they finish their courses they will be interested in coming back as permanent staff members or staff members for a number of years, perhaps as part of the overall job experience that they will try to collect.

I think we have been very successful in this; the impression we have in talking to the Public Service Commission, for example, is that the students that have had that experience in the Department of Finance have been good advocates to their friends of the worth-whileness of getting experience in the department because they felt that they had been used well, that they had got good experience and that they therefore are well disposed either to coming back themselves and working in the department or to sending their friends along to us at subsequent times. We have had some very good students.

Senator Yuzyk: I notice that your maximum was in 1966, when you had 22 students. Do you set the numbers that are employed, or is this according to application?

The Chairman: They have to seek the approval of the Treasury Board.

Mr. Bryce: We have to accommodate it within our budget and manpower limits, and since 1966 we have added significantly, as you will see from one of the other tables, to our number of permanent officers. So that that year we were not under quite such a reign of austerity as presently, but meanwhile our regular staff has grown. We cannot give proper attention to more than 15 or 20.

Senator Yuzyk: This is what I wanted to know and this summer, 1969, are you planning to increase this number of employment of summer students?

Mr. Bryce: I should be able to answer that question but I am afraid I cannot tell you.

Senator Yuzyk: For instance, take this figure of 22 in 1966; has your department since 1966 hired some of these students, I don't know how advanced they are, as officers in your department?

Mr. Bryce: We certainly have hired a number of those who were formerly with us during the summer. I would be hard put to it right off the bat to tie them in with the 1966 group, but we have hired quite a number of good young men.

Senator Yuzyk: I would think though that you should try to increase the number of summer students, because in the end the more you have the greater proportion will be employed.

Mr. Bryce: Yes.

Senator Bourget: Has the department any grant system of subsidies to help those stucents to go on post-graduate courses? Mr. Bryce: We have as described here, sir, on pages 13 and 14 in the English, our training inside the department and the fact that we send some men off on educational leave to improve their qualifications. We have got to do this with care because a lot of our me come to us having financed themselves or got other funds for their post-graduate work and we cannot discriminate unreasonably, but we have sent a number off on educational leave.

We have also in the last two years had a sort of visiting professor, with us. First, Professor Renaud of the University of Montreal and currently Professor Bonin of the University of Montreal, and I hope we are going to have one next year.

Senator Kinnear: About how many universities are represented by these suddents?

Mr. Bryce: I would have thought about half a dozen probably; we tend to get a fair number from the main universities.

Senator Kinnear: Montreal, Queens and Toronto, say?

Mr. Bryce: And Laval; we have done well from Laval.

Senator Yuzyk: How about the west? Are there some coming in from the west?

Mr. Leacey: Manitoba and British Columbia. Some of them go to post-graduate work outside the country and then come back.

The Chairman: All the senior officers come from the west.

Senator Grosart: On the bottom of page 6, you say you agree with the evidence we had from the Bank of Canada and the Economic Council about:

...the importance of improving the statistical base upon which our economic analysis rests.

Would you tell us what is being done about this and who is doing it?

I ask the question because we are a science policy committee and this would seem to be a major priority in science policy in the economic area at the moment.

Mr. Bryce: On that, sir, you have had a big brief from the Bureau of Statistics which I have read and they give a number of instances of programs that they are inaugurating. I think you will see in the estimates for 1969-1970, that they have been given by

the government more funds; they have been given a larger increase in funds. I hesitate to say than in recent years, but I think it is reasonable to say that the Treasury Board has taken a pretty understanding attitude towards the Bureau in the past year and in dealing with next year's program.

That would be a better question perhaps to address to Simon Reisman.

Senator Grosart: But your reference here is more specifically to the DBS figures.

Mr. Bryce: That is right.

Senator Grosart: What about the other statistical bases other than those produced in the DBS series?

Mr. Bryce: The Bank of Canada produces some of the financial figures, not nearly the volume that the DBS does. The Bank keeps improving its series as part of its regular process.

Senator Grosart: Nobody is doing a science series.

On page 12 of the brief I am very happy to see that Mr. Bryce suggests something that we could be doing ourselves about this, referring to paragraph 17 on page 11, where I read:

Whether or not these and similar Royal Commissions...

The Reference is to Glassco, Carter and so on:

. .constitute the best way of undertaking research in the social sciences and on public policy is a matter which this committee, or another, might well study.

You suggest here, as I understand it, that the Royal Commission may not be—or perhaps I should put it this way—that we may be putting too much reliance on Royal commissions?

Mr. Bryce: This is a feeling I have had. It is basically a personal feeling and it has been based on talking to a number of those who have served on such royal commissions or served as the directors of research, secretaries, and so on.

They have to organize their research quickly, they have to superimpose it on other commitments of the kind of people they want to get, they have to try to direct the research to the purposes of the commissions. In fact, the research may take longer than the work of the commission itself.

We have spent tens of millions of dollars on research through this channel and it seems to me that it would be worth while for this committee or some other committee to talk with some of those who have directed it, to some of the members of these commissions, those who have served on the commissions, and try to make an assessment. Undoubtedly, this has been the chief way in which we have had research carried out in the social sciences in Canada in the past 25 years.

The Chairman: Is not the number of royal commissions we have had in these various fields a reflection of the shortcomings of economic research within the Government?

Mr. Bryce: There are two aspects of that.

Senator Grosart: It could be the opposite, of course.

Mr. Bryce: There are two aspects to be considered in answering that question. If there had been better continuing arrangements for doing research and publishing the results, would the Government have set up fewer royal commissions? I am not sure that the answer to that is yes. Indeed, if you look back to the British model, the role of the royal commission there is not to do research but to call witnesses, get their views, have four or five or a dozen wise men sit down and discuss it in an objective way.

The Chairman: Yet their main budget is in the field of research.

Mr. Bryce: I was going to say that the Canadian model of royal commission has been different and has been very research oriented. I would not say the research activities have been almost pre-eminent, but they have been of equal importance as the deliberations and hearings of the commissions themselves. This has been, therefore, largely a Canadian institution not entirely in accordance with the earlier traditions of royal commissions.

Is it a good way to get research done? I would have thought the accumulation of material brought out by the Economic Council, for example, would reduce the need for a royal commission to do this. On the other hand, the tradition has become so strong that it would seem to me a worth while project to examine whether these efforts have really been successful, whether the quality of the work done, whether the relevance to the work of the commission in both nature and time, was such as to make it valuable for the purpose of the commission, and also whether

it has made it valuable for the purpose of general scholarship and other research in the country, because an enormous amount of literature has been produced out of all this.

Senator Grosart: Of course, governments do not always want royal commissions to report too soon.

Mr. Bryce: That is right, but there is a degree in all this.

Senator Grosart: You spoke about a Cabinet committee on priorities. Does that committee have its own secretariat? Does it do any research of its own, or does it do any direct science research?

Mr. Bryce: It is of course served by the Privy Council office and the Cabinet office. The Science Secretariat is there and I should not discuss their role. It would be better if you got someone from the Cabinet office to do that, but it does not have a big organization of its own. It has a secretariat. The Cabinet secretariat serves it. The Science Secretariat is available to it and produces material for it from time to time.

Senator Grosart: But, structurally, would the Science Secretariat have a mandate, a legislattive or order in council mandate to serve any such committee or is it confined to the very interesting CPCSIR, the Committee of the Privy Council for Scientific and Industrial Research, which somebody said met seven times in 10 years.

Mr. Bryce: The Cabinet, Secretariat and the Science Secretariat, as I understand, can serve whatever group or Cabinet committee the Prime Minister or the President of the Privy Council or Secretary of the Cabinet wants it to serve. The Science Secretariat has developed since I was Secretary of the Cabinet. I do not know enough directly about it.

The Chairman: They are part of the general operation.

Mr. Bryce: They are part of the operation, that is right.

Senator Grosart: Would you care to answer this question? I will understand if you do not. Does the Cabinet Committee on Priorities meet regularly or only in crises?

Mr. Bryce: Regularly, sir.

The Chairman: To come back to an earlier question, I am still intrigued about the man-

power situation in so far as economists and social scientists are concerned. You have answered my earlier question. I think Mr. Hockin was dealing with it mainly. In terms of the Department of Finance, as there been a study made of the federal financial contribution to manpower developing or training programs in universities in the field of the social and economic sciences as compared with what we are doing for, let us say, the physical sciences?

Mr. Bryce: I think, sir, there is no doubt—let me first say that. The federal Government has in recent years been giving quite substantial support to the universities generally through the post-secondary educational arrangements. I was one of those who worked that out and I feel that on the whole it was really a massive program at a time when we assessed that the country was being confronted with a really major problem. Now, the other way that we give some support, and what I assume you are referring to here, is through the support of research projects or of individual post-graduate scholars and I think it is fair to say that...

The Chairman: Graduates college.

Mr. Bryce: Sorry, that is right, but scholars in post-graduate work. I need hardly say this to you, but we have not been as forthcoming with funds and volume as we have been in the physical sciences. This is a long story I suppose as to why not, but the figures are publicly available. You might have them in your records here. Well, why not? Partly because the physical sciences have a long tradition in this regard. We have been in this business for a long time. Secondly, I think there is a greater, more widespread recognition of the ultimate value of the research done in the physical sciences and technological work.

The Chairman: At least we have more faith.

Mr. Bryce: More faith. I think it is fair to say that governments, until 10 years ago, have been a bit reluctant to get into the support of work in the social sciences, where you get into much more controversial issues. When you are supporting studies on a lot of things in social sciences, they are often involved in issues of policy concerning Government policy and I know through the fifties there was a general feeling that it was better to keep away. Well, research in the social sciences and especially the development of computers

has become a much more expensive business and there is a whole lot more of it. I think it is fair to say that there is now a much greater demand for this, to which we have responded only in part. This is another area where we really need a little more work done centrally within the Government to assess the potential value to the country, and to the Government, of research in the social sciences and the methods and channels of its support. One of the major studies done for the Science Council and Canada Council jointly will shortly be coming out—in a few months, I suppose.

The Chairman: In a few months?

Senator Grosart: The Macdonald Report.

The Chairman: In March.

Mr. Bryce: All right. These mills grind rather slowly, in our experience.

Senator Grosart: It will come out before ours, Mr. Chairman.

Mr. Bryce: From there we may get a greater knowledge. I would like to see the department able to devote more manpower itself to the study of the role of university social science research in Canada, its value and so on. It is one of those things to which we have not given enough priority as yet. We have not got enough really good staff to put on it as yet, to feel we could make an effective contribution.

The Chairman: Do you not think that it would be perhaps a good thing to revive this interdepartmental committee on socio-economic research. I do not know—perhaps it is confidential—why it was set up originally. I do not know why it was abandoned. There may be some justification—quite apart from the experience, which might have been not a good one, as to the first exercise.

Mr. Bryce: I think that it really was a series of meetings rather than a highly structured body which was created. We did have a

series of meetings on the subject and with the growing pressure on budgets in the last eighteen months there really was not enough money available to warrant a committee figuring out new ways of spending money.

Senator Grosari: Mr. Bryce, would you say that one of the reasons why we appeared in Canada to place more reliance on co-ordination of research between departments and Crown agencies, than on control, might be that, unlike other countries, we have perhaps a greater concentration of senior personnel in Ottawa?

Mr. Bryce: A greater concentration?

Senator Grosart: Of senior personnel.

Mr. Bryce: Of the total country's senior personnel, or the Government's?

Senator Grosart: I mean the Government's?

Mr. Bryce: Yes, I guess that is true, sir. That is true. I hesitate over it, because I am not sure that it is as true in the physical and technical sciences as in the social field. Some of the other work is in laboratories across the country, but I suppose that is the case.

Senator Grosart: I said that because one seems always to see the same people at the cocktail parties.

The Chairman: Do you have any other questions?

Senator Grosart: No.

The Chairman: Honourable senators, we might end at this stage, but before doing so I would like to thank Mr. Bryce and his colleagues very much for coming before us this morning and for pointing out some gaps in our effort.

Mr. Bryce: Thank you, Mr. Chairman.

The committee adjourned.

APPENDIX "35"

STATEMENT BY THE

DEPUTY MINISTER OF FINANCE FOR THE SPECIAL COMMITTEE OF THE SENATE ON SCIENCE POLICY

March 1, 1969

Mr. Chairman and other Honourable Senators:

- 1. I appear before your Committee in response to your reiterated personal request even though I do not regard the analytical work of the Department of Finance as research, in the sense you are using the term, and I do not presume to be an expert on the government's science policy. I am pleased to tell you something about the department, its objectives, operations and requirements and to answer your questions as best I can. The department is a substantial user of the results of research carried on by others, and endeavors to apply information and analysis to its primary task of assisting the government to reach financial and other economic decisions. Perhaps some of our work falls within your concept of development, though your definition does not seem designed to cover it.
- 2. The department has no general statutory definition of its duties, and wields little direct authority over anything except a few special programs which it carries out, such as grants to provinces and municipalities and some guaranteed loan programs. Its essential functions are to assist and advise the Minister and the government on a variety of actions which have significant effects upon the economy and upon the over-all program of the government.
- 3. This year for the first time we have had to place before Parliament, in the new form of the Estimates, a definition of the Program Objectives of the department. They are brief and read as follows:

"The primary objective of the Department of Finance is to assist the Minister and the Government to decide upon and implement financial and other economic policies and measures that will best accomplish the major economic and other objectives of the government.

In support of this main objective the Department:

(a) analyzes and appraises the economic situation and prospects in Canada and in other countries of interest to Canada;

(b) considers and advises the Minister and the Government upon fiscal and other economic policies and measures, including those proposed by other departments and agencies of government, as well as tax and tariff and other proposals originating in the department;

(c) studies the fiscal position of the Government of Canada and recommends specific measures to meet the requirements of the Government within appropriate fiscal policies, by action in regard to expenditure, lending, taxation, borrowing and cash management;

(d) assists and advises the Minister in regard to matters concerning the balance of payments, exchange reserves, international monetary and financial arrangements, coinage and other related subjects:

(e) participates in international negotiations and other meetings relating to trade, finance, taxation, economic development and other economic subjects;

(f) studies the fiscal position of provincial governments, advises on policies relating to federal-provincial fiscal and economic relations, carries on discussions with provincial authorities and pays grants to provincial governments and grants in lieu of taxes to municipalities;

(g) administers various statutes relating to guaranteed loans, the capital budgets and financing of Crown Corporations and Agencies and makes contributions to international financial institutions."

4. In carrying out these objectives the department is organized into some 13 divi-

sions, each of which is a small group of up to about a dozen officers with a Director in charge. These divisions are grouped under three Assistant Deputy Ministers, and a Senior Tax Adviser. In addition, we have a fairly substantial support staff providing various services-including a library, several registries, clerical and stenographic services and personnel and other administrative services. This serves the Treasury Board Department as well as Finance. Beyond this we have the Mint attached to the department, but shortly to become a Crown company under the Minister of Services and Supply. An outline organization chart of the department is attached to the text of this statement, and some tables of personnel statistics.

5. I will not endeavor to describe initially the roles of the various divisions of the department. If the members of the Committee wish to go into them I would be glad to respond to questions. I would like to emphasize that over the years the department has endeavored to avoid detailed operational responsibilities, or to transfer them to others, in order that it can concentrate on the central analytical and policy work that is described in its program objectives above. As a result, while we recommend the content of tax laws and the tariff to the government, the Department of National Revenue administers them. While we recommend the various public debt operations to the Minister and the government, the Bank of Canada carries them out as our fiscal agent, and gives us very good advice as well. Shortly the Mint will make the coinage to our order; we shall simply buy it and sell it through the banking system. Experience has shown successive Ministers of Finance, and their Deputies, that the pressure of urgent work on policy issues and major decisions tends to crowd out proper attention to the management of operations.

6. In discharging its central role, the department has to take into account a wide variety of economic and other information, analyze it and bring it to bear on the various issues confronting the Minister and the government, in the light of our knowledge of government policies, and endeavor to reach sensible decisions as to what should be done. This applies not only to major issues of fiscal policy, for example, but also to the many and economic fields coming before the Cabi-

we have to deal with a variety of other departmental or interdepartmental or international actions in financial, trade and other economic fields where officials operate within general lines of policy laid down by Ministers.

7. In carrying on this work the department must have men-or women-with knowledge, education, training and experience. Most of all we need people with intelligence and good judgment, and the ability to express themselves. Some of them must be good negotiators. We rarely have time to do research in the scientific or academic sense of that term-but our officers are expected to know where and how to draw upon and apply the results of research done by others, not only in other parts of the public service, and elsewhere in Canada, but in other countries as well. I wish we had more time to do this in greater depth, and indeed ultimately to carry on some research within each of our divisions, but we have had to operate under pressure for years now and have had to give priority to urgent tasks from week to week.

8. In addition to knowledge our officers in many cases require the technical capacity to apply modern methods of analysis to our problems. This is perhaps best exemplified in our macroeconomic analysis of the economy, for the purpose of forecasting and of assessing the probable effects of various fiscal or other economic measures. Here we now benefit from direct access to a large computer in which is stored a very large number of series of economic statistics, which our officers can consult and analyze very quickly and easily. This has already been described to the Committee by the Bank of Canada. We also maintain and develop and use for our analytical work a mathematical model of the Canadian economy. The original version of this model was worked out twenty odd years ago in the Department of Reconstruction and then transferred to the Department of Trade and Commerce, where further work was done on it. We took it over in 1964 and have done considerable further work on it since that time. Details of it were published several years ago. If the Committee is interested, Mr. Leacy of the department will be glad to answer questions about it. I wish only to cite it as an example of one kind of analytical instrument we must specific problems and proposals in financial use in our work-for which we claim no intellectual originality, as many other people net, the Treasury Board and various Cabinet use models for similar work elsewhere. I Committees from week to week. In addition might add that we never rely upon the model

alone for our answers but rather use it to undertake is the set of financial flow accounts. check our more conventional methods of eco- We expect these will help us in our work on nomic analysis and judgment. The develop- subjects relating to the capital market, ment and use of a model of this kind has the including not only questions relating to our further advantage of requiring our officers to own borrowing and lending and foreign put their analysis at some stage into precise and consistent form, particularly in connection with complicated relationships where secondary and tertiary or even further effects may have to be taken into account. In the end of course we must recognize that we do not know and cannot put into figures the precise working of the complex economic system in which we work, and we must allow as best we can for uncertainty and for various influences we cannot measure.

9. Other fields of our work do not lend themselves so readily to modern quantitative analysis, but we endeavor to apply just as serious efforts at analysis and appraisal. In the field of tax policy we have devoted a great deal of effort to the analysis and appraisal of our current tax system and the proposals for changes in it. These include both the proposals of the Royal Commission on Taxation and those we have received from others. We have developed numerous proposals for consideration by our Minister. Much of this work has to be done by experts who understand not only the tax system but how people and businesses react to it. In calculating the revenue effects of possible tax changes we use, along with other information, a model of the taxpaying population organized for us by the Department of National Revenue in their huge computer and based upon a sample of 100,000 1967 tax returns. In forecasting the potential effects of tax proposals on the capital markets and related flows of capital we have studied with care some quantitative analysis of the Carter proposals done by the staff of the Commission and others and we arranged to have some further studies made by the Institute for the Quantitative Analysis of Social and Economic Policy, at the University of Toronto, which we have made publicly available to others interested.

10. We hope this year to be able to apply to our work in the department—and thus to the analysis of issues before the government-two of the new major statistical productions reported to your Committee by the Dominion Bureau of Statistics. One of these—the new input-output tables and related studies-we hope to use in our work on economic development analysis and in work on trade subjects. The other which we have asked the Bureau to exchange operations but also questions concerning financial institutions and legislation bearing upon them. I might add that this is a good illustration of the importance we see in the work of the Bureau of Statistics, and I should like to support what the Bank of Canada and the Economic Council have said in their briefs to your Committee about the importance of improving the statistical base upon which our economic analysis rests.

11. A great deal of our work depends upon information about specific industries and the trade in specific products. This is of course most obviously the case in regard to tariffs and trade negotiations and arrangements. In these fields our officers must look to a wide variety of sources of information. Some of it of course comes directly from those affected by our decisions. Our officers have to understand not only the principles of international trade theory—but also the highly important institutional structure in which production and trade is now carried on-as well as the complex of laws and trade agreements affecting it. We are assisted in this part of our work by the reports of the Tariff Board to which are referred subjects requiring considerable investigation and research. We have also been assisted by the increasing amount of outside research work being produced now in Canada, and we hope to see more of it carried to the stage of studies of particular industries and their structure and behavior. Within the public service the creation and growth of the Department of Industry has made available to us a large and valuable source of detailed information and knowledge, supplementing that already provided by the Department of Trade and Commerce and other departments such as Agriculture and Fisheries. In this field of trade there is a well established tradition in Ottawa of consultation and co-operation between departments, but we must in the end be in a position to assist the Minister of Finance with considered and informed support on matters for which he is primarily responsible to Cabinet and to Parliament. Those of you who have had occasion to study in detail the work of the department, and particularly of Mr. Rodney Grey, on the new anti-dumping code and the legislation to implement it will be aware of the complexity

and quality of the department's work in this field.

12. Another example of the nature and quality of the work of the department with which Parliament has dealt is to be found in the system of equalization grants to the provinces, paid in accordance with the Federal-Provincial Fiscal Arrangements Act and the complex regulations made under it. Here the government was confronted with a problem of great importance and great controversy. As a result of considerable study of the principles involved and various possibilities, and the practices of other countries, we were able to produce an objective, logical formula, simple in essence but very difficult and complicated in application. This has, I suggest, won a very wide measure of agreement in Canada. It is the kind of result we would like to produce more often, insofar as the country can afford it.

13. The work I have mentioned and illustrated so far relates to matters which we initiate ourselves. Much of our work, however, is more of the nature of the work of the opposition in Parliament in that it involves a critical appraisal of the proposals of others. The government considers from week to week various proposals put forward by individual Ministers, departments or agencies, or groups of them in consultation. These proposals must be analyzed, appraised, tested against a general framework of policy, reconciled with our constitutional powers and responsibilities, and finally fitted into a budget and financial program. The main groups that engage in this critical appraisal are the staff of the Treasury Board, the staff of the Cabinet Office, and the Department of Finance. The delineation of responsibilities for this work of analysis, appraisal and criticism is nowhere laid down clearly and precisely, particularly since the Treasury Board staff has been split off from the rest of the Department of Finance. Broadly speaking, it may be said that the Treasury Board Department concentrates on managerial matters and departmental budgets while the Department of Finance concentrates on economic matters and the government budget. In any event our main role is to analyze and appraise the economic proposals that are brought forward and to help the governand critical judgment we can muster and

putting forward the proposals and others examining them. This work is all too frequently done under considerable pressure of time and urgency.

14. In the several roles that I have described, the department must bring to bear not only particular economic considerations for which we have to rely on people with special knowledge and techniques, but also an integrating role that takes into account a wide variety of considerations, social and political and sometimes technical and legal as well as purely economic. Moreover, proposals, whether our own or others', must be judged in relation to government policies and programs as a whole and some conclusion regarding priorities reached. Merely because an idea is a good one or its purpose is desirable is not sufficient to warrant the government implementing it. Relative values, and cost in relation to the cost of other things, all have to be judged, as well as whether or not the matter is something which properly falls within the responsibilities of the federal government rather than a province, or, for that matter, within the private sector.

15. It can be seen from this description that it would be difficult to define research roles for officers or even divisions within the department which would cover all the considerations we must endeavor to bring into account. It is for this reason that we need to have, as I have said, officers with intelligence, a good education, experience, common sense and good judgment who can turn their attention quickly and effectively from one aspect of a problem to another, drawing upon sources of information as required and applying the results of research as well as knowledge of government. We intend, in our own specialized fields of economic analysis, taxation, capital markets and public finance generally, to develop a larger group of specialists with the time and education to keep fully abreast of work being done by others both in Canada and elsewhere. We plan, as such officers become available, to do enough original research work in the department to attract and retain first-rate economists who will be able to understand and appraise what others are doing as well as to contribute ment to decide whether these should be themselves to the solution of the problems accepted, modified, deferred or rejected. In confronting us. However, it would be out of this work we have to use all the information the question for us to do enough research to meet the needs for information and expertise carry on considerable discussion with those which we require for the wide range of matters on which we have to focus attention from time to time.

16. The department has over the years initiated with the government a number of major projects of inquiry, research and report through the medium of royal commissions. This has been the major form in which research in the social sciences and related public policy questions have been carried on in Canada in the past several decades. The first example that I would cite is the Rowell-Sirois Commission which brought together the work of many distinguished Canadian scholars in the late '30s and produced a report and series of research studies which have been recognized as one of the great milestones of Canadian public inquiries. While its specific proposals were not implemented, its work has illuminated much of what has been debated and accomplished in the past 25 years. A second project of this nature initiated in the department was the Royal Commission on Canada's Economic Prospects. Again a considerable number of scholars from outside and inside the public service were engaged on thorough investigation and research for the commission, which has been of great value both to us in the public service and to others. A third such project initiated by the department was the Royal Commission on Banking and Finance, the results of which, both in terms of research and report, have been utilized in preparing legislation to place before Parliament in recent years. Two further major inquiries have been initiated by the government to deal with central matters in the department's field of responsibility. One was the Glassco Commission on Government Organization and the other was the Carter Commission on Taxation. Both of these major commissions carried on a great deal of research, some of which was immediately utilized by the commission in preparing its report but all of which represents a serious and concerted effort to apply research techniques to the major problems confronting us. The Carter Commission particularly produced a vast literature of research studies as well as the monumental report itself, which has been recognized far and wide as a most distinguished contribution to the literature on the subject, despite the inevitable controversy over its proposals.

17. Whether or not these and similar royal under and the proportion of recent university commissions constitute the best way of under- graduates on strength in the department is

taking research in the social sciences and on public policy is a matter which this Committee, or another, might well study. I have had some doubts whether it is the most effective way of doing research because of the way in which the inquiries have to be organized and the pressure of time under which some of them have felt they must work. In any event this research, under the auspices of royal commissions, has been the chief form in which research has been initiated and financed by the government in the subjects in which the Department of Finance is most involved.

18. I need hardly remind you Mr. Chairman that in 1963 the new Government and new Parliament established the Economic Council of Canada in order to produce more research into our economic problems on a systematic and continuing basis. In addition of course the Council renders its collective judgment on the results of this research and its application to many of the economic problems confronting Canada. The Council deals with the government at arm's length on these matters, giving us their reports in published form, so that the results of their research and the advice that they tender are available for all to see as well as the government. We in the Department of Finance of course make extensive use of the work of the Council and its published research reports. We take to heart what the Council recommends even though we do not always wholly agree with it. We feel that a body organized as is the Council, and free from the day to day pressures of having to reach decisions, is much better able to undertake a lot of research of this character than is our department.

Personnel

19. Your Committee has asked those appearing before it for some specific information relating to personnel and personnel policies. In view of the nature of the department and its work as I have described it, I am not sure just how far you would wish to have information about our staff. We do not have any one particular research division, and the information I give will relate to the department as a whole. Statistical tables are attached to this text.

20. Over 75 percent of the officers in the department have one or more degrees, 50 percent of the officers are 34 years of age or under and the proportion of recent university graduates on strength in the department is

high. The continuing policy of the department now is to recruit young graduates with studies beyond the Bachelor degree level. Considerable effort is made to ensure that we enroll officers who show high potential for advancement to senior levels. While we prefer to recruit men or women who have graduated in economics or other social sciences, our chief interest is to get first-rate, intelligent people with the qualities of mind and personality we need for our work.

- 21. Recruiting is accomplished primarily through programs conducted by the Public Service Commission. The Socio-Economic and Administrative Trainee Programs direct an increasing number of high-calibre graduates to the department. In conjunction with recruiting efforts conducted formally through the Commission, numerous informal contacts are maintained with universities and other likely sources in an attempt to identify individuals with high potential who might be interested in a career with the Department of Finance. The department is also actively engaged in a summer employment program which permits students engaged in postgraduate work to gain first hand, on-the-job experience. Some of these graduate-assistants normally apply for permanent employment with the department upon final graduation.
- 22. The criteria upon which the hiring of professional staff is based involve evaluations of academic performance, recommendations from university professors and others, relevant work experience, and impressions gleaned from interviews as to the ability of the individual to participate in the work of the department as described above.
- 23. The continued development of officers within the department is encouraged through a periodic system of evaluation and appraisal of performance on which recommendations for courses, training, salary increases and promotions are based.
- 24. All departmental employees are encouraged to increase their knowledge and skills through a variety of courses offered by private institutions, universities and the Public Service Commission. Financial support is given to those involved in programs of study through partial reimbursement of tuition fees, time off from work to permit course attendance and allowances to defray the cost of course materials. Full time educational leave,

with an allowance to cover living expenses etc., has been and will be granted to those employees whom the department feels it is in its best interest to support toward the attainment of higher qualifications. Over the past two years approximately 10 percent of the staff have attended language training courses.

25. In addition, seminars are conducted from time to time within the department to enable employees to keep up to date with recent developments in their area of interest and expertise, to become acquainted with new concepts and techniques and also to keep abreast of the important activities of other divisions of the department.

26. The department has a high ratio of senior officers to junior officers because of the nature of our work and responsibilities, and our relationships with other departments, agencies and governments. Many of our senior and middle rank officers go to work in other departments of the public service, usually in higher paid positions, and we in turn recruit officers from elsewhere in the service. Like other departments we have real difficulty in finding experienced and well trained economists and statisticians. There is an over-all shortage of such people in Canada. There must still be scores, if not hundreds, of vacancies for such people in Ottawa and new positions for such work granted by the Treasury Board are essentially hunting licensesand much of the hunting is done within the public service itself. Our work suffers from this shortage as does that of others. The supply of young graduates, including some with post-graduate training, is now much better and we are trying to readjust our working arrangements to use more young, well trained persons in place of experienced economists, but in our kind of work it is difficult to carry this substitution very far.

27. It is these limitations on the numbers of experienced men and women able and available to do the kind of work we do, rather than money or policy, that mainly determines how much we can do and how well we can do it. As time goes on we expect to have enough highly qualified officers to do a better job of bringing to bear on government economic policies more of the growing amount of research work being done in the social sciences in Canada and elsewhere.

Personnel Statistics—Department of Finance (Jan. 31, 1969)	
Establishment positions. Frozen positions. Positions available. Establishment strength. Positions vacant.	391 23 368 339 29
Breakdown:	
Executive Officers. Finance Officers. Program Administration Administration Services and Informa-	25 88
tion Services Officers	25
Joint Services Officers (serving Dept. of Finance and Treasury Board Secretariat)	23
Clerical Staff.	89 88
THE REPORT OF THE PROPERTY AND THE PROPERTY OF	

Year	Strength	% Turn-Over	Remarks
1962/63 1963/64 1964/65 1965/66 1966/67	149 152 177	2.9% 13.4% 11.8% 13.6% 10.8%	Build up in strength largely due to increases to the Treasury Board Staff
1967/68. 1968/69. Jan 31 '69.	137 152 161	19.0% 11.8%	Treasury Board staff separated from Finance in Sept. '66, not included in turn-over percentage

Total....

CLASSIFICATION OF PROFESSIONAL STAFF

Country of:	Birth	Secondary Education
Canada	22	25
England Scotland	2	STATE OF THE STATE
Holland	1	
	27	

Mean number of years since graduation: 28.3 Mean number of years with the Department of Finance: 9.1 Average age: 46
Per cent effective in both official languages: 18.5%

12.1		41	D 1 1	1 1	1 1
(0)	At	the	Bachel	lors	level

Country of:	Birth	Secondary Education	Bachelor's Degree
CanadaEngland		66	67 5
Iran. Germany U.S.A.		1 2	MonShretce C
India. Turkey. Scotland		al reministration	
Rumania	discilling into the		
	74		

Mean number of years since university graduation: 12.6 Mean number of years with the Department of Finance: 4.7 Average age: 37
Per cent effective in both official languages: 33.7%

(c) At the	Master's	level
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Country of:	Birth	Education	Degree	Degree
CanadaHolland	1	36 1	37	30
SwedenEnglandScotland	3	3	3	6
U.S.A. Denmark	JANSHIN - SJ			1
	40			

Mean number of years since Master's degree: 11.1 Mean number of years with the Department of Finance: 8.2 Average age: 35 Per cent effective in both official languages: 32.5%

(d) At	the	Ph.	D.	level	
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Country of:	Birth	Secondary Education	Bachelor's Degree	Master's Degree	Doctorate
Canada England	3	5	4 1 1	3 2	1 2 2
U.S.A. India. Germany Ireland.	1 1 1	1		1	1

Mean number of years since Ph. D.: 24.5 Mean number of years with the Department of Finance: 6.1 Average age: 44 Per cent effective in both official languages: 50%

Previous Experience of Present Staff January 31st 1969

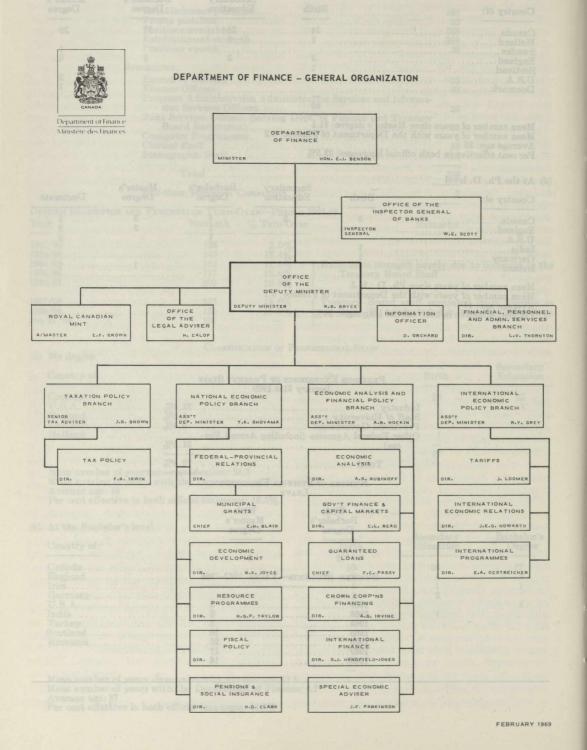
TOWN ADDRESS OF THE PARTY OF TH	00 100
Industry	23.4%
Staff of University	8.5%
Provincial Government	23.4% 8.5% 9.4%
Other Federal Agencies (including Armed For-	,,,
ces)	31.5%
SOURCE STREET, PROVINCIAL STREET, SECURING	
Total	

Number of Staff on Education Leave

With	With
Bachelor's	Master'
Degree	Degree
2	Turbono .

SUMMER STUDENTS-YEARS 1962-1968

1	962													3
1	963			8										3
	964													
1	965													10
1	966									×			Ä	22
	967													
1	968													16





Just Semion-Twenty-eighth Parliament

THE SENATE OF CANADA

PROCEEDINGS OF THE OMNITTEE

SCHNCE POLICY

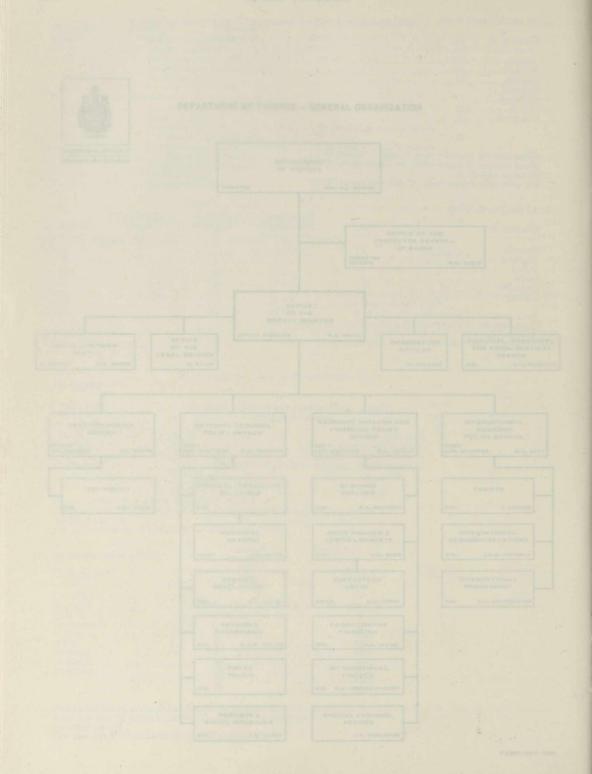
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No. 33

WEDNESDAY, MARCH 5th, 1969

WITNESS:

Manuel et Manuel Brector, Science of Science Foundation,





First Session—Twenty-eighth Parliament
1968-69

THE SENATE OF CANADA

PROCEEDINGS
OF THE
SPECIAL COMMITTEE
ON

SCIENCE POLICY

The Honourable MAURICE LAMONTAGNE, P.C., Chairman
The Honourable DONALD CAMERON, Vice-Chairman

No. 35

WEDNESDAY, MARCH 5th, 1969

WITNESS:

Maurice Goldsmith, Director, Science of Science Foundation, London, England. First Session-Twenty-eighth Parliament

THE SENATE OF CANADA

MEMBERS OF THE SPECIAL COMMITTEE

ON

SCIENCE POLICY

The Honourable Maurice Lamontagne, Chairman
The Honourable Donald Cameron, Vice-Chairman

The Honourable Senators:

Aird	Grosart	Nichol
Belisle	Haig	O'Leary (Carleton)
Blois	Hays	Phillips (Prince)
Bourget	Kinnear	Robichaud
Cameron	Lamontagne	Sullivan Sullivan
Carter	Lang	Thompson
Desruisseaux	Leonard	MOCYuzyk monoH as
Giguère	McGrand	

Patrick J. Savoie, Clerk of the Committee.

WEDNESDAY, MARCH 5th, 1969

WITNESS:

Maurice Goldsmith, Director, Science of Science Foundation, London, England.

ORDERS OF REFERENCE

Extract from the Minutes of the Proceedings of the Senate, Tuesday, September 17th, 1968:

"The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That a Special Committee of the Senate be appointed to consider and report on the science policy of the Federal Government with the object of appraising its priorities, its budget and its efficiency in the light of the experience of other industrialized countries and of the requirements of the new scientific age and, without restricting the generality of the foregoing, to inquire into and report upon the following:

- (a) recent trends in research and development expenditures in Canada as compared with those in other industrialized countries;
- (b) research and development activities carried out by the Federal Government in the fields of physical, life and human sciences;
 - (c) federal assistance to research and development activities carried out by individuals, universities, industry and other groups in the three scientific fields mentioned above; and
 - (d) the broad principles, the long-term financial requirements and the structural organization of a dynamic and efficient science policy for Canada.

That the Committee have power to engage the services of such counsel, staff and technical advisers as may be necessary for the purpose of the inquiry;

That the Committee have power to send for persons, papers and records, to examine witnesses, to report from time to time, to print such papers and evidence from day to day as may be ordered by the Committee, to sit during sittings and adjournments of the Senate, and to adjourn from place to place;

That the papers and evidence received and taken on the subject in the preceding session be referred to the Comimttee; and

That the Committee be composed of the Honourable Senators Aird, Argue, Bélisle, Bourget, Cameron, Desruisseaux, Grosart, Hays, Kinnear, Lamontagne, Lang, Leonard, MacKenzie, O'Leary (Carleton), Phillips (Prince), Sullivan, Thompson and Yuzyk.

After debate, and—
The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Thursday, September 19th, 1968:

"With leave of the Senate,

The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That the name of the Honourable Senator Robichaud be substituted for that of the Honourable Senator Argue on the list of Senators serving on the Special Committee on Science Policy.

Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Wednesday, February 5th, 1969:

With leave of the Senate,

The Honourable Senator McDonald moved, seconded by the Honourable Senator Macdonald (Cape Breton):

That the names of the Honourable Senators Blois, Carter, Giguère, Haig, McGrand and Nichol be added to the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.

ROBERT FORTIER, Clerk of the Senate

MINUTES OF PROCEEDINGS

WEDNESDAY, March 5, 1969.

Pursuant to adjournment and notice the Special Committee on Science Policy met this day at 3:30 p.m.

Present: The Honourable Senators Lamontagne (Chairman), Belisle, Blois, Bourget, Carter, Giguère, Grosart, Hays, Kinnear, Lang, Leonard, McGrand, Robichaud, and Yuzyk—14.

In attendance:

Philip J. Pocock, Director of Research (Physical Science).

The following witness was heard:
Maurice Goldsmith, Director,
Science of Science Foundation,
London, England.

(A curriculum vitae of the witness follows these Minutes).

At 5:40 p.m. the Committee adjourned to the call of the Chairman.

ATTEST:

Patrick J. Savoie, Clerk of the Committee.

CURRICULUM VITAE

Goldsmith, Maurice began his academic life as an economist and sociologist. He became interested in the significance of the natural sciences and turned to a study of physics. He began to express his ideas as a science writer in the mid-1930's, and was a founder-member (First Secretary-Treasurer) of the Association of British Science Writers. Invited to join UNESCO in 1949, where he was concerned with problems of the communication of science. In 1953 he set up his own organization, Science Information Service, In London, In that year he began also publication of science magazines for schools. He has much experience of the mass media, and is now concerned with a redefinition of the concept of the popularization of science. His activities and interests in promoting understanding and appreciation of science are wide. He does not rate the scientist more highly than the artist—both are significant. His books include: The Scientist and You (editor), 1959; The Young Scientist's Companion, 1961; the Young Physicist's Companion, 1962; Mechanisation in the Classroom (editor), 1963; Careers in Technology, 1963; Science, History, and Technology (joint author), 1965.

THE SENATE

SPECIAL COMMITTEE ON SCIENCE POLICY

EVIDENCE

Ottawa, Wednesday, March 5, 1969

The Special Committee on Science Policy met this day at 3.30 p.m.

Senator Maurice Lamontagne (Chairman) the Chair.

The Chairman: Honourable senators will recall that during the first days of our inquiry we heard a certain number of wise men from Canada and abroad who had a great knowledge of science policy, of the science of science or, as we heard in Toronto last weekend, science squared. This exercise has been more than useful to us and I think it should be continued as occasions arise.

We have today one of those very fortunate occasions. Mr. Maurice Goldsmith, who is Director of the Science of Science Foundation in London, England, is at present making a Canadian tour and studying more closely the Canadian science and research effort. He has been good enough to interrupt his visits to Canadian universities and accept my invitation to appear this afternoon before our committee.

A detailed biography of our guest has already been circulated, and will, of course, be printed in our proceedings. Therefore, without further introduction I will now invite Mr. Goldsmith to give us the benefit of his views on science policy, views which are based on a wide and varied experience.

Mr. Maurice Goldsmith, Director, Science of Science Foundation, London, England: Thank you very much indeed, Mr. Chairman and senators, for the privilege of coming before you in this way to give you some comments of my own experience in the field of the science of science and of science policy. I must apologize that I have no written statement, but as you, sir, have pointed out, this has been thrust upon me suddenlike, and I am extremely happy to have accepted your invitation.

In a sense, I am highly motivated so far as Canada is concerned, because I have always

been interested in the problems of this country and have made a number of visits over here during the past 12 to 15 years. Also, last year we were extremely fortunate in that Dr. Solandt, Chairman of your Science Council, accepted an invitation from the Science of Science Foundation to give the annual lecture of the Foundation in London, England. He was one in a rather distinguished series of speakers. The year previously the annual lecture has been given by Sir Solly Zuckerman, the Chief Scientific Adviser to the British Government.

I think it is clear from the evidence you have already heard—and I have looked through the evidence that has been published—that one basic idea of modern politics is shared by all governments, whether they are capitalist or socialist and whether their economies are planned or semi-planned: this is that science and technology are the necessary means to produce more wealth and to promote the people's welfare. Among the statements made about this there is one that is typically relevant. It was made a few years ago, in 1964, by Alexei Kosygin, Chairman of the Council of Ministers of the U.S.S.R., when he said:

Under the present conditions the development of science is one of the factors decisive for our economic growth.

This statement, of course can be paralleled by similar statements made by leading government ministers in almost all countries.

Science policies are aimed at directing the use of resources for research and development. It is interesting that there is this similarity of views between different forms of government; this may be as important historically as are the differences of outlook on other matters.

Science policy I regard as an expression of a radically new approach to economic and social policy, but even now the questions about scientific and economic policy and many of the solutions proposed are arrived at intuitively and empirically. There is no background theory available to help in decisionmaking. Even as economic policy now has available a body of economic theory, developed particularly since the day of Keynes, I believe that science policy will also come to be so provided, so that the hot wind of irrationality will be taken out of decision-making in national science policy. This can be done only by basic research designed to assess the factors responsible for the growth of science, by developing a body of science critics competent to take a critical look at government decisions on and for science. This, Mr. Chairman, is what the science of science, or science squared, is about. Its concern is to lay the intellectual foundations, among other things, of science policy.

The growth of science up to now has been the result of a rather promiscuous collusion between the practitioner of science, the educationist and the politician, but the clamour for exports and experts, for improved productivity and for trained manpower, and the need therefore for centralized planning through a national science policy based upon rational criteria for decision-making, is resulting in redefinition. I believe that never again will science and technology be left free to grow entirely by chance, as they have done up to the present moment.

The science of science, very simply, is concerned with insuring that science no longer develops haphazard and uncontrolled.

We seek a rational and explanatory account of the structure and behaviour of science. That is we use the methods of science to study the processes of science itself; the fact is that even the practitioners of science, who regard scientific method as the most distinctive of human activities, have only just begun to see that science now needs to be studied as are other human activities. We need to look internally at science as a discipline with its own history and logic in order to determine whether there are laws of growth within science. If we can determine that there are, then we shall be able to predict and use science as a tool more wisely. Second, we need to look at science externally in its effect on society.

Both these aspects are covered in this new field of research to which we have given the name science of science. In order to study science, it is necessary to do research in a whole variety of topics, such as the sociology of science and its history, the psychology of scientists and of creativity in scientific work, the flow of scientific information, the popular communication of science, operational research in science and the principles and philosophy of planning in science. We have also to study the role of science in different types of society, decision making in national science policy, the economics of science, scientific advance, and the planning of research and development.

I have been told often that the separate things I have mentioned are being done. Of course, it is true, but we believe that when these are done in isolation they may make some contribution to knowledge, but only a co-ordinated consideration of balanced interactions will prove meaningful it is to this co-ordinated consideration that we give this name, science of science.

The phrase "science of science" was first used just over 30 years ago, and it has come into a popular use only in the last 10 years. The Science of Science Foundation is now recognized as having begun to institutionalize the science of science. May I say very speedily, Mr. Chairman, that the Science of Science Foundation in the United Kingdom is registered as a company limited by guarantee and entered into the register of charities as an educational trust.

We believe that science is one of the subcultures and that the other subcultures of the arts and humanities are equally important if we are to begin to solve the serious problems that present themselves to us in living in an age of technological revolution. Because of this we have on the Advisory Council and on the various committees a range of individuals who represent all the cultural patterns in the broadest sense. The president of our advisory council is the Nobel laureate, Sir Peter Medawas, FRS, a distinguished biologist. We have Professor H. Bondi, FRS, an internationally known mathematician; Professor Asa Briggs, the Vice-Chancellor of Sussex University, and a distinguished social historian; and Charles Carter the Vice-President of Lancaster University, an economist who first began studies in Britain in this whole field of research and development and national economic growth. These are: the artist, Sir Robin Darwin, the Principal of the Royal College of Art in London; Dr. Alexander King, you have already heard; and Gerard Piel, the publisher of the *Scientific American*. We also have Professor D. J. de Solla Price, the historian of science at Yale; a distinguished British Q. C., George Rink; the man responsible for the phrase "the two cultures", Lord Snow or C. P. Snow; Lord Jackson of Burnley, FRS, a well-known engineer, and chairman for many years, of the Government's Manpower Committee.

The SSF Committee of Management has an equally mixed group. The chairman is Dr. J. B. Adams, at present Member Research of the United Kingdom Atomic Energy Authority, who has just accepted an invitation to become the Director of the 300 GEV High Energy Particle Accelerator Project which CERN is to start somewhere in Europe. So, Mr. Chairman, the science of science has practical expression through the Science of Science Foundation.

Now, I would like to look at some of the organizational problems which you here are involved in, but before I do so I would like to mention that the Science of Science Foundation is not only a body concerned with promoting theoretical studies, but also is concerned with practice. We were responsible jointly with the Ciba Foundation for an international symposium on "Decision Making in National Science Policy" which was published at the beginning of last year. It is a book, which to my great pleasure, I find many of the people in this country who are concerned with problems of decision making now using as a basic text.

We are organizing also in April of this year at Churchill College in Cambridge, an international symposium on "Technological Innovation and the Growth of the Economy." I am happy that Andrew Wilson, from the Science Council, will be officially representing Canada on this occasion. The SSF are not just a sort of long-haired group trying to do romantic things, but we are concerned with very practical problems. We recognize that without basic theory, practice would have to be based on a purely pragmatic, and opportunistic, approach and in that way we really would not get very far at all.

Now, Mr. Chairman, may I make some very personal comments on what I have observed here in Canada, especially in terms of the very vivid discussion that is now going on in relation to science policy. I have found this extremely exciting, because I have not known

don; Dr. Alexander King, you have already in the many countries that I have visited the same degree of excitement about science poli-Scientific American. We also have Professor D. J. de Solla Price, the historian of science extremely important to people in Canada.

In 1966, an OECD committee on Government and the Allocation of Resources in Science dealt with the performance of certain essential functions by central agencies of government. The essential functions were: (1) interdepartmental co-ordination; (2) long-term strategic planning; (3) secretarial, statistical and other services; (4) co-ordination with educational and economic policies.

I mention these specifically because I feel that the discussion about this may have some relevance to the debate which is going on here at the moment, as to what should be the organizational forms developed to implement proposals for a national science policy.

Dealing with these in order—(1) interdepartmental co-ordination—clearly, this arises from the many-sidedness of support for research, in which there is a danger of duplication, omission and unco-ordinated growth.

In France, there is an interministerial Committee for Scientific and Technological Research, which is assisted by the Délégation Générale for Scientific and Technological Research. In the U.S.A., there is the Federal Council for Science and Technology assisted by the Bureau of the Budget and the Office of Science and Technology. These act, in a sense, as the central organization to secure rationalization and co-ordination.

I must confess that I am not very clear how this is done in my own country, but we do have an Advisory Council on Science and Technology, which is a central grouping linked to the Ministry of Technology. We do have research councils and there are special links developed in terms of officials and invited members who may sit on the main committees.

This co-ordination might lead to a science budget, as exists in some way in France and Belgium. The French science budget, for example, has an ex-ante approach, that is, it shows all the research and development items of all the departments separately in their estimates, except that there are no disclosures about nuclear work, space research, and defence. These items are collected by the Délégation Générale and are passed on to a consultative committee of scientists. This

committee looks at these and makes recommendations to an interministerial committee, which then recommends to the Government the general size of the science budget and the principles of its distribution.

We do not have this in the United Kingdom, and I do not think it exists in the United States. In my own country, there is a general feeling that it is better to relate scientific programs to social activities or to specific activities, such as defence or medicine, rather than to other scientific activities.

This OECD report did make an interesting suggestion about an ex-post approach, that is, an agreed presentation of departmental expenditures in science, once the allocations had been made. This would be extremely useful, as it would make clear the demands of politics upon science. It would present also what is called the "opportunity cost" of certain large scale commitments of scientific resources, say, the amount devoted to space research or high energy physics and so on. This would then provide the necessary information for the public and might lead to a general debate by the public about these forms of expenditure.

The report also suggests that it would be useful to present this scientific spending as part of the total national spending. This, of course, would mean that it would be useful to develop a national inventory of scientific resources which would include manpower, plant and equipment, and so on.

Also, the report suggests that in terms of interdepartmental co-ordination, there ought to be machinery to identify possible areas for such co-operation in "complex projects"—this is the phrase that they have picked up from the Russians—that is, areas which need to be co-ordinated and which would result in existing departments or institutions being brought together in their research activities.

I think that there is a case, and a strong one, for interdepartmental co-ordination. The organizational form that is required to do this is another matter, to which I shall return in a moment.

Then there is long-term strategic planning. This is usually done by high level scientific advisory bodies. In Britain, for example, there is the Council for Scientific Policy,

which reports to the Minister of Technology. As I have said, there are formal contacts between these, because of overlapping in their membership, but clearly long-term strategic planning is important if we are to have a perspective against which the shortterm projects can be measured. This is something that might be done by the Science Council.

Then, the third point, secretarial, statistical and other services: The report suggested that most of the bodies then existent had part-time staff and that there was a need for a full-time secretariat. It was necessary to identify issues, pose questions, and ensure a flow of new ideas into the political system. Quite clearly, so far as I am concerned, this seems to be the role that the Science Council is fulfilling, or will be required to fulfill, in the future.

Finally, there is the question of the co-ordination with economic and educational policies. This is concerned with the need to organize discussion between scientific and non-scientific agencies of government on, for example, manpower policy, social and economic needs, R & D, national development, and so on.

What are the organizational forms which might take care of these essential functions? I have heard suggestions in this country-and these are very personal views on my part and necessarily incomplete because I do not know the Canadian scene sufficiently intimatelyfor a department of science, for a ministry for science policy, and for a ministry for scientific affairs. The arguments I have heard would indicate that by and large a department of science would tend to be regarded as "interfering" in the affairs of other departments. If it is felt by those who know the Canadian scene that this is so, then of course there is no point in pursuing this one any further, except to say that in countries which I know departments of science do not seem to have been all that successful. We had in Britain at one time the first minister for or of science, then Lord Hailsham now Quintin Hogg. (He wanted to enter the House of Commons in furtherance of his political career so he gave up his peerage.) As a result of that particular experience, successive govwhich reports to the Secretary of State for ernments have never re-appointed or named Educational Science and there is the Central a minister of or for science. Of course, this Advisory Council on Scientific Technology, had nothing to do with the quality of Hailsham, but rather with the complexity of the situation.

A minister for science policy is an extremely interesting suggestion. If such a minister were to be appointed, the Science Council would be an important factor in providing the basic studies required to allow him to operate.

The other suggestion is to have a minister for scientific affairs. Again, I think this is a very interesting suggestion because it indicates that a minister for scientific affairs might include the functions of a minister for science policy, and would also include the need to concern himself in what is happening in science in various departments.

However, whatever the final decision arrived at, one can only measure the significance of the appointments in terms of the powers the minister has to get things done. This, Mr. Chairman, in practice means, so far as I can tell from other countries, that there must be some kind of special understanding on the part of the chief minister, or the prime minister. In fact, we know from experience in other countries that if you want to get things done and if you have a strong prime minister, then things do happen.

The question has arisen-and I want to spend a minute commenting on this-of providing the scientific community with a voice. I have heard suggestions that the Science Council might become this voice. If the scientific community feels it needs a general voice outside of its specialized institutions, then this requires to be considered. But I do think it might be unwise if a body such as the Science Council came to be regarded as a kind of propagandist voice, because science policy concerns the well being of the whole community and the statements that the Council prepares must be objective. If they are not objective statements on which everyone can rely, but are regarded as presenting or representing particular interests, then I think the value of such a body at this level in the government machine would fall to the ground.

I want, if I may, to say also that Sir Solly Zuckerman, whom I have mentioned as the Chief Adviser on Science to the British Government, has had probably the longest experience in the world in this field. Since the beginning of the last war, he has been involved in advising governments on policy. He has said:

Science is inevitably in the public arena and decisions about the deployment of our scientific resources must in the end inevitably be political. Advisory bodies can only advise. In our system of government the power of decision rests with the minister concerned or with the government as a whole or with boards of companies. Although we are learning fast, the scientist as we stand today not only does not have the responsibility for public discussion, but also still lacks the apparatus with which to predict the repercussions of technological development, and it is the repercussions which more than anything else transform the sphere of politics, not straightforward decisions like that of increasing the size of the scientifically trained population.

Science policy would have a much greater meaning than it has if only there were fewer unknowns in the scientific and technological process and since the scientist is in the public arena only as the expert worker and adviser it is his employer, whether it be the government or the board of an industrial company which commands his service and the responsibility for action, the decision whether to accept or reject his advice is theirs and theirs only. If the scientists who now advise want more than this then they will have to become politicians or if not that then leaders of industry.

I have quoted this at length, Mr. Chairman, because I think it is an important and wise statement. Sir Solly has referred to the fact that we are required to have fewer unknowns in the scientific and technological process. It is in this regard that I think science of science has a particular contribution to make, because if we can increase our understanding of the internal processes of science and of the effects of science on the community in which we live, we can then reduce the number of unknowns, and in reducing them it becomes much easier to help make decisions.

We have to recognize that from the scientific analysis there may come some advice to governments, but it would be dangerous to confuse the objective study with the advice. They are two different things. The objective study has to be re-interpreted in terms of what the government of the day requires.

One other comment, Mr. Chairman: in the discussions in this country I have had a very strong feeling that the public must in some way be brought into the decision-making process. They do this indirectly whenever they have the privilege of voting, but I think something much more intense and immediate and familiar is required continuously, because there must be a recognition within the country that science and technology is of importance and that it is no use that scientists and some politicians should say so. There must be developed a scientific and technological temper within the country. This, of course, is part of, or should be part of, the whole educational process.

Without the development of a technological temper it will be very difficult to get the sympathy for expenditures on science that is required at the present day. Therefore, attention should be paid to forms which are required to insure that the scientific and technological pulse of the people is felt continuously, and there may be merit in the suggestion I have heard that the Association for the Advancement of Science now in Quebec might be extended to include the whole country, so that it performs a kind of AAAS function.

I do feel, also, that you ought seriously to consider the possibility of an on-going role for this very committee to which I am honoured to have been invited to present some views.

In Britain, we have the Parliamentary and Scientific Committee, which is an informal body meeting regularly at the House of Commons, on which are represented members of both houses, plus scientists and industry. This is an extremely useful forum for the exchange of views. There are regular monthly meetings, and the members of the house really get an idea of what industry and the general scientific community is thinking and feeling. I have had the impression here that this committee of yours, Mr. Chairman, has come in a sense to be regarded by the scientific community as a kind of ombudsman. I know this is not your function, but it does express something to which attention requires to be paid.

I have just one story, Mr. Chairman. The scientists, it has been suggested, must always be on tap, but not on top. I am reminded of the story of Blondin, a famous tightrope

walker who, towards the end of the last century, proceeded to do his famous walk across Niagara Falls. I think this was to be about 1,100 feet on a tightrope. This was a great occasion. Blondin stepped onto the tightrope carrying his assistant on his shoulders. After they had gone a little distance his assistant said, "Well, sir, I think we have demonstrated that we can do this. Do you not think we ought to turn back?" And Blondin looked up at him and said, "Not at all. You may be on top but I am the one who is determining where we are going."

Finally, Mr. Chairman, as I believe in the equal relevance of all the subcultures and believe that the poets and writers can always provide us with some special insights, a quotation from the English poet, W. H. Auden, from his poem New Year:

The choice of the patterns is made clear which the machine imposes.

What is possible and what is not, to what conditions must we bow

in building the Just Community now.

Thank you.

The Chairman: Thank you very much.

Hon. Senators: Hear, hear.

The Chairman: I can see in this last quotation where comes the Canadian concept of a just society. Thank you very much indeed, Mr. Goldsmith, for this much illuminating talk. I am sure that you have raised all kinds of questions in the minds of the members of this committee, so if you do not mind we will proceed immediately to the discussion period. Who is going to be first?

Senator Carter: I wonder if Dr. Goldsmith would mind telling us a wee bit more about the Science of Science Foundation. I would like to know how long it has been in existence, how big a staff you have and what are your relationships with educational institutions on the one hand and Government institutions on the other hand.

The Chairman: And how is it being financed.

Senator Carter: Yes, the budget.

Mr. Goldsmith: Mr. Chairman, the Science of Science Foundation first began to operate in 1964. We began because we felt that this was something useful to do in social terms, and then in the middle of 1966 we recognized

that interest was growing at such a great rate that we had to provide some established legal form for it. So we set up this educational trust.

From the beginning, we were concerned with attempting to clarify for ourselves what exactly we mean by the science of science. It is all very well having the general phrase, but what on earth is it, what is a science of science approach to education, what is a science of science approach to technological innovation, and so on. We began a series of key seminars on the financial aspect. The Science of Science Foundation is not endowed by any industrial or government group.

We have been provided with certain facilities by the CIBA Foundation in London, and by various other bodies. What is happening now is that our activities have grown so that we are, on March 24, leaving the CIBA Foundation and moving into other premises. Our full-time staff is not at all large. It consists of about three people. Our part-time staff of volunteers-and this is something that we have developed quite deliberately, because we believe in flexibility-is extensive. We have a number of committees—an editorial committee, an educational committee, an industrial committee, a library committee, a medical committee, a science critics panel. We can call upon the services of about 70 people, who are prepared to give up time to work on our committees.

We have set up at the University of Sussex a Science of Science Foundation Library, which we hope will contain the most complete collection of science of science material in the western world, and which is gathering new material at a remarkable rate. This material is available to any genuine student, and facilities for study are provided in the resources that we have at the University of Sussex.

Our seminars have been adressed by such distinguished people as Sir Peter Medawas, FRS, on "Creativity"; Dr. A. Rahman, Director of the Research Planning Unit at the CSIR in New Delhi on "the Planning and Organization of Science Research in Developing Countries"; Professor Asa Briggs on "The New Model for Adult Education"; Dr. Arnold Kramill of the Rand Corporation, now of the Institute for the Future, on the "Technological Gap"; Sir Charles Goodeve, FRS., on "Research and Development"; Dr. A. C. Cottrell, FRS, now Sir Solly Zuckerman's deputy, on appeared in Russian, Japanese, Italian, and

"Science and Economic Development," and many other well-known people.

Each of the various committees organizes seminars. For example, during recent months we have had a series of seminars, organized by the Industrial Committee, on the right environment for creativity in applied research. These have been post-graduate seminars held at Imperial College in London. Among the topics considered were studies in the psychology of scientific creativity in industrial laboratories; the psychology of the scientist in a business environment; the professionalization of the science student; the introduction of a company philosophy using socio-technical assistance concepts and its impact on scientists.

The Library Committee have had a series on the re-organization and documentation of communication, with special reference to science and technology. The Medical Committee have been concerned with the tools of health service planning and the perturbations which will be caused by new developments. The Education Committee dealt with the interphase between education and industry, and so on.

We have had an international symposium on decision making in national science policy, and we have the one on technological innovation next month.

We have an annual Science of Science Foundation lecture, which is given each year at the Royal Institution. The first was in 1965 on the scientific foundations of science policy by Professor A. J. de Lolla Price; the second by Dr. S. Dedijer, the director of the science policy program at the University of Lund in Sweden; the third was by Sir Solly Zuckerman; and the fourth by Dr. O. Solandt. The fifth, to be given by Dr. Robert Charpie, President of Bell and Howell, on "Technological Innovation and the Growth of the International Economy."

There are very many other activities in which we are involved, and we have also close contact with the science of science groups in countries such as Czechoslovakia, Australia, Hungary and so on.

We have a number of publications, many of which have been translated and published. The Science of Science, for example, now published as a Penguin book, has now Spanish. I hope that gives you some imformation.

Senator Carter: Yes, thank you. If I understood you correctly—I may be wrong—my impression was that you described the objectives of your foundation, that you reduce the number of unknowns in scientific development processes and you have just cited a number of seminars and you also referred to some theoretical studies.

Mr. Goldsmith: Yes.

Senator Carter: Are there special studies going on, apart from the seminars?

Mr. Goldsmith: Yes. What we are doing is instigating studies. It is rather difficult, because the field is so new that the scientists of science do not yet exist. There are studies that we would like to see done, and that I think could very usefully be undertaken in Canada. These would really make a contribution to basic knowledge, as a result of which there could be practical application. For example, what is the efficiency of basic research? That is a very important question. There is work being done in different places, but much more is required because it is an important problem. Should the head of the department really be the organizer of basic research? This is a question that requires an answer of some kind. We work by tradition in the scientific field.

Senator Carter: I gather what you are trying to do is to discover the laws that govern the development of science itself.

Mr. Goldsmith: That is right.

Senator Carter: Your seminars, as I listened to them, covered a wide field. They covered medicine, decision-making, economic development in different countries. Have you got far enough to have any laws emerging?

Mr. Goldsmith: Not from seminars, because the seminars themselves are designed deliberately to get people from different disciplines to come together. All our seminars are multi-disciplinary. No seminar consists only of natural scientists or just social scientists. All seminars bring in all the disciplines, and if I can get the artist and humanist to come along as well, all the better. They must be multi-disciplinary. The purpose is to get people to think in a science of science way,

but the basic research must be done within the university. This is beginning; a number of universities—Edinburgh, Sussex, Manchester, Bath, Bradford and Loughborough—are already begining to look at these basic problems. The research must be done within these universities. The field is so very wide open at the moment that there are any number of Ph.D. theses that can be written. It is only if we can obtain this basic knowledge that we can then make recommendations about the application.

For example, one of the theories with which you are familiar is that of the exponential rate of growth of science; that is, that since the days of Gallileo and Newton science has been doubling in the western world roughly every ten to twelve years. Well, this is a theory. It requires to be looked at rather critically and carefully. Also within developing countries the doubling rate is said to be about five to seven years. If this is so, quite clearly in terms of our expenditures of resources we must take account of this, because if there is this kind of growth we must clearly examine the implications to see what are the practical requirements of this kind of theory. In this field of the laws of growth of science, or of the way in which scientists behave, we just know nothing at all; we know more about the moon than we do about science as a social phenomenon.

Senator Carter: I should like to follow this question a step further. You said all your seminars were multi-disciplinary. Is that because you are working on the theory that there are general laws basic to all fields of science rather than specific laws for each different field?

Mr. Goldsmith: We are working on the theory that science is a unity. Science in Britain is the natural science, as you know, and this is what we call the Anglo-Saxon heresy. On the continent it is what the Germans call wissenschaft-general culture, general knowledge. I think we have arrived at the stage when we must recognize that what is equally important in terms of the problems that face us is the possibility of finding various nontechnological solutions to these problems. In other words, if we have pollution of the atmosphere we can call in a chemist or an engineer to find a technological solution. But could not the behavioural scientist and the lawyer also provide a solution of some kind?

It is only in this multi-disciplinary approach that we begin to find both technological and non-technological solutions to these common problems.

Senator Carter: I should like to go back to your comments on the Canadian scene. You said you had heard three ideas, which were to have a minister of science, a ministry of science policy or a ministry of scientific affairs. I was trying to distinguish between these three entities as you were talking about them. I gather the only way you distinguish between them would be the powers vested in them?

Mr. Goldsmith: Not exactly. I think a department of education and science would really be a combination, of the Ministry of Technology in Britain and the Department of Education and Science. It would be a real department, whereas the other two suggestions, as I understand them, would not necessarily have a department linked to them. In other words, a minister for scientific policy or a minister for scientific affairs would really have an important co-ordinating et cetera function and would not necessarily have a department of any kind which he would be running.

Senator Carter: Probably you, Mr. Chairman, can enlighten us on this. My impression is that we already have something like that now, because the honourable Mr. Drury, who I think is the President of the Privy Council does not have a department but he certainly has a responsibility...

The Chairman: He is not the President of the Privy Council.

Senator Carrer: What is he?

The Chairman: He is President of the Treasury Board.

Senator Carter: He does not have a full-fledged department.

The Chairman: In so far as he is President of the Treasury Board he has a department.

Senator Carter: The only drawback is that he himself as minister of science would be passing judgment as President of the Treasury Board on his own estimates and that sort of thing. He has some responsibility at the present time, I gather, to evaluate what is going on in agriculture, fisheries and other

It is only in this multi-disciplinary approach departments, so that would be the beginnings that we begin to find both technological and of a ministry of science policy.

The Chairman: To be more precise—I am sure Mr. Goldsmith already knows, because this was discussed in Toronto during last weekend—Mr. Drury at present is not only President of the Treasury Board but is also President of the Inter-departmental Committee of the Cabinet on Science and Industrial Research and the National Research Council also reports to him.

Senator Carter: Yes, but what I was leading up to is if you go beyond that.

The Chairman: But, the Science Secretariat and the Science Council both report to the Prime Minister.

Senator Carter: Yes, but if we had a full-fledged Minister of Science Policy I do not see how he could function unless he had powers to veto or some superpowers to veto or make decisions with regard to the scientific projects in other departments.

Mr. Goldsmith: I cannot say anything on this, Mr. Chairman, because as you recognize these are rather delicate political matters and which obviously have important implications. All that I can say is that theoretically these three possibilities that I have mentioned have been brought up in this country, I tabled these. What is required is a co-ordinator. Whether this co-ordinator would also be empowered by the Prime Minister to have a veto function I am not competent to say at all. This would depend entirely on whatever the Prime Minister thought was necessary.

Senator Carter: If you got to the point where someone had to decide priorities he would either have to persuade the other ministers to his way of thinking or else he would have...

The Chairman: As capacity as chairman of the committee.

Senator Carter: I am not talking about if we had a Minister of Science Policy.

The Chairman: Presumably, if you had such an animal he would also be president or chairman of that Cabinet committee on scientific and industrial research, and that is where it could...

Mr. Goldsmith: Such an individual would have available special studies, say from the

Science Council, which would offer him a series of objective alternatives ranged in order of importance. This is proposal No. 1, which will have the following effect. This is proposal No. 2, which will have the following effect given et cetera, et cetera. That kind of advice does not exist at the moment.

science is to forecast technological evolution, and the function of science policy is to illuminate discussions and to make them more rational or clearer for the people who are taking the decisions", so that as I have said, Mr. Chairman, there must be complete objectivity in the basic documents that are provid-

Senator Carter: Thank you.

The Chairman: We will come back to this later.

Senator Lang: Mr. Chairman, in listening to Dr. Goldsmith, I always have nagging in the back of my mind the suspicion that the word science of science is a contradiction of terms. I noticed that when you enumerated the governors of your institution, from my lack of knowledge of who they might be, I assumed they were probably scientists like yourself. This is the form of my question that I may be asking you to decide. This is not a question that I expect an objective answer on. Is not perhaps philosophically the scientist the least competent man to judge science policy? Are we not, if we set up institutions to ascertain a science of science, we are begging our question. The scientist may very well be the least competent person to judge science. Maybe the politician is the most competent person to judge science or maybe even the lawyer. Where can the peer judge the peer with a degree of objectivity necessary to philosophically achieve your ultimate aim? If our guest would comment on this I would appreciate it.

The Chairman: I am sure he will.

Mr. Goldsmith: Mr. Chairman, this is a very important question, but factually may I say first that the advisory council in the committee of management does not consist only of scientists. It consists also of artists, and businessmen and economists and behavioural scientists.

Senator Lang: And one Q.C.

Mr. Goldsmith: And one Q.C.

The Chairman: Do you not think it is enough?

Senator Lang: Far too few.

Mr. Goldsmith: In addition, Professor Raymond Aaron the distinguished French sociologist whom we discussed this with, put it quite well. "The function of the science of

science is to forecast technological evolution, and the function of science policy is to illuminate discussions and to make them more rational or clearer for the people who are taking the decisions", so that as I have said, Mr. Chairman, there must be complete objectivity in the basic documents that are provided to the politician. I want to insist upon this, because it is the politician who has 'to take the can back', not the scientist. Therefore, to the politician must be left, in a democratic society, or any other society if it comes to that, the ultimate decision as to which particular recommendations shall be implemented or not. I hope that I have answered the senator's question.

Senator Lang: I think maybe you have ducked my question.

The Chairman: If you are not satisfied come back with a supplementary.

Senator Bourget: If you pass to the politicians do you think we should not have then a minister responsible?

Mr. Goldsmith: I did not get the beginning. I am sorry.

Senator Bourget: If you are saying that the final decision should rest on the politicians am I right in saying this?

Mr. Goldsmith: You are right.

Senator Bourget: Then, does it mean also that for that part there should be established an administrator of whatever you call it, technology or science, one man in the Cabinet that would be responsible for it also?

Mr. Goldsmith: I think this is one of the possibilities that somewhere or another there ought to be somebody responsible for weighing up the objective advice that is offered in terms of science policy.

Senator Lang: By scientists.

Mr. Goldsmith: I do not know what you mean by the term scientist.

Senator Lang: I am trying to get back. I think probably my colleague is taking the other end of the spectrum. My question is this, is a scientist competent to advise the politician as to science policy?

Mr. Goldsmith: I think the scientist is competent to say that if we continue to allow waste products from industrial chemical establishments to flow into our rivers and lakes that we pollute these, and then to support the statement by objective scientific fact, I do not see how the politician can do anything but call upon the scientist to provide him with the evidence for this. The scientist is the person who is required in a scientific and technological society to consider the implications of science and technology and then to make recommendations to the politician. In the same way as if you, senator, were concerned with say transferring some property to somebody, you would go to a lawyer. You would not go to another politician. That would be stupid.

Senator Lang: I think you have ducked my question again with respect.

Mr. Goldsmith: I think it ought to be rephrased then; I do not get it.

Senator Lang: Let me try to rephrase the question. You have invited me to do so. You may admit my premise, that judgment by one's peers may be a very fallacious judgment.

Mr. Goldsmith: It is a basic democratic principle.

Senator Lang: I am not concerned with democracy, I am referring to truth. It may not be consistent. I am suggesting that perhaps a judgment of scientists by their peers is not in the best interests of science. It may or may not be.

The Chairman: I think our guest this afternoon has already answered that question—and he agrees with you.

Senator Lang: Yes, he agrees. I am saying is or is there not something in the governmental structures that will provide the synthesis of the political action on the one hand and the scientific advice on the other, I do not think, to use your words, there is an interphase or there can be an effective interphase, between the purely scientific advice and the political. I think there has to be a synthesis somewhere that will produce objective advice for the politician. How this is created I am not sure, but I think this is a form of machinery which we should be looking for.

Mr. Goldsmith: Yes.

Senator Lang: There may very well be—in your example, pollution—in order to restrict the use of automobiles, it may not be just a

question of eliminating carbon monoxide from the air or the effluent into a river: it may be also by controlling human behaviour through a feasible means, by the use of magisterial force. I do not know, but I am wondering if there is not here somewhere, in between, to avoid what I consider inefficient interphase between the purely scientific community and the purely political judgment.

Mr. Goldsmith: On this last point, I think there ought to be, obviously, some kind of individual who can make an assessment on the advice given by the scientist.

I think, also, that if what you are suggesting, senator, is that the scientists should have, say, politicians present in their discussions, this is up to whether this is likely to be useful or not, I do not know.

Senator Lang: It could happen.

Mr. Goldsmith: May I just tell you a story. Civil scientists became known in Britain in the year 1863, when the first of the Alkali Acts was passed. This was due to the fact that in, I think, the northern midlands of England, some of the landed gentry discovered that their land was being destroyed, it was no longer as fertile as it had been and also that their cattle were dropping their young prematurely. They were very much concerned about this and they called for a committee of inquiry.

This committee of inquiry found that there was an intensive production of muriatic acid, (hydrochloric acid), in that region, and that the fumes and the waste products were doing this damage.

This was scientific objective evidence presented to the politicians of the time. They were very powerful in those days, Mr. Chairman, because this report, which in these days would take years, was prepared in twelve weeks.

Senator Lang: There was economic orientation there.

Mr. Goldsmith: Yes, their property was being threatened rather radically. Now, as a result of the Alkali Act, it was agreed that a civil scientist shall be appointed a commissioner to supervise and have a look at what was happening generally with this kind of environmental pollution. This seems to me an excellent example of the way in which objective scientific advice is considered by politi-

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cians, and then used by politicians, to make a decision in the interests of the community. This is all that I am suggesting now, in a much more complex field where it is not only a particular field that is being polluted but a whole environment, and not only physically but also mentally. I would hate to be a politician at the present moment. The responsibilities are too great.

The Chairman: I wonder if you would give us some of your views on the general evolution of science policy in the socialist countries?

Mr. Goldsmith: Ah, that is a difficult one. The science policy in the socialist countries, is, of course, obviously linked up with a sort of dominant political party view, that is, as I quoted Kosygin earlier on, that science is important. They have a very vast program within all the socialist countries for the popular dissemination of science. In other words, they want an immediate feedback from people or an acquiescence and agreement by people that science is important.

So they have tremendous programs, and I do not think that there is any distinguished scientist in any of the socialist countries who is not involved as an officer of either a national or regional grouping for the popular dissemination of science and who goes out and gives lectures.

This is a very important factor in getting, as it were, a scientific and technological temper within a country.

So far as science policy is concerned, this stems of course from the communist view that society has to be planned. What is interesting is that the socialist countries, as have the non-socialist countries, have taken up the science of science approach in quite a remarkable way.

In the Soviet Union, I know that there is a tremendous amount of work being done on basic research in the science of science, because what the Russians want to do is to discover whether there are any internal laws of growth in science and technology and, if there are, to apply these. They are doing an enormous amount of head counting in this field and there are federal units, such as the one at Kiev, which are really spending large sums of money, so far as any other country is concerned, including even the United States in doing these basic studies. In the SSF newsletter, which is read around the world, we have

published a report on the multifarious activities there in the science of science.

I hope you will forgive me, Mr. Chairman, if I do not really answer in full your question on the science policies in socialist countries, because this would then demand a look at the kind of machinery that they have set up and I am afraid I could not give you this unless I really went and had a look at my own sources of information again. But there effort is linked up with a determination to deploy science and technology in the interests of the community. There is not all that much wise employment all the time, but there it is.

The Chairman: Is it not true that, at a certain stage, their research and their science effort was closely associated with the academies and was a kind of higher—level exercise, and that there has been a tendency recently to link this effort much more closely with economic growth and social well being?

Mr. Goldsmith: Yes, indeed. The academies of course, have always had two kinds of programs; one, programs for what they call basic research—and I think that they are very traditional in this regard, they are prepared to spend any amount of money on basic research. They believe this is important. They believe that in basic research the factor of chance is very important and that something may come along which, if it pays off, will take care of all the money spent. In addition to that, the programs of the academies of science and the various institutes are linked to the national goals as expressed in the official party program. In Czechoslovakia, for example, Academician Sorm is not only President of the Academy of Science and head of his own Institute, being a chemist. but also he is a member of Parliament and a member of the Central Committee of the Communist Party. Such an individual is extremely powerful. It means also that any decisions taken at the political level are in some way interpreted and passed on.

The Chairman: So they have ministers of science there?

Mr. Goldsmith: In some form, yes.

Senator Robichaud: I should like to return to the statement referred to by my colleague Senator Bourget. You said that in the end the decision must be political, and we understand that. In your judgment, which would you think would be more effective or more practical, a single minister, a minister of science or scientific affairs responsible for science, or a committee of ministers whose departments are involved in research and science? Which of the two would you think would be more effective?

The Chairman: Why not both?

Mr. Goldsmith: You have me! I just do not know what the answer is. I think this is the kind of thing one requires to look at with a rather deep inside knowledge of the political scene. The appointment of a minister, whether he is concerned with science or anything else, is a political appointment and has political significance. The setting up of a department again in terms of the government's general program is a political decision and I do not think general theory is really very meaningful here.

Senator Robichaud: Is it not a fact also that the final decisions are very seldom left to a single minister?

Mr. Goldsmith: I have never been a cabinet minister so I do not know.

The Chairman: To pursue this, without trying to bring you down to the Canadian situation, is it not true that all countries, including the United States and Canada, all countries that have a relatively important science effort, have some kind of minister with a special responsibility? I agree there is a lot of variation from Great Britain to Germany, from Germany to France and to Japan.

Mr. Goldsmith: Yes. The OECD calls meetings of ministers of science from the OECD member countries. They may be either ministers of education who have a direct responsibility, or ministers of industry or ministers of technology. Obviously there is an individual somewhere, but what his exact role is will, I think, depend very much on national political and cultural characteristics. Certainly somebody exists somewhere. In Britain we set up a Department of Education and Science, which concerns itself with basic science, and separated applied science from this in the Ministry of Technology. I think there ought to be the most intimate links between basic science and applied science. If one is concerned with basic science as a cultural good in the same way as, say, the arts and humanities are

cultural goods, quite clearly we must spend money on basic science as a cultural good. To separate off basic science from applied science raises a problem, but it resulted because of the particular needs which expressed themselves in Britain at that time.

The Chairman: Probably also because the central government in Great Britain is responsible for education as well.

Mr. Goldsmith: Yes.

The Chairman: Since basic science is mainly done in universities the two were conceived to be complementary to one another.

Mr. Goldsmith: That is absolutely right.

Senator Kinnear: I noticed that you said science and technology will unite to help mankind, or words to that effect. I think that is very important. Probably through science and technology we will never run into a manpower situation such as we had in 1929 and the thirties. I wonder if you would agree that that is part of your work?

Mr. Goldsmith: I think the whole point about the development of a national policy is the fact that, as expressed in Report No. 4 of the Science Council, once you begin to postulate national goals, clearly you begin then to organize a program to insure that you have the right kind of manpower available to meet your national goals, and even though these may be short term, it is still a term which allows of the production of the right people, so there is not any wasteage. I think in terms of a national program of this kind declared objectives of national science policy will make a considerable difference.

Senator Bourget: In your opinion should there be some relation between the amount of money spent on R & D and the GNP?

Mr. Goldsmith: Well, we know there is no clear direct relationship. I suppose there is some causal relationship, but it is a bit obscure.

The Chairman: It is certainly not a current relationship.

Mr. Goldsmith: You know the position with regard to Britain. I have forgotten the figures, but Japan and Germany are spending much less but are getting a much bigger payoff than we do in Britain. We ought to have some basic studies on this. This really requires to be looked at very carefully. It also depends on the definition of "innovation". If innovation includes R & D, one has to look at the whole innovation spectrum and see what allocations require to be made. One of the things we require to look at is the extent to which basic research in itself requires to have money spent on it regardless. I remember that one quite distinguished scientist in Britain said, "I would spend all the money that we are spending now nationally on everything on basic research." This is a gross overstatement, because of course he did not mean it. I asked him why and he replied, "We will get such pay-offs and such break-throughs that we will astonish the world with the fertility of the things we discover," They may or may not do so, but this does mean that we require to have special studies done on this particular aspect.

The Chairman: In other words, we are quite sure that science and technology may have a great influence on growth?

Mr. Goldsmith: Of course.

The Chairman: Of course, the invention of the steam engine really determined the whole development of Great Britain, for instance, perhaps more than any other factor in modern history in Great Britain.

Mr. Goldsmith: Yes, the steam engine of course is the spirit of managerial enterprise which existed in those days. I think this is

terribly important. That is to be able to take a process and diffuse it very speedily. This is a key factor the Americans specialize in.

Senator Carter: Have you any suggestions or do you know of any experience in other countries where they have developed some sort of criteria to determine when basic research on a certain line should be discontinued?

Mr. Goldsmith: Again this requires special studies. You know, once you start a project, it is very difficult to know when to stop it.

Senator Lang: We stop them here pretty easily.

The Chairman: Even before they start. So perhaps in this respect we may be more efficient than others.

Mr. Goldsmith: Yes. If you do not do anything you are highly efficient.

The Chairman: Any other questions? Before drawing this meeting to a close I would like again to thank you very, very much for spending this afternoon with us and to give us your views so frankly, even in respect of Canada and even if you have not been in Canada for long, beyond this recent trip. Again, thank you very much on behalf of the members of the committee and on my personal behalf.

Mr. Goldsmith: Thank you.
The committee adjourned.



First Session—Twenty-eighth Parliament
1968-69

THE SENATE OF CANADA

PROCEEDINGS

OF THE

SPECIAL COMMITTEE

ON

SCIENCE POLICY

The Honourable MAURICE LAMONTAGNE, P.C., Chairman
The Honourable DONALD CAMERON, Vice-Chairman

No. 36

THURSDAY, MARCH 6th, 1969

WITNESSES:

TREASURY BOARD: S. Simon Reisman, Secretary; J. L. Fry, Director of Economic Measures and Scientific Research Division; and Bruce McDonald, Director of Planning and Analysis Division.

MEMBERS OF THE SPECIAL COMMITTEE

ON

SCIENCE POLICY

The Honourable Maurice Lamontagne, Chairman

The Honourable Donald Cameron, Vice-Chairman

The Honourable Senators

Aird
Belisle
Blois
Bourget
Cameron
Carter
Desruisseaux
Giguère

Grosart
Haig
Hays
Kinnear
Lamontagne
Lang
Leonard
McGrand

Nichol
O'Leary (Carleton)
Phillips (Prince)
Robichaud
Sullivan
Thompson
Yuzyk

Patrick J. Savoie, Clerk of the Committee.

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THURSDAY, MARCH 6th, 1969

WITNESSES:

of Economic Measures and Scientific Research Division; and Bruce McDonald, Director of Planning and Analysis Division,

The Opera's Printer Offswa 1969

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ORDERS OF REFERENCE

Extract from the Minutes of the Proceedings of the Senate, Tuesday, September 17th, 1968:

"The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That a Special Committee of the Senate be appointed to consider and report on the science policy of the Federal Government with the object of appraising its priorities, its budget and its efficiency in the light of the experience of other industrialized countries and of the requirements of the new scientific age and, without restricting the generality of the foregoing, to inquire into and report upon the following:

- (a) recent trends in research and development expenditures in Canada as compared with those in other industrialized countries;
- (b) research and development activities carried out by the Federal Government in the fields of physical, life and human sciences;
- (c) federal assistance to research and development activities carried out by individuals, universities, industry and other groups in the three scientific fields mentioned above; and
- (d) the broad principles, the long-term financial requirements and the structural organization of a dynamic and efficient science policy for Canada.

That the Committee have power to engage the services of such counsel, staff and technical advisers as may be necessary for the purpose of the inquiry;

That the Committee have power to send for persons, papers and records, to examine witnesses, to report from time to time, to print such papers and evidence from day to day as may be ordered by the Committee, to sit during sittings and adjournments of the Senate, and to adjourn from place to place;

That the papers and evidence received and taken on the subject in the preceding session be referred to the Committee; and

That the Committee be composed of the Honourable Senators Aird, Argue, Bélisle, Bourget, Cameron, Desruisseaux, Grosart, Hays, Kinnear, Lamontagne, Lang, Leonard, MacKenzie, O'Leary (Carleton), Phillips (Prince), Sullivan, Thompson and Yuzyk.

After debate, and—
The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Thursday, September 19th, 1968:

"With leave of the Senate,

The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That the name of the Honourable Senator Robichaud be substituted for that of the Honourable Senator Argue on the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Wednesday, February 5th, 1969:

With leave of the Senate,

The Honourable Senator McDonald moved, seconded by the Honourable Senator Macdonald (Cape Breton):

That the names of the Honourable Senators Blois, Carter, Giguère, Haig, McGrand and Nichol be added to the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—Resolved in the affirmative.

ROBERT FORTIER,
Clerk of the Senate.

MINUTES OF PROCEEDINGS

Thursday, March 6th, 1969.

Pursuant to adjournment and notice the Special Committee on Science Policy met this day at 10:00 a.m.

Present: The Honourable Senators Lamontagne (Chairman), Carter, Grosart, Kinnear, Lang, McGrand, Robichaud, and Yuzyk—8.

Present but not of the Committee: The Honourable Senator O'Leary (Antigonish-Guysborough)—1.

In attendance:

Philip J. Pocock, Director of Research (Physical Science).

The following witnesses were heard:

TREASURY BOARD: Date to the state of the sta

- S. Simon Reisman, Secretary;
- J. L. Fry, Director of Economic Measures and Scientific Research Division; and

Bruce MacDonald, Director of Planning and Analysis Division.

(A curriculum vitae of each witness follows these Minutes.)

At 12:35 p.m. the Committee adjourned to the call of the Chairman.

of the Treasury. Held various posts in this Organization finishing in the fall

Patrick J. Savoie,

Clerk of the Committee.

CURRICULUM VITAE

Reisman, S. Simon. Mr. Reisman was born in Montreal, Quebec. He received a B.A. in Honours Economics and Political Science from McGill University and an M.A. from the same university in 1942. In 1945, he attended the London School of Economics. In 1942, he joined the Canadian Army and served overseas with the Royal Canadian Artillery. He returned to Canada in 1946 and joined the Civil Service with the Department of Labour. He transferred to the Department of Finance that year and in 1954 was appointed Director of the International Economic Relations Division. From 1955 to 1957, he was Assistant Director of Research on the Royal Commission on Canadian Economic Prospects. Mr. Reisman is the author of "Canada-United States Economic Relations" which was prepared for the Commission in 1957. In 1957, Mr. Reisman was appointed General Director of Economic and International Affairs in the Department of Finance. In 1961, he was named Assistant Deputy Minister for Economic Affairs, Industry, Tariffs and Trade in that department. In July 1964, Mr. Reisman was appointed Deputy Minister of the Department of Industry. Since 1947, Mr. Reisman has served as a Canadian delegate in various international economic, tariff and trade conferences and has also participated as a negotiator for Canada in numerous trade agreements, including the Canada-U.S. Automotive Agreement and the recently concluded Kennedy Round of tariff negotiations at Geneva. In April 1968, Mr. Reisman was appointed Secretary of the Treasury Board.

Fry, James Lawrence. Place of Birth: Hartney, Manitoba. Date of Birth: July 6, 1927. Education: High School—Hartney, Manitoba University of Manitoba—B.A. 1948 University of Toronto—M.A. 1950 Political Science. Employment History: Joined the Federal Government in 1950 as a Junior Administrative Officer, assigned to the Department of Finance, Comptroller of the Treasury. Held various posts in this Organization finishing in the fall of 1956 as Establishments Officer for the Comptroller of the Treasury Organization. Fall of 1956 joined Treasury Board as a Group Chief and have been employed by Treasury Board since that time, becoming a Director of the Program Analysis Branch early in the 1960's. At present, Director of the Program Analysis Division responsible for Economic Measures and Scientific Research Departments.

Macdonald, Bruce A. 1950—Carleton University, Bachelor of Commerce (economics and mathematics). 1954—Master of Arts (Mathematical Statistics and Economics) Columbia University. 1951-56—Economist and Statistical Adviser, Economics Branch, Department of Agriculture. 1956-60—Chief, Data Processing Section, Department of Agriculture (computer applications for agricultural research, production and marketing and general administration). 1960-66—Director, Planning and Development Branch, Office of the Comptroller of the Treasury. Directing division concerned with data processing,

work measurement and organizational analysis, and accounting systems analysis. November, 1966—Director, Planning and Analysis Division, Program Branch, Treasury Board. Directing a division responsible for the technical development of the government's program budgeting system, the promotion of cost-benefit and systems analysis, and the analysis of patterns of government expenditures.

work measurement and organizational analysis, and accounting systems analysis. November, 1966—Director, Planning and Analysis Division, Program Branch, Treasury Board, Directing a division responsible for the technical development of the government's mortain integral system, the promotion of cost-hearfit and systems analysis and the analysis of patterns of government.

Beisman S. Simon. Mr. Reisman was born in Montreal. Springly-boxes with a p.A. in Renours Economics and Political Science from McGill University and an M.A. from the same university in 1943. In 1945, he attended the London School of Economics. In 1942, he joined the Canadian Army and served overtone with the Royal Canadian Artillery. He returned to Canada in 1948 and bined the Civil Service with the Department of Labour. He transferred to the Department of Finance that year and in 1954 was appointed Director of the Assertational Economic Relations Division. From 1955 to 1957, he was Assistant Director of Research on the Royal Commission on Canadian Economic Prospects. Mr. Reisman is the author of Canada-United States Economic Relations which was prepared for the Commission in 1957. In 1957, Mr. Reisman was appointed General Director of Economic and International Affairs in the Department of Prospects. In 1961, he was named Assistant Deputy Minister for Economic Affairs, and states and Trade in that department in July 1964. Mr. Beisman was appointed Deputy Minister of the Department of Industry. Since 1947, Mr. Beisman has served as a Canadian delegate in verious international economic, tariff and trade conferences and has also participated as a negotiator for Canada in numerous trade agreements, including the Canada-U.S. Automotive Agreement and the recently concluded Kennedy Round of tariff negotiations at Livreya. In April 1968, Mr. Reisman was appointed Secretary of the Treasury Beard.

Fry, Icross Lawrence. Place of Birth: Hartney, Manitoba. Unite of Birth: July 6, 2527. Education: High School—Hartney, Manitoba University of Manitoba—3.A., 1946 University of Toronto—3.A., 1956 University of Toronto—3.A., 1956 University of Toronto—3.A., 1950 as a Junior Administration Officer, assigned to the Department of Finance, Comptroller of the Total Property Head various posts in this Organization finishing in the fall of 1966 as 1966 parameter for the Comptroller of the Treasury Organization. Full of 1966 parameter for the Comptroller of the Treasury Organization. Full of 1966 parameter Board as a Group Chief and have been anaptoped by Treasury Board times that time, becoming a Director of the Property Administration for Economic Mossures and Scientific Research Departments.

Mecionall Price & Pro-Christon University, Bachelor of Commerce (economics and mathematics) Fig.—Matter of Arts (Mathematical Statistics and Economics) Columbus University 1951-56—Economist and Statistical Adviser, Economics Breach, Department of Agriculture, 1956-60—Chief, Data Processing Section, Department of Agriculture (computer applications for agricultural research, production and marketing and general administration). 1950-65—Director, Planning and Development Branch, Office of the Computer of the Treasury, Directing division concerned with data processing,

EVIDENCE

Ottawa, Thursday, March 6, 1969

The Special Committee on Science Policy met this day at 10.00 a.m.

Senator Maurice Lamontagne (Chairman) in the Chair.

The Chairman: We are very grateful to Mr. Reisman for having accepted to be with us again this morning. I suppose that we will go to the questions immediately. You do not have any addendum to make since you were with us?

Mr. S. Simon Reisman, Secretary, Treasury Board: That is correct, Mr. Chairman. I have said what I have said and probably exhausted what I know, so you can test me now.

Senator Carter: I apologize because I do not think I was able to be present at the last meeting. The question I am asking may have been already answered at an earlier meeting; if so, then there is no need to go into detail on it.

On page B-1 you have a diagram showing the Prime Minister and you go down the line to the Cabinet; then from the Cabinet you have over on the right a Chairman of the Committee of the Privy Council on Scientific and Industrial Research. Down through him the National Research Council, then Canadian Patents and Development Limited.

Just how does this Chairman of the Scientific Committee function? Does he do any coordination, or does he just evaluate what is going on in different departments and report back to the Cabinet? Does he exercise any influence on priorities of projects?

I would like you to explain a little more fully just what is involved in this function of the Chairman of the Committee of the Privy Council on Scientific and Industrial Research and how that would relate to a Minister of Science Policy, if we had one?

Mr. Reisman: Mr. Chairman, I am not an expert on the apparatus of the Cabinet com-

mittees and Cabinet committee structure. I do have a general familiarity with this committee for several reasons: one, the present Chairman of the Privy Council Committee on Scientific and Industrial Research is the Honourable C. M. Drury and he has been Chairman of that committee for quite a few years, first in his capacity as Minister of Industry. He kept that position as Chairman of that committee when he became President of the Treasury Board.

Since I have served Mr. Drury for the past five years, both as Minister of Industry and as President of the Treasury Board, I have some familiarity with it, although it is not in the general line of my duties. As Deputy Minister of the Department of Industry before I took my present post, I was a member of the Officials Committee which worked under the direction of this Cabinet committee and prepared a good deal of the background work and the preliminary examination of subjects which were to come up on the agenda of this committee. This is how I had a relationship to it.

It is a Cabinet committee established by law; I believe it is the National Research Council Act which set up this committee and I believe there are only two committees of the Cabinet that are established by law: one is this committee and the other is the Treasury Board. All the other committees are established as part of and ad hoc working arrangement. This one has this formal status as a committee of Cabinet; it derives its authority from the Cabinet.

The Chairman: Like Treasury Board?

Mr. Reisman: Like Treasury Board; its deliberations would form the subject of a report to the Cabinet. It would be the government itself that would be taking the decision; this committee in the period that I had some

to dealing with major program issues.

The Chairman: Major new programs?

Mr. Reisman: Major program issues, new program issues and in that context.

The Chairman: I am just quoting the minister to you, you see, because Mr. Drury, I am sure you have noticed this, has made a statement recently that this Cabinet committee was not dealing with general policy but was dealing only with new programs.

Senator Carter: Would that Cabinet committee make any decisions or recommendations with respect to priorities when there is a conflict between one department and another, and did this committee have anything to do with the cancellation of the telescope out on the west coast somewhere?

Mr. Reisman: I am trying to recall, sir, just what committee of Cabinet looked at the whole telescope situation. Speaking from memory, this particular committee did on several occasions deal with the telescope, but so did other committees of Cabinet on other occasions.

Mr. L. Fry, Director of Economic Measures and Scientific Research Division, Treasury Board: I think the main decision was the Priorities Committee's; I do not think that the Industrial Committee met more than once, if it met at all, on the telescope.

Senator Carter: Would that decision come back to Cabinet through the Chairman of he Committee on Scientific and Industrial Research, or come back directly from the Priorities Committee, which is not established by law, I gather?

This one, as you pointed out, like the Treasury Board, is one of two Cabinet committees which are established by law and apparently have certain powers vested in them by law.

Mr. Reisman: I think that Mr. Fry, who has just made a comment on this and has refreshed my memory on it, is quite correct, that on the occasion of the examination of the telescope project from the point of view of whether resources should be allocated to it was last examined—I should not say was last examined, on the occasion of that major deci- as its name indicates, a very key and central sion it was the Priorities and Planning Com- committee of the Cabinet, dealing with priorimittee of the Cabinet, which is the committee ties as its name implies.

contact with it usually confined its meetings concerned with priorities, that examined this and then reported to Cabinet.

> The Chairman: And in the case of ING it went to Treasury Board and the Cabinet?

> Mr. Reisman: In the case of ING it also was discussed in great detail before the Priorities and Planning Committee; it was examined by the Treasury Board; it was examined by Priorities and Planning; it was examined again by the full Cabinet.

> Senator Grosart: Are you saying, sir, that these two scientific decisions did not go to the Cabinet Committee on Science and Industrial Research?

> Mr. Reisman: What I am saying is that of the meetings of this committee which I attended neither the telescope nor the ING proposition at the time they were looked at in terms of priorities was examined by this committee, but I am not a member of this committee at the present time. I am not privy to all the documents and discussions that take place in this committee, and I think if you wanted to know more about this committee, its agenda and what subjects it has covered over the last period of time you would really do better to invite as a witness the chairman of that committee or the secretary of that committee and he might be able to give you more information.

I can tell you that several years ago when I was with the Department of Industry this committee met on some major matters of scientific programs.

Senator Grosart: Is this the Priorities Committee?

Mr. Reisman: No: the Priorities and Planning Committee is quite a new committee.

The Chairman: I believe that it was established after the last election?

Mr. Reisman: As a matter of fact it was established prior to the last election; if I am not mistaken it was established probably about 14 or 15 months ago, in the closing months of the Pearson administration. Then it became much more active following the election.

The Priorities and Planning Committee is,

Let me add something here. Matters arising on a number of committees of Cabinet when they involve questions of priority will appear on the agenda of the Committee on Priorities and Planning after having been considered by a particular functional committee of the Cabinet.

The Chairman: It is a kind of super committee.

Senator Grosart: But would you not agree that everything that comes before every committee of Cabinet involves priorities as to spending?

Perhaps I should not ask you to answer that, because it is probably in the policy field.

Mr. Reisman: No, it is a reasonable question, Senator Grosart. I think that it is a fair statement that a subject appearing on a committee of Cabinet that involves the expenditure of funds, that any discussion about that in a sense involves discussion about priorities. These functional committees will look at spending problems in relation to the sort of subjects that appear before that committee. The one committee that can look at expenditure questions from an overall point of view I think, as the Chairman indicated a sort of master committee looking at the total picture and being able to relate expenditures related to one function and expenditures in other functions is the Priorities and Planning Committee.

The other two bodies that are able to look at expenditures from that point of view are the Treasury Board and, of course, the Cabinet as a whole.

Senator Carter: I can understand your Priorities Committee making a decision as between priority given to a scientific project or to a nonscientific project, but when it comes to priorities within, choosing between one scientific project and another, is that to be carried out also by the Planning Committee, or is it to be carried out by the Committee on Scientific and Industrial Research?

Mr. Reisman: Sir, you are raising a question which perhaps I can comment on in a manner that will throw a little light on this whole question: Perhaps I can best do this by choosing an example.

Let us take this whole subject of satellite communication; as you know, the government has taken a decision and has made announce-

ments about a major project to construct the satellite, to get it up into space and, through it, to enlarge, elaborate and develop a major new, highly scientific communications system in Canada.

How is such a project to be looked at? Is it to be looked at as a scientific project? Is it to be looked at as a communications project? Is it to be looked at as a national project concerned with nation building and unifying the country? How is it to be looked at?

What I tried to indicate when I appeared before your committee, sir, several weeks ago, was that at least from the way that I look at the problem scientific research, scientific activities to be understood at least in accordance with my way of looking at things, should be seen as an instrument together with other instruments for achieving certain goals and objectives. In the case of communications, which is one of the very high technology and high scientific based fields, any project dealing with communications will inevitably have a very considerable scientific research and development and innovative content to it. The project was initiated not for science's sake; it was initiated for the sake of developing a good communications system, for helping in the process of nation building, helping to unify the country.

Science inevitably would form a very substantial component of that whole project. I would ask you, sir, although I am not permitted to ask questions here, but I would simply pose a theoretical question as to how one should approach such a project? Should one say, now in the interests of science we should be building a communications satellite and casting it up into space? Or should we look at it the other way, that from the point of view of communications or whatever your objectives are we should be developing this as a national project, and of course it will have a high scientific content?

There is your dilemma in terms of how in conceptual terms one examines this sort of thing.

The Chairman: It is not always that kind of dilemma though, because you have chosen a very good example to suit your own theories, but if you look at ING or if you look at the telescope, then the situation is much clearer.

Senator Carter: I was going to say that I would not regard the illustration that Mr.

Reisman used as being parallel or even related to the question I posed, because putting up a satellite for communications is not much more difficult from installing a telephone. You are using technology that has already been developed and while some more developments may come from it, yet what you have done is accept it and the technology is available at the moment and you are putting it to a use. All these other things flow from that, but if you come to the heart of the question you are in a totally different situation. It is that kind of situation when you choose between one scientific project and another.

I do not see that the satellite was in conflict with any other scientific project as a scientific project; it may have been in conflict with whether you should build another highway somewhere or not.

Senator Lang: Or the PEI causeway.

Senator Carter: Or the PEI causeway, but not in conflict with another scientific project; that is the point I was trying to make.

Mr. Reisman: Mr. Chairman, I would like to comment on this: First, let me say that in making my observation I obviously believed that it was highly relevant to the question and I still believe that it is highly relevant to the question. Let me tell you why: It is not correct, sir, to say that that project is based on an established, well known state of the art; there is a great deal of scientific research of a basic kind, of an applied kind, and of a developmental kind that will have to be carried out, involving very large expenditures in connection with this operation. Indeed the new Department of Communications will have a very considerable scientific wing. I think the senators are familiar with the Organization Bill which is before Parliament at the present time and which in this question envisages the movement over to the Department of Communications of a very considerable number of scientists in this field of communications, satellite communications in particular, who had been attached to the Defence Research Board but who in their work had conducted a great deal of I might say almost pure research and also applied research in communications work. They are the group that built the Alouette and the Isis I and are working on the Isis II.

It is interesting because a good deal of the research in communications, which is only partly oriented research, is the basis on which it is possible for a country like Canada to even contemplate going into the satellite communications business, but there is a great deal of science that continues to be done. There were a number of questions put that I think we should explore a little and that is that kind of project as compared to other projects which are more science oriented in terms of their original intent and purpose, but in response to this specific question I could perhaps comment on that too.

Senator Grosart: I am not directing a question to you, Mr. Reisman; I would just like to say to the Chairman that surely it is incredible that the ING and the BC telescope decisions were made, if they were made, without any reference to the Committee of the Privy Council on Science and Industrial Research. It would seem to me that the Priorities Committee, which is another committee of Cabinet, would look to the other committee for assessment and even advocacy just as they would look to the Treasury Board, which is another committee of Cabinet, for an assessment and advocacy or the opposite in terms of financial resources available.

This seems to me, Mr. Chairman, to perhaps go to the heart of the problem of the whole ING and telescope decision, that the committee which surely had the function of sorting out the scientific priorities within the billion dollars which we are going to spend on science research, surely that committee should have been alive at that time.

I do not want you to comment on that.

Mr. Reisman: I can if you want me to, sir.

Senator Grosart: Go ahead.

Mr. Reisman: First I want to be very clear on this: I did not say, and I do not think you said I said, that the Privy Council Committee on Scientific and Industrial Research did not examine the ING and did not examine the satellite; I did not say that.

Senator Grosart: No.

Mr. Reisman: In fact, if you asked me to make a guess about this, I myself as I said was a member of the staff supporting committee of this committee and at that time I was privy to all the work that went on in this committee for an interval of time.

The Chairman: I am sorry, but perhaps I misunderstood you: I got the impression, and this is good to clear up immediately for the record, when you were speaking about this, that the ING had not gone to the committee.

Mr. Reisman: No, I want you to be very clear about that, Mr. Chairman; I did not say that.

If you ask me to guess about that, I would say that at some time or other both the telescope and the ING were examined by this Privy Council Committee on Scientific and Industrial Research; I am not certain.

Senator Grosari: Mr. Chairman, I think the misunderstanding arose this way, that Mr. Reisman referred the question to Mr. Fry and asked Mr. Fry what committee it went to and Mr. Fry, as I recollect, said it went to the Priorities Committee, but it is true that he did not say it did not go to the other.

Mr. Fry: I think I said that it probably went once to the other committee, but it was Priorities Committee that made the decision and the recommendation to Cabinet.

Senator Grosart: Perhaps we can find out if it did go to the other committee?

Mr. Reisman: I want to take this a little further: If you want to know about the agenda of this committee, as I indicated I think you ought to call other witnesses who are better informed on that subject.

I do know that many subjects came before this committee and I would be almost sure that at some time or other both those subjects ING and the telescope, were looked at by the Privy Council Committee. I know for certain that both of them were looked at by the Treasury Board; I know for certain that both of them were looked at by Priorities and Planning: I know for certain that both of them were examined in great detail by the Cabinet. But having said that, I think I should add something else and say this, that in all my experience in government, which is now running to about a quarter of a century, I have never seen a subject examined so thoroughly and with so many resources applied to it.

The Chairman: I do not think that there is any criticism about this.

Mr. Reisman: And the ING project. There were numerous meetings of numerous committees; there were numerous ministers who

addressed themselves to it; there were many, many professionals, both inside the public service and outside the public service; there was documentation that stands at least that high; there was a thorough-going examination of this.

Indeed, I would venture the opinion that if all subjects that come before government are examined with that thoroughness and that care we would have occasion to be very proud of the way in which decisions are taken.

The Chairman: Or the government could come to a standstill.

Mr. Reisman: That is your comment, sir. This government is really quite capable of carrying on a great deal of intensive work on many subjects; it is amazing.

Senator Lang: Mr. Chairman, I cannot help but agree with what the witness says there. I think that where the credibility gap arises as far as the public is concerned is not a decision of whether we should proceed with ING or we should build a telescope, but that we should decide to do so and then shortly thereafter decide we should not do so. It is the reversal of position that brings into doubt the competency of the governmental structure; it is not the decision-making, it is the reversal of decision-making within a very short period of time.

The Chairman: I would prefer, senator, for you to keep that question for a little bit later on, because I think that we were on quite an important track that I would like to finish before we go to this. We were really dealing when Senator Carter asked his original question with the process of decision-making and the role of that special Cabinet committee in it.

As far as I am concerned, I would like to ask another question in relation to that once others have had the opportunity to put questions in that field, on that aspect of our problem, then you can come back with your question.

Senator Lang: I will take your position at face value, Mr. Chairman, for the moment.

Mr. Reisman: I would like to speak on a point of fact only and then we can let it drop.

The Chairman: I do not want to let it drop, but to drop it temporarily.

Mr. Reisman: The honourable senator made reference to the fact, to the alleged fact, that a decision with respect to ING had been taken and then reversed; this is not correct.

Senator Lang: In either case?

Mr. Reisman: This is a subject in connection with ING with which I am thoroughly familiar; I know as a matter of fact that a decision of government had not been taken. There were decisions to do some preliminary investigations, to do some feasibility studies, to have some examinations made, but the decision to proceed with that project as a project was never taken.

Senator Carter: Are you talking about ING or the telescope?

Mr. Reisman: I am talking about ING; I am not talking about the telescope.

In the case of the telescope, the fact stated by the honourable senator is correct, but with respect to ING it was not correct.

Senator Grosart: Except that there was a decision that was reversed, Mr. Reisman, to support Senator Lang's position. Although the first one was not a government decision it was a decision in effect, a recommendation anyway, a strong recommendation, a recommendation that could hardly have been stronger by the Science Council and by the working paper of the Secretariat.

I think this is what Senator Lang refers to, that the public assumed that when we had set up a Science Council and it recommended an expenditure of \$7½ million in that particular year that the government would go ahead.

Mr. Reisman: With respect, sir, if I can be allowed a comment on fact again. With respect, Senator Grosart, on the matter of ING and I think the evidence is there for all to see and the reports can be turned up, the recommendation made by the Science Council, and I was a member of the Science Council at that time, an associate member of the Science Council and still am, was not a clean-cut recommendation. It was a recommendation that was hedged by a considerable number of qualifications. Indeed, even in its final form, in its most articulate form, the advice was conditioned by a requirement that it be reviewed after certain feasibility work had gone forward.

There was never a clean-cut recommendation on this from the Science Council of Canada; there is no question about that. Senator Grosart: It depends what you mean by clean-cut, Mr. Reisman; I do not want to argue this thing indefinitely, but when the Science Council and the Secretariat working paper starts to talk about exciting new horizons, scientific horizons that this will raise, they may have made qualifications, they make many qualifications, but what I am saying in support of what Senator Lang said is that the public reading those two reports were entitled to think that the main science advisers to the government were very enthusiastic about this and suggested it should proceed.

I would suggest to you that the reservations related not to the \$7½ million but to the \$150 million. The thing that is incredible to me about that decision and again I make my position clear and say I also find the Arrow decision incredible, what is incredible to me about it is (a) that the decision was announced in an almost casual way in Calgary and not in Ottawa, and the Arrow decision was about as casual, but the incredible thing is that these feasibility recommendations were not carried out, for purely financial reasons as the Prime Minister said. He gave two reasons: one was the financial stringency, which we all understand; the other was really the letters to the paper when it boils down to it, the Associate Dean of Engineering, and so on.

I just say it is incredible to me.

The Chairman: This is a matter for the record; I would like to pursue the first line of questioning.

I think that to go back to your point, Senator Grosart, if I can say so as Chairman, I do not think that you finally came back to Senator Lang's original point, because I think, if I remember correctly, Senator Lang was saying that there had been a decision; you say that there was almost unanimous advice, which is not the same thing.

Senator Lang: I will confine my references to the telescope.

The Chairman: In relation to this Committee of the Privy Council on Scientific and Industrial Research you referred originally to a kind of committee of officials serving and presumably advising that committee. Could you say a little bit more about this committee of officials?

Mr. Reisman: I think to understand the work of the Privy Council Committee on Scientific and Industrial Research in recent years one has to reflect and examine the very important changes, innovations and adjustments that have been taking place in the last number of years in the whole apparatus of government with respect to scientific matters.

As you know, the establishment of a Science Secretariat in the Privy Council office is a relatively recent innovation; it is only a matter of a few years. The creation of a Science Council of Canada is a relatively recent innovation. The whole process of committee structure under the Cabinet has undergone major changes and development in the last several years. The whole staffing support and technique for examining problems at the Cabinet level and in bodies related to the Cabinet has undergone very important changes in the last number of years.

Senator Grosari: But it is so that the Science Committee of the Cabinet has been going since 1916. I will not say going; it was established in 1916.

Mr. Reisman: It is correct, sir, that the National Research Council Act of many years ago established this Committee, but in matters of institutions as in matters of life generally there is change and evolution and adaptation to changing needs.

This is no less true of that Standing Committee of the Privy Council than it is of many, many other institutions. I know this to be so because at the time that I was Deputy Minister of the Department of Industry major questions about organization in this and in related fields took place. At one stage the major inputs in conection with the work of the Privy Council Committee on Science and Industrial Research came from the National Research Council. There was I think for many years a committee of officials presided over by the President of the National Research Council that examined matters which would later be placed on the agenda of the Privy Council Committee on Scientific and Industrial Research.

The Chairman: This was a very important aspect of the responsibilities of NRC because that committee, as you know, as a matter of fact never met really, at least up until recently.

Mr. Reisman: That is right. And with the establishment of the Science Secretariat ques-

tions arose as to how the Privy Council Committee could be best served and after long deliberations a decision was taken that the head of the Science Secretariat in the Privy Council Office would be the Chairman of that supporting staff committee. This seemed to be a reasonable thing to do by virtue of the fact that the National Research Council itself was a major operating scientific agency and there were many other such operating agencies. The new Department of Industry itself had launched a number of important programs in the field of industrial technology. So the composition of those committees, the chairmanship of those committees, the secretariat for those committees, were all adapted to reflect the changing emphasis and I might say the growing emphasis on science and policies of the government in respect to science within the governmental framework.

So there were very big and important changes that were taking place and I suppose it is correct to say that during the period when this evolutionary process was taking place and this adaptation of institutions was taking place that these committees were not meeting as frequently as one perhaps might want them to meet on matters of substance. The fact that an institution is evolving and adapting to the changing needs, to my mind anyway, is not a reason why it should be cast out in favour of some other untried institution.

If an institution is not working the way you want it to work, change it and make it work the way you want it to work; do not create yet new institutions that are untried, untested, and who knows, they may be even worse than the ones that you put aside. I think it is really in that kind of context that one might examine some of the existing institutions in the scientific field.

The Chairman: To come back to my question, would you describe this committee of officials as to its composition? I understand that you just told us that the Director of the Science Secretariat is the Chairman of that committee?

Mr. Reisman: Yes; when I was a member of that committee as Deputy Minister of Industry the Chairman was the Director of the Science Secretariat and the membership,

although I do not know if I can give you a comprehensive list, comprised of those departments and agencies of government that were active in the scientific field or that had programs for the encouragement of science. That would have taken in the National Research Council, Defence Research Board, Department of Energy, Mines and Resources, the Department of Agriculture, the Department of Fisheries and Forestry, the Department of Industry, and I dare say there are one or two others.

Senator Carter: May I put in a supplementary question there, Mr. Chairman: Was there any special reason for making the Science Secretariat an adjunct of the Privy Council office rather than of the Committee on Scientific and Industrial Research?

I understand that probably this question should be put to somebody else, but as far as your knowledge goes?

Mr. Reisman: This, senator, is a reasonable question: The Treasury Board, I think by statute, has a responsibility for organization of government and all its parts, and from that point of view I should be able to make some kind of comment and I hope an intelligent comment on this.

The structure of the Privy Council Office, and it may well be, sir, that you may want to have a witness from that central agency, has on its staff, it is not a large staff but has on its staff people with competence in a variety of disciplines. They are there to assist the Cabinet and to assist the Cabinet committees in their deliberations. It has been evident from the earlier remarks that a considerable number of important subjects with a high scientific content come before Cabinet committees and come before the Cabinet and it was considered desirable to have added to the staff of the Privy Council Office a small group with a competence in these fields.

The servicing of one of the committees of Cabinet which happens to be a standing committee, a committee established by statute, is really no different from the job of the Privy Council Office in serving any other committees. This happens to be one of the functional committees and a statutory committee, so it seems to me entirely in order that one would look to the Privy Council Office and its various emanations and components for servicing and support to Cabinet and committees of Cabinet of which this is one.

This Science Secretariat when it was first created had a variety of functions. One of the functions was to support this statutory committee. Other functions were to give advice on all scientific matters that came before Cabinet and in addition when the Science Council was created they were also given the task of providing the professional and secretariat services for the Science Council of Canada.

As you know, there is a bill before Parliament right now which provides the Science Council of Canada with a secretariat of their own. I think a considerable part of that secretariat will in fact be drawn from the Science Secretariat of the Privy Council Office.

Senator Carter: Do you think that will disappear then?

Mr. Reisman: No, sir; what has really happened is that they have taken the Science Secretariat and they have split it into two parts; one part will perform the functions which I described a moment ago, to serve the Cabinet and Cabinet committees internal to government, to conduct studies on request, and to advise generally on these matters.

The other part will serve the Science Council of Canada; the Science Council of Canada would then be in an advisory role concerned with not only science in government but with science in the nation generally. They would be an independent body; they would not be an operating body; they would not be a policy-making body; they would be an advisory body and they would advise and recommend on all matters.

The Chairman: And they will serve the Science Secretariat as well?

Mr. Reisman: I do not know whether I have put it quite that way, sir. They will be producing reports; they will be doing studies; they will be making investigations, and they will be presenting reports to the public generally and to government.

Now, when they present a report to government the people inside the government who are competent to look at these reports and advise on them will be found in a number of areas, but especially in the Science Secretariat. If the Prime Minister or the

Scientific and Industrial Research wants to know about the last report on the Science Council, he will very likely turn to the Science Secretariat and say, well, gentlemen, what is in that and how does it fit in with other things and can you give us an abstract and some advice on it? They will be doing that job.

The Chairman: It seems to me that this is an important aspect of our investigation, and we will have to decide among ourselves whether we should hear from witnesses about this, especially the Clerk of the Privy Council, Mr. Robertson and/or Mr. Drury.

Senator Carter: My other question is way back in the other part of your brief, pages 49 to 54. You give an illustration of the decisionmaking process there; you have two alternatives, system A and system B. Then you work out the cost benefit ratio and come to the conclusion on page 54 that when you have to choose between B and A the breakeven point comes after 40 years. After that the cost benefit ratio for B is much greater and much better than for alternative A, but it takes 40 years to accomplish that.

I presume you infer, although I note you have qualified this by saying you have oversimplified the problem, but the question in my mind is this, that if the inference is, if the deduction is that the decision would be in favour of alternative B, which is going to take 40 years to break even, where are you making any allowance for technological advances that are going to occur during those 40 years, because up to 40 years alternative A is better?

It seems to me that if I were making that decision I would plump for alternative A on the assumption that within 40 years they will both be obsolete and you will have something much better to provide.

Mr. Reisman: Senator Carter, a cost benefit analysis is rife with problems and a wise man would approach cost benefit analyses with many, many qualifications. I would not dispute and I would not argue with what you have said.

This is an example given for illustrative purposes; it may well be that looking at alternatives A and B and the illustrative example, the sort of considerations that you have just Now, in that example I do not think there

Chairman of the Privy Council Committee on you to the alternative which did not look as good if you took the very long term but looked safer in the short term if you made the assumption that there was a good prospect that technology would change the situation. There is no question about that; cost benefit analysis has nothing magical about it. What it tells you, and it has got all kinds of fancy language, but what it says to you is that in examining alternative courses of action you really ought to try to do your homework, do your bookkeeping, try to quantify the choices and see whether in fact you can come to good decisions on the basis of that kind of analysis.

There are many, many problems, particularly in the government sector, which do not lend themselves to this kind of quantitative analysis. If one were to ask one's self, let us say, that the objective one wants to reach is the unity of Canada over the long term and one examined various ways of moving in that direction, I defy anyone to take that kind of problem and put it into quantitative terms and determine your choices on that basis.

The Chairman: Or the cost of separatism.

Mr. Reisman: Or the cost of separatism.

Senator Carter: This is an illustration though in your own brief as to how decisions are arrived at and it seems to me that I would not make decisions on the basis of the assumptions that you have quoted. I would not make the decision which you arrived at in your brief.

Mr. Reisman: This, Senator Carter, is on the basis of the interposition of an assumption about technological change. Now, it may well be that in this particular area one could make some rather more concrete assumptions about technological change. Let us take a specific example: Let us take the case of Ontario Hydro, which currently has to take decisions as to whether to build a power capability, whether to expand their hydro capability by a variety of means available to them. They can either build thermo stations, using coal; they can build nuclear stations; or they can perhaps make a deal with Manitoba in connection with the development of the Nelson River. These are all different ways of expanding the volume of power that they have access to.

raised, namely the introduction of assumption is much question that if one looked at the about changes in technology, could well lead very short term the thermo station approach the longer term, namely a period long enough to amortise the very heavy capital requirements of a nuclear station, the nuclear station would look like the more attractive one.

Senator Lang: And the time it would take to get it into operation.

Mr. Reisman: All right; now, they look at these and they have to ask themselves what is going to happen to nuclear technology? What is going to happen to thermo technology? What is going to happen to their continuing relationships with the government of the Province of Manitoba if we are looking at the Nelson River development?

Now, different people can come to different conclusions about the assumptions they should make, about the possible changes that could occur over a period of 35 or 40 years, which is the period of amortisation for the capital intensive project.

In the event, as you know, Ontario Hydro opted for the capital intensive nuclear station approach to it. You, senator, or others, may wish to say in that context that it was not a wise decision because they were not taking into account major changes which may well take place in the field of nuclear technology and they may well come up with some antiquated nuclear stations long before they are amortised but at least the cost benefit approach permits you to lay out on paper what you know are facts and what you know are assumptions, and you can then make some judgments about the assumptions themselves and then come to a conclusion.

Even the best cost benefit analysis is no substitute for judgment and some elements that go into the equation will inevitably involve judgment.

Now, you came to a different judgment than the people who wrote this example; I must confess I did not write that example. I read it and when I read it I had some of the same questions that you have. That is all it is, it is an illustrative example.

We have here with us right at the table a very high grade professional in this whole matter; perhaps you would like to put a question or two to Mr. Bruce MacDonald?

Mr. Bruce MacDonald, Director of Planning and Analysis Division, the Treasury Board: look at everything with the same kind of Senator, we have a chapter in here explain- attention. I remember being at various hear-

might look more attractive, having in mind ing the theory of cost benefit analysis and the that it requires less capital. If one looked at intent of this illustration was to clarify some of the terminology, rather than to force decisions as to whether or not to build hydro dams.

> The Chairman: A kind of high school exercise.

Mr. Reisman: That is all it was, ves.

Senator Carter: I do not think I will pursue it any further.

The Chairman: It seems to me that Treasury Board in looking at the proposals put by agencies and departments is looking not exclusively but almost exclusively to new programs.

As a matter of fact, this assertion was contained in one of Mr. Drury's latest speeches; I read his speeches more and more. He was saying that Treasury Board was looking at new programs. I am sorry I do not have the quotation here, but this is what he said; would you care to comment about this?

Do you look exclusively or mainly at new programs?

Mr. Reisman: Mr. President, I have not got the quotation so it is awfully difficult to comment on it.

Perhaps I would say this...

The Chairman: Comment on what you do.

Mr. Reisman: If the Honourable C. M. Drury made an observation, I am sure it was a correct one and I would not wish to contradict it in any way, but what I would comment on, if you will direct the question to me in terms of what we look at, I can tell you that we look at the old programs, look at the ongoing programs, look at the new programs, look at everything which forms the subject of governmental expenditures, everything, and in looking at them we look at them in terms of how to fit them into a total national budgetary picture. In this we are guided, of course, by the wishes of the government and the priorities which the government establishes, but we look at everything.

Now, perhaps I ought to wait for your next question before commenting any further. I think I see the direction in which you are leading, but I think it should be put in the form of another question.

The Chairman: I am sure that you cannot

ings in the preparation of estimates when I was in the Department of Northern Affairs, and even in the office of the Privy Council. At that time at least there was the exercise of what we used to call "going to confession" before Treasury Board. If Treasury Board was looking especially at new programs, assuming more or less that the money given to the department the previous year was all right, they were looking at the addition, at least they were puttting a special emphasis on that kind of examination.

I am sure that you attach a much higher priority to looking at new programs than looking at programs that have already been approved in the past by Treasury Board which were at some stage new programs.

Mr. Reisman: Yes. I suppose, sir, that that observation of yours has a certain general validity in it. If I were to bring in a motion and time study expert to examine what I do in the course of a day and he were to follow me around with a stop watch and determine how the sen or staff of the Treasury Board spend their time, I think you would probably find that proposals for new expenditures occupy a considerable portion of the day-to-day work of the staff of the Board.

But then the staff of the Board, of course, is not made up only of people in the senior management brackets; it is made up of a staff that has some depth to it and in addition to looking at the problems that come to them from day to day they also have a very considerable on-going operation. That on-going operation is very much concerned with the on-going activities of government.

Now, I think to spell that out a little, let us take a relatively new program of the government, let us take the program of the government in relation to manpower training, occupational training of adults. This is a program which was put into effect three years ago, or thereabouts. There was very careful examination made of it and the government decided it would proceed in that direction and devote considerable resources to it. It is quite obvious that when you launch a new program you try to make sure that your whole management apparatus is properly equipped to do it well, but once you have got it launched it is going to take a little time before you know how it is working.

We, as part of good management control, are encouraging departments of government to have within their establishments built-in

capability of applying continuing review and analysis and evaluation of a program of that kind. We let them go to it and after a few years we will come back to them and say well, gentlemen, how is that program going? You set certain objectives for yourself; you applied certain resources; are you accomplishing your objectives? Are you using your resources effectively? Are you getting the results you anticipated? This is part of an on-going operation.

Now let us take a different sort of program; let us take a program that was introduced 20 or 25 years ago. I will take a specific example: I believe that at some time during the war a program was introduced and implemented by the Department of Agriculture to encourage the breeding and the production of a high grade hog that produced a good lean bacon ideally suited for the British market. Now, that program went on for many years and over the years it had good results. After a while perhaps its utility and its effectiveness in that direction became less marked. It would be a function of the Treasury Board to encourage the departments to review programs of that kind and if they do not do so on their own, to help them in that review process.

I can recall some years ago when this was looked at and some encouragement given to the Department of Agriculture to weigh that particular program against other things and to see whether they wanted to continue with it in that form, or perhaps in a modified form. Only recently, when the financial situation was such that one had to look very carefully at some of the ongoing programs, with our encouragement did the Department of Agriculture decide that perhaps it was time to abandon it.

There I have given you two examples, one of a very old program, one of a relatively recent program and I can give you examples of new activities where our attention will vary depending on a number of considerations and also on the organizational capability, both within the department and the Treasury Board, to give attention to that kind of problem.

I will make a confession here; I myself do not believe that the capabilities built into departments and built into the Treasury Board in past years have been adequate to the task of adequately reviewing all the ongoing activities. I think we are making some

gains in this direction. There is a great tendency, and this is true in the private sector as in the public sector, for on-going things to continue on even long after they are no longer very useful. It is vital in circumstances where you never have enough resources to do everything you want to do that you have a good, effective on-going operation that vets and examines and evaluates the things you are doing, to see whether savings can be obtained or programs should be abandoned or modified, or replaced by new ones.

I am sure that Mr. Drury would agree with all of this, because I know I have discussed this with him on many occasions. He is rather devoted to this idea of a good effective management system of this kind: I know he prods me a good deal to see what we can do to develop our capabilities in this connection.

The Chairman: I think Mr. Reisman wanted me to explain to him what I had in the back of my mind: I think if you put too much emphasis, or almost exclusive emphasis on new programs then by the same token I think that you create a great inducement. I am speaking now especially of research agencies and research programs which are less perhaps wide than those you were envisaging when you were referring to the manpower training programs, et cetera. You create an inducement in those agencies to continue these older programs almost indefinitely, or to change internal composition as they go along without changing the name of the program, so that they can get the same amount of money year after year for these programs without going to Treasury Board and asking for more money for a new program which might be much more important than those they are carrying on.

Mr. Reisman: I take it, sir, the import of your question is that if we apply tougher rules or tougher scrutiny to new proposals than we do to old ones, there would be a built-in danger that less essential and less desirable things would be carried on and good things, deserving of higher priority, would not be permitted; this is your question?

The Chairman: Yes; or that at least less important things would go on almost indefinitely.

Mr. Reisman: There is certainly a danger of this; I can tell you that, in our relationships with departments and agencies, in speaking

to them, in writing to them, in giving them our views as to how to proceed with program evaluation, and in the preparation of their estimates and the preparation of their program proposals, we now have this five year forecast and we try to the best of our ability to encouage them to review carefully all the things that are going on and to think increasingly in terms of scales of priorities.

There is a tendency on the part of people to want to do all the things they have always done and in addition to do new things. What we like to encourage them to do is to have in their minds and committed to paper if they can, because we are pressing them to do this, an ordering of the things they can do according to their judgments as to their relative importance.

Now I am going to let you in on something: Questions were raised a little earlier about the telescope. In connection with the telescope, and I think I did indicate to you earlier that this was a subject that was considered at various levels in government, it was certainly considered by the staff of the Treasury Board on a number of occasions, indeed if my memory is correct this was a project that we first heard about, I think, in 1960. If I am not mistaken, the first proposals in connection with that major telescope were presented in some proposals that came in either in 1959 or 1960, and I think that the decision to proceed was taken in 1964. Then the decision to cease that project was taken in 1968.

Senator Lang: It was late 1967.

Mr. Reisman: Late 1967. In connection with that project at one stage in the evaluation that was taking place on the part of our staff, and evaluations were taking place elsewhere also, I put a fairly direct question to that department. I asked them where in the scale of priorities they put that project in relation to the whole range of scientific activities and other programs in which they were engaged and, as you know, they have a very substan_ tial budget devoted to scientific and research matters, in oceanography, in geology, and in water research. There was a certain reluctance to reply to that question, but I pressed it and the answer I got was that it was low man on the totem pole; the answer I got is that they wanted to do it and they thought it was desirable to do but all the other things they were doing they thought were more important.

thinking. If your implication, and I do not think there was that implication, is that perhaps in adandoning the telescope something of high priority was being put aside because we were not scrutinizing adequately ongoing activities, then I would like to assure you that those questions were put directly. Foreseeably we got answers to them: those answers figured in the advice that we put up and, as I say, other advice was put up too, and the government eventually took its decision.

I would not want to pretend, I do not think it would be right of me to pretend that our system for evaluation and for priority determinations is perfect by any means. I think there are many weaknesses in it, many weaknesses indeed, and I am quite sure that there are many things that are going on in government that are of lower priority than things that people would like to do but for which they do not have resources.

It is important that we develop in the departments and in the central agencies an improved ability to cope with that kind of problem. I think that we are doing that progressively: we will never be perfect, but I think we are going to get better at it as we go along.

Senator Robichaud: The question I had in mind was covered by the last part of your question and by the reply given by Mr. Reisman, but perhaps I could ask another question which has to do with programs on a lesser scale than the ones that have been mentioned. Could we be told who decides, or how a decision is reached regarding the economic value of a certain program?

I will give an example of a small program: Subsidies were given for the construction of fishing vessels; as an example, a subsidy of \$100,000 on \$300,000 wooden vessel would provide jobs for six to seven men. The life of one of those vessels is 20 years, so during its lifetime it would provide work ashore for 30 to 40 people. All at once we find out that the government, or the department concerned, decides to practically do away with this program. As we look at this year's estimates, for example, there is just enough money to cover expenditures for the carry-over from the

Now, that kind of attitude and that kind of the same time, take the ADA program. Under response, which I can assure you departments ADA, companies are in a position to get do not arrive at easily, is central to our grants for the construction of processing plants, but there is practically no control. All they have to do to qualify is to build a plant that will qualify under minor requirements. I mean, four or five plants could be built in the same area without trying to find out if there is a potential for those plants, and whether it is economically sound to proceed with such construction.

> Who takes a decision? Is it the departments involved or Treasury Board?

> Mr. Reisman: Let us deal first with the shipbuilding subsidy; there are a variety of shipbuilding subsidies that form part of the on-going policy of government and I am not sure which one you are referring to?

> Senator Robichaud: I am referring to the wooden ship subsidy.

> Mr. Reisman: There is a wooden ship subsidy; there is a trawler subsidy; then, of course, there is the commercial ship subsidy.

In connection with programs of that kind, once the government has decided that it wishes to have a program and its terms and conditions are defined, then the Treasury Board does not have all that much to do with it. The Treasury Board will have a great deal to do with it at the time it is being advanced and formulated and developed, and once the decision is taken to have such a program, then the responsible department carries that program forward.

Senator Robichaud: In this case in 1946.

Mr. Reisman: And this was a 1946 operation. We will, as I indicated earlier, from time to time have a look at the program and see whether it is in need of change or whether it should be abandoned. As you know, important changes have been introduced in the various shipbuilding subsidy programs.

In respect to the subsidy for commercial vessels, as a result of a very careful review by government, I think it was done on the staff side by an interdepartmental committee with the former Secretary of the Treasury Board as the Chairman, they spent I think something like five or six months reviewing that program. They decided that the subsidy should be changed, I think it was from 40 per present fiscal year. There is a program that cent to 25 per cent, a particular capital cost has been effective in helping the economy in allowance feature should be eliminated, that a specific area of assistance to an industry. At the subsidy should be reduced progressively

from 25 per cent to 17 per cent and that when it reached that point it should be converted into a tariff. Now, this was a recommendation; the government accepted it and this is now in process of happening.

In connection with the trawler subsidy, I think that only a few years ago the subsidy carried a weight of 50 per cent. Again as a result of a review, and on that occasion the review was conducted in the Department of Industry at the request of the Treasury Board, the subsidy was reduced from 50 per cent to 35 per cent. This was done on the basis of an examination of the competitive position of the Canadian trawler industry as compared to competition elsewhere in the world.

I think it was at that time that they also had a look at the subsidy on wooden fishing vessels and came to the conclusion in consultation with the Department of Fisheries, in consultation with the private sector, that the health of the Canadian fishing industry and the health of the shipbuilding industry related to the fisheries would be advanced more by emphasis on the steel vessels than on the wooden vessels, which they felt were becoming antiquated. This is how the thing was evolved.

Now, whether the decisions were right or whether they were wrong, I can tell you that they were the subject of a great deal of analysis and eventually became the subject of a government decision.

Senator Robichaud: This is the kind of decision, you see, that can really be questioned. This is no place to do it, but I could really question it for hours and show where mistakes are being made. Such decisions could have the effect of destroying completely an in-shore fishery or a fishery that takes place even within the area of the Gulf of St. Lawrence. Certainly plants companies which have received grants from the government to operate fish processing plants may have to close their doors due to lack of production because the type of vessel required to bring them the fish they need in order to operate will not be available.

Mr. Reisman: Senator Robichaud, perhaps I should not make this observation, but if my memory is correct at the time that these things were under consideration I think you were the Minister of Fisheries. I know that your department was very directly involved in the studies and in the review, and I sus-

pect, although I am not sure, that you were a member of the government that took the decision on these matters.

Senator Robichaud: I would like to question this because the facts are that this was one of the programs that was out of control. It is true there was no control on the amount of subsidy. All the provinces had to do was to go ahead and build boats, but in November 1967 a meeting was held with the provinces concerned, and a system of control was established. Then, twelve months later we find that the program is discontinued. To me this is not acceptable to the industry.

What I was trying to find out was who was responsible? Would it be a Treasury Board decision or one of the government departments involved?

Mr. Reisman: I think the answer, sir, is that that was a government decision.

The Chairman: There is no such thing, apparently, as a Treasury Board decision.

Senator Carter: We hear about them a lot though.

The Chairman: Oh, yes, but they do not exist.

Senator Robichaud: What I wanted to come to is the economic value of certain programs. There was a program which really was providing jobs in an area where they are needed, and then all at once the program is discontinued. The effect in years to come could be serious.

Mr. Reisman: If I am not mistaken, sir, although this is subject to checking, I believe that the program remains in force. I also believe that the department, and when I talk about the department, of course, I mean the minister, that this decision was taken by that department in terms of their sense of priorities in their scale of things. They preferred to put more resources into something else rather than into that particular program, but the program as far as I know is still on the books; it is an on-going program.

If you feel very strongly about this, sir, I would suggest that you make representations to the Minister of Fisheries on the subject.

Senator Robichaud: They have been made already.

Mr. Reisman: Your second point, sir, was on ADA, the area development program which, as you know, is being reviewed very into being at the end of March under the Honourable Jean Marchand. This is a program that I did have a lot to do with in a period of quite a few years and I think you will find that the terms and conditions under which incentives are given in the area development program are established by statute. There was the Area Development Incentive Act and there was a Department of Industry Act. Both statutes are on the books. The Department of Industry Act establishing the Area Development Agency will I think disappear when the new department legislation comes in but, as it exists today and as it existed during the period that I managed it, the terms and conditions were established by statute and processing and manufacturing enterprises that qualified under the terms of that legislation were entitled to subvention in accordance with a fixed schedule.

You asked whether there was any detailed scrutiny in examining the applications; there was scrutiny, but only in terms of whether the application conformed to the terms of the legislation and whether other conditions, such as the equity provided by the entrepreneur. whether the equipment to be put in was new, and all these conditions. These were examined; if they met the terms and conditions the subsidy was granted.

That may sound pretty haphazard but indeed this depends on your philosophy of economic organization and economic enterprise. I think it was an assumption of the government that private enterprise could be relied on to make investments which in their judgment would be valid. It turned out I think in some industries that a number of enterprises made optimistic assumptions about what the market would be and some of them got into difficulties, not too many. Some of them did but, of course, this is of the order of things in our private enterprise system. Judgments are made, investments are made and the Act had that basic assumption that when in a private enterprise economy the entrepreneur decides to make the investment, he would have examined the market situation and made his investment in the expectation of a profit. Sometimes the expectations are not fully realized.

The Chairman: I would like to come back to your brief: On page 3 you describe the program branch, which is of more direct trade and commerce is planning to do. Do you

carefully and there will be a new and interest to us, although it is not an exclusive regional development program interest. You show there that there are five under the new department which will come main divisions in that program branch and in terms of research finance, external aid and trade and commerce are in division I. I understand because of the explanations that you have further on Defence Research Board is in division No. II, social sciences, including economic research is mainly in division IV, while economic measures are considered in division III and research in transportation, housing and cmmunications are in division

> Now, the whole branch has people working in it.

Mr. Reisman: Fifty-five officers.

The Chairman: Fifty-five officers, yes, of course. I assume that they are not like senators; they have secretaries.

Mr. Reisman: They do not all have them; we are probably as economical in that respect as anybody.

The Chairman: Well, let us say 55 professional people.

Mr. Reisman: Yes, sir.

The Chairman: Would they be assigned to specific divisions?

Mr. Reisman: These officers? Oh, yes indeed.

The Chairman: So how many would you have attached to these various divisions?

Mr. Reisman: It would vary between five and nine officers per division, depending on the weight of work. There is a certain flexibility, I might say. If we get a heavy input in a particular area and a lighter input elsewhere we will shift people around, but these people are allocated to their divisions and within the divisions the sections. In the ordinary course of events they become pretty expert in the particular field to which they are required to address themselves.

The Chairman: So that these five or seven people, for instance, have to examine all the programs within their division, including of course the research component of these individual programs. In finance, for instance, to take division I, what they are doing in finance in terms of research, what external aid is doing or planning to do, what industry, not think that even if they are experts it is not many people to look at all of the policy questions and the programs involving policies and also the research aspect of it, especially when you come to DRB and big organizations like NRC?

Mr. Reisman: There are a number of points you are raising, sir: First you point out that we do not have a large number of people and we have a great deal of work to do. I certainly will not argue with that; I think that is very, very true. We are a pretty lean organization and we work our people very, very hard

You are raising the question whether with numbers of the kind indicated and responsibilities of the range indicated they can do a competent job. It really turns on what their job is. We like to think that the job of management and the job of evolution and the job of formulation belongs to a department or an agency. They have the numbers of people, they have the expertise, this is what they are paid for and we like to think that they should be entitled to manage these situations which they have been appointed or hired to manage.

I think the term that Bob Bryce used in his evidence before this committee in describing the role of the Department of Finance is that they regard themselves a bit like the official Opposition in Parliament in dealing with departments and agencies in the field for which they have responsibility. In a very real sense that is the way we operate also.

The ability to ask intelligent, probing questions at a critical time and to pursue them is a very large part of our job. We ourselves do not have to be scientists to ask intelligent questions about a science program.

The Chairman: We cannot argue against that.

Mr. Reisman: Although we have some scientists as well.

The Chairman: How many would you have?

Mr. Reisman: I suppose that on our staff we have quite a few people who are trained in engineering and who are trained in the physical sciences and who are trained in the social sciences.

For example, Dr. Wagner who is here with us today is in Mr. Fry's Program Division. Incidentally, that is the program division that has most of the scientific programs.

The Chairman: That is the third division.

Mr. Fry: The major scientific programs are concentrated there and we do a co-ordinating job with the other divisions who have scientific programs. Dr. Wagner is involved in that, so there is an overall look taken at science.

Mr. Reisman: Dr. Wagner was a Professor of Physics at McGill University; he was a Director of Research at RCA Canada; he ran a corporation producing high technology products called Syntex; he was the President of that organization and we are now fortunate in having him on our staff. From time to time we have to call upon him to make some important and highly professional technical and scientific inputs.

Strangely enough in our Personnel Policy Branch running one of the divisions, I think it is Manpower Division, we have a man who is a Ph.D. in entymology and who did a great deal of highly qualified scientific work.

I think if I ran through my various branches you would find quite a few engineers and scientists and quite a few economists as well.

The Chairman: But this man who specializes in entymology would probably have some control over entymologists, but not over their programs, because he is in the personnel field.

Mr. Reisman: Let me give you an example of the way we work and how flexible we have to be: When the government decided that they wanted to engage in an improvement of the government apparatus through a major reorganization a large part of the burden fell on the Treasury Board. Ten or eleven task forces were set up to deal with one or other aspect of this reorganization. One of the task forces dealt with the amalgamation of the Department of Forestry and the Department of Fisheries and also with the Fisheries Research Board. We needed a Chairman for that task force and we leaned into our Personnel Policy Branch and picked this man because he had a great expertise in the field, had worked with, I think, the forestry branch and we used him in that capacity. As you know, the Department of Fisheries, the Fisheries Research Board and the Department of Forestry have a very hefty science program and the whole question of how they might be organized in order to get the most out of that apparatus fell heavily on the Chairman of

that task force. We happened to be fortunate and we were able to use that man in that capacity.

So we try to make use of our people that way, but I would not pretend that we have a wide or a large number of scientists who can range over the whole field, but we do have quite a lot of intelligent people who can ask the right questions.

The Chairman: I do not deny that, but to come back to this third division there, you will have about five to seven people there?

Mr. Reisman: There are nine.

The Chairman: And of course they have to look at all the economic measures of the government. This is a pretty wide field, so that even if they are very competent and they are hard workers, and I do not deny this at all, I suppose that there is very little time to have a serious look at all the individual research programs within these fields.

So when they feel that they cannot appraise a program, where do they go?

Mr. Reisman: I suppose a large part of our work is to know where to go; we have become very expert in getting people to do the work that we need to have done. As I say, this really is the art of asking the right questions. I suppose if you talked to departments they would complain to you that we ask too many questions and that we require them to turn in too much material, but if we want to investigate a particular situation, a particular area, the Treasury Board has within its powers the right to ask questions and to get answers.

What we need really is not an ability to provide the answers, but a good critical ability to scrutinize them, to understand them.

Now, with the creation of the Science Secretariat we have an additional capability in government which is also available to the Treasury Board.

The Chairman: They have eight people there.

Mr. Reisman: We can cite some examples where if one needed advice at the Treasury Board level on a particular project or program for which we ourselves did not have enough expertise to make a judgment on it ourselves, we turn to the Science Secretariat and within the limits of their staff they have been very co-operative and on a number of

occasions have been able to provide very good help.

The Chairman: We have been told stories, and I am sure that these are completely untrue stories, that on certain specific programs Treasury Board would turn to the Science Secretariat; Science Secretariat would not have, unfortunately, the proper expert knowledge and would go back to the original agency, which had been the first proposer, for advice to give you.

Mr. Reisman: I think those are apocryphal stories that probably have lots of humour in them but not too much truth.

The Chairman: Of course you would not know this; nobody would tell you this.

Mr. Reisman: You would be amazed about how much we know; you really would be quite amazed. When the comment was made that the Science Secretariat is made up of a half a dozen or so people, I think we must not overlook the fact that the Science Secretariat themselves have on many occasions turned to help outside the government in particular areas. They have set up task forces; they have conducted particular investigations; they have hired people on contract; they have set up teams made up partly of their own people and people from the outside. people from other departments, but if the suggestion is that they are sort of a closed circle, that the people who are proposing are also the people who advise on the critical evaluation, it could happen, but if it happened it would be highly exceptional and it would be because somebody in the Treasury Board had been asleep and I am telling you we do not get that much sleep.

Senator Lang: I want to ask a question as to whether it would be feasible to implement a scheme whereby in some or all programs of government after initiation a time was set upon it which the controller of that program had to show cause, say before the Treasury Board, why his appropriation should be renewed?

In other words, is there any way to build into the system something that puts the onus on those carrying the scheme to show cause within a certain time why they should continue?

ourselves, we turn to the Science Secretariat I do not know whether this is a feasible and within the limits of their staff they have idea or not, but it puts the onus on those who been very co-operative and on a number of are carrying forward the thing and also I

mind at the inception of the scheme that could be beneficial.

Mr. Reisman: It is a very interesting idea. Some of the programs of government which derive from specific legislation are often cast in terms of specific periods of time when they have to be renewed. If that is the wish of the government, to renew them, then they need fresh legislation at that time, so that you have that kind of control in some instances.

In other instances, of course, the operating departments have to come back for appropriations each year. Now, in coming back for appropriations they are required to submit a case; they are required when they ask for money either for something on-going or for an expansion of a program, or for a new program to tell you what they want the money for. Increasingly they are required to tell you what their objectives are; they are required to tell you that in some kind of time frame too.

This provides an opportunity at the time when we do a program review and at the time when we are preparing the estimates to get at them. This, of course, puts an onus on them to submit justification, but it puts the onus on the central agency to apply a critical scrutiny.

Let me give you an example; I mentioned the manpower program earlier. It was a relatively new program; we felt that the time had come a year ago to do a critical scrutiny. We wanted to know now what they had got, what they had accomplished? They told us that it was a little early for them to come up with any definitive expose or findings on that. We told them that the next time they came up for money they had better have such an evaluation or they would find it very difficult to get their money.

We will be beginning to look at this next year and we are expecting that we will get such a critical evaluation; if not, they will have a tough time getting money.

This is the kind of annual process there is now. Your Chairman, Senator Lamontagne, indicated that there are a lot of programs and there are not many program officers, and are we always on the bit? We try.

The Chairman: I am sure.

Mr. Reisman: And at times we are quite successful. This is an exciting idea; it would be very helpful to us, really, if some such in the department, but we did not see it.

think it might create a certain attitude of system were introduced. We are widespread; perhaps this is the sort of thing you might want to make some recommendations about. Senator; it would please us.

> Senator Lang: My thought was at time span greater than a year; I think the year is a pretty heavy onus, coming back every year to justify it tends to become automatic over a certain number of years, or it tends to remove the burden from the proponent. I was thinking of a time span considerably longer perhaps. It would not have to be arbitrary; perhaps it would be different in the case of these programs, beyond a yearly estimate, a five year scheme, or three years, ten years, or whatever it may be, where the problem of retaining that appropriation then became critical and not as routine as the requirements of an annual estimate.

> Mr. Reisman: Just as a quick, off-the-cuff reaction, sir: From the Treasury Board point of view I could see a great deal of merit in a system of that kind. I hope you will persuade your colleagues on this committee that this is a proposal that is worth their very careful consideration.

> Senator Robichaud: I want to make a brief remark in relation to the question which I asked a while ago regarding the fishing vessel subsidy: I was prompted to ask this question following the one asked by Senator Carter on the illustration of cost benefit analyses which is described in Appendix D of the brief.

My suggestion would be that someone on the staff of Treasury Board would take the same illustration of cost benefit analysis and apply it to the subsidy on the construction of wooden vessels and see what results they will get.

Mr. Reisman: I am not sure whether we have done such a study.

Mr. Fry: No, we have not done a study ourselves on that particular program, but we are more and more engaging departments to use this sort of study. We are also in our own shop working up examples which we are going to departments with and saying here is how you can do this kind of thing, let us get started on it.

We are meeting with a great deal of acceptance of the idea, but that particular program, it may have been the subject of cost benefit

Senator Robichaud: I would hope that it would be done, because there will certainly be some surprising results.

The Chairman: In terms of personnel for government establishments, do you look at this situation fairly closely, not only in terms of possible savings but in terms of also providing the personnel? We have had complaints throughout our inquiry here that various agencies had such an establishment, a given establishment, but they could not find the people to hire and their research activities were being limited by this.

In particular we have been told by the Chairman of the Public Service Commission that some time ago, perhaps three weeks ago, he received requisitions from various departments for 400 additional economists and he was certainly under the impression that he could not find them.

Mr. Reisman: We ourselves with Treasury Board are not the recruiting agency for the government; this is done by the Public Service Commission. We are concerned with establishment; we are concerned with pay and conditions of work; we are concerned with training. In all these fields in the personnel function we, of course, have to be keenly aware of what is taking place in the market.

If we have provided establishment for particular classes of let us say scientists or economists and the classifications and the pay are such that they cannot hire them, then obviously we are not doing our job very well. So we do try to keep very close touch with the market in connection with our classification work and also in connection with the pay and conditions which, as you know, is largely the subject of collective bargaining today.

So either through collective bargaining or through the decisions of the employer we try to keep the pay levels competitive with the private sector who employ similar people but, as you know, there are shortages in certain fields which cannot be overcome in the short term, no matter what we do in respect to classification and pay; all it would mean is that you would rob Peter to pay Paul.

The Chairman: That means that a few years ago we were wrong perhaps in our assessment of the situation. We were told, for instance, that in certain fields through government financial encouragement in universities in terms of scholarships and all this we were about to produce a surplus in certain fields of

Ph.Ds, and here we have this great scarcity in the field of economics and the social sciences generally. My own conclusion is that there is an imbalance there, that nobody looked at that kind of imbalance a few years ago.

Mr. Reisman: Where does responsibility reside in a country like our own for decision in respect of training, education, graduate schools, and that kind of thing?

The Chairman: I am speaking only now of financial inducements which are given very generously by the federal government in various fields.

Mr. Reisman: I suppose the major inducement provided by the federal government in the field of these high skills is through the program whereby the federal government pays half the total cost for the country as a whole in operating post-secondary institutions; that takes in all the universities, all the graduate schools.

The Chairman: Of course this is the most important part of it, but in addition we have—

Mr. Reisman: In addition the National Research Council gives grants; the Canada Council gives grants; there are other devices also. For example, right within the public service there are a variety of facilities whereby people can upgrade their skills, or go back for training in certain fields where there are great shortages. For example, in connection with translation a facility has been provided where people can be taken on, put on pay, and then sent out to training immediately; there are a variety of measures of that kind.

In our Manpower Division we try, both through training within the government apparatus and through training assistance, to encourage people to go out to the universities and upgrade their skills; we try to do that in a manner which best fits the needs. In other words, if it comes to our attention that there are surpluses in some areas we obviously are not going to be as generous in the kind of assistance we provide there as in some of these social sciences.

The Chairman: But you never had any systematic overall view of this whole manpower situation in relation to what government needs?

Mr. Reisman: Let me put it this way. The personnel function in the Treasury Board is

perhaps the most rapidly growing function we have. I suppose something like half our total staff today are in the Personnel Policy Branch. That takes in collective bargaining; it takes in pay and conditions; it takes in manpower development; it takes in that whole range of things.

We are at present trying to do that kind of job which was not done at all five years ago. Today we have that function. Obviously there are deficiencies. But there must have been inadequacies for some time. It is awfully difficult in a country where you have so much diversity and where the decision-making process is so diverse between all the private and public institutions, the universities and the institions, to get just the right fit.

My own feeling is that we have got to do a lot more in this field, a lot more.

The Chairman: Especially if in addition to having the science component of all our programs we do not have an overall science budget, because then we cannot see the imbalances.

Mr. Reisman: Mr. Chairman, I think you know my prejudices in this field. I myself think that the notion of an overall budget for science is nonsense; it is a view I have developed over a long period of time, having worked closely with it and my reason for it is it really turns on what is science? I have here a piece of paper which was prepared for me and describes how the OECD, the Organization for Economic Co-operation and Development in Europe, with Canada as a member, defines science. There are pages and pages of disciplines that are embraced in their definition. They have six categories; they have natural science, which takes in mathematics, physics, chemistry, physical chemistry, biology, botany, zoology, biochemistry, biophysics, geology, and so on. Then they have got a whole series of categories under engineering science, metallurgy, mechanical, construction, electrical, aeronautical, and so on. Then medical sciences, agriculture and social sciences, and so on.

If one looks at the activities under all these fields, they are so diverse and so widespread and penetrate every field of human endeavour that to talk about a single budget embracing all these diverse activities is an abstraction of the kind that my mind is incapable of grasping in terms of developing an effective tool for financial control or of management.

This is really my difficulty; it is not a religion with me, it is just that it is not a helpful concept in terms of doing the kind of work we have to do in connection either with training, development, budgetary control or choice of priorities or whatever our real job is; that concept does not seem to give me much help.

The Chairman: I think you have forgotten your old Keynesian days.

Senator Lang: Perhaps it is a good thing, too.

The Chairman: It seems to me that there is, of course, a necessity to look at sectors of research connected with their policy mission; that is for sure.

Mr. Reisman: Yes.

The Chairman: And you certainly agree with that?

Mr. Reisman: Yes, sir.

The Chairman: Of course, even here I would say that in our federal system we have at the federal level several research programs which are not directly related to a federal mission because the mission does not exist. It belongs somewhere else, like in forestry, for instance, but on top of that is it not true that whatever we feel there is competition for manpower among various fields between the different sciences? There is competition for funds; there is also a growing interdependence between various fields. So that, for instance, research in forestry may help research in agriculture, or research in the physical sciences may have a growing impact on the result of research, or as a contribution to the live sciences.

So that at some stage I am tempted to make an analogy between what we call microeconomics and what we call macroeconomics. Of course, your microeconomic approach does not give you the whole story, but the other one does not tell you the whole story either; the two have to complement each other. Otherwise there are a lot of fools in this world now looking at science or science of science or science square—a lot of people losing their time.

Mr. Reisman: I suppose, sir, there are a lot of people losing their time.

The Chairman: Not in Treasury Board.

Mr. Reisman: I think I understand what you are talking about when you talk about the micro approach and the macro, but in the

macro approach it is a question of what you put into the basket. If you talk of macro-economics you are examining how all aspects of your economic system fit together, relate to one another. There are certain instruments and certain tools for influencing the economy which must look at all the economic programs and activities of the country; at least you are dealing with a packet of things which have some commonality, which have a discrete and distinct relation.

The Chairman: The aggregates can contain a lot of different things, too.

Mr. Reisman: Let me put it this way: If you are talking about a program to induce the upgrading of technology in Canadian industry, which is a very important area of government activity relative to scientific and technological development of the country and you have that category of things in the technological development of Canadian industry, which has many, many facets, some of it is done through incentives through the taxation system, some of it is done by grants, some of it is done by contracting out by operating agencies of government. There is no question that all these are related one to the other; indeed, there is a study going forward right this moment, initiated by the Treasury Board, to examine all aspects of governmental activities which relate to the stimulus of industrial research and technology. Here is a family of related problems.

The Chairman: This is also related to intramural programs.

Mr. Reisman: It is indeed; indeed, one of the programs which I initiated in the Department of Industry when I was there was to try to relate more closely the scientific activities which take place in the universities to the needs of the surrounding industrial community. We provided what we called establishment grants to set up research development institutions, industrial research institutes we called them, in universities. We gave them an initial contribution to get established on a basis whereby they would be supported in the long term by the industrial community around them. This was a deliberate effort to develop a relationship between what is being done intramurally in the universities and the needs of the industrial community.

We used our funds very sparingly, but I think effectively, and by the time I left the department we had five such institutions going.

The Chairman: You are beginning now to develop a very important aspect of the overall view.

Mr. Reisman: Now, if you are taking a macroscopic view in the field of industrial research and technology, I agree with you entirely, but if you want to relate industrial technology, sir, to the life study of the butterfly or the sex life of the giant crab, or some other matter, then I really think that this gets you into trouble.

The Chairman: You are just teasing me; I do not think that we should pursue this seminar for too long. We will have occasions to come back to this.

Mr. Reisman: Mr. Chairman, I wonder if I can make one comment?

The Chairman: Yes.

Mr. Reisman: The notion that you developed in your theme about a single science budget; I used rather strong language in describing it on a personal basis. I think I used the adjective that to my mind that is nonsense. I think I would like to strike that from the record because it is a much too dramatic way to do it.

I know that many thoughtful and able people have seen merit in that kind of approach, at least from one point of view. I can see some merit in it too, from that point of view, namely as a means of focusing the attention of the public at large on the fact that the national resources devoted to an area of disciplines is not adequate. From that point of view, taking all of your figures together and adding them together and saying to your people, now look, do you think you are allocating your resources properly if you only devote X dollars to all the scientific activities taken together?

From that point of view I would acknowledge that it is useful to put all these things together and perhaps for certain other purposes.

In terms of management control, in terms of priority setting in the more discreet sense that we are engaged in it I have rather more difficulty with it, but to attach the word nonsense to it is an overstatement substantially and I would like with your permission to strike that from the record.

The Chairman: I would be the first to agree.

Senator Carter: Does the Treasury Board review the programs of the Scientific Research Board; say the Fisheries research Board, we are talking about fisheries research now? Do they come to Treasury Board to get their programs reviewed?

Mr. Reisman: Yes, they do, sir.

Senator Carter: They have to justify what they are doing?

Mr. Reisman: Absolutely, sir. Now, in that connection I might just observe that I believe that the government organization bill envisages that the Fisheries Research Board will become an integral part of the Department of Fisheries and Forestry, in the same way that the scientific activities of the Forestry Department were an integral part of the department.

The Chairman: I thought it would be the other way around.

Senator Robichaud: May I just remark that the Fisheries Research Board has a freedom to determine its priority; they determine what program they would like to see proceeded with first.

The Chairman: Yes, first, but then they have to submit it to the Treasury Board.

Senator Robichaud: But they select their own priority.

Mr. Reisman: Yes, indeed; this is true for every department and agency. We do not try to tell these people who are experts what they should be doing. We may ask questions about it, but it is their business and we try to maintain that. This is correct, sir.

Senator Carter: I was interested, you see, way back when you were talking about this telescope, that it had a lowest priority on the list, but that was for that department where it was competing with a lot of other projects which that particular department were more interested in. It does not follow that if you had somebody reviewing that on a national basis or in an overall context that it would still be low man on the totem pole.

Mr. Reisman: You are raising a most vital issue, senator; there is no question that this issue that Senator Carter now raises is perhaps the most difficult of all. If you look at individual agencies and departments it is at least manageable to talk about priorities. If you begin to look at a number of agencies and departments and begin to pull them

together your problem of priorities become even more difficult. Then if you put it on a total basis it is not in the less—

The Chairman: Perhaps it becomes more difficult, but it also becomes more realistic.

Mr. Reisman: I will comment on that sir. It is not only a matter of one science project with another science project; indeed it is one whole program against other whole programs.

For example, let us take a program like the ING, which was a vast program involving I suppose hundreds of millions of dollars; whatever figures were put in initial reports I think one can say fairly that this involved hundreds of millions of dollars. In that sense a program of that magnitude has got to be offset not only against scientific things but against virtually everything else that the government does. It has got to be offset against such a thing as the causeway to Prince Edward Island, or Medicare, or the whole regional development program, which is also in that range of magnitude.

These are the most difficult things of all and this is, of course, why man invented government; this is what it is about and the government through its whole elaborate structure has somehow to make these choices. Do they always make the wisest choices? Do they have the apparatus that permits them to even measure this one against the other? This is the greatest dilemma of all; all I can say on that is that we are trying to develop methods and mechanisms to make that job of government more manageable or, as the Chairman said, that is the only realistic way to go at it. In the end that is true and this is why you have a Prime Minister, this is why you have a Priorities and Planning Committee; almost all these choices in the end have to go up there.

When they looked at ING, surely in the minds of each of the ministers who were there and in the minds of the Cabinet to whom they reported, they must have been thinking in terms of that program in relation to the whole range of commitments that they had already made or were being pressed to make.

There is no logical way that I know of for making these choices, but we do try to do it.

The Chairman: It would be a nice note to end on, but I think I still have another question which is much more down to earth. You were speaking about the Treasury Board and its meetings. How many meetings of Treasury Board are there a week usually in the normal period?

Mr. Reisman: In my short period with the Board, which is about a year now, we have had one meeting a week of the Board itself; we have had several occasions when we have had an urgent meeting of the Board and we now have another committee on collective bargaining, which is a subcommittee of the Board and they meet on request. They have met maybe a half a dozen times in the course of the last six months.

The regular Treasury Board meets once a week, on Thursday at 2.30 p.m., either in the Cabinet Chambers or next door here down the hall when Parliament is in session. Today we have a meeting at 2.30 p.m.

The Chairman: How many decisions would you reach in the course of one meeting, a typical meeting?

Mr. Reisman: It varies a good deal; I would say that during the period that I have been Secretary of the Board we would take somewhere between 20 and 30 decisions, of which perhaps two or three might be important and the others would not be terribly important.

The Chairman: Not more than that?

Mr. Reisman: Not more than that. We have rationalized that a great deal, sir. I believe you were on the Treasury Board in earlier years and Senator Robichaud certainly was. We have moved very dramatically in terms of the agendas of the Treasury Board in a very important way; we have delegated to depart-

ments and agencies decisions of how many typewriters they can have and this and that. What we try to keep on the ministers' agenda are things that really matter; I think you would commend that, would you not, sir?

The Chairman: Yes, is there an agenda circulated prior to the meetings to ministers?

Mr. Reisman: Yes, sir; what we do is we have a black book for each minister and the day before the meeting each minister on the Board who has indicated that he will be available to attend gets a copy of the book, which contains the agenda and descriptive material in relation to each item on the agenda. In addition to the ministers I am always present, together with the Assistant Secretaries of the Board, each of whom speak to their section of the agenda.

The Chairman: I am glad that there is an agenda now.

Senator Robichaud: There has been an agenda now for a couple of years.

The Chairman: Thank you very much again for spending this time, submitting yourself to all these questions and sharing your vast experience with us.

Mr. Reisman: Mr. Chairman, you and your colleagues have been most gracious in receiving me. I have been treated very, very well. I have enjoyed this experience, and I hope there will be occasions when you will give us a chance to come in and comment again. Thank you very much.

The committee adjourned.

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Senator Hobichaud: There has been an agenda now for a couple of Year hand out the Chalmash: Think you very much again for speeding this time with hing you west to all these questions and sharing your west.

Mr. Rebissen Wri Chelmen, you and your colleagues have been most gradous in reselving me I have been treated very very well I have been treated very very well I hope have enjoyed this experience, and I hope how will be occasional when returned give us a chance to come in and comment egain.

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First Session—Twenty-eighth Parliament
1968-69

THE SENATE OF CANADA

PROCEEDINGS

OF THE

SPECIAL COMMITTEE

ON

SCIENCE POLICY

The Honourable MAURICE LAMONTAGNE, P.C., Chairman
The Honourable DONALD CAMERON, Vice-Chairman

No. 37

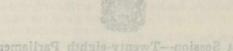
THURSDAY, MARCH 6th, 1969

WITNESSES:

POST OFFICE DEPARTMENT: C. F. Hobbs, Director General, Planning and Systems; H. D. W. Wethey, Director, Engineering Branch; and R. D. Myers, Acting Director, Postal Service Branch.

APPENDIX:

36.—Brief submitted by the Post Office Department.



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PROCEEDINGS

MEMBERS OF THE SPECIAL COMMITTEE ON

SCIENCE POLICY

The Honourable Maurice Lamontagne, Chairman
The Honourable Donald Cameron, Vice-Chairman

The Honourable Senators:

Aird	Grosart	Nichol
Belisle AD DE MA	Haig WOMAL HOIST	O'Leary (Carleton)
Blois	Hays	Phillips (Prince)
Bourget	Kinnear AO GLAMO	Robichaud
Cameron	Lamontagne	Sullivan
Carter	Lang	Thompson
Desruisseaux	Leonard	Yuzyk
Giguère	McGrand	

Patrick J. Savoie, Clerk of the Committee.

THURSDAY, MARCH 6th, 1969

WITNESSES:

POST OFFICE DEPARTMENT: C. F. Hobbs, Director General, Planning and Systems; H. D. W. Wethey, Director, Engineering Branch; and R. D. Myers, Acting Director, Postal Service Branch.

APPENDIX:

36.-Brief submitted by the Post Office Department.

THE QUEEN'S PRINTER OTTAWA, 1989

ORDERS OF REFERENCE

Extract from the Minutes of the Proceedings of the Senate, Tuesday, September 17th, 1968:

"The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That a Special Committee of the Senate be appointed to consider and report on the science policy of the Federal Government with the object of appraising its priorities, its budget and its efficiency in the light of the experience of other industrialized countries and of the requirements of the new scientific age and, without restricting the generality of the foregoing, to inquire into and report upon the following:

- (a) recent trends in research and development expenditures in Canada as compared with those in other industrialized countries;
- (b) research and development activities carried out by the Federal Government in the fields of physical, life and human sciences;
- (c) federal assistance to research and development activities carried out by individuals, universities, industry and other groups in the three scientific fields mentioned above; and
- (d) the broad principles, the long-term financial requirements and the structural organization of a dynamic and efficient science policy for Canada.

That the Committee have power to engage the services of such counsel, staff and technical advisers as may be necessary for the purpose of the inquiry;

That the Committee have power of send for persons, papers and records, to examine witnesses, to report from time to time, to print such papers and evidence from day to day as may be ordered by the Committee, to sit during sittings and adjournments of the Senate, and to adjourn from place to place;

That the papers and evidence received and taken on the subject in the preceding session be referred to the Committee; and

That the Committee be composed of the Honourable Senators Aird, Argue, Bélisle, Bourget, Cameron, Desruisseaux, Grosart, Hays, Kinnear, Lamontagne, Lang, Leonard, MacKenzie, O'Leary (Carleton), Phillips (Prince), Sullivan, Thompson and Yuzyk.

After debate, and—
The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Thursday, September 19th, 1968:

"With leave of the Senate,

The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That the name of the Honourable Senator Robichaud be substituted for that of the Honourable Senator Argue on the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was— and most control Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Wednesday, February 5th, 1969:

With leave of the Senate,

The Honourable Senator McDonald moved, seconded by the Honourable Senator Macdonald (Cape Breton):

That the names of the Honourable Senators Blois, Carter, Giguère, Haig, McGrand and Nichol be added to the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—Resolved in the affirmative.

ROBERT FORTIER,
Clerk of the Senate.

MINUTES OF PROCEEDINGS

THURSDAY, March 6th, 1969.

Pursuant to adjournment and notice the Special Committee on Science Policy met this day at 3:30 p.m.

Present: The Honourable Senators Lamontagne (Chairman), Belisle, Bourget, Carter, Kinnear, Robichaud and Yuzyk—7.

The following witnesses were heard:

POST OFFICE DEPARTMENT:

- C. F. Hobbs, Director General, Planning and Systems;
- H. D. W. Wethey, Director, Engineering Branch; and
 - R. D. Myers, Acting Director, Postal Service Branch.

(A curriculum vitae of each witness follows these Minutes).

The following is printed as Appendix No. 36:

-Brief submitted by the Post Office Department.

At 5:00 p.m. the Committee adjourned to the call of the Chairman.

ATTEST:

Patrick J. Savoie,

Clerk of the Committee.

HOBBS, Clement F., B.Sc. (Maths), P.Eng., F.I.S., F.S.S., has been appointed by the Public Service Commission to the position of Director General, Planning and Systems. In making this announcement, Postmaster General Eric Kierans indicated that the appointment was effective January 27. In his new position, Mr. Hobbs will be responsible for four branches: Operational Research (econometric techniques applied to solving managerial problems): Information Systems (computer operation and programming, systems analysis); Systems Research (transportation systems and mail sortation systems for the future); Strategic Planning (long-range planning of the department). The first two of these branches are already in existence, but the latter two are in the planning stage. A native of London, England, Mr. Hobbs served in the British army from 1944 to 1948, after which he worked for the United Nations in Geneva for one year. He returned to England in 1949 to work as a statistical assistant for the Medical Research Council where he was involved in the Montebello atomic tests and served as the Council's back-up man for the Everest expedition. He joined the Guided Missile Division of the Fairey Aviation Co. in 1953, working in the advanced weapons design group, and in 1954, he received his B.Sc. (Maths) from the University of London. Mr. Hobbs arrived in Canada in 1955, joining the Department of National Defence Inspection Services at Nicolet, P.Q., where he was a Senior Ballistics Officer. In 1959, he transferred to Ottawa to work with Army Equipment Engineering as a systems analyst and, in 1963, was appointed as Head of Systems Analysis. During his tenure with the D.N.D. in Ottawa, Mr. Hobbs developed two statistical standards for quality control inspection, both of which are accepted in Canada, Great Britain, Australia and the U.S.A. Mr. Hobbs was named Superintendent, Systems Engineering, at the Canada Post Office in 1965, and was subsequently appointed Director, Statistical Programmes (now known as Operational Research) in 1966. In 1960, he qualified as a Professional Engineer in Industrial Engineering, and two years later was elected a Fellow of the Royal Statistical Society. In 1968, he qualified as a member of the Institute of Statisticians and was immediately elected a Fellow. Mr. Hobbs and his wife, Sonia, were married in 1960 and have two children—a girl, 4, and a boy, 2.

WETHEY, Harry D. W., B.Sc., P.Eng. Mr. Wethey is Director of Engineering of the Post Office Department, having been promoted to that position from Chief Engineer in May 1965. The Post Office Engineering Branch which he now heads, covers all aspects of postal mechanization for new or improved major post offices. This ranges from the industrial engineering study during planning, to production of plans and specifications, supervision during installation and organization of maintenance for the equipment in the completed plant. The Branch is also responsible for Research and Development and for the provision of a wide range of "standard" equipment from sorting cases to platform trucks. Mr. Wethey came to the Post Office in October 1957 when he was appointed Chief Engineer. During his time as Chief Engineer, both the Research and Development Division and the Systems Engineering Division were brought into being and their programmes of work were developed. At the same time, the Mechanical and Electrical Engineering Division was expanded in size and in the scope of its work. Mr. Wethey accompanied the Director in 1957 and again in 1961 to American-British-Canadian Post Office Technical Information Exchange Conferences in Washington, D.C. In addition, during his tenure as Chief

Engineer, he made three trips to Europe on postal mechanization matters. Born in Winnings Man, he received his grade and high school education at Neepawa, later attending the University of Manitoba from which he graduated in Electrical Engineering (cum laude) in 1931. On graduation he was commissigned in the Royal Canadian Corps of Signals (Regular Army), Early in World War II he served in field units (Signals) and received a Signal Staff appointment in 1940 with the rank of Major. He served as Liaison Signal Officer with the United States Signal Corps in 1943 and 1944 at the Pentagon, Washington, being promoted to the rank of Lieutenant-Colonel on this appointment. From 1944 to the end of the War he was Officer Commanding the Canadian Wireless Unit on loan to Australia. At the close of the War he was appointed to command the Royal Canadian School of Signals at Kingston, Ontario, He spent a year in Switzerland in 1948 as Army Member of the Canadian Delegation to the Provisional Frequency Board, during that time being chairman of a working group. For five years he was Senior Lieutenant Colonel in the Directorate of Signals at Army Headquarters, dealing with various phases of radio communications. He has commanded the Northwest Territories and Yukon Radio System with Headquarters in Edmonton, consisting of a network of 22 radio stations. His hobbies include curling and reading. Married, he has a daughter.

MYERS, R. D., Recently appointed as Acting Director of Postal Service, Mr. Myers entered the service in 1954. He worked in the Montreal and Winnipeg Post Offices during the time the Methods and Standards Programme was introduced to these offices. He was educated in Winnipeg and was with Burns & Company for a number of years in several western cities doing Methods and Standards work. He was a 'Naval type' during the war. Married, he has a daughter and three sons.

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THE SENATE

SPECIAL COMMITTEE ON SCIENCE POLICY

EVIDENCE

Ottawa, Thursday, March 6, 1969.

The Special Committee on Science Policy met this day at 3.30 p.m.

Senator Maurice Lamontagne (Chairman) in the Chair.

The Chairman: Honourable senators, the head of the delegation representing the Post Office Department this afternoon is Mr. C. F. Hobbs, Director General of Planning and Systems. He is accompanied by Mr. H. D. W. Wethey, Director of the Engineering Branch, and Mr. R. D. Myers, Acting Director of the Postal Service Branch.

I understand that as usual Mr. Hobbs will make a brief opening statement; Mr. Hobbs?

Mr. C. F. Hobbs, Director General, Planning and Systems, Post Office Department: Mr. Chairman, honourable senators, in response to your request a brief was presented by the Post Office Department.

The activities of the Post Office of interest to your committee fall within the definition of applied research and development, data collection and scientific information since all our research has specific practical objectives.

The research and development division of the engineering branch are primarily concerned with electro/mechanical equipment used in mail processing and handling, but they provide a service in all areas where engineering skills are required, for example, the development of items of standard equipment in new and modern form and the evaluation of mail processing equipments obtainable from other countries.

The establishment of an operational research branch was authorized in 1966. This branch offers mathematical, statistical and economic skills to all branches of the department.

The main contribution to date has been in the areas of mathematical model building for

transportation and mail volume forecasting problems and in data collection and analysis for revenue and cost determination by class of mail.

Both of these groups are small, but I believe they have made a significant contribution to the solution of some of the department's problems and there is no doubt that their skills will be utilized to the full in the future.

If you have any questions Mr. H. Wethey, the Director of Engineering and Mr. R. Myers, the Acting Director of Postal Service or I, will try to answer them to your satisfaction.

The Chairman: That statement was certainly brief.

Senator Carter: He is a good engineer.

The Chairman: We have had longer opening statements before but this one was certainly to the point. Senator Kinnear?

Senator Kinnear: Thank you, Mr. Chairman. I have read the brief. Not being an engineer or a scientist I found some of it difficult but, like every person in Canada who is interested in the mail, I did find some questions to ask.

The mail service has not changed a great deal in the past hundred years to the layman. No doubt it has changed a great deal to the Post Office Department. I think probably everyone in the department has read what Postmaster General Lawrence O'Brien said of the USA, that if the US phone business were run like the post office, carrier pigeons would have a great future.

The Chairman: The government phone directory is almost like this.

Senator Kinnear: At the present one sees other indications of a coming revolution in postal services brought about by technological advances. For example, the New York Times of June 23, 1968, notes that Britain is

improving the handling of mail and, of course, from the experience of a great many people who travel in Britain they think that their mail service is a great improvement over the services in many other countries.

The British Post Office is introducing a system of mechanized mail handling that it says will be the most advanced in the world. The system relies on an integration of several electronic machines connected by conveyor belts. It includes segregators which separate letters, packages and newspapers; automatic letter facers, which turn all letters the same way, cancelling them; and letter coding machines, which print phosphorescent dots on the letters based on the destination's postal code.

I suppose this is very repetitious to you, but to me it is quite interesting. The letters then are read by automatic letter sorters at a rate up to 20,000 an hour into individual stacks to be placed into bags for despatch or for postmen to begin their deliveries, and so on it goes.

I wonder how that compares with what we are doing in Canada?

Mr. H. D. W. Wethey, Director, Engineering Branch, Post Office Department: We are quite familiar with what is being done in Britain. A great deal more mechanization and automation of the mail can be done there because with their larger centres and larger volumes it is economical. We have in fact some of the elements that you have just described in Canada for the segregation and automatic facing up and cancelling of mail. We have sorting equipment for parcels, although not yet for letters.

In the larger centres, where the best economies can be achieved in mechanization, Montreal and Toronto, the present state of the buildings is such that there is not room for mechanization and our efforts for those two cities at the moment are being bent towards the production of facilities which can contain mechanization.

Senator Kinnear: Thank you. I know that there is something wrong in Toronto, because I live in the Niagara area and I have not had mail under three days from here to Coburn, Ontario, which is just sickening. It has to go around Lake Ontario and get into the Niagara area. Also, I noted the Postmaster General admits the slowdown on March 5 at Toronto and Montreal; the problem is inadequate facilities; the volume has increased 85 per cent. You are the engineer?

Mr. Wethey: Yes.

Senator Kinnear: Are you planning any improvement in space, and when?

Mr. Hobbs: We have a project on to study Toronto and we have already completed the data collection phase which will tell us where the mail moves from outside the city into it, from inside out of it and within the city. We have our plans made and by the end of this year we hope to have the location of new facilities identified on the grounds of economy and speed of transportation between these centres. We hope to use exactly the same techniques we are using in Toronto, and in Montreal at a later date.

Senator Belisle: Mr. Chairman, can I ask a supplementary to this? Referring to the sorting of mail in Ottawa here, for instance, I presume that you have a central place where all mail comes in and then is distributed?

Mr. Wethey: This is correct.

Senator Belisle: Would you answer this question? Approximately a month ago a letter was sent to me from Sudbury addressed "Senator Belisle," but instead of being sent to 403 Simpson Road it was sent to 403 Alta Vista. I got it ten days after it had been forwarded to "7 Belisle," and it was addressed "Senator Belisle." Finally it was sent ten days afterwards to the Senate here.

Senator Kinnear: Just to point out the other side of the picture, today I sat alongside a lady from Mexico at lunch and she told me that they received a letter in just over 24 hours from here to Mexico City. I said, "I can almost walk home and it takes me three days to get mail." I do not mean to be facetious; those are just facts.

Perhaps you could describe now the model referred to on page 10 of your brief. This might help us to understand what you are doing, the development of a model for simulating the complete processing network?

Mr. Hobbs: Yes, I think I can describe that reasonably well. We know when mail comes into the Post Office in bags it must first be emptied from these bags and culled. These bags are emptied. Then the contents are culled, separating letters from small packets. Then the letters move through facing, cancelling and processing. Each of these is an operation which takes time and people and you can put a time value and a rate of processing to each one of these. You can

simulate this in a computer model and you can provide the link from process to process by imagining what would happen if we had a conveyor belt there moving at a certain speed.

You can virtually build a model of the network, representing the flow of letters through the post office. By running this model you can, if you insert given processing rates, find out how long it will take the mail from the time it comes in until the time it goes out and you can identify those areas where you need to improve your processing rate so as not to cause a bottleneck. This is basically what the model does.

Senator Kinnear: A great many people handle mail. A computer like they are suggesting for England not only sorts the incoming but the outgoing mail and would reduce the manpower to about one person. Now, I do not think we want to be too fast in adopting that method unless you have other jobs in sight.

The Chairman: Before we go on, Senator Kinnear, can I ask a supplementary question about this model? When did you start to develop this?

Mr. Hobbs: Which one are you referring to; the first or the second one?

The Chairman: The first one?

Mr. Hobbs: We started the docking model in 1966, shortly after the operational research branch was formed. It was operational in 1967.

With regard to part (ii), the development of a model for simulating the complete processing network of the internal workings of a post office, that was started in 1967 and was completed in September 1968.

The Chairman: Do you not think that we were a little bit late in starting these studies and using, or at least developing and adapting, these new methods to our own system?

Mr. Hobbs: Sir, the branch was only started in 1966, so that really I do not think the department as far as I am aware had a capability to do this prior to that date.

The Chairman: No, the department existed, so why was the branch established that late?

Mr. Hobbs: I do not know, sir; that is when I came to the department.

The Chairman: Then we have developed the method and we do not have the housing facilities now, so we will have to wait?

Senator Kinnear: Apparently the housing facilities are very short. Then, also, I notice in the Toronto Globe and Mail of Tuesday of this week that private mail delivery service has been started in British Columbia and will move east. It is by the same company which started in Oklahoma, and somewhere I read, and I believe it to be true, that private enterprise can make money where other corporations cannot. Have you gone into this business and looked over what they are doing about providing mail delivery? Do you think it is a good idea?

Mr. Hobbs: I think that is a question for Mr. Myers.

Senator Kinnear: And will it spread throughout Canada?

Mr. R. D. Myers, Acting Director, Postal Service Branch, Post Office Department: What is happening here, of course, is that private enterprise is looking at the best part of the business where they can make a dollar. We are now going into the market research business to take a look at the whole thing. There is no question, in my mind at least, that a competitor can select any given portion of the business and make a profit on it. We are looking at the total business of the Post Office. Traditionally we have been in, for instance, the savings bank business. We are out of that now because it is no longer economical, and the private sector looks after this end of things more economically than we do. I do not think that that is a bad thing.

Senator Kinnear: Do you mean going out of the savings bank?

Mr. Myers: I mean private industry; if it becomes more economical for them to do it then I see no reason at all why they should not.

Senator Carter: Could I have a supplementary here?

The Chairman: Were you finished with your answer?

Mr. Myers: Yes, except I would like to make this one point, that I think we are probably going to become a great deal more competitive in the future when we get this kind of study organised and are able to handle larger volumes.

Senator Kinnear: I am still not quite sure that you have done an investigation into how the private mail delivery is working and whether you recommend that it be continued across the country?

Mr. Myers: If I understand right, this particular private mailer, he is doing nothing more nor less than what has gone on for as long as I certainly can remember. We have firms in almost every city in the country who deliver householder mails, samples.

Senator Kinnear: This is not door-to-door delivery then?

Mr. Myers: Oh, yes.

Senator Kinnear: I thought you meant taking it out to mailing boxes throughout a city; is he doing that too?

Mr. Myers: No. This company, as I understand it, is in the door-to-door business and is handling householder advertisements, samples, and so on. I think it has been called "junk mail," the kind of thing that we find a little expensive to handle.

Senator Kinnear: Thank you. I did have a question on junk mail here. The greatest complaint today that I hear about is the amount of mail that is discarded. Each time we receive mail there is so much advertising and so many free gimmicks, and so on, that waste paper baskets are filled with it. Is that the kind of mail you think can be handled more cheaply by contract?

Mr. Myers: I am not sure that it necessarily is done more cheaply by private industry. You see, there are several types of mail. The mail that goes around to every household in the district without an address and is simply delivered from door to door without pre-sorting can be done relatively cheaply by a private firm if it hires labourers at the minimum wage rate. This tends to become a sideline for us, because we are in the business of sorting addressed mail, but it does not necessarily mean that in the sum total that industry can, just by virtue of being a private industry, do it more cheaply than we can. But this is the mail that I am referring to.

The Chairman: Would that include political propaganda?

Mr. Myers: It could.

Senator Carter: I think you have just about answered my supplementary. What I was concerned about is. If I understand you correctly, you said you were looking after the whole picture before you plunged into this. It seems

to me that you could very well farm out the "cream" to a private company and then be left, like the trains, where the trucks and the express companies skim off the cream.

The Chairman: Or the CPR.

Senator Carter: Yes. The trains are worse off than they were before, and this could very well happen to the Post Office Department.

Mr. Myers: This is really precisely why we are going into the market research business, because traditionally this is exactly what has happened. At one stage in the game the Post Office was the communications business in Canada, and as the newer media came along they took over bits and pieces of it—this has been true down through history with the telephone, the telegraph, and so on. Express companies, for instance, have with their present structure deliberately selected the most profitable end of the parcel handling business and left us with the rest.

We think that we need to look at the total picture, hence the market research, to simply see where we can fit in and do the most efficient job, because we after all do have an enormous distribution system and it is up to us to find the most efficient way of utilizing it.

Senator Robichaud: I am sure that the Post Office Department is receiving a lot of complaints about delays in mail delivery. Now, what I would like to know is how much effort is being done on the part of the department in order to investigate and find, exactly pinpoint, the reasons why these delays occur. I will give examples which are so evident.

If you go down on Tuesday morning, say, after 10 o'clock, after the first mail has been delivered to the reading room of the Senate or the House of Commons, you will find out that the latest newspapers on hand from the Maritimes are dated probably Thursday of the week before, which is five days late.

Now, at my home I receive two of those papers and on Monday I get the Saturday's paper.

Now, why is that? There must be something wrong, because those papers are published at the same time. They must be delivered to the post office at the same time. They are second-class mail. There I get it in about 24, or 36 hours, whereas it takes about 5 days for the newspapers to reach the reading room of the Senate or the House of Commons here.

Mr. Hobbs: I can say that we have a newly appointed director just recently who has been charged with looking into this type of problem and hopefully he will be able to solve it.

Mr. Myers: I would have said precisely this, that besides the long range problem we have right now, there are improvements being made every day in the situation you are describing. But it does remind me of a situation that I happen to know about. Some Maritime paper, or perhaps papers, and I cannot remember which ones now, were mailing the papers for the Senate and the House of Commons in with the Ottawa city mails. This is quite a different practice in our organization. So it got into the city process and went around the merry-go-round a little bit. As you know, you have your own post office and by the time it gets here I can see a delay of a day or two anyway. I am not going to explain 5 days.

Senator Kinnear: I think it is a terribly serious matter. I had to phone home because I was looking for an important piece of mail. I said, "Do not send it now, because I do not know if I will get it. I am leaving for home in 7 days and if you mail it it is going to take me 7 or 8 days to get it." However, I noticed that you said earlier that the mail for computer service needed to be in a condensed area of population and probably a small country. But this is what they say about Australia, which is anything but a small country. It was reported in the New York Times of April 9, 1968, that Australia is also introducing electronic aids. An Australian-invented electronic mail sorting system now being used in Sydney is so fast, efficient and economical that postal officials predict it will soon be installed in post office operations around the world. It is claimed that the system operating in Sydney sorts letters at the rate of up to 300,000 an hour into a memory bank of as many as 50,000 coded destinations within the post office.

Mr. Wethey: This is quite true. I have seen this installation and it is an excellent one. It was put into a brand new building especially designed to contain it. We are unable to put in a large-scale letter sorting installation in Montreal and Toronto until such time as we have buildings properly designed to take them.

If I may, I would like to add a bit about postal mechanization in general. Mechanization with materials handling, which is a matter of lifting the mail up and distributing it

and that sort of thing, is extensively used in Canada and there is no difficulty with it, but the automization of the mail processing—that is the facing, cancelling and sorting—is an extremely difficult and uneconomic operation.

In industry if you are automating to make engine blocks or to fill boxes of corn flakes, the product with which you are dealing is one of uniform size and characteristics. If by chance there is some engineering or machine problem caused by the object with which you are dealing, it is under your control and you can alter it a bit to make it more easily machinable. In our industry, however, we are at the mercy or whim, as you might say, of the mailer and we are trying to apply modern techniques to a product the characteristics of which we have absolutely no control over at the moment.

Neither from an economic point of view do we have control over the volumes that are going to arrive at our plant or when they are going to arrive. I am sure you will realize that for the economic use of expensive machinery the ideal thing is to have a steady flow throughout the 8-hour shift or the 3 shifts of 8 hours in the 24 hours.

All postal administrations are faced with this difficulty. In the past the tradition has been that the operating people have come to the engineer and said, "We have a problem; would you please put wheels under it and mechanize it." Some of the best brains in the world in postal administrations have been bending their efforts towards this for a number of years, and none of them have a completely satisfactory or economic system.

Work is going on now in the Universal Postal Union and, in individual governments, towards the standardization of envelope sizes and, coming after that, the limitation within certain restrictions of colours of envelopes, because when you get into sophisticated equipment, not only are the letters handled mechanically, but they are read electronically and sorted through the use of a computer.

Our tradition, I suppose, is that mailer may mail whatever he likes in any form, but, like everything else in modern civilization, we are being closed in by the demands of the machine. Therefore, to make progress in mechanization we must do two things. We must first bring the range of things to be dealt with within the orbit of the machine. Then, having done that, we must bend efforts to make machines better than they are today in this field.

Senator Belisle: You are presently constructing a new building beside the Union Station at Alta Vista for sorting mails. Are you thinking of equipping it with the best of machinery?

Mr. Wethey: With the best available at the moment.

Senator Belisle: Is it available Canadian, or would it be at par with Australia?

Mr. Wethey: There would be nothing in it at the moment for letter sortation, because we ourselves are not satisfied yet that the systems used in Britain and Australia, which involve an operator coding on the envelope with phosphorescent dots, the destination of the letter and the letter being scanned electronically are the best for our purposes. We would prefer, since we are not at the moment being forced into it, to wait till the optical character reader is developed further, where the address is read directly.

Having a keyboard operator to code is something like the situation in the computer business where you must have a keypunch operator. Today that is being eliminated, and optical character readers are going to read documents directly and thus dispense with the intermediate human intervention. We are trying to do the same thing.

There will be in the new Ottawa terminal the most modern equipment for facing and cancelling of letters, and for sorting of parcels.

Senator Carter: You are designing the building, I presume, so that you can utilize these techniques when they come?

Mr. Wethey: Exactly; the floor loading is ample to take letter sorting machines, and the space and facilities are all there so that when automatic letter sorting is economically sound for us to use we will.

The Chairman: But why do you say that you are not forced to do this now, while other countries like Australia have already done so?

Mr. Wethey: The Australians have done it in Sydney, which is a very large city. At the moment it is not economically sound to go into it in a city like Ottawa with existing letter volumes.

Senator Kinnear: Could you try Toronto instead of Ottawa, with Toronto having a

population million and three quarters and Ottawa about three hundred thousand?

Mr. Hobbs: I think once we have our facilities located strategically, the problem at the end of this year will be passed to the engineering branch. I am sure Mr. Wethey is going to consider just this.

Senator Kinnear: I did want to ask one other question about the speed of mail delivery. How is the mail carried? Is it by air, or are you still using rail and truck, too? What are the percentages? Are you using helicopters at all from airports to postal department?

Mr. Myers: I do not know what percentage is carried by rail.

Senator Kinnear: You could almost guess, I would think, whether aircraft is used more than train?

Mr. Myers: For first-class mail, without any question; all first-class mail goes by air if it is faster by that method.

Senator Robichaud: Five days from Halifax.

Mr. Myers: Slow airplanes!

Senator Kinnear: What about trains? To what extent are trains used? Do you use them for newspapers?

Mr. Myers: Newspapers, parcels, circulars.
Senator Kinnear: What about trucks?

Mr. Myers: We use any sort of transportation, whichever is the most economical or provides the best service.

Senator Robichaud: Is there quite a tendency now on the part of the Post Office Department to transfer from train to trucks, particularly for distances within, say, a hundred to two hundred miles? Are trucks used more than trains now for such distances?

Mr. Myers: I think that is fair, yes.

Senator Belisle: Do you use piggyback also?

Mr. Myers: Yes, we use piggyback, or containers. We certainly use containers.

Senator Belisle: Coming back to the engineering branch, what kind of setup have you there? Have you got lathes and machinery? What kind of a staff have you?

Mr. Wethey: I will give you a very brief prepared comment, if I may: Research and

Development division does research and development concerning post office equipment and new mechanical, electronic and electrical mail handling machinery. It also investigates and reports upon the suitability of various types of existing new equipment, on related materials and processes and it makes recommendations concerning their adoption.

When a specific mail processing machine is selected from outside Canada it must be evaluated on live mail as it exists in Canada. This is done by the Research and Development division, either in our postal laboratory at our headquarters in Confederation Heights or in a working postal terminal.

It is a rather interesting fact that you cannot simulate live mail; you must do your testing and evaluation on live mail, and sometimes this is done at the expense of the speed of the mail but it is a thing with which we must put up.

Even dead mail, oddly enough, does not behave in the way that live mail does. I do not think people fully realize this. Dead mail loses its resiliency, and if it is being handled in letter form at high speed it does not "fly" in as nicely as live mail does.

Also this division is our technical liaison contact with other departments, with manufacturers and with research and development departments of other postal administrations. We keep abreast of what is being done in post offices in most of the advanced countries of the world. We husband our limited resources in research and development by ensuring that we do not duplicate fields already being explored by other countries.

Through the universal postal union and our own personal contact in the United States, Britain, Australia, Germany, Switzerland and the Netherlands we have easy access to the latest developments at no cost, but we also contribute our knowledge and developments in return.

In addition, this division manages controlled tests of materials and equipment as required by the post office. It operates a research workshop for the production of prototypes. I might say with respect to both of our workshops that we follow rigorously the Glassco Commission recommendations on make or buy; we do not manufacture things if they can be economically bought outside.

This gives you in a nutshell what the research and development division does. It has a small one; its total strength is 22.

The Chairman: Since when have you operated these shops?

Mr. Wethey: Since 1961, when we moved out to our new location at Confederation Heights.

Senator Bourget: What you do there, if I understand it, is to make the design yourself and develop the machine. Then if it is found acceptable, you ask a company to produce it?

Mr. Wethey: This is quite correct, but I would like to make it clear that we are not at the moment engaged in developing large, expensive, or complicated machinery; it is more in the line of perfecting and re-developing standard equipment, things like letter sorting cases. One small example is the bag rack, which traditionally has been made of welded pipe and is an expensive and bulky thing to ship and to store.

We have developed a new one which goes together with pieces of bended pipe, something like the tail piece of a car exhaust system. It can be assembled with a few simple bolts, a little like a child's tinker toy set. Actually, it will give you a variety of racks which, for shipment and storage, come in separate pieces to save space.

Senator Bourget: Whenever you have some difficult problems or you want to improve some kind of machine that you use, do you ask some private organization to do research or do you seek help at the National Research Council?

Mr. Wethey: Yes, we do indeed. We do not try to build within our organization skills or talents that can be obtained outside.

Senator Bourget: Then, how much of the funds expended in your engineering branch go out as extramural research?

The Chairman: Or development?

Senator Bourget: Or development?

Mr. Wethey: I would say a negligible amount; I am afraid I do not remember what in detail is shown under that heading. The table that we had in the brief showing amounts spent is practically all for internal. The big part is salary for employees in the division.

Senator Bourget: But whenever you transfer a research project to NRC does NRC charge the Post Office Department for it?

Mr. Wethey: Not in my memory do I Development Limited, and if it were a remember giving anything in this particular way to NRC. They certainly would charge if we wanted a service. They have a schedule of fees under which we would pay them but, as I said earlier, we are so well acquainted with what is going on in the rest of the world that we do not have to do a very great deal in the intricate and expensive machinery side at all, and I think it better that we do not.

Senator Bourget: And you avail yourself of research that is conducted outside this country?

Mr. Wethey: That is right.

Senator Bourget: Very much so?

Mr. Wethey: Yes.

Senator Bourget: As far as machinery that you need is concerned?

Mr. Wethey: Yes, sir.

Senator Bourget: In the research that you have been doing in your engineering branch have you developed some patents?

Mr. Wethey: Yes, I think a small number, about 7 patents—some of them to do with the handling of pieces of mail at high speed.

One had to do with a special lock for mail bags. The lock operated quickly and easily. Another had to do with a theft-proof mail receiver for the wall of a small post office.

We did have complaints that sometimes on weekends naughty boys would open the receiver and take a stick with a piece of chewing gum on it and poke down and retrieve letters that were dropped in. So we invented a device which as you opened the door to put your letters in brought a slide down at the back, something like the night depositories in the front of a bank.

Senator Bourget: Has this patent been licensed to some private company?

Mr. Wethey: We passed the design to the Department of Public Works, which is responsible for providing this equipment to buildings. I must confess I do not know what they have done about it.

Senator Bourget: Are there other countries who have been interested in that particular patent?

Mr. Wethey: There may have been. We have dealt through Canadian Patents and mail boxes on a certain side of the road.

marketable patent I am sure that we have.

Senator Bourget: But you are not aware of

Mr. Wethey: I am not aware of this particular thing.

Senator Bourget: And the patent was taken only here in Canada and not in other countries?

Mr. Wethey: To the best of my recollection.

Senator Bourget: And you have not talked to private industry to find out if they would be interested in developing that kind of a patent so that they could get some revenues, and indirectly the department could also get some revenues?

Mr. Wethey: I must confess we have not, to the best of my knowledge, in this particular thing.

The Chairman: It would be, I suppose, the specific responsibility of Canadian Patents and Development Ltd. not only to see that this patent is used but also to derive the revenues. It would not go to your department?

Senator Robichaud: When we drive through rural areas where rural routes are established, we see all kinds of mail boxes. I remember in the old days they even used discarded nail kegs. They do not have them any more, because they are not used for packing nails. Some mail boxes are on the road, others are on the side of a ditch-you see them all different ways. Are there any postal regulations to determine the use of such boxes, and particularly the way they should be placed?

Mr. Myers: Yes. We have regulations about this but they all relate to the size, to weatherproofing, and this kind of thing. We do not interfere with the citizen's right.

Senator Robichaud: Who could enforce such regulations?

Mr. Myers: We police it all right.

Senator Belisle: Do you deal with the municipality?

Mr. Myers: No, it is private.

Senator Belisle: But you make your request through the municipality that you want the

Mr. Myers: I am not at all sure that we even do that; we are talking of the rural mail boxes?

Senator Belisle: Rural mail, yes. I was a mayor 15 years ago and I received a communication from the Post Office Department requesting that rural mail boxes be placed.

The Chairman: Did you comply with their request?

Senator Belisle: Yes, we did, and we had some arguments with rural mail box owners. We passed a bylaw in Sudbury.

Senator Carter: I wish one of the witnesses would explain this last column of figures at the bottom of page 5 dealing with funds expended. It is under your research and development division—expenditures associated with scientific activities. Under the heading of capital, you have, \$5,000.00 for 1962/63; \$15.7 thousand for 1963/64; \$21.3 thousand for 1964/65; only \$1.1 thousand, 1965/66; \$3.8 thousand, 1966/67. Then you jump up to \$60.5 thousand all of a sudden. There is a very great lack of uniformity there. I wonder what is behind that?

The Chairman: Of course, these are capital expenditures. They are irregular by their nature, but I am sure that we can have an answer.

Senator Carter: Yes, but there is a tremendous discrepancy from one thousand all the way up to sixty thousand.

The Chairman: You may even have constructed buildings for the purpose of research and development.

Senator Carter: As I understand it, this is all capital, expended in connection with research and development.

Mr. Wethey: I am sorry. When I said that a part of the duty of this division, although its title is research and development, is to evaluate equipment obtainable from other countries and a part of that evaluation is buying one or two of these equipments. This has to do with the purchase of facer, cancelling equipment.

Senator Carter: So this represents the prices of the equipment that you were testing in any particular year?

Mr. Wethey: Yes, this is correct.

The Chairman: In connection with this, if I may be allowed, on the top of page 6 you have \$105.00 as funds for university education. What can you get for \$105.00 in terms of university education?

Mr. Wethey: These are courses where under Treasury Board regulations if a person wants to improve himself he may register for a night course and at the successful completion of the course half of the fees are repaid by the department: That is what these are. Our people in their own time are improving themselves.

Senator Kinnear: There are not many availing themselves of the opportunity.

Mr. Wethey: We have in the division only five or six engineers, in a total of 22 people.

Mr. Hobbs: If I could make a general statement on the cost of the evening courses, I can tell you that the one I took the year before last cost approximately \$100.00. I think this is normal for evening courses, and if the department refunded half of the fees this would be \$50.00, so that the sum of \$350.00 in 1963 to 1964, for example, would represent 7 men taking courses.

Senator Carter: Could I come back to page 3, paragraph (h) where you talk about the feasibility study and the advantages of a Crown Corporation? I am one of those people who think Crown Corporations should be kept to a minimum because they are buffers between the Government and the people, and particularly where the Government is performing a public service. It is only a few days ago, or a couple of weeks ago, that the Postmaster General came out with some new changes, new regulations, with respect to the mail; and there was quite a little outcry about it and he had to backtrack on some of it. I wonder what would have happened if we had a Crown corporation? Is that a part of your feasibility study?

Mr. Hobbs: Not as far as I am aware.

Senator Carter: How long has your study been going on?

Mr. Hobbs: I have a list of the studies here. We did small preliminary studies in October and we actually got on to the true studies, identifying the actual studies that we ought to do, starting in November.

The Chairman: Was not that a recommendation of the Glassco Commission?

Mr. Hobbs: I do not think it was.

Senator Carter: Are there other countries in the world where the post office has been replaced by a Crown corporation?

Mr. Hobbs: It is certainly being considered in the same way that we are considering it.

Senator Carter: Where?

Mr. Hobbs: In England.

Mr. Wethey: The United Kingdom—and there is a commission report in the United States, where a recommendation was made that the United States post office should be a commercial corporation.

Senator Carter: Do you have access to their feasibility studies? Are they further advanced than we are?

Mr. Hobbs: We have access to all the documentation concerned. Furthermore, Mr. Wilson, who is special adviser to Mr. Kierans, was over in England a few weeks ago and discussed this quite fully. I personally have not examined all the documentation, but I understand it is there.

The Chairman: Why was it not in the Glassco Commission Report? Was this recommendation contained in the Montpetit Report?

Senator Belisle: I believe it was.

Mr. Hobbs: I have read it, but I do not recall it.

Senator Bourget: Are those studies made by the department itself or do you intend to get the help of some outside organization because it will be, we understand, a very long study?

Mr. Hobbs: We do have the help of an outside organization at the present time. We identified six specific studies that we are working on with the firm of Kates, Peat, Marwick. In our preliminary studies, we identified these six studies as being so interrelated that they should be done with one company.

We did identify other studies which we hope will lead to improvement in our service in the very near future, and these are being let to other companies, other consulting companies, other than Kates, Peat, Marwick.

Senator Bourget: Do you have any deadline to complete them?

Mr. Hobbs: Yes, sir. We have a deadline for the completion of these studies and it is in August-September of this year.

Senator Bourget: For asignment and report?

Mr. Hobbs: This is a study to see what the implications of a Crown corporation would be. Perhaps I should say that it will lead to blueprint which will guide us in one direction or the other. This would not include, of course, any implementation.

Senator Robichaud: On page 6 of your brief you refer to research policy and you state that programs and projects are initiated and priorities are established according, first, to the needs of the postal operation service. Well, there is no question about the needs of the postal operating service. Secondly, the potential economies to be achieved—there is no question about that. And then, the third point, the acceptance by the operating staff of proposed changes. My question is whether you encounter much reluctance on the part of the operating staff? I would leave Saturday's delivery aside for the moment. However, do you encounter much reluctance on the part of this staff in accepting changes?

Mr. Hobbs: If these changes are well explained and are made perfectly clear, I would say no.

Mr. Wethey: May I add that we have adopted a policy so far as the engineering branch is concerned of introducing mechanization gradually with a careful course of explanation to the people involved. We are quite aware of the natural human resistance to change and the fear of the unknown. So we do our utmost to make certain that things are explained and we have had no trouble whatsoever so far.

Senator Robichaud: I see. I will skip No. 3. Coming back to 4, contract administration absorbs as much effort as in-house development for your scale of work, but this does not preclude future development being undertaken as a contractual basis, you say. My question is, if a mail contractor is on a rural delivery route or is transporting mail from one station or post office to another, or along a road which covers many post offices, and is giving good service, why does the department at the end of three years call or almost insist on calling for new tenders? Those people gather experience. They get accustomed to the work, particularly where they have long

routes, say, 50 or 100 miles with maybe 10 or 15 post offices along the way. They get used to that and they get equipped for it. They have the proper equipment and then at the end of three years the Post Office Department will call for new tenders and nine times out of ten, if they follow that policy, they will have to accept the lowest tender, which is much higher than the one which was in existence previously. Why this policy?

Mr. Hobbs: I am not quite sure, sir, whether that statement and the ones following it relate exactly to your question. I think it relates to the scientific aspect of our endeavours.

Senator Robichaud: Well, that may be so, but can you answer my question anyway? Why is the department following this policy?

The Chairman: You ask that as a supplementary?

Senator Robichaud: Yes. This is my main question, really. That is what I was leading to. This has been my experience in the past, and I was in the other place for 15 years and it was my experience there that the Post Office were advising me that they were calling for new tenders. If there are complaints, then I agree that there is justification for that. But in many cases they put people out of business first and then the new tender is substantially lower than the old one that was actually giving the service.

The Chairman: Even if it is outside our ambit, or at least not at the heart of our investigation, this perhaps is a good question.

Senator Robichaud: I ask it because they do mention contracts here.

Mr. Wethey: They had to do with developmental contracts mentioned, and only with

The Chairman: Would this kind of system be more or less forced on you by the Treasury Board regulations?

Mr. Myers: I am not even sure. I believe, however, that the contracts are written for five years now.

Senator Robichaud: Well, that is an improvement, in any event.

Mr. Myers: I am not sure how the next contract would be for more money, though. If the old contractor had his contract for X wanted to ask about? 20093-23

number of dollars, surely he would put in at that rate the next time.

Senator Robichaud: No. He is taking a chance that he might get more money. They are all asking for more money. I am sure the department is well aware that the main complaint they are getting is from contractors who say they are not getting enough money. In many cases it is true, but what will happen when they call for new contracts? Either they have to give it for more money or they have to give it for quite a lot less. But then sometimes after six months they have to call for new contracts again because the contractor finds he cannot operate at that low price. So as I say they have to call for new contracts. This is one of the main complaints in the mail delivery particularly the kind of delivery

The Chairman: I suppose this has something to do with the average duration of parliament. Now that we have a majority government they have extended it to five years.

Senator Kinnear: At the bottom of page 7 where you mention "plastic street letter box"-is that the large letter box in which they store letters to be picked up and distributed?

Mr. Wethey: No, it is a plastic letter box about this high which is mounted on a pole. There is one near the Lorne Building at Elgin and Slater.

Senator Kinnear: Do you have a patent?

Mr. Wethey: No.

Senator Kinnear: I thought you would have. I had not recognized anything made of plastic in that line.

The Chairman: In general when you develop something that is new you would certainly try to have a patent on it would you not?

Mr. Wethey: Yes, if it is something original and new, we would. It would be mainly to protect ourselves from later on being overcharged by someone outside who might patent the same thing if we didn't.

Senator Carter: The list of projects in Appendix D, have these all been completed?

Mr. Wethey: No, some of them have had to be suspended because of higher priority work turning up. Were there any specific ones you

Senator Carter: No. You have quite a list there and I was wondering what period of time they represent.

Mr. Wethey: The year is represented in the first two digits and it started in 1959.

Senator Carter: Most of these or at least a good many of them would be completed by now. How many would be current projects?

Mr. Wethey: I am afraid I would have to start looking at each one in turn. I regret to say I do not have that data in the form in which you want it right now.

Senator Carter: Have you ever done any investigation to find something to replace the mail bags? You say you use containerization—big containers. Are these containers filled with bags and parcels?

Mr. Wethey: In some instances the parcels would be put in in bulk and in others the containers would contain bags.

Senator Carter: Are you convinced that bags are the best available type of container?

Mr. Wethey: No, not from an engineering point of view because a bag is a most awkward shape to handle on conveyers whether vertically or horizontally. But it takes a long time to find anything better, and we have not been in a position to put a major effort into it. There is a mail bag study committee in the department.

The Chairman: This is one committee I did not know of.

Mr. Wethey: There are so many current projects I am afraid we don't always have the time to sit back and think out the long-term uses of things.

The Chairman: How many members are on that committee?

Mr. Wethey: It is a small committee; I would say three or four.

Mr. Hobbs: May I add that some of the studies are being contracted out one of which is aimed at improving our present operation one is a study of containers which is scheduled according to my records here to take four months.

Senator Carter: I would think containers would be a very economical way of handling bulk mail. I was wondering if you could not adapt the container idea to smaller units, something better suited to your operations.

Mr. Hobbs: I sincerely hope that in the four-month study they will solve our problem.

Senator Robichaud: In Appendix E, paragraph 2 you mention:

Bulk handling of mails in wire mesh locked, wheeled containers moving between...

different points. How much is this being used, or is it only in the experimental stage?

Mr. Myers: Some are in regular use—(a), (b), (c), (d)—they all are.

Senator Robichaud: Those mentioned there?

Mr. Myers: Yes.

Senator Robichaud: Is it being done on a large scale or is only a small percentage of the mail handled this way?

Mr. Myers: In sum total it is only a small percentage, but going into the London, Hamilton, Kitchener area represents by far the bulk of the mail moving between Montreal and these points.

Senator Carter: Is that surface mail only?

Mr. Myers: Yes.

Senator Carter: What about Air Canada?

Mr. Myers: We are using Air Canada containers. This is one of the problems we have in this business. You have commercial containers used by railways, trucking and shipping companies, and so on, and generally you have to fit your modules into their containers, but it is not always suitable for us.

Senator Carter: These are developed and owned by the Post Office; these are not containers from the railways like the Air Canada ones? You say you get them from Air Canada, but these wire mesh containers are your own containers, are they?

Mr. Myers: No, in the case of the first one they are C.N.

Senator Carter: You have under Appendix E, section 2: "Containerization... Bulk handling of mails..." Then you have "(a) Montreal, Toronto, Hamilton, London and Kitchener" and so on—(a), (b), (c), (d), and (e).

Mr. Myers: Yes.

Senator Carter: Are these wire mesh containers commercial containers or containers owned by the Post Office?

Mr. Myers: In most of these cases we have developed them ourselves. In the case of the British and foreign post we are using the regular, commercial ship containers.

Senator Robichaud: On the next page, page 2 of Appendix E, you refer to "Government Operated Motor Vehicle Transport", and you say at the present time you are using it in Windsor. Could you comment on that? How is it coming along? Is it more satisfactory?

The Chairman: When was it started?

Senator Robichaud: How long has it been in operation?

Mr. Myers: Windsor has been in operation for a number of years. I am afraid I could not put an exact date on it. The Montreal, Toronto and Vancouver areas are in the experimental stage.

Senator Robichaud: When you say "in the experimental stage", to what extent? Does it cover 20, 25, 50 per cent of the mail handled in those areas, Montreal, Toronto and Vancouver?

Mr. Myers: About 20 per cent, I should think.

Senator Bourget: Have you found that it is cheaper to have this mail handled by the Government or by private enterprise? Have you some statistics on that?

Mr. Hobbs: This work at Windsor has been going on, as Mr. Myers has said, but the evaluation of it is being done in one of our studies under way at the present time, to see if it is economical, and if it can be employed elsewhere and show the same economies.

Senator Robichaud: If it has been going on for so long, and they are only now proposing to experiment with the same system in Montreal, Toronto and Vancouver, cannot we deduce from that that the Post Office department is far behind in adapting to modern methods, or, at least, in assessing the value of a system that it has in operation.

Mr. Hobbs: I believe, sir, that if you put in something like a Government-operated motor transport system in Windsor, you must let it run over several years before you can evaluate it. It has got to settle in, I do not think we have been that tardy.

Senator Belisle: Are you referring to the cost or to the service?

Mr. Hobbs: Well, to both.

Senator Robichaud: You refer here to significant savings in selected areas.

Mr. Hobbs: Yes.

Senator Carter: I should like to ask you about this mechanized money order system. When one goes out to an airport he can write out an insurance policy on a machine. I do not see why we could not have that type of machine for money orders. I am thinking of a machine on which you could fill out the money order, stamp it, and there it is. After all, the getting of a money order now takes a little bit of time.

Mr. Hobbs: Yes, sir. Hopefully our new money order system will answer your question. I understand that we are due to start it next year.

Senator Carter: It will be something along that line, will it?

Mr. Hobbs: Well, our money order will be in three parts with carbons between. You will fill this in yourself, and the number of the office where you bought it will be imprinted on the money order by means of a machine that is rather like a cheque writer. You will, of course, retain your portion and the other portion will be sent in by the Postmaster to our headquarters where we will have a computer...

Senator Carter: Why do you not just send out printed cards. You do not need a machine for that.

Senator Robichaud: Chargex.

Mr. Hobbs: This is one of our competitors. There is a study which was completed just today, and I have not yet seen a report on it, on environmental forecasting. We hope to keep this up to date, to show us what the environment in which we will be operating will be like, and where we can expect significant competition, and perhaps you have put your finger on one of the significant areas already.

The Chairman: Senator Kinnear, do you have any further questions?

Senator Kinnear: I am wondering about the zip code. It seems to be doing a tremendous job in the United States, which has ten times our population. When we are so slow with

our mail deliveries in very important areas of the country, why on earth cannot something be done to remove the difficulties?

Mr. Hobbs: One thing I might say here is that although the American zip code system operates at the present time, I was at a symposium about a week ago at which a gentleman who is considered to be extremely knowledgeable in this field predicted that it would encounter severe difficulties within the next ten or fifteen years because of the way it is designed, and because of the movement of population from one area to another.

Senator Kinnear: Are you considering one for Canada that is an improvement?

Mr. Hobbs: I would say yes, most definitely. We are considering it in our management information study at the present time. I myself have examined a geographic system, and we have a code committee. We put this idea to them and some form of coding is most definitely under consideration, but coding is not as easy as it would appear on the surface.

The Chairman: We have now a pretty good study on the future movement of population in Canada, and I am sure you are aware of those. Our movements may be less complicated than in the United States so I am sure that we are, from that point of view, perhaps in a better position than the United States to develop new methods for this.

Mr. Hobbs: I sincerely hope we are. The methods that we have examined have borne in mind this demographic shift. I think we may come up with a system which may be completely independent of movements in population and transportation. We have to bring a lot of attention to this.

Senator Carter: That is assuming that present trends will continue, but maybe we will have to alter those trends just to exist.

The Chairman: Are you in favour of a dictatorship?

Senator Carter: No.

The Chairman: This is one of the few statistical series in Canada at least which has not changed very much since 1950. I was looking at this just the other day, that the movement of urbanization, for instance, in

Canada has been going up systematically and at about the same rate for more than a century.

Senator Carter: But, it is creating monstrosities.

The Chairman: I agree.

Senator Carter: We cannot permit this. We will have to change.

The Chairman: I agree, but I do not know if the Government will have sufficient powers to alter the movement very much.

Senator Carter: I would not say that. I think economic policy could be designed to arrest it anyway.

The Chairman: In order to send more people to Newfoundland?

Senator Carter: Sure, we have lots of room.

Senator Robichaud: Lots of fish; I do not know about room.

Senator Belisle: Could I move the adjournment?

Senator Kinnear: I am satisfied, thank you. I am not satisfied with the answer, but I am satisfied that we should adjourn.

The Chairman: Before we adjourn, I understand that this move into the electronic age in the Post Office Department is fairly recent. I do not want you to criticize it or to accept it, but this is really fairly recent. In your view at the moment, are you making as rapid a progress as you can? You do not feel any inhibition in what you are doing through any artificial constraint by the so-called manipulators of Government funds?

Mr. Hobbs: No, sir. I just find it very difficult, as I think all organizations do, to find the sort of people that we need to do this work. This is my main problem. People seem to be in very short supply.

The Chairman: Thank you very much indeed. I am sorry that we have to adjourn at this moment. Perhaps we will see you in a couple of years to find out what progress has been made.

The committee adjourned.

APPENDIX "36"

BRIEF TO THE SENATE SPECIAL COMMITTEE ON SCIENCE POLICY BY THE POST OFFICE DEPARTMENT

General Note

The paragraph and sub paragraph numbering used in this submission corresponds directly with the numbers used in the Guideline of the Special Committee, Part II, Section 2, "Content of Submissions"

2.1 Organization

- (a) Appendix A to this submission is an Organization Chart of the Post Office Department in which the units directly concerned are shaded, to assist in their identification.
- (b) The Post Office department reports to Parliament through the Postmaster General.
- (c) Appendix B to this submission is a block diagram indicating the organization of the Research and Development Division.

Appendix C to this submission is a block diagram showing the organization of the Operational Research Branch.

- (d) The Post Office Department has no formal agreements regarding scientific activities, with organizations outside of Canada.
- (e) The Department has no overseas offices.

2.2 Organizational Functions

(a) The function of the Post Office Department is:

within the terms of the Post Office Act, to develop and maintain a nationwide network of postal communications and other services to all sectors of the Canadian community and contribute to the social and industrial growth by providing efficient communications and services at the lowest possible economic price.

While the Post Office Act contains no specific statutory references to scientific activities, it is Departmental policy to apply scientific methods, where possible, to the solution of important problems.

- (b) Standard commercial equipment and processes are employed wherever possible. Where necessary, new adaptions are sought from industry and commerce. Special equipment is developed only if an economic advantage can be shown or if it is essential to maintain a consistent standard of postal service.
- (c) Primarily through the Engineering Branch, the Department monitors and evaluates the development work of other Postal Administrations in terms of its possible value for application in the Canadian postal system. This involves regular personal contact between officials of comparable rank and responsibilities, by exchange of visits, correspondence and reports. The Canada Post Office has no overseas offices or agencies.
- (d) Cost-benefit analysis is used in the selection or design stages of equipment or systems. A service-wide production control programme and cost ascertainment system provide for a regular review. Methods and standards are revised as necessary or where a need is indicated.
- (e) Outside studies commissioned during the past five years, to suggest improvement in the Department's operating procedures, are as follows:
 - (i) Contract Assessment Formula—Development by Stevenson and Kellogg Limited—1963.
 Improve and up-date the methods of assessing the fair value of City and Highway transportation services contracts and establish standards for land mail costs.
 - (ii) Flexible Budgetary Control Programme
 by Stevenson and Kellogg Limited-1964.
 A survey and report with recommendations for a comprehensive budgetary system consistent with Post Office operating requirements.
 - (iii) Cost Ascertainment Programme by P.S. Ross and Partners-1964. The design, testing and implementation of a sampling programme to produce cost and revenue data covering the services offered by the Post Office, with a known and acceptable standard of accuracy. Training Departmental personnel.
 - (iv) Second Class Mail, Cost Survey
 by P.S. Ross and Partners-1965.
 Develop detailed data, covering all cost factors for second class mail, with specific data on certain publications.
 - (v) Royal Commission on Working Conditions in the Post Office Department by the Honourable André Montpetit—1966. An enquiry concerning grievances related to work rules, codes of discipline and other conditions of employment affecting non-supervisory operating employees, exclusive of salaries.

- (vi) Organization Study-Planning and Administrative Services of the Post Office Department by Public Service Commission-1967,
- (vii) SCERT simulations for Selection of a Computer System by P.S. Ross and Partners—1968.
- (f) The Post Office Department's activities and programmes as referred to in this report are restricted to and consistent with its responsibilities and powers in providing postal service and with the highly specialized nature of its operational problems.
- (g) We have not experienced, nor do we foresee new or major hindrances to performing our functions of a scientific nature, as referred to in this report. The subsequent sections of this brief refer in part to specific areas in which we forecast future study.
- (h) We are currently engaged in a study of the feasibility, advantages and possible disadvantages of operating the Canada Post Office as a Crown Corporation. One of the major areas of study is Organization. These studies are just beginning and any attempt to forecast the results would be purely speculative.

2.3 Personnel Policies

- (a) The normal recruiting programme of the Public Service Commission is employed for hiring members of university graduating classes.
- (b) No unique criteria have been or are being developed to help identify those who will be creative and effective researchers.
- (c) Normal employee appraisal and performance review programme is employed.
- (d) The standard Public Service Commission classification review and assessment techniques are employed.
- (e) The standard Treasury policy for extramural education is observed.

2.4 Distribution of Activities

The scientific activities of the Post Office Department, as referred to in this report, and the funds expended in this respect (supplies, materials and salaries) are entirely Headquarters oriented and are made predominantly in Ontario and Quebec.

2.5 Personnel Associated with Scientific Activities

(a) Personnel establishment of units conducting scientific activities. No guest workers, staff-on-loan or post-doctorate fellows.

	Research & Development Div.	Operational Research Br.
Scientific and Professional	5	7
Technical	professions staff 1962	6
Supporting Personnel	10 100000	Divilor all
Waterloo Univ. Co-op Programme	0	4
Summer Students	MCZ - COOL bas arez	2
(b) Professional Staff devoting most of their time to administrative duties	Research Bratch one mem	Janou 3 oqO

(c) Professional Staff Associated with Scientific Activities

		Research and Development Div	Operational R	esearch Branch
		Bachelor Level	Bachelor Level	Master Level
(i)	Country of birth	Canada – 2 U.K. – 2 Germany – 1	Canada – 4 U.K. – 1	U.K. — 1 India — 1
(ii)	Country, secondary education	Canada – 2 U.K. – 3	Canada – 3 U.K. – 2	India U.K. 1
(iii)	Country of University degree		Canada – 4 'U.K. – 1	India — 1 U.K. — 1
(iv)	Work years since graduation	Average -22	Average - 4	major are
	Years in present Organization	Average - 7	Average - 2	Average75
(v)	The Average age	45	30	36.5
(vi)	Operate effectively in Canada's two Official languages	none	60%	none
mber	of staff by year			

(d)

Number of staff by year and level

1902	ost Off & Department as referred		
1964	(suppl be materials and saleries)	Branch	was
1965	anthy is Ontario and Quebec. en	organized	in 1966
1966	6	sociated frith Scient	1
1967	Man Man Can Survey of the Sala	2	2
1968	units anducting scientific activi	lo memididate is	(a) E ersonn
1969		6 6 6	3
1970	8	8	3
1971	8 Development Div	10	4
1972	8	in the PollOffice D	4
1973	8 1966	12 anoisset	4

(e) Turnover of professional staff 1962 to 1968 inclusive Research and Development Division—nil except

1964 - 25%, and 1965 - 25%

Operational Research Branch one member per year. anilovab That Innoissators (d)

Current professional personnel who have been employed	Research and Development Div. Operational Research B			
(i) by industry (ii) on University staff	100% none	43% 14%		
(iii) by Provincial Government (iv) other Federal agencies	none 40%	none 57%		

- (g) There are no staff members on education leave.
- (h) Number of University students given summer employment

Research and Development Division-1967-one

Operational Research Branch-1966-four, 1967-three

- 2.6 Research and Development Division-Expenditures Associated with Scientific Activities
 - (a) Total funds spent (includes salaries, superannuation, space usage cost):

Functions: 1. Intramural Research and Development

- 3. Scientific Information (a) another logical asset
- 4. Testing and standardization

Scientific Discipline: Engineering and Technology (only).

Area of application: (16) Other (provision of engineering support to mail processing)

	Intramural R & D	Scientific Information	Testing
	(thousands \$)	(thousands \$)	(thousands \$)
1962/63	148.2	2.8	Nil
1963/64	215. ±10	3.3	Nil
1964/65	219.1	3.6	2.4 ±1.0
1965/66	207.7	3.9	18.7
1966/67	256.8	4.4	3.0
1968/69	guitaren 209 i era zerutin	column, abov2.6\!!! expend	"Isto T 99 3 (d)

(b) Funds expended:

	Operating (thousands \$)	Capital (thousands \$)
1962/63	146.0	5.1
1963/64	202.6	15.7
1964/65	203.8	21.3
1965/66	229.2	establified according
1966/67	260.4	3.8
New Zealand A		(i) the needs of the p
1968/69	253.0	60.5

(c) Funds for university education:

1962/63		0
1963/64		\$350.00
1964/65		\$350.00
1965/66		0
1966/67		\$ 65.00
1967/68		\$ 15.00
1968/69		\$105.00

Operational Research Branch-Expenditures Associated with Scientific Activities

(a) Total funds spent, or estimated (includes salaries, superannuation, space usage cost and special services).

Functions: 1. Intramural R. & D.

- 2. Data collection
- 3. Scientific information

Scientific disciplines (2) (f) mathematics

(3) (c) economics

Areas of application: (6) transportation

(15) administration

(16) other—postal systems.

Breakdown-in thousands of dollars

Year	Total		Function	to noisi	Scier Disci	ntific ipline	Areas	of Applie	cation
		(1)	(2)	(3)	(2)(f)	(3)(c)	(6)	(15)	(16)
1966	29.5	27	1.25	1.25	24	5.5	5.5	12	12
1967	83.8	75	4.4	4.4	66	17.8	17.8	33	33
1968	137.2	126	7	7	110	27.2	27.2	55	55

- (b) See "Total" column, above. All expenditures are in "Operating" category.
- (c) Funds for University Education: 1968-\$152.00 other years nil.

2.7 Research Policies

- (a) (1) and (2) The nature of our scientific endeavour falls into the category of development. Programmes and projects are selected or initiated and priorities are established according to:
 - (i) the needs of the postal operating service,

- (ii) the potential economies to be achieved, and
 - (iii) the acceptance by operating staff of proposed changes.
 - (3) Yes. The design and installation of a new type of slanted belt parcel sorter (1966/67).
 - (4) Nil. Contract administration absorbs as much effort as in-house development for our scale of work, but this does not preclude future developments being undertaken on a contractual basis.
 - (5) No funding of extramural research.
 - (6) Not applicable in any appreciable degree. No significant difficulties.
 - (7) Not applicable.
 - (b) Not applicable.

2.8 Research Output

(1) (2) and (3)

	Patents Granted	Licenses Issued	Articles Published	Reports Issued (Intra-mural)
1962	1	0	0	0
1963	0	0	0	0
1964	3	0	2	0
1965	3	0	0	0
1966	0	0	0	2
1967	0	0	0	7

- (4) (5) (6) (7) (8) None.
- (9) No significant impact.
- (10) None.
- 2.9 Projects-Research and Development Division.
 - (1) For list of projects 1962 to 1967, see Appendix D.
 - (2) (a) Plastic street letter box. Conceived as a means of reducing maintenance and repair costs, and of improving the Departmental image by adoption of modern aesthetic designs, the box is made from fibreglass reinforced plastic (polyester) in three basic parts using matched metal moulding techniques. The design and development was either performed or administered by this agency, and boxes went into service in 1965. International interest has been shown by the United States and New Zealand Administrations.

- (b) Slanted belt parcel sorter. The concept originated in Australia, and was subject to modification by the British G.P.O. Both sources were recognized when a prototype machine was designed, fabricated and installed in the Winnipeg Post Office in 1967. Considerable difficulties were experienced owing to the configuration of other types of parcel sorting equipment already installed with which the slanted belt machine was required to be compatible.
- (c) Pitney-Bowes Mark II facer canceller. This commercially available machine, in widespread use by the United States Post Office Department was rented for twelve months to permit a detailed performance evaluation to be effected, in Toronto and Winnipeg, in 1966. The results enabled a processing cost to be determined which showed the machine to be economic, and as a result, the decision to adopt it for the Canada Post Office was made.
- (d) Steel sorting cases. Traditionally, all sorting cases for letters have been fabricated from hardwood, and only a limited number of sources are available at reasonable prices. A design has been evolved whereby sheet steel is formed into two basic shapes from which a variety of sizes of case may be assembled. Provisional estimates indicate savings in procurement cost of over 50%.

Projects-Operational Research Branch

- (1) However, a comprehensive description of the work of this Branch as related to the use and/or adoption of existing scientific knowledge, techniques and methods, is provided in the following:
- (2) (a) Forecasting
 - (i) Based on the revenues and costs attributed to each class of mail as determined by the Cost Ascertainment programme, five year forecasts of revenues and costs are made, using econometric methods. These forecasts are based on mail volumes and are used to determine the timing and magnitude of rate changes and for the Programme Review reports.
 - (ii) A computerized forecasting system has been developed which forecasts the manhours to be consumed and total mail volumes to be processed by individual sections within a Post Office for all Post Offices under the Production Control System.
 - The system updates the monthly forecasts each month in the light of the most recent observations and forecasts twenty-four months in advance. Each section's model was developed using regression analysis for establishing trends, Fourier Analysis for seasonal trends and exponential smoothing for adjusting model coefficients on a monthly basis.
- (iii) The Engineering Branch has a standing requirement for the long range forecasting of all significant mail streams in selected Post Offices for the purpose of facilities planning and systems design. Mail volume forecasts have been made for Calgary, Don Mills and London Post Offices using econometrics and trend analysis method. Forecasts were accompanied by growth factors, levels of confidence and confidence limits.

(iv) A personnel forecasting system has been developed for the manpower planning division. The system predicts the number of vacant positions by location, class and level for any specified number of years in advance. In predicting vacancies, allowance is made for departure from the positions by transfer, separation from the public service, retirement and attrition.

(b) Statistical Sampling and Analysis Techniques

(i) A continuous statistical sampling programme has been developed for collecting Cost Ascertainment mail volume data on a national basis every 28 days. The total population of Post Offices was divided into five strata and sample offices were selected within each strata resulting in a two way stratification cluster sampling programme for proportions, means, and ratios.

The mathematical statistical models for the random variables were subjected to a complete error analysis, to determine the sources of sampling and non sampling errors. In order to reduce errors and remove biases, sample sizes were changed and a revised method of analysing the data was developed.

The sample results are edit/audited and analyzed by a computer programme package on a 28 day basis. These results form the basis of the cost ascertainment report produced at the end of each year for the Canada Post Office.

- (ii) A sampling programme was designed to collect data on the arrival patterns and service time patterns of post office vehicles in the Edmonton Post Office. The sample sizes were first determined on an economical time basis and the data was analysed to develop probability distribution patterns. The variance in the distribution was examined on a sequential time basis for significance to determine whether further sampling was required. These distribution patterns were later used as input to a vehicle docking simulation programme. A random number generator was developed for each unique distribution pattern.
- (iii) A scientific method has been used to compute the number of points of delivery made by individual letter carriers on a particular day through the use of multiple regression analysis. This method is used to adjust the workload of letter carrier walks.
 - (iv) A market analysis of the vending pattern of stamped envelopes and an assessment of manufacturing, transporting, warehousing and vending costs was made. From this analysis a new rate structure was developed and implemented to provide the Department with a fixed margin of profit. Subsequently, a second market study was conducted to determine the significant effects of the new price structure and to verify predicted financial return.

(c) Simulation and Optimization

(i) A model was developed for simulating a vehicle docking system for a Post Office. The purpose of this model was to provide the Engineering Branch with a design tool for determining the size and configuration of vehicle docking facilities. The model is capable of simulating a number of vehicle services and can determine the maximum number of dock bays required to provide a specified service with predetermined queue lengths. The input required is the number of hours over which service is to be given, the simulation interval size, a distribution pattern for vehicle arrival rates and service rates and a specified maximum allowable queue length for the design day. The model operates on 360/65 IBM Computer.

(ii) A computerized method of auditing the mail processing capacity of a postal operation was developed on an experimental basis. The model can simulate the present flow processing network and the flow of mail volumes along each path of the network on a discrete time basis. The model compares the capacity of a processing link on a time basis to the actual flow and determines the utilization factor of the system.

Using a stochastic matrix principle, the inputs to the model are moved forward and divided along each link on a discrete time basis. The model operates on an IBM model 360/65.

- (iii) The development of a model for simulating the complete processing network of the internal workings of a Post Office has been considered and is under development. This model will be capable of accepting a number of different mail input sources and processing them in a different fashion. The model will contain transmission links (conveyors, mobiles etc.), processor nodes, preprocess queues, post process queues and buffer storages. It will have the capability of adjusting the processor and transmission capacity based on queue size build up. The transition matrix for movement of mail through the network will be a stochastic matrix operating by successive multiplication on a discrete time basis.
- (iv) The development of a model for optimizing the intra-city transportation and mass processing of mail is also in its initial stages. The objective of this model is to determine the best number, function and location of postal processing facilities in a large city such as Toronto and Montreal. The required input to this model is the intra-city distribution matrix of mail volumes, the transportation costs, processing cost at each facility considered, and constraints on the movement and processing of mail.

(d) Quantitative Analysis

- (i) Using methods of quantitative and statistical analysis, a method of classifying postmasters positions was developed and programmed for a computer. The basis for the study was a survey of some 300 Post Offices in which a large number of variables measuring the activity in a Post Office were recorded and examined. Five significant variables were separated and a model was developed for evaluating the job classification of each postmaster individually based on these variables. The solution to the problem was found by developing a ranking scale and locating each postmaster on this scale through a system of weighting each variable in accordance with its importance and other constraints.
- (ii) A method of determining new levels of mileage rates for personal vehicle used for post office business was developed by breaking the cost of owning and operating a

motor vehicle into significant components. Each component was critically examined to identify the owner cost or operating cost which should be reimbursed. By using a method of weighting economic indicies associated with each type of cost, an overall index of operating cost was developed for the past ten years. Since the weights chosen were subject to error, a statistical error analysis model was developed to determine the sensitivity of the various assumptions made. The error analysis revealed that the final results were only affected within a small margin of error by errors in the major assumptions.

- (iii) The statistical model for the Cost Ascertainment revenue system consists of a two way stratification of three random variables whose product is taken to arrive at revenue estimates for 17 categories of mail. It was necessary to find the most significant sources of error in this model whose components were estimated from continuous field sampling. Using the variance estimates from the sampling programme, the model was subject to an analytical error analysis and each source of error was located and measured.
 - (iv) A number of different types of processes occur in the Post Office since there are many different types of mail populations whose patterns fluctuate due to many outside demands. These demands tend to change the patterns of mail volumes, rates, growth trends, and flow distribution patterns. It is often necessary to fit curves to patterns such as the ton miles of mail moved by air, arrival rates of mail vehicles, average content of highway service vehicle etc. To fit these curves requires the use of regression analysis, logistic curve fitting techniques, Pearson curve fitting technique, trend analysis, etc.
 - (v) Hypothesis testing, variance analysis and non parametric techniques must be employed in many problems in order to test for significant difference between means and proportions to separate sources of variation in processes and to draw sound conclusions from statistical studies.

Projects-Other Branches and Divisions of the Post Office Department

(1) Appendix E to this brief is a list of projects performed by the Branches and Divisions of the Department that are not primarily engaged in research or work of a scientific nature.

The Senate Committee is undoubtedly aware of the difficulties in defining exactly those activities which are to be regarded as "scientific" within the terms of this brief. In cases of doubt we have included the item so as to ensure that the information we provide is as complete as possible and, with the knowledge that any item may be disregarded if it is not appropriate.

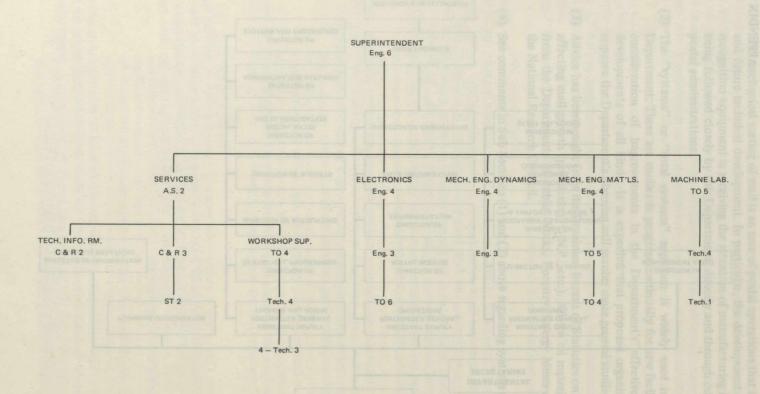
2.10 Effects of Scientific Activities on Post Office Operations

(1) Forecasts of new techniques or equipment will be used for planning and construction of new postal facilities. Information may not affect the new facilities only as far as the kind of equipment, but also as far as mail volume is concerned, e.g., improvements in facsimile transmission may reduce the growth in mail volume. The mechanical sorting of mail is an area of postal operations that is subject to current and future technical development. In particular, the development of optical character recognition equipment is receiving the attention of manufacturing firms. Their work is being followed closely by this Department, directly and through our liaison with other postal administrations.

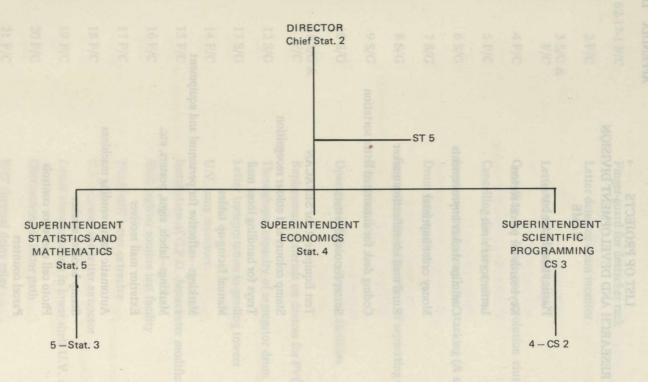
- (2) The "systems" or "total systems" approach is widely used in planning by this Department. There are studies in progress continually for new facilities, which involve consideration of improvements in the Department's effectiveness due to new developments of all kinds. It is expected that proposed organizational changes to improve the Department's planning will involve more general studies of this kind.
- (3) Advice has been sought from the Dominion Bureau of Statistics on forecasts of factors affecting mail growth (population, G.N.P., etc.). Advice on materials has been sought from the Departments of Public Works, Forestry, Energy Mines and Resources, and the National Research Council.
- (4) See comments in Sub Sections (1) and (2) above regarding systems planning.

Science Policy

APPENDIX "A"



POST OFFICE DEPARTMENT
ENGINEERING BRANCH
RESEARCH & DEVELOPMENT DIVISION



POST OFFICE DEPARTMENT
STATISTICAL PROGRAMMES BRANCH

LIST OF PROJECTS

RESEARCH AND DEVELOPMENT DIVISION

PROJECT NO.	NAME	
59-1	Plastic street letter box	
60-1	Keyboards for parcel sorters	
61-1	Letter sorter's rest	
61-2	Cummins stacker improvements	
61-3	Money order imprinter	
62-1	Rural mail identification marker	
62-2	Coding desk for automated letter sortation	
62-3	Sorter for coded letters	
62-4	Test Equipment for SEFACAN	
62-5	Stamp colours and colour recognition	
62-6	Trays for handling loose mail	
62-7	Manual facing-up tables	
62-8	Markings-reflective for personnel and equipment	
62-9	Markings—labels, signs, posters, etc.	
62-10	Exterior mail receiver	
62-11	Automatic stamp vending machines	
62-12	Stamp booklet stacker	
62-13	Photo cell conveyor controls	
62-14	Parcel counters	
62-15	Theft proof snorkel	
62-16	Standing mail box	
62-17	Modifications to SEEACAN	

62-17-1 F/C	Finger-guard for destacker rack
2 F/C	Letter detector beam monitor
3 S/G & F/C	Letter detector beam lamps
4 F/C	Cancelling die head; one revolution clutch
5 F/C	Cancelling-die inking system
6 S/G	Improvements to long letter stacking (& electronic gauging)
7 S/G	Drum feed monitor
8 S/G	Improvements to operation of separating towers
9 S/G	Key extraction
10 S/G	Operation-indicators-repeater facilities
11 S/G & F/C	Replacement materials on devices for PVC cord belts
12 S/G	Through-put capacity of segregator drum
13 S/G	Letter transportation in grading towers
14 F/C	U.V. lamp monitors
15 F/C moitmotest bas i	Installation of G.P.O. destacketer modification kit
16 F/C	Shift register routine test facility
17 F/C	Thick/stiff letter extractor
18 F/C	U.V. scanner and letter extractor
19 F/C	Letter transportation in lower shelf U.V. section
20 F/C	Obstructions in letter path
21 F/C	EHT thermal delay relay
22 S/G	Wide letter extractor
63-1	Special purpose data recorders

63-2	Stamp tagging	
63-3	Group mail box	
63-4	Relay box	
63-5	Mail bag lock	
63-6	Load carrier for electrical tractors	
63-7	Platform trucks	
63-8	*Photo cell conveyor controls	
64-1	Letter bundle banding	
64-2	Slanted belt parcel sorter—general background	
2-1	Background	
Elities 2-2	Concepts	
	Electronic keyboard logic	
	Stamp colours and colour recognition	
	Electrical wiring and logic:	
	Manual Facing-up tables	
	Parcel induction monitor	
	Gate desynch. alarm, indication and restoration	ISF/C _n
	Mechanical keyboard wiring	
	Parcel exit No. 1	
	Ball track selector	
	Gate control system	
	Control console	
	Control wiring	
	Circuit protection	
* D&D Test Project	Standing mail box Special purpose data recorders	

^{*} R&D Test Project

	115 V a.c. primary power supply	
	6 V d.c. power supply	
	12 V d.c. power supply	
	48 V d.c. power supply	
	180 V d.c. power supply	
64-2-5	Winnipeg installation	
	*Parcel sorter No. 1 exit	
-6	Quotations and contracts	
80-0-7	Saunier Duval memory	
-8	Test and evaluation	
-9	Ottawa (R. & D. Div.)	
64-3	*Letter singulator	
64-4	*Porelon stamp tests	
64-5	*Solenoids-stamp vending machine	
64-6	*Theft proof mechanisms	
64-7	*Stamp booklet stacker	
64-8	*Bayonet bag lock	
64-9	*Friden postage meter	
64-10	*Spring motor—stamp vending machine	
64-11	*International face-up and cancelling machine	
64-12	*Cancelling ink settlement	
65-1 xod yddol 11-3	Label and band trough-	
	Letter batching	
65-2	Inks, pad and cancelling	
65-3	*Mechanical keyboard for slanted belt parcel s	
65-4	Tubs and trays for conveyor systems	

65-5 yliqque	*Sorting case labels—Dymo	
65-6	*Tape reader	
65-7	*Pitney-Bowes Mark II and mechanical tables (Toronto)
65-8	*Pitney-Bowes Mark II SEFACAN and mechan (Winnipeg)	ical tables
66-1	Preculling device; bag opening station	
66-2	*Parcel sorter No. 1 exit drive circuits	
66-3	Poster display frame	
66-4	*Prototype parcel sorter	
66-4-1	Gate operation	
-2	Auxiliary gate slaving	
2-3	Memory reliability	
2-4	Induction performance	
-5	Sorter prototype	
-6	Installation performance Phase II	
66-5	Improved lock box stopper	
66-6	*Roneo-Neopost postage meter	
66-7	Container for knock-down bag rack	
66-8 onlidom amilianos bi	Letter carrier bundle tag	
66-9	*Tagged stamps appraisal	
66-10	Label and band trough-E-11 lobby box	
66-11	Improved letter slide-standing mail boxes	
67-1 sorred belt parcel sorrer	Redesign: E-2 Work measurement tray	
67-2 Test Programs 2 10 10	Redesign: Rotary date stamp	

67-3	*Edger-Stacker/Mark II F/C evaluation
67-4 / MITALANDO EDIFIGO	Trough Design—mechanical tables
67-5 YTTV (170A 3)AII	Improved sorting cases
67-6	Redesign: bag racks
Miscellaneous	
65-0-1	Tray shelf for B-2 table
80-0-6	Identification badges Impact testing

PROJECTS

BY BRANCHES AND DIVISIONS OF THE POST OFFICE DEPARTMENT

NOT ENGAGED PRIMARILY IN SCIENTIFIC ACTIVITY

1. All-up Mail Service.

Domestic all-up mail service is the system by which all first class mail is carried by available air service, when transmission by air will expedite delivery, provided the piece does not exceed the limits of size and weight that may be prescribed.

This service first commenced July 1, 1948 when surface letters paid at first class rates, up to one ounce in weight, were given airlift on a space-available basis, due to the limited capacity of the aircraft then in use. On April 1, 1954, the weight limit was lifted to "Up to and including eight ounces" without space limitations. Premium air mail rates applied domestically only to mail weighing more than eight ounces if airlift was desired.

On November 1, 1968, the eight ounce restriction was removed and the service is now subject only to the weight limit of 25 pounds which is applicable to first class mail generally.

2. Containerization.

Scope — Bulk handling of mails in wire mesh, locked, wheeled containers moving between

- (a) Montreal, Toronto, Hamilton, London and Kitchener
- (b) St. John's and Port-aux-Basques
- (c) Montreal and Quebec (traved mail)
- (d) British and foreign posts (Atlantic) and Canada
- (e) Other post offices subject to availability of equipment

Purpose – to reduce terminal mail handling, speed service and reduce costs.

3. Motorization of Letter Carrier Routes.

Commencement – 1959 to certain routes with special delivery problems.

New problem areas -

- (a) Conveyance of letter carriers from Post Office to commencement of route and return
- (b) Expansion of door-to-door delivery in towns having 2,000 points of call but no public transportation facilities
- (c) Continued expansion to suburban areas beyond public transportation

- (d) Increased costs of public transportation
 - (e) Increased demands from employees.

Additional uses or expansion—

- (a) Delivery of relay bundles
- (b) Delivery of parcels(c) Street letter box collections.
- 4. Combined Urban Services.

Scheduling of street letter box collections, parcel delivery and special delivery services to permit combining all three under a single "Transportation" contract.

Advantages-reduced cost and improved service.

Government Operated Motor Vehicle Transport. 5.

Scope—Present—Windsor Proposed-Montreal, Toronto and Vancouver

Experimental operations-controlled simultaneous operation of government owned and leased vehicles by Post Office employees side-by-side with private contractors.

Advantages—significant savings in selected areas.

- 6. Distributing Centres.
 - Definition-a post office located in a city or town in the geographic or socio-economic centre of an area, used as the main receipt and despatch point for a number of smaller dependent Post Offices.

Purpose-to improve processing and delivery of mails for smaller dependent post offices and reduce congestion by by-passing larger terminal offices.

Additional objectives—

- (a) Faster handling of transit mails
- (b) Simplified distribution knowledge requirements for employees
- (c) Improved incoming and outgoing mail services
- (d) Base for development of a postal code.
 - 7 Letter Carrier Route Measurement

Purpose—to determine and assess increases or decreases in individual work loads.

Former basis for route adjustments-semi annual carrier self-check.

New method—developed on the basis of objective time standards and the application of Basic Motion Timestudy.

8. Experimental Issues of Specially Gummed (DAVAC) Postage Stamps.

While DAVAC gum has the advantages of being tasteless, non-curling and positive bonding, its use was discontinued because of the manufacturing difficulties attributed to DAVAC gummed paper.

- (a) Pressure sensitivity
- (b) Soft edges
- (c) The dust Factor

9. Elastic Bands.

Purpose - to replace twine to tie bundles of letters for transmission through the post.

Observations:

Savings per 1,000 bundles

*Materials Labour	\$1.93 3.64	
	\$5.57	

^{* (}bands are reused 6.35 times)

10. Analytical Method of Training Staff.

Major objective -

- (a) improve accuracy of letter sorting
- (b) reduce time to bring personnel to a satisfactory production level.

Technique — Exercises to improve perception, recognition, manual dexterity and stamina.

11. Cost Ascertainment.

An accounting system designed to allocate costs and revenues to each class of mail and postal service.

Operation — Employs various statistical sampling techniques as the basis for data collection on a continuing programme to assemble basic data at carefully selected points in the postal service.

Product — An annual report containing pertinent and detailed cost and revenue information on postal activities, mail volumes and special services.

Basic Purpose - Reviewing, formulating and revising postal rates and fees.

Other source material — Census statistics, price index data and wage rates.

12. Standardization of Envelopes.

To introduce Universal Postal Union standards for envelope sizes and the weight of paper for envelopes.

Purposes – To rationalize mechanical and manual treatment of letter type mail within the postal service.

13. Mechanization of Money Order System,

A new money order system is being developed that will speed up service to the patron, permit automated accounting and financial control, and reduce costs of administration.

14. EDP System for Production and Cost Control.

A system of electronic data collection, processing and transmission is being developed to produce, economically, the information required for efficient and effective control of the increasingly complex field operations of the post office. The first system is being introduced in the Toronto Post Office and will be extended to all major post offices in Canada.

By analysis of the statistical data obtained, the Postmaster and Supervisors will be able to forecast mail volume receipts and, accordingly, counteract with effective staffing arrangements.

CONT.

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Other source material - Census statistics, price index data and wage rates.



First Session—Twenty-eighth Parliament 1968-69

THE SENATE OF CANADA

PROCEEDINGS
OF THE
SPECIAL COMMITTEE
ON

SCIENCE POLICY

The Honourable MAURICE LAMONTAGNE, P.C., Chairman The Honourable DONALD CAMERON, Vice-Chairman

No. 38

WEDNESDAY, MARCH 12th, 1969

WITNESSES:

DEPARTMENT OF EXTERNAL AFFAIRS: Marcel Cadieux, Q.C., UnderSecretary of State; James Coningsby Langley, Assistant Under-Secretary of State; D. M. Miller, Legal Planning Section, Legal Division; Jacques Gignac, Head, Cultural Affairs Division; and Marc I. Dolgin, Cultural Affairs Division.

APPENDIX

37.—Brief submitted by the Department of External Affairs.

First Session-Twenty-eighth Parliament

1968-69

THE SENATE OF CANADA

MEMBERS OF THE SPECIAL COMMITTEE

ON

SCIENCE POLICY

The Honourable Maurice Lamontagne, Chairman
The Honourable Donald Cameron, Vice-Chairman

The Honourable Senators:

Aird Grosart Nichol Belisle Haig O'Leary (Carleton) Phillips (Prince) Blois Hays Kinnear Bourget Robichaud TTAMO Sullivan Lamontagne Cameron Carter Thompson Lang Desruisseaux Leonard Yuzvk Giguère McGrand

Patrick J. Savoie, Clerk of the Committee.

WEDNESDAY, MARCH 12th, 1969

WITNESSES:

DEPARTMENT OF EXTERNAL AFFAIRS: Marcel Cadioux, Q.C., UnderSecretary of State; James Coningsby Langley, Assistant Under-Secretary of State; D. M. Miller, Legal Planning Section, Legal Division; Jacques Gignac, Head, Cultural Affairs Division; and Marc L. Dolgin, Cultural Affairs Division.

APPENDIX

37.—Brief submitted by the Department of External Affairs.

THE QUEEN'S PRINTER, OTTAWA, 1949

1-20002

ORDERS OF REFERENCE

Extract from the Minutes of the Proceedings of the Senate, Tuesday, September 17th, 1968:

"The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That a Special Committee of the Senate be appointed to consider and report on the science policy of the Federal Government with the object of appraising its priorities, its budget and its efficiency in the light of the experience of other industrialized countries and of the requirements of the new scientific age and, without restricting the generality of the foregoing, to inquire into and report upon the following:

- (a) recent trends in research and development expenditures in Canada as compared with those in other industrialized countries;
- (b) research and development activities carried out by the Federal Government in the fields of physical, life and human sciences;
 - (c) federal assistance to research and development activities carried out by individuals, universities, industry and other groups in the three scientific fields mentioned above; and
 - (d) the broad principles, the long-term financial requirements and the structural organization of a dynamic and efficient science policy for Canada.

That the Committee have power to engage the services of such counsel, staff and technical advisers as may be necessary for the purpose of the inquiry;

That the Committee have power to send for persons, papers and records, to examine witnesses, to report from time to time, to print such papers and evidence from day to day as may be ordered by the Committee, to sit during sittings and adjournments of the Senate, and to adjourn from place to place;

That the papers and evidence received and taken on the subject in the preceding session be referred to the Committee; and

That the Committee be composed of the Honourable Senators Aird, Argue, Bélisle, Bourget, Cameron, Desruisseaux, Grosart, Hays, Kinnear, Lamontagne, Lang, Leonard, MacKenzie, O'Leary (Carleton), Phillips (Prince), Sullivan, Thompson and Yuzyk.

After debate, and—
The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Thursday, September 19th, 1968:

"With leave of the Senate,

The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That the name of the Honourable Senator Robichaud be substituted for that of the Honourable Senator Argue on the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of Proceedings of the Senate, Wednesday, February 5th, 1969:

With leave of the Senate,

The Honourable Senator McDonald moved, seconded by the Honourable Senator Macdonald (Cape Breton):

That the names of the Honourable Senators Blois, Carter, Giguère, Haig, McGrand and Nichol be added to the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.

ROBERT FORTIER, Clerk of the Senate.

MINUTES OF PROCEEDINGS

WEDNESDAY, March 12th, 1969.

Pursuant to adjournment and notice the Special Committee on Science Policy met this day at 3:30 p.m.

Present: The Honourable Senators Lamontagne (Chairman), Aird, Bourget, Carter, Giguère, Grosart, Haig, Hays, Kinnear, Lang, McGrand, Robichaud, and Yuzyk—14.

In attendance:

Philip J. Pocock, Director of Research (Physical Science)

The following witnesses were heard:

DEPARTMENT OF EXTERNAL AFFAIRS:

Marcel Cadieux, Q.C., Undersecretary of State; James Coningsby Langley, Assistant Undersecretary of State; D. M. Miller, Legal Planning Section, Legal Division; Jacques Gignac, Head, Cultural Affairs Division; and Marc I. Dolgin, Cultural Affairs Division.

(A curriculum vitae of each witness follows these Minutes).

The following is printed as Appendix No. 37:

—Brief submitted by the Department of External Affairs. At 5.30 p.m. the Committee adjourned to the call of the Chairman.

ATTEST:

Patrick J. Savoie,
Clerk of the Committee.

Curriculum Vitae

Cadieux. Marcel Q.C., Born in Montreal on June 17, 1915. BA (Grasset Coll., Montreal, 1936); LSEP, LL.L (Univ. of Montreal, 1939); post graduate studies (McGill Univ., 1939-40). Created Q.C. 1961. Joined External Affairs as Third Secretary August 1941; Third Secretary, London, January, 1944; Second Secretary, Brussels, February 1945; Ottawa, March 1947; First Secretary, Paris, September 1951; attended courses at NATO Defence College, Paris, November 1951; Counsellor, Delegation to NAC and OEEC, Paris, June 1952; Adviser to the Canadian Commissioners, ISC, Indochina, September 1954; Ottawa, March 1955; Asst. USSEA and Legal Adviser, December 1956. Deputy USSEA, July 1960; Undersecretary of State for External Affairs, May 1964. Member of the International Law Commission, 1961. Member of the Board of Governors of the National Film Board. Author of "Le Ministère des Affaires Extérieures"; "Premières Armes", "Embruns" and "Le Diplomate Canadien". Married (Anita Comtois). Two children.

Langley, James Coningsby, Born in Ottawa on May 1, 1922. (BA (Oxford Univ., 1949); MA (Univ. of Toronto, 1950). Joined British Army 1941 (Pte); served in United Kingdom, India; discharged 1946 (Capt). Instructor, Univ. of Toronto, 1949-50. Joined External Affairs as FSO 1, June 1950; Second Secretary, Brussels, October 1952; Adviser to the Canadian Commissioners, ISC, Indochina, November 1955; Ottawa, February 1957; First Secretary, Washington, May 1959; Counsellor, July 1960; Appointed Permanent Representative of Canada to OECD, Paris, February 1962. Ottawa, January 1965. Appointed Assistant Undersecretary of State for External Affairs July 18, 1966. Married (Stephanie King).

Miller. David Miles. Born in Sprinagar, Kashmir, on April 6, 1932, B.Com, LL.B (University of British Columbia, 1957, 1958). Called to Bar of British Columbia, 1959; practised law, Messrs. Campney, Owen and Murphy, Vancouver. Joined External Affairs as FSO 1, August 1959; Third Secretary, Pretoria, June 1961; Second Secretary, October 1962; Chargé d'Affaires a.i., September 1963-August 1964. Ottawa, August 1965. FSO 3. FSO 5 April 1968. Head, Legal Planning Section, Legal Division, External Affairs. Married (Mary Carrick Hincks). One child.

Gignac, Jacques. Born in Shawinigan, Que., on July 24, 1928. BA (Coll. Jean-de-Brébeuf, Montréal, 1949); Th.L, L.Sc.S (Institut Catholique de Paris, 1955, 1957). L. Lettres (Sorbonne 1957), Univ. de Montréal (1957-58); Professor at Coll. Sainte-Marie, Montréal 1958. Joined External Affairs as FSO 1, September 1958; Vice-Consul, Boston, July 1959; Second Secretary, Paris (Embassy), February 1962. Ottawa, September 1965. FSO 5. Head, Cultural Affairs Division, External Affairs, October 1967. Married (Françoise Teisserence). Three children.

Dolgin, Marc Isaac. Born in Winnipeg on March 16, 1940. BA (University of Manitoba 1962-63), B.Comm (Hons) 1964. Joined External Affairs as FSO 1, September 1964. Moscow, May 1966; Ottawa, September 1967. Cultural Affairs Division, External Affairs. FSO 3. Married (Adele Caren Berkowitz).

THE SENATE

SPECIAL COMMITTEE ON SCIENCE POLICY

EVIDENCE

Ottawa, Wednesday, March 12, 1969

The Special Committee on Science Policy met this day at 3.30 p.m.

Senator Maurice Lamontagne (Chairman) in the Chair.

[Translation]

Chairman: Madame, gentlemen, we have the pleasure, this afternoon, of welcoming Mr. Marcel Cadieux and his colleagues from the Department of External Affairs.

Despite his age, Mr. Cadieux is perhaps among the more senior members of this Department and I have no hesitation in stating that he has given long and faithful service to his country.

[English]

The Chairman: I am very pleased indeed to welcome on behalf of the committee, Mr. Marcel Cadieux, the Under-Secretary of State for External Affairs. He is accompanied by Mr. James Langley, Assistant Under-Secretary of State for External Affairs, and Mr. Freeman Tovell, Director General of Personnel Branch, and Mr. David Kirkwood, head of the Office of Economic Affairs.

As usual, Mr. Cadieux will make an opening statement and then the meeting will be open for discussion.

[Translation]

Mr. Marcel Cadieux, Under-Secretary of State for External Affairs: Thank you very much, Mr. Chairman, for your very kind words of welcome. I have, in fact, prepared a statement and, with your permission, I should like to present it.

[English]

We have already pointed out in the departmental brief that although the Department of External Affairs itself does not engage directly in any form of scientific research—here I must explain that scientific is understood in a

rather narrow sense of science in relation to the total sciences, the exact sciences, because in the legal field we certainly engage in some research—the increasing extent to which science and related technological advances have assumed international dimensions, the multiplicity of international organizations concerned with scientific matters, and the complexity of problems created by rapid technological advances, has brought about important changes in traditional methods of approach to the conduct of foreign affairs. This has made this department increasingly aware of the need to keep itself informed on a wide variety of scientific and technical matters, and also to ensure that it is organized that it can rapidly and effectively deal with such problems.

The tremendous strides which have been taken in recent years, not only in space but in advancing knowledge or our own environment, has opened up wide new areas of international concern. A legal framework for preserving the peaceful character of space now exists in the 1967 treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies. The value of the treaty lies in the fact that it points the way toward similar treaties in other areas of even more direct concern to humanity and the need can be foreseen for a series of such treaties dealing with the environment and such matters as the "Ocean Depths", world pollution, cybernetics, as well as a treaty or treaties governing the use of communications and other types of application satellites, e.g., earth resources, weather, navigation, etc., to ensure that the rights of individual countries are protected and of the maximum benefit to all users.

To cite an example of great current interest, one of the important international areas in which Canada is active is disarmament. Nearly every disarmament subject has a scientific dimension and the department frequently requires scientific advice in order to evaluate disarmament proposals. As a consequence, it has developed very close working relationships with the Defence Research Board, Atomic Energy of Canada Limited, the Atomic Energy Control Board, and the Department of Energy, Mines and Resources, as well as the Department of National Health and Welfare. The Department, in co-operation with the Director of Chemical and Biological Defence of DRB is participating with other experts in the preparation of a study for the United Nations Secretary-General on the consequences of the use of chemical and biological weapons. This report, when completed, will be referred to the Eighteen-Nation Disarmament Committee, ENDC, which will consider Canadian proposals along proposals put forward by other countries in this field. In connection with the Comprehensive Test Ban, CTB, there is reason to believe that teleseismology may eventually become a most effective method for surveillance of adherence to a CTB treaty. Proposals for such a treaty are often accompanied by complex technical arguments which only seismologists engaged in this type of research are competent to assess. Nevertheless, our department must be sufficiently well informed on subjects of this kind to be able to determine the value in political terms of proposals put forward by various countries. Canada ranks with Britain and the United States in this field and has made significant contributions to it, both politically and technically, at international meetings. Through the Department of National Health and Welfare, Canada also monitors atmospheric radiation levels and thus assists in the surveillance of the Partial

On the question of nuclear weapons and technology, Canada has taken an active part in the preparation of a recent study for the United Nations Secretary-General on the effects of the possible use of nuclear weapons. This study was related to the Non-Proliferation Treaty, during the negotiation of which the Department frequently called upon the advice of the AECL and the AECB in connection with safeguards provisions and peaceful nuclear explosive services. Canadian interest in disarmament has also been reflected in the very active role taken by Canada in support of measures placed before the United Nations.

Canada is also active in many other areas of United Nations activity related to scientific and technological developments, particularly those aimed at taking greater advantage of the earth's resources for the benefit of mankind at large. Much of Canada's activity has been within scientific programmes sponsored by UNESCO. As a country surrounded on three sides by water, Canada has, quite naturally, shown particular interest in programmes initiated by UNESCO for the study of hydrology and oceanography. In keeping with its broad responsibility for advancing Canadian interests, the Department has been instrumental in securing Canadian representation on the Co-ordinating Council of the International Hydrological Decade, and in the secondment of a Canadian representative, Dr. J. Fulton of the Science Secretariat, to participate in the preparatory work for the Middecade Conference. The Canadiam Committee on Oceanography, although primarily interested in Canadian programs, has been active in some aspects of UNESCO's oceanographic activities. Dr. J. R. Tully of the Fisheries Research Board is Chairman of the Working Committee for the Integrated Global Oceans Station System which is one of the major projects undertaken by the Inter-Governmental Oceanographic Commission. In other areas of interest to UNESCO, a Canadian delegation attended the Biosphere Conference in September of 1968 and a Canadian, Dr. J. M. Harrison, A.D.M., Research, Department of Energy, Mines and Resources, is President of the International Council of Scientific Unions which is UNESCO's chief adviser on scientific matters. While department does not participate directly in the purely scientific work of these organizations, it follows closely the proceedings of each and is active in the decision-making process which determines the organizations on which Canada is represented as well as in the selection of personnel to serve in them.

In another area of interest to our Department which promises to be of increasing importance as time goes on, Canada has participated actively in matters relating to the development of satellite technology and is at this moment directly involved in negotiations for the working out of definitive arrangements for the Interim Communications Satellite Corporation, INTELSAT. Canada has also participated actively in a working group and prepared a joint paper with Sweden on the implications, political and otherwise, of direct

broadcasting from satellites, a development which can be expected to take place within the very near future. The department has also been involved in negotiations in connection with the Government's plans to launch a domestic telecommunications satellite in 1971.

Scientific and technological advances have also given rise to new problems in international law on which this department provides advice and assistance. The recognition of the potential value of the seabed as a source of minerals, food and other resources has involved the department deeply in international discussions and negotiations. Similarly, the development of satellite communications can be expected to raise a number of very complex problems regarding national rights and sovereign jurisdiction as well as difficult questions concerning re-broadcasting, recording and author's rights. Although the department does not necessarily take a leading role in each of the foregoing activities, it has a definite interest in all of them and consequently it endeavours to keep itself well informed on the technical aspects of each problem in order that its advice, when required, will be cogent and constructive.

In keeping with its general interest in economic developments, the department some time ago recognized the role of science as a determinant of economic growth. This has found direct expression within the Organization for Economic Cooperation and Development, OECD, of which Canada was a founding member. The department has had a science counsellor on the staff of its mission to the OECD who represents Canada on the OECD scientific committees, namely, Committee for Research Cooperation, CRC, the Committee on Science Policy, CSP, and the Committee on Scientific and Technical Personnel, CSTP. In carrying out his functions, the science counsellor, through the department, has particularly close working relations with the National Research Council. the Science Secretariat of the Privy Council. and the Department of Manpower and Immigration. The department also coordinates exchanges with other science-based departments and contributes budgetary support to certain scientific programs sponsored by the OECD. Since joining the OECD, the department has participated with other departments and agencies in three major OECD meetings on science held at the ministerial level.

In the field of defence research, Canada has taken an active part in NATO defence science

organizations for many years, as a consequence of which numerous productive contacts have been developed and sustained. Scientific information is exchanged between the Defence Research Board and a number of European countries including the Netherlands, Norway, France, Greece, West Germany and Denmark. Cooperation with Britain has been particularly close.

The department's interest is, however, by no means limited to broadly based international organizations, but is pursued wherever there is a definable Canadian interest. For example, last year Canada joined the International Council for the Exploration of the Sea, whose headquarters are in Copenhagen, after having had observer status for a number of years. This Council, that is, the ICES, apart from Canada and Îceland, is entirely European in membership and is a promising forum for cooperation between Canadian and European oceanographers. With regard to meteorology, the free exchange of meteorological intelligence among the nations of the world, with the possible exception of postal services, is the outstanding example of continuing effective and efficient international cooperation. Canada, as a member of the World Meteorological Organization, participates with all countries of Europe in this Organization. The department has also been active in encouraging cooperation with European countries, bilateral basis with other countries. Scientific exchanges form an important part of our cultural agreements with France and the Soviet Union and the Department also assisted in the conclusion of a scientific exchange agreement with Brazil last year. The department is currently assessing the prospects for the conclusion of scientific agreements with other countries where the level of scientific advancement is such that it would be in the general interest of improving bilateral relations to recommend that scientific exchanges be placed on a more formal basis. In order to ensure that such exchanges, as well as the many informal exchanges which now take place on an agency-to-agency basis are facilitated, the department foresees a need during the next few years for increasing the number of scientific attachés at its posts abroad.

One question which the Department must continuously ask itself is whether or not its present arrangements are adequate to meet

the demands placed upon it for coordinating Canadian external policy in this most difficult and complex field. To this end, the department has an active concern in the work of the Senate Committee on Science Policy and any other initiative aimed at coordination and direction of science policy within the Government. At the same time, the department must carefully examine its own structure to ensure that it is organized effectively to serve the Canadian scientific bilaterally and multilaterally, on numerous other scientific projects related to resources both renewable and nonrenewable, forestry, health sciences, northern research, and the exchange of scientific and technical information. The National Research Council in cooperation with the Department over a period of years has concluded a number of bilateral agency-to-agency agreements, not only with European countries, but with other countries where sufficient interest has developed.

Bilaterally, because of its close proximity and a very great degree of cooperation between Canadian and American industry in the defence field and in many other areas, it is quite natural that scientific cooperation with the United States is proportionately greater than with other countries. However, science knows no international boundaries and the level of Canadian scientific cooperation with countries other than the United States is nevertheless impressive. As has been noted elsewhere, the Department of External Affairs is responsible for the negotiation of treaties with governments and has a role in the formulation of Canadian foreign policy. In the atomic energy field, this has been expressed in formal agreements covering atomic energy safeguards with EURATOM, West Germany, Spain, Sweden, Switzerland and Britain, In addition, Atomic Energy of Canada Limited has inter-agency agreements with national atomic energy agencies in Italy, the Soviet Union, Britain and France. In space, Canada has cooperated with Britain, France and Norway, as well as with the United States, in the Alouette-ISIS Satellite Programme to investigate the ionosphere. Under informal arrangements with West Germany, Canada has recently launched rockets containing experiments for the peaceful exploration of space by West Germany scientific institutes. The Canadian sounding rocket programme has also carried experiments for Swedish and British scientists. In connection

with the proposed launching of a Canadian domestic communications satellite. Canada has within the past few months sent two technical missions to Europe to look into the possibility of increased cooperation in the development of satellite technology. The initial results of these missions have indicated that there are many areas where Canada and European countries could cooperate; in particular, the European Space Organization in which Canada participates as an observer. The opportunities which may present themselves in this particular field are being closely examined at the moment, together with the possibilities of greater bilateral cooperation between Canada and France and Germany with respect to the joint Symphonie Project.

During recent months, a good deal of attention has be paid to the broadening of scientific exchanges on a community. As explained in the brief presented to the committee, scientific liaison and/or negotiation between the official scientific community in Canada and their counterparts in other countries and international organizations has been related to the activities and concerns of various units of the department. While this system has worked well to date, the department, as part of its continuing examination of its operational techniques, is giving some thought to the possible advantages of setting up an office or division which would have the responsibility for departmental co-ordination of scientific and technological aspects of Canada's external interests. Such a new division or office would be able to assist other departments and agencies in avoiding duplication of Canada's efforts in various fields of interest and help them to take advantage of expertise in one area for application to another. It would also provide science-based departments with a central focus within the Department of External Affairs to which their enquiries and communications might be directed. This is a matter of immediate concern to the department and a subject which is now being actively reviewed. Should our further examination indicate that re-organization along these lines would be fruitful, a recommendation to this effect would be put forward for approval.

While it is recognized that the interests of the committee are directed primarily toward scientific matters, it would perhaps not be out of order to add a word about the use of technological devices in the department's operations. The department already makes use of

very advanced electronic communications equipment for advancing its ability to provide missions and delegations with information and instructions, and to ensure that the views and analyses of officers posted abroad become available to the department by the most rapid and secure means possible. However, there are a number of areas, particularly in the administrative field, where the department believes it can improve its operations. The application of computer technology has already taken place in the financial management area. It is intended to apply as rapidly as possible similar techniques to the maintenance of personnel and property records. The advantages of systems of this kind can readily be seen when related to a department with large quantities of equipment and machinery as well as furnishings and other properties at many points overseas.

The department has also been studying with increasing interest the subject of information storage. This relates to the use of computer techniques and technologies for the filing of information which would tend to provide us with relevant background material to assist in the analysis of political developments and thus to enable us to attempt to forecast with a greater degree of accuracy possible trends in international affairs. Experiments along these lines have already been carried out in other countries and we are at present gathering information with a view to determining to what degree they might be used in Canada. This would indeed be a complex system involving the transmission, selective dissemination, storage, retrieval and final disposition of substantive information on international developments. In my opinion, if such techniques can be applied to the conduct of foreign relations, they should be used and certainly I consider them to be worthy of serious investigation.

Thank you, Mr. Chairman.

The Chairman: Merci, monsieur Cadieux. Senator Aird will initiate our discussion,

Senator Aird: Mr. Cadieux, thank you very much for your presentation. It was received by the members of the committee only half an hour ago, and I really have not had time in which to give it consideration, but, read together with the brief which we received last week, I must say that it goes a long way towards answering some of the questions that occurred to me upon my reading of the original brief.

Early on in the first brief it was stated, I believe, that, in effect, your department had no science policy as such, and you relied upon other departments for information and advice, et cetera.

What concerned me, sir, was that there seemed to be lacking in the first paper an attitude towards science, and I note from your second brief, particularly beginning at page 11 and following through to the end, that you seem to indicate there is, if I may say so, an awareness of the contribution that scientific research can and should play. So, after reading the two documents together, I am pleased with what I discern to be your attitude.

Going back, however, to the original brief, it seems to me that its emphasis lay on people; and of all the departments or agencies of government. External Affairs depends primarily on people. It does not matter whether you are in Brussels or in Kuala Lumpur, if you meet a Canadian representative then he is Canada to the people of that country. I would like to divide my questioning, if I may, as between the people abroad and the people at home, and, as a supplement to that, the research facilities available to the people abroad and the research facilities available to the people at home.

First, turning to page 9 of the original brief, under Item 15, Mr. Cadieux-and I trust you have it before you-I was concerned when I looked to see the current personnel establishment, and people on strength by category of personnel, not so much to find that London was vacant at the moment. because no doubt it will be filled, but what about, as you point out in your second brief, Sweden; what about Japan, what about West Germany, and, possibly, what about Switzerland? It seems to me, sir, that these are countries that excel in some specific scientific endeavour. It would seem to me to be just as logical, for instance, to have a man in Sweden, given today's circumstances, as it would be to have a man in some other countries of the world. I think that Canada could very well learn from the centres where there is a genesis and a new thinking. Therefore, my first question-and it is partially answered perhaps, but perhaps you might care to amplify it—is: Do you have specific intentions as related to specific countries? I should be

particularly interested in knowing whether or between you and the N.R.C. as it relates to an not you have any ideas on representation in Moscow.

Mr. Cadieux: In these matters our department is one member of a community that makes recommendations to the Government on priorities as to where personnel should be assigned. We are in touch with the Science Secretariat, the National Research Council and various other agencies. The recommendations are based on a variety of points of view as to where the interest might be in the country concerned. This is from the point of view of the consumer, so to speak.

This has to be reconciled with the allocation of resources, and here different processes are brought into play; there are other priorities that impinge on the resources, and this has to be balanced against these requirements. The end process is the number of posts that can be allocated for purposes of scientific liaison in any given year. Last year we were able to have an allocation of four. In future years we hope it will be possible to have more. Certainly in light of the discussion in this committee and the growing awareness of the importance of science in the development of the country, the development of certain countries and their relevance in terms of significance for Canada, it may be possible to get a larger establishment. At this point I hope that some of the countries you mentioned will be included in the list of those for which appointments can be made.

Senator Aird: Thank you. Would you care to answer perhaps a little more specifically about the U.S.S.R.? The reason for my question relates to testimony we had from the National Research Council on October 23, 1968. It is quite a full document, and in Appendix I, at page 1 they list International Exchanges. The first relates to formal agreements with organizations outside Canada. They say:

(i) Since 1959, the National Research Council has had an agreement with Soviet Academy of Sciences providing for the exchange of (a) three senior scientists and (b) seven research workers each year. A copy of the current agreement is attached (Attachment 1). Also attached is a list of Canadian scientists who have visited the U.S.S.R. under the agreement (Attach-

It is true this is ten years old. Would you

exchange of this kind? Is it working?

Mr. Cadieux: I think it is. I think we have good liaison with the N.R.C. This applies not only in relation to the U.S.S.R. but to any other country in the world. I expect that we will be developing even closer liaison in the future, because this problem is increasing in importance. There is a plan that I have discussed with the director of the council whereby a representative of the Department of External Affairs would sit in on their council subcommittee meetings concerned their international relations to comment, as required and at their request, on the international implications of whatever problems they wanted to discuss with him. I think that will mean a very great advance in the liaison between us.

In the past I have always found that our people in the working level have been very easily in touch. They have attended the meetings as required, and they have been in touch over the telephone and the contacts have been continuing and easy. My impression is quite satisfactory.

Senator Aird: If I might turn then to the people at home. Once again, in your presentation today you indicated that there is a new awareness, an awareness of the necessary back-up here in Ottawa. As I gather from the material, perhaps there is some kind of a scientific division, a scientific adviser who, I presume, would be responsible to you. One of the things that has concerned us in committee, Mr. Cadieux, is the liaison and the reporting. Should a scientist report to a scientist or should he report to a member of the Department of External Affairs? Would it be your view that the suggestion that I understood you to make in your submission is about to come to pass?

Mr. Cadieux: I think the problem has two or three levels or dimensions. In places where you have a scientific adviser there is his relations with the head of mission. How does he gear with the political head of mission? This is the first dimension and here I think a good deal depends on personality, but generally it is a matter of common sense that the scientific man, just like the military man or the commercial man must have some rapport comment on the amount of liaison presently with the man who represents the totality of the Canadian Government, the head of mission. There has to be an understanding as to what the broad priorities and areas are.

On the other hand, there is another requirement and that is that the scientific representative must meet the technical requirements of his department. There is in some cases a need for reconciliating what may be the broad political objective that the head of mission may have in mind as well as the more urgent, more technical and more pointed needs of his own specialized department. It is more technical than real.

With a minimum of good will I have found that in the various posts and various fields this has been worked out so that while in theory you could have conflicts, here in practice, given the minimum of good will and common sense this is workable. This is one area where I think you have a problem of the scientific man reporting, in effect, to a chief of mission, who normally might not himself be a scientist in the technical sense of the word. This is one area.

The second area is at the departmental headquarters. Normally the head of the foreign office, whether myself or any successor, is again not necessarily a scientist in the narrow sense of the word. Whether you had in the Department of External Affairs a division headed by a scientist or a general officer, one has to take into account the specific interest of the Department of External Affairs, that it is not to judge the scientists, and not to pass judgment on their views as to what the priority trends and requirements are.

However, in this field as in other fields, to relate what may be the emerging scientific requirements in the world community with the political requirements of the country or of the world community, is essentially a political job.

Now, what you want to have in this position in the Department of External Affairs is someone who is capable of communicating with people who are immersed more than he is in the substance of scientific work, but this is not particular to the scientific field, because you only have four Assistant Under-Secretaries or five who are covering a great variety of divisions. You have people responsible for economists who may not be economists themselves. You may also have people who are co-ordinating the work of specialists in cul-

tural relations who may not themselves be cultural relations experts. What they must have is an appreciation for the political implications of cultural work. This is the essence and I think it is possible also in the scientific field, but where it is very essential that you should have a meeting of minds is both in the type of people who are concerned with scientific work in External Affairs and the people who supervise them as well as an ability to communicate on the side of the supervisor, an ability to appreciate what the scientific man is doing who is working in External Affairs, and some kind of ability to appreciate the political side of things.

Otherwise, there will be a very serious communication problem.

This is so much so that I think it is not inconceivable that you could have a scientist, who for a while would take an interest in the stream of political affairs and divide his attentions. He could be not only a scientist but perform usefully as a supervising officer in the field of foreign affairs. His job is to marry scientific development and policy in international affairs with the general stream of foreign policy, or you could work at it the other way. This is the second level.

First the missions, then the department and then you have Government. Here you get into the situation where the ultimate decisions are made by the Treasury Board and by the Cabinet committees and Government, Again you may have scientific advisers, but ultimately the decisions are not made by scientists; they are made by people elected by the citizens in the country to decide what are the national priorities. Again, there must be an understanding of what science can do for the country and in terms of its projection abroad. what those abroad can do for Canada and an understanding of what the dimensions are. This is where perhaps the quality of the advice that is given to them and the ability of the people to interpret these things for those who make these decisions, may be a vital link and again the machinery available to the Government to put all these things together and to put into perspective may be an essential truth in the process. I think at the other end that there has to be ultimately a kind of admixture of the expert and the generalist to determine whether it will be possible to arrive at a balance.

Senator Aird: Thank you very much for your very full answer, because it enables me

to perhaps make a simple question. I think you have made the case very clearly that your department should have perhaps the initiative in the recruitment of these scientists who become politicians and advisers, be it economics, science or whatever.

At the present time, as I read your brief, this initiative lies with the Science Secretariat. I am slightly confused as to the role of the NRC as an adviser or as a source, but it seems to me that your point is very well made and I would like to hear you either confirm or deny my strong feeling that the initiative should lie with your department.

Mr. Cadieux: At the moment there are not many, as you pointed out. As time goes on and science becomes more important in our national and international life I can well see that in the recruitment of people who will play a role in policy formulation in the Department of External Affairs, that some background in science may become a requirement or that at some stage in their career an exposure to science in the special sense in which it is used here may become essential if we wish them to perform their co-ordinating role. That I think is one way of approaching it or alternatively, when people are selected, whether by the Science Secretariat or at the invitation of the Science Secretariat by the National Research Council on grounds of their general attitude to community with nonscientific people. It may well be for a period of service with the foreign office that part of the operation will involve a period of training at an institution that will give them the foreign policy background and familiarize them with the broad implications of the various fields in which they will be required to operate. I think it is possible to approach it from both sides. But certainly, as the volume of the operation increases, the techniques will have to be refined, and whoever deals with it will have to develop an awareness of the other side, because it is the ability to communicate which makes it possible to integrate. Otherwise, where there is no integration there is no understanding on the other side of what this is all about. It is no good if you have foreign service officers who do not and who cannot appreciate the implications of this great big scientific revolution that is going on. But then again, it is no good if the scientists on their side are incapable of securing an understanding on the part of political leaders and their advisers, or what this

means in terms of community building and interchanges amongst people and what the effect of this can be at the political level in terms of exchanges of persons and things like that.

The Chairman: At the moment do you have a veto on the suggestions or nominations made by the Science Secretariat?

Mr. Cadieux: Like many things in life, this I have not dealt with in terms of veto or in black and white. I am sure that what would happen is that we would not wish to be arbitrary and lending departments would not wish to impose or to force us to accept someone that appeared to be unsuitable. I think that the way it works is that, if someone is suggested and if he seems to have the qualifications required to do the job, then we have no reason to object. But, if it seemed that, either because of a file review or because of his reputation, or in the light of his experience, that a man did not adapt well to life abroad, then I think our representations would certainly be entertained by the agencies responsible. But here again, I think it works on a basis of rather more informal communications. In theory, I think that certainly the Head of Mission abroad and our department would, I would think, have the final say, that is, for good reason. If it came down to whether a man would or would not be posted at a certain mission it is not within my experience that either in this field or any other that it has happened, because the agencies that offer or suggest personnel to be posted abroad have screened them and they act responsibly in this matter. They well realize that the people they send abroad will, in their various fields, be their ambassadors in that field abroad, they will also be the ambassadors of the country and they are usually very anxious to put their best foot forward.

Senator Aird: Mr. Chairman, if I might put two short questions, to finish off. I think they are probably answered ahead of time. I am gratified to see what I consider to be an attitude, in the second paper.

My first question relates to the availability of material, your library, your inventory, and so on, in the department, as it relates to people going to new postings: what is the extent of research papers? Are you satisfied with the extent of the research availability?

To give you an example, now that we have the consideration of the proposed recognition of Red China, is your department adequately stocked with research material, to enable a young man sent there to have as fully as possible educated himself, before departure?

Mr. Cadieux: Well, the short answer is no. Ideally, we would like to train our people for a long period before we post them to a country. Ideally, we would like them to know the language. Ideally, we would like them to read the good books, to know the people who are knowledgeable about the country.

Senator Aird: And the bad books, too, sir?

The Chairman: In that sense, "bad" may be covered by "good".

Senator Grosart: Mr. Mau's book.

Mr. Cadieux: In real life, you sometimes have to meet operational requirements that are urgent, and you have to compromise. It is not always possible to do this and this is one problem. You may have a young officer at a post who becomes very ill and who has to be returned to Canada, when you expected that he would stay there for two more years. You have to select somebody in a hurry to replace him, so you do not have two years to train somebody. You do not have such a supply in a relatively small department like our own, to be able to stack people just in case. So you have to point the finger at somebody and he has to go, and this may happen fairly often.

This is one of the risks of the profession. We have to do what is less than perfect. Ideally, if we had the time and if we had the resources, we certainly would wish to provide that training.

Another thing that is important is that there is an element of training in the job also. If you have sufficient staff on a mission, the best place where he can learn, let us say, about a country like Chile, is in Chile. If you send him there, he will learn the language with the particular accent that may have developed in Chile and that is noticeable as the accent of the people of Chile, the accent of the language that is spoken there. Also, he learns about the literature, he learns about the poetry and he learns all about the country. So, if you can expose him there, without engaging him too much or too quickly, operationally, this is a very good form of training, too.

However, we tend to run lean, because we want to economize on resources, and it is not

always possible to keep the people on training for very long and we are caught here and there between conflicting requirements. We have to make as good and as quick use as we can of our human resources and in the course of operations, particularly when they are young, if they are keen, they will take some of their leisure time to inform themselves about the folklore, to read books, and so on. We find that, even though they do not spend a great deal of time on what is formally called training and they are engaged in operations sometimes very quickly after they get there, their natural keenness to learn about the country where they are, leads them in a short time to find out a great deal about it, to read the books and to be quite knowledgeable.

This is not possible in countries which have a language or a culture that may be more esoteric. If it is an Arabic country, or the Soviet Union or if it is a country like Japan, then this system of quick posting and this sort of assignment to operations does not work. Then the officer must really be given time to learn and must be given formal training. In countries that have a culture which is not too far removed from our own, or in countries that even have our own language as an official language, like French, like English or Spanish or Italian, then the amount of time that an officer needs to move into operations and perform satisfacorily does not have to be as great.

I come back to your point, ideally what we would want to have, if we could, is to have enough people and to be able to select our people sufficiently in advance so that they would have time to prepare themselves in a more leisurely fashion by reading the best books, by meeting the people, by learning the language, by being more knowledgeable, more expert about the country, than we can afford to do now.

The Chairman: Are you satisfied with what the Canadian universities are doing in that field in order to prepare more specialized people for you?

Mr. Cadieux: In a way, no; but I am wondering whether it is fair to expect universities to gear themselves to that, because the market may not be large enough. We do not send enough officers to any one given area to expect one, let alone many universities to provide facilities, to train these people and I apart from our own department, where there are enough people to be trained to make it worthwhile for universities to devote their resources and to create the training facilities.

I know that some years ago the Association of Colleges and Universities looked into this and certainly found that the facilities were not adequate. Perhaps for the sake of learning, for the sake of the advancement of learning, it would be desirable that there should be more than we are doing now. But if in terms of our department, before we sent somebody to a country, say, the Middle East, were we able to send him to an institution in Canada where he could learn the language and the history, that would be all very well, but I do not think that our own requirements are such that we could justify the expenditure. It will always be more economical for us to send the man to the post and tell him he is not to work there, that he is not really available for operations for approximately a year and a half but that he must study hard and use the local institutions. That way is much less expensive.

Now, whether, for the country, you engage in a very different set of considerations, I do know, but as a department it would be difficult for us to justify or encourage universities to do that just for us.

In other respects, when it is a matter of consulting the members of the academic community, as we have been doing in the current review of foreign policies, then that is the course we adopt. It is a delight, really, to be able to meet people who have examined in depth the subjects and to be able to exchange views with them. This was the case in Toronto over the weekend with respect to Latin America. There is no doubt that over recent years there has been, on the part of people engaged in academic life, and also businessmen and newspapermen, a considerable increase in the knowledge about Latin America-an increase to the point where there can be a very fruitful exchange with these people. But I doubt whether we could pull this together into an institution and then dispense specialized knowledge to help officers take posts; I doubt if we have reached that stage vet.

Senator Aird: It seems to me, Mr. Cadieux, that, particularly in your department, com-

do not know any other institutions in Canada, interest, which is appropriate in view of the fact that in today's technology we have almost instant communication with all parts of the world. I was happy to look through a book entitled The Year 2018, with which I am sure you are familiar. I was particularly interested in one chapter in the book dealing with communications. It is breath-taking to wonder what the world is going to be like at that time. It seems to me, and I presume it is the case, that your department is extremely aware of the importance of communications and instant communications, and it is my strong belief that any research research oriented study should be in this field, and I think that is really more of a comment than a question, Mr. Chairman. Thank you.

> Senator Grosart: Mr. Cadieux, like Senator Aird, I was very happy to get the second part of the submission. It answers some of the questions I was going to ask, because when I looked over the establishment of the department I was amazed to discover that there was not a Division of Scientific Affairs. I know you have had for some time a Division of Cultural Affairs, and I see Mr. Gignac here. I think at the moment Mr. Gignac probably has more attachés abroad than you have in science. I do not object to that, as Mr. Gignac well knows, because I have a keen interest in that field.

> particularly interested in am mechanism of getting science into our foreign affairs decisions, and I am aware, of course, that we are all just beginning to catch up with this scientific revolution. I think it is probably true to say that all our departments are a bit behind in that respect. Now, I take it you are going to establish a new division. I know you have not said that that is going to take place, but you have said that you are looking at it you give the impression that you are examining whether or not the present arrangements are adequate to meet the demand placed on the information input into Canadian external policy in this most difficult and complex field. To take an example of an area where there seems to be in Canada a rather large deficiency gap, I would like to ask you some questions about the input of scientific, particularly technological, information into Canada through the Department of External Affairs.

Japan has, as we know a network of permunications are of vital and dominant sons and offices supplemented by missions which they send abroad. I would think the Canadian situation is to some extent comparable to that of the Japanese situation in that we cannot expect in Canada to initiate a very large share of the world's scientific development. Is there anything contemplated in this "new look" that you have indicated that would somehow step up this input?

Mr. Cadieux: My answer to this, I think, is really twofold. First, the scientific community will have to be organized within Canada and some decisions will have to be made before this can be projected abroad. In a way, our department is not the initiator in this. This is the first point. You know, we in external affairs reflect the requirements of the scientific community in this field.

The second point is that the policy review in regard to the Pacific is only in contemplation; it has not yet started. I think this is part of our review of our relations with the Pacific countries. Then here is the question of what we would do in that area and in particular in relation to Japan and the examples we will be getting from Japan will be looked at. You know, in our relations with Europe, the possibility of exchanges in the scientific field and what we can do in this area have been examined very carefully and some recommendations have been made.

Senator Grosart: One of the reasons I raise this question is that the Economic Council, in its Fifth Report, tells us, on page 55, that we have been, historically, heavily dependent upon technology originating abroad, and it says that it is essential to seek to maintain efficient arrangements for monitoring and screening new scientific and technical developments taking place in other countries and to ensure that means are available for disseminating information available to sectors of our society which can be effectively used.

At the moment I think we are doing practically nothing in that area, is that correct?

Mr. Cadieux: No. Our missions keep scanning this and the scientific community in Canada, even though it is not represented by an attaché in Japan, is not, I would say, unaware of what happens in Japan. In fact, they certainly receive the scientific magazines and scientific communications coming from Japan, and they are aware of what is going on there. I mean there are congresses and there is an exchange of persons. We visit

there and the Japanese scientiss come here. There is a good deal going on. One thing that may be missing—and we may yet fill that gap and we make this recommendation to the Government—may be the appointment of a special team from the scientific community to be placed in Japan. I specify Japan, if that is the place where you want them to be. But, on the other hand, the fact that such a team has not been appointed does not mean that at the moment nothing is happening.

Now, I am not a scientist and I am not in a scentific department. Just how much they get and through what means I am not able to tell you, but my suspicion is that they get a good deal. It seems to me unthinkable that Canadian scientists are unaware of what is going on in the scientific world, including the part that is Japan.

Senator Grosart: The Economic Council does seem to suggest there is a gap and that something should be done, and I suggest that maybe the Department of external Affairs should be doing it. For example, in Japan their present target is 900,000 abstractions per year from foreign scientific information. Now I think it is obvious that we are not anything close to that. It seems that they do take their responsibilities or some of their responsibilities more seriously. In their Ministry of Foreign Affairs they have a number of agencies; the Overseas Technical Co-operation Agency, the Technical Training Centres, the Development Survey Teams and the Economic Co-operation Bureau. They also have their science attachés. I gather they have eight now which is rather more than the number we have but it seems to me that if Treasury Board is willing we may be stepping up ours.

Mr. Cadieux: We have four, and the way it works is this; the scientific community gets together and they have to advise us in External affairs as to where the priorities lie. As diplomats we are not well placed to say that the hottest thing happening in the scientific world is in Germany rather than in Japan. Here we need to get information and answers from the various scientific agencies. Naturally there will be some discussion, compromise and priorities which may have to be set where political considerations come in. Where many agencies are involved there may have to be a consensus developed to decide where we can go. We cannot afford all these things at the same time in all these places. That is

the difficulty we face. But my impression is that these publications must be exchanged between national libraries, particularly the specialized ones. So there must be a good deal of knowledge available.

Senator Grosart: But if somebody does not take the responsibility as it has been taken in Japan and in other countries we are not going to get to this level of excellence which I suggest we need. The Japanese, for example, have had as many as 30 people abroad connected with their science information centre. They do nothing but look at technological developments. The OECD report on Japan places a lot of credit for their technological development on this very factor. Some people say theirs is an imitative economy, but my view is that the Japanese have been clever enough to convince the rest of the world that it is an innovative economy. You also mentioned that it could well be that we must wait for a consensus of the scientific community, but I suggest to you that if that is the case you will wait forever.

Mr. Cadieux: Each year when we develop our estimates we consult the scientific agencies of the government because we know we have to come to some kind of agreement as to what we put up in our establishment. This is where discussion comes in because there must be some kind of decision made. If all the scientific agencies agreed that the order is Japan, Germany and Sweden, then my job is easy. I put that on the list and say "this is the program" and obviously it will be like that. It may well be that in the end I will have to make a decision in going to Treasury Board, because this is on the establishment of the Department of External Affairs. Personally I prefer to go along with the agreement of the agencies when I get it. But it must be remembered that this is a governmental decision as to how much of our national resources can be invested in this kind of arrangement because at this point it becomes government policy and requires government decision.

Senator Grosart: There seems to be some evidence that there has not been this full degree of integration. Take for example the case of Brazil and the National Research Council. There seems to have been some conflict there. Is that so? I am referring now to the agreement between the National Research Council and its counterpart in Brazil.

Mr. Cadieux: This was very satisfactory and it has worked very well.

Senator Grosart: But why Brazil?

Mr. Cadieux: Because I think Brazil seems to be economically, industrially and scientifically at a point where such exchanges seem to the National Research Council to be more likely to be fruitful, but this is done for reasons which I as a diplomat am not in a position to judge. I think the scientists of the National Research Council would be able to tell you why. The only answer that I as a foreign service officer can give you is that when the scientists come to us and say they want to make an agreement with Brazil because it will be good for us and it will be good for Brazil and I look and see that there is no objection, then that is our contribution.

Senator Grosart: That is really the crux of my objection to the present system. I don't think it is necessary to be a scientist to guess that the National Research Council Agreement with Brazil was an ad hoc arrangement and that circumstances arose where maybe personalities were involved and so on. My suggestion is that the Department of External Affairs should ask "why do we have a scientific agreement with Brazil instead of with somebody else?"

Mr. Cadieux: I understand the question, but the problem is different. The problem is that in order to advise the National Research Council on this we have to have and we are having now a general review of our relations with the whole of Latin America, and before we have completed this review we are not really in a position to tell the National Research Council it has to be these countries in priority, and in these fields rather than in that one. So that instead of saying to the National Research Council "there is this thing that you think is good, but don't do anything until your review is complete", we said "if you think this is important for your purposes, do this and later when the review is completed we will have a general picture of the whole thing and there will be advice on cultural relations and there will be obvious indications as to priorities". This is the next

Senator Grosart: And in due course this would apply all around the world?

Mr. Cadieux: We hope so, but this is a long process and must be taken part by part.

The Chairman: If I may interrupt you, Senator Grosart, I have a kind of a supplementary question on this. It seems to me that this exclusive reliance, for instance, on the National Research Council or on scientists primarily interested in science may lead to the creation of a gap because most of the scientists are not too interested in technology. And technology is the kind of thing which you cannot find very often, or least technological innovation is not the kind of thing you can find in scientific journals. You have to be on the spot to detect what is happening and to report it. Also technological innovation is not really a scientific problem; it is really a political and economic problem. If you rely exclusively on the pure scientists to advise you where you should go, and if there is no other basis for decisions as to whether we will have a look-out staff in one country or another, then we may end up by not doing very much in this very important field for the development of Canada.

Mr. Cadieux: The problem is even more general than that. When you look at your relations with a country, you may find that the overall interest may be in promoting cultural relations as opposed to scientific relations. If you are after the two, which will it be? It may be a tricky decision to make. There have to be some priorities, and it may well be in the overall national interest to have one more commercial man, if there were special trading opportunities, and you might not be able to afford for a year or two either a cultural or scientific man, and this is what I think this new instrument, this program budgeting is going to enable the department to develop. They will look at the relations over a period of years, and in particular during the next year, and they will say what are the objectives in that area or in that country, what we hope to achieve and what are the priorities. Hopefully it should be possible to say, "These seem to be the more important objectives, and these seem to be the areas in which it is more important to move." It will call for a degree of interdepartmental co-ordination that even in the best circumstances is not easy to achieve. This is the first kind of problem.

Then you have another kind of problem, one that is more tricky. The National Research Council, in a way, is not under the authority of the Department of External Affairs; they have a special status. I am not

an expert on that, but it is my impression that they enjoy a kind of autonomy, and the way it works is not really by the Department of External Affairs throwing the book at them or trying to be hectoring; we work by consensus and consultation.

In the future, once we have developed these things—and these are not easily measurable among other things, the priorities between various types of activities the country can undertake and the relative urgencies and dividends you can get from investments in manpower or resources—the only thing we will be able to hope to achieve is some kind of understanding for what we are trying to do by discussion with the people in the National Research Council, and if the National Research Council-and I am speaking to your question about an agreement-feel terribly keenly about an agreement with Brazil, it may be impossible for External to say, "You just cannot do that. I do not want you to do it." That will not be realistic it will not be sensible. All we will be able to do will be to say, "Look, perhaps you have overlooked another country where the same effort could be invested, perhaps with greater dividends for the country." But at that point we would have to be very sure of our ground and would have to have indications from their own point of view-this is, what they are responsible for, science—that in that general area we knew better than they did what was good for them.

The Chairman: Why do you not also seek the advice of the Department of Industry, which is mainly interested?

Mr. Cadieux: Under this new system we will be consulting the various agencies concerned, and it may well be our task may not be simplified because we may well find a great diversity of view on the part of agencies, some of which are independent of Government.

Senator Grosart: We have been a little frightened in this committee by the end result of a lot of ad hoc decisions in the science field, and all I am really saying is that I would hope that perhaps the new entity or the "new look" that seems to be indicated on page 11 here, would assume responsibility for a plan in the one area I am speaking of, that is this inflow of information. I suggest it cannot be left to ad hoc decisions here and there,

because it is so vitally important to Canada that we use what resources we have to know what is going on around the world and to find out what we can use. I suggest that at the moment there is nobody who has been given or has accepted this responsibility.

If I may ask a question arising directly out of other pages of your report, the comment you make at the bottom of page 2 is:

The Department, in co-operation with the Director of Chemical and Biological Defence of DRB is participating with other experts in the preparation of a study for the United Nations Secretary-General on the consequences of the use of chemical and biological weapons.

What is going on there? I did not know that Canada was in this business, and yet we seem to be taking the lead in this.

Mr. Cadieux: Well, I do not know if there is one of my colleagues who is informed on this.

Mr. D. M. Miller, Legal Planning Section, Legal Division, Department of External Affairs: If I may, sir, the study was suggested and agreed to last year in the General Assembly, and it is being done under the auspices of the Secretary-General. Really the people participating in it are participating in a sort of quasi-private capacity; they are experts. I am afraid I cannot recall the name of the man who is the Canadian involved at the moment, but there are some experts working in this field with the Secretary General, and they are responsible for producing a study report on the types of weapons that are possibly being contemplated in the future, the effects of chemical and biological agents that are being used or stockpiled or worked on, in a sort of research sense; and the idea, of course, is to work towards some sort of international agreement, modernizing past agreements such as the Geneva Protocol of 1925, to try to bring more countries under the umbrella of banning the use of these weapons, about which there is very little known. The research has been conducted, if at all, in secret, and it is not easy to find out what other countries have been involved in, both friendly and unfriendly countries. There is a fear and a feeling of uncertainty and, as I have said, this study was set up in the General Assembly last year, and this will be carried forward. The ENDC is very much involved. This is a subject it is turning to and

this study has begun, now it has completed its non-poliferation studies, and it is a completely new area in which the Secretary General is involved, and Canada is participating.

Senator Grosart: So the proposals, the brief says Canada will put forward, will be, I take it, with regard to control and defensive rather than offensive?

Mr. Miller: That is correct.

Senator Grosart: On the same page, sir, there is a reference to the two test ban agreements, the comprehensive and the partial. Recently we had some press reports about concern in Canada over fall-out from the United States test. Would that come under the comprehensive or the partial test ban?

Mr. Miller: It is under what is called the partial test ban treaty. There is no comprehensive. This is a hope, that one day there will be such a comprehensive test ban which will forbid the use and testing of nuclear weapons; nuclear weapons can be tested underground but not in the atmosphere, and if tested underground the radiation should not be allowed to escape into the atmosphere, and the problem about rising radiation levels was connected with the partial test ban.

Senator Grosart: What do we call the non-proliferation treaty? Is not that a comprehensive plan?

Mr. Cadieux: This is another treaty. It concerns the non-transfer of nuclear weapons, and the technique for producing nuclear weapons, to countries that do not have them now.

Senator Grosart: Yes, could creating them, which leads to testing them. The two are very closely tied together. If you are going to be prohibited from making them then you are also prohibited from testing them.

Mr. Cadieux: Yes.

Senator Grosart: That is, if you are prohibited from developing them to the explosion point.

Mr. Cadieux: Yes.

Senator Grosart: What has happened in regard to this protest we made to the United States? Have we had a reply?

Mr. Cadieux: I am sorry, but I am not briefed on that.

Senator Grosart: I was just curious on that point. Do you at the moment have in the department a cadre that you would call a group of scientists?

Mr. Cadieux: Not apart from those that we borrow from the...

The Chairman: I wanted to ask that question as well at some stage...

Senator Grosart: Then, I will leave it.

The Chairman: No, but I would like to have defined more generally what we understand here by "scientific activity". Our terms of reference include not only the physical and the life sciences, but also the social sciences.

Mr. Cadieux: If that is the case, then all of our officers...

The Chairman: But how many of your people would be involved in research activities in this field? Some of your people are involved in cultural activities and also in the field of human relations without doing any research, but...

Mr. Cadieux: There are those who are involved in the development of international law who sit in the Sixth Committee of the General Assembly, or who sit on the various special committees of the United Nations concerned with outer space, the definition of "aggression", or with the elaboration of the principles of the charter—this is a whole area in the legal field. This is the forefront of legal development in terms of international law.

Senator Grosart: How many people would be engaged in that field at the moment?

Mr. Cadieux: A good half dozen, I would say. But, you know, they are at the forefront of knowledge in this area. They have to do the thinking, and they have to keep in touch with the other people in other countries, because there is not much literature available in this field.

Senator Grosart: You have scientists in CIDC, which is a part of your operation, but do you have science advisers within the establishment of the department itself?

Mr. Cadieux: No, we consult the other departments when we have a requirement for scientific advice. If it is a matter that concerns atomic energy then we will call on the people from Atomic Energy of Canada and

ask for their advice. We write to them or phone them. We are in touch with them, and they act as if they are part of the department. The same is true if it is in any other field, whether it is the National Research Council or the Defence Research Board. The people in the department develop fairly close relations over a period of months and years with the people dealing with these subjects in these various scientific agencies.

Senator Grosart: Then, I would hope that when these new developments take place you will have behind you a cadre of scientists because we have been told over and over again that unless you have intramural scientific capability you do not have a capability of digesting the incoming scientific information.

Mr. Cadieux: This is a problem, and I wonder if we can go into this a little deeper, because I am troubled about the implications. One difficulty is that if you take a man who is a scientist and bring him in to foreign policy, and keep him there for 15 or 20 years, at the end of that time how much of a scientist do you still have, and how much of a diplomat? This is one area.

Do you get better service if you get a scientist to move temporarily into External Affairs for a posting, and who is able two or three years later to go back to his outfit, when you replace him by another person. This is one solution.

Another solution is the one we follow now, that of having a centralized unit in the department that has a liaison with the other agencies and branches. They are capable of leading the scientists, but they are essentially political people concerned with foreign policy.

Then, we are always dealing with people who are really full-fledged scientists, and whose credentials cannot be questioned, because they are involved with the scientific agencies of the Government.

There are two or three possible solutions here, and one may be more effective than the others. I know there is this idea that by having a scientist in the Department of External Affairs you somehow increase the hold of science on policy. It may well be it produces that, but it may be better to have diplomats who are sufficiently aware of the importance of science to have day to day liaison with scientists who are good at their job, which is that of developing science. In that way you

get good scientific advice, and the scientific influence will be better. If you get a man who has worked on some particular problem to go with a diplomat to an international conference that is dealing with that problem, then that man is terribly effective because he is dealing with his own field to which he will return afterwards.

It is a choice that has to be made. I am not suggesting it is the best, but it may be the best. What we want here is the most effective answer. I do not think there is any quarrel about whether we should remove scientists from their milieu and have them operate as diplomats. I do not know whether that is a good thing.

Senator Grosart: I agree that there is no easy answer to this, but the suggestion at page 11 does indicate to us that you have this very important matter under active consideration, although, as I said at the beginning, it is surprising to look over your establishment and not find a division of scientific affairs.

I have one final question which arises out of a comment you make at page 7:

In the field of defence research, Canada has taken an active part in NATO defence science organizations for many years...

We have a real problem in this area. I made some notes on it. I will not enter into the matter in detail, but it refers to the countermortar radar. We have had a bit of difference in evidence here as to what really happened. The question that comes out of it is: If we develop a weapon in the Defence Research Board or elsewhere particularly for NATO, or if we consider one of the many other activities of, say, the National Research Council that are directed towards Canada's fulfilling some of her international obligations, what role does the department itself play in persuading NATO, or some other organization with which we have a defence agreement, to buy our Canadian development?

Perhaps I could just go over the history of this. In the NRC brief the counter-mortar radar was described as another technological success, and in the DND brief we were told that it materially exceeds the stated military requirements of NATO, and then Dr. Solandt of the Science Council told us:

It is amazing how often these projects are not stopped; they keep on drifting away from their original mission-orientation towards being more broadly-based research in the same field but not really properly planned ...One minor case in point which I heard of recently is that the National Research Council has been working on a counter-mortar radar since 1944 or 1945 and it was just cancelled... I was in touch with that program many years ago and I know that it would have been better to stop the whole thing many years ago, because first of all interest in the problem had grown less or almost disappeared.

Then Dr. Schneider gave a rebuttal and stated that Dr. Solandt's view was quite in error and misleading:

Apart from the external influences which acted to deny Canadian access to the export market, a number of other factors undoubtedly played a part. These include...the lack of a well defined and closely co-ordinated effort to 'sell' the equipment in foreign markets.

Are we backing up our various scientific agencies in the international field?

The Chairman: Or in the sense in which I think you put your question more precisely perhaps a moment ago, when you asked whether the Department of External Affairs was involved in encouraging our allies to buy our technological innovations.

Senator Grosart: I am asking: is the department prepared to back this up? Is there this co-ordination, real co-ordination?

Mr. Cadieux: The answer again is: in general, yes; in specifics it may not always work the way it would like to. I know for a fact that our ambassador to NATO, for example, is very alive to this and is pushing very hard. I know our ambassadors in specific countries are following this closely. However, one faces competition in these things in some cases, and this is one reason why sometimes it does not succeed. This is an area where competition is very feverish, where the national scientific plan and the national industrial plan are trying to achieve the same results sometimes in the same fields.

Senator Grosart: My question related to subjects in which we lacked a co-ordinated effort.

Mr. Cadieux: The point on co-ordination here is that there is NATO machinery in which these things are being considered, and I know that the NATO delegation is very well aware of the industrial and balance of payments implications for us in these things. I

know our delegation has been working very hard on this whole range of problems. In certain NATO countries certain specific projects have been pursued at a very high level. In some cases, if we have not succeeded it may well be that there has been insufficient co-ordination or something has gone wrong; in other cases the competition may have been too strong; another factor may be that lack of co-ordination may have prevented it, but it is hard to say that because we do not succeed it is necessarily due to lack of co-ordination.

Senator Grosart: Not in all cases, but this was a case in which that statement was made. I again come back to the question of a planned mechanism in areas in which it would seem the Department of External Affairs could be taking the lead.

Senator Hays: On page 3 of your brief you say:

The department could not, therefore, be said to have "a policy toward science" or "science policy", except under the broadest interpretation of these terms. Nevertheless, it makes a significant contribution to the formulation of Canadian scientific policy in relation of its international responsibilities.

I wonder if you could enlarge on this and give us some specific examples, and how you initiate it.

Mr. Cadieux: One specific example that comes to mind is the Swedish item in the United Nations concerning pollution and environment. This is a case at the international level. The Department of External Affairs mobilized the scientific officers of the government here so that we can play a role and associate ourself with the Swedes in this exercise. This is an example of where another country makes a suggestion and we go to scientists to be able to play our political role in the knowledge of the scientific implications.

In the field of disarmement, in the 18-nations committee this whole business of the test that we have been discussing before arises, whether or not tests on the ground could be detected, and a good deal depends on whether the scientists can give an assurance or not. This is an area in which we have been pressing the scientific community to tell us what degree of certainty could be achieved. It is an instance where the pressure comes from the political level on to the scientific community to explore, to push and to refine their instruments, to process their

answers. These are two examples that I can give.

Senator Hays: In this field, are you satisfied with the priority given to this problem?

Mr. Cadieux: These are, we think, particularly important in the case of disarmament, when we complete this treaty on tests; I think this would be important in terms of the move towards disarmament.

In the case of what we call the Swedish item, this whole business of environment, I think a new chapter in international co-operation is opened up. It had seemed that the international community was approaching the problem of regulation of international problems in a sort of isolated way. They dealt with this subject and that subject and there seemed to be no pattern emerging. During the last couple of years, however, the whole thing seems suddenly to have come together. It is very majestic and impressive suddenly to see the world community being conscious of the fact that it is now faced with the task of regulating a vast field going from outer space to the depths of the ocean. This involves the question of responsibility, of good neighbourliness, and it is quite a transposition to the broad new areas of the whole body of law that had been developed for the domestic community.

Lawyers have suddenly become seized of this, and the increased activity of lawyers at the international level is almost extraordinary. In later years, when people write the history of law, I think that this decade and the decade to follow will mark a tremendous advance in all these areas. What is important is that the lawyers have now refined their techniques and in this new field walk hand in hand with scientists, because they cannot move without knowing where outer space begins, where the continental shelf is and where it gets into the ocean depths. No lawyer can advance in these areas without having a scientist at his side.

As can be seen, the requirements of the world community, so that they could live together, compelled lawyers to develop regulations, and in turn the lawyers turned to scientists to get the facts, to get the answers and the impetus. I think it is a very good partnership. This is what I had in mind when referring in the brief to this requirement for organization. I do not want to imply that only

lawyers have become aware of this. In- scientists. I have found, myself, that the liaisdependently I think the scientists have had a on between the External Affairs and the feeling of community of interest among themselves, of the world of science having a language of its own, having a solidarity of its own and having interests of its own. What is new, I think, is this feeling of rapport between the lawyer and the scientist, and I think the diplomat, that seems to be emerging, a feeling that the three of them and the various other people concerned in this have a real job to do in the years to come.

Senator Hays: How does this sort of cooperation in your department fare with regard to the Arctic problem today, the jurisdiction there and so on?

Mr. Cadieux: When you are dealing with the Arctic you are dealing with waters and various types of ice conditions. I do not want to be more specific than that because the matter is under review and it depends on, in some cases, the answers the scientists will give you. This is again a good illustration that in order for answers to make sense they must be related to fact, and the scientists are there to make their important contribution.

Senator Hays: In anticipation of what the answers may be, in so far as the scientists are concerned, for instance, who owns the sea and are we doing enough in scientific research to exploit this properly?

Mr. Cadieux: Well, this is a matter of judgment as to how much we are doing. It would be difficult for me to say, but what I have in mind, when you have water you have a certain legal situation, but if the water is frozen all the time how do you distinguish that from earth that is covered with ice? This is possibly a situation that may not be the same as where you have an island which is surrounded with free-flowing water. These are the kinds of situations where the scientists may be very essential in telling the lawyers and the policymakers what the actual physical conditions are. Whether or not there is enough scientific research done in these areas I am unable to say.

Senator Hays: In lieu of this what is the priority in your department now? Has this changed in so far as scientific policy is concerned?

Mr. Cadieux: What I have noticed I think over the past 10 years, and this has become increasingly so, is the growing importance of science as a field and of close liaison with the

scientific community is something that has worked extremely well, as far as I can judge. The rapport has been good and when they have been asked to give advice they have given it readily and in forms that have been extremely useful for the purposes for which our department exists.

Senator Hays: There has been nothing determined in so far as these jurisdictions are concerned and in so far as the sea and the ocean is concerned.

Mr. Cadieux: Well, the Government I think will give an answer on this very soon. The Prime Minister has said that he will...

Senator Hays: What about the Pacific and the Atlantic? Where is the continental shelf?

The Chairman: There has been a question put to the House of Commons recently.

Mr. Cadieux: I think answers will be given by members of the Government on this subject and in order to observe the discretion that is becoming to a civil servant this is a delicate matter.

Senator Grosart: It is roughly a 200-fathom definition.

Mr. Cadieux: I think the rule under the convention that was signed in 1958 as to where the shelf ends is 200 meters or where it ceases to be exploitable, but the problem there is a little uncertainty and it has created difficulties.

Senator Carter: I have two questions. On page 2 you look into the future and you foresee a need for a number of treaties dealing with a number of matters such as ocean depths, world pollution and you add cybernetics. What do you see in the future of cybernetics that is going to require or might require an international treaty?

Mr. Cadieux: I gave this as a mere example of the kind of things that may develop in the future. It is just for illustration. It may or may not come.

Senator Carter: I thought you knew of some definite things that were taking place and that were going to require international...

Mr. Cadieux: I was afraid it would be interpreted that way. Perhaps I should have been more clear in my expose. It is the whole of a range of problems that seem to be getting suddenly very considerable and things we may not have in the past considered suitable for international regulation may well become so in the future.

The Chairman: They may very well be. For instance, certain computers will become so complicated and so expensive that only the big powers will be able to produce them and perhaps there might develop a need for having some kind of international agreement to provide for the exchange of these.

Mr. Cadieux: I think I can give some examples of the kinds of thing that I have in mind. For instance, under the treaty on non-proliferation there is a commitment on the part of the big powers to conduct peaceful explosions for certain purposes under certain conditions as a service to the world community.

If you are a big power and you have the kind of machine that I think may be available in some years and you get this working you may be able to calculate what will be the supply situation eight or nine months from now and also calculate that the supply will be plentiful. There is no point in keeping your stocks and therefore you might as well sell now quickly and you may be able to undersell a number of countries that do not have this kind of equipment and gain a great advantage over them. This might be an application where commercially you could undercut the poorer countries that do not have the same resources.

Senator Grosart: Are you speaking now of peaceful uses of nuclear energy?

Mr. Cadieux: Yes.

Senator Grosart: Under the non-proliferation treaty—I was going to say if we wanted to build a causeway...

Mr. Cadieux: You could build something and it would be done under supervision and the big powers would undertake to do that.

Senator Grosart: We would have to buy it from one of the atomic powers.

Mr. Cadieux: With prices to be negotiated.

The Chairman: For the moment it is still the causeway.

Senator Carter: Your answer led right into the other question that I had and that was in regard to NATO. You just referred to a huge

nation like the United States with tremendous resources becoming a giant in technology and the rest of the world becoming pygmies. You have NATO. Is Canada taking any initiative in NATO to try to get an integration of the various scientific research programs of the different countries to offset that sort of thing?

Mr. Cadieux: I think some years ago the Italians raised the problem of the famous technological gap and I believe NATO has been involved in the problem ever since. There have been a number of intensive studies as to what could be done to try and regress the balance.

Senator Carter: They cannot regress it alone because these countries are too small. What are they doing in order to come together and work out a co-ordinated program? Is Canada taking any initiative to get the NATO nations to do that?

Mr. Cadieux: Not what you would call an initiative. I think we are concerned with the problem and I think we are examining various steps that can be taken to alleviate it, because this has political implications that are very serious for the alliance. This is related to the problem of investment and it is also related to the problem of brain drain. There are all sorts, such as the problem of migration and various aspects that concern NATO.

Senator Carter: Could you put it the other way. Is there anything being done to eliminate overlapping so the countries in NATO are not spending their money and resources along the same line of research or doing the same thing.

The Chairman: You really want the department to take a very long view once we have eliminated duplication in Canada.

Mr. Cadieux: I think there is some knowledge in NATO on the military side as to what kind of research is done by various countries. How far that goes and how exhaustive that is I would not be too sure. I do not think this extends to the commercial side really to prevent that, to the non-military side, because here you get into industrial and commercial secrets.

Senator Carter: Take the United Kingdom, which has developed a very high level of technology in computers. So far she has not been able to get into the Common Market, so the Common Market could benefit from that. What is to prevent the NATO countries from taking advantage of that if they wanted to?

Mr. Cadieux: Here we get into another range of problems which are political.

Senator Carter: I am referring to what Canada is doing about this. Are we doing nothing to let nature take its course?

Mr. James Coningsby Langley, Assistant Under-Secretary of State for External Affairs: If I might say one word, I think that a fair amount is in fact being done, not only in NATO, senator, but in the Organization For Economic Co-operation and Development. There are three scientific committees—one of which is devoted to the idea of scientific research. Its task really is twofold: it runs a certain number of joint scientific projects and, secondly, it discusses science in the various countries of the Alliance, in an attempt to do just what you have been mentioning, coordination and so on.

In addition to that, through the OECD and the other bodies, there are a number of other joint scientific programs, such as, for example, through the European nuclear energy agency and agencies of that kind, which have reactors which are run jointly by a number of countries.

This, as the under-secretary was saying, is far from ideal, but I think it is a very important beginning towards the concept of coordination. It has been left, however, to the OECD rather than to NATO, which perhaps has the advantage, because it covers this whole range of civil sciences. You have, for example, the Swiss and the Swedes in there, as well as the Japanese and as well as NATO countries.

So I think it would be fair to say that a fair amount is being done and that, in addition, the whole concept of the role of technology in production and productivity is under study in that same body.

Senator Grosart: What is the status of the suggested UNESCO Treaty on the exchange of scientific information?

Mr. Jacques Gignac, Head, Cultural Affairs Division, Department of External Affairs: What is the question again, please?

Senator Grosart: A couple of years ago there was a good deal of activity in developing a treaty for the exchange of scientific and, I think, cultural information, but the emphasis was on scientific information and UNESCO was to be the sponsor of this.

Mr. Gignac: A multi-lateral treaty?

Senator Grosart: Yes.

Mr. Gignac: I am afraid I am not aware of that.

Senator Grosart: I have a reference to it. I know I have it somewhere, but I do not know where.

The Chairman: Are there any other questions?

Senator Grosart: Excuse me, Mr. Chairman, I have just found it. This is in an OECD report. This has reference to a Japanese report of their Science and Technology Council. It reads:

The report stresses the improvement of mechanisms to make available world scientific and technical literature to Japanese users and also recommended Japanese participation in the proposed UNES-CO Treaty for the international exchange of scientific documents.

This is in the 1968 OECD report on Japan.

Mr. Dolgin: There is a series of agreements which are known as the Florence and Beirut Agreements, which cover three things, educational, cultural and science material. This is in effect now, in fact. In regard to this treaty to which you referred, I am not aware of it. These agreements, in a sense, promote the free flow of information and the introduction from country to country of this material. Is that the answer which you wished?

Senator Grosart: It is quite possible that the word "treaty" was not used in the formal sense. This may be the answer to it.

The Chairman: This may be an arrangement.

Senator Grosart: Yes.

Senator Aird: May I ask a supplementary question which goes back to one of Senator Grosart's earlier remarks relating to the extrapolation of scientific documents in Japan and which seemed to be in such volume. Do you, Senator Grosart, have the figures as to the sources? How many of these documents come from the U.S.S.R.? How many come from other countries?

Senator Grosart: If I can remember them, it is rather interesting that 39 per cent of all the abstractions in the Japanese processing of material is of Russian material. About 21 per

cent is German, about 15 per cent is English, and I think 15 per cent would be French and the rest 11. I hope that that adds up to 100. The figures are roughly of that magnitude.

The amazing thing about it is that the Japanese find 39 per cent, of the material that they consider important to abstract, in Russian.

Senator Aird: The reason for my question of course is that...

The Chairman: You want to come back to your original question again.

Senator Aird: When one is looking for priorities and looking for a situs for personnel, the Japanese example perhaps is of some strong guidance.

The Chairman: I am sure that the undersecretary has taken your wish into very serious consideration.

Before closing, I have a question which is related to one I asked before. You have spoken a moment ago about the lawyers who were working for you now on this new great field of research. But, apart from that, and outside of the physical and life sciences, do you have in the department a division or a special service of research, doing research in the field of political and economic sciences and related fields?

Mr. Cadieux: No.

Mr. Langley: Historical?

Mr. Cadieux: We have an historical unit that looks at our archives and that classifies documents and publishes them gradually. If you bring science and history as a science in, that I think would be a scientific fact. Then we have a planning unit and, to the extent that these people are really doing research as a long range development, that is also there.

The Chairman: But there is no specific program, no specific staff engaged in regular research in support of the constant review of our foreign policy?

Mr. Cadieux: There are two operations that are going on that are related to that. One is that, for the past two years there has been, as a conscious and as a very substantial operation, a review of foreign policy going on. So far, there are three sectors that have been particularly involved. One is that of relations with Europe and defence; two, Latin America; and, three, China. Therefore, these three

sectors have been the object of very thorough, and in the case of Latin America, have been a continuing in-depth study.

This is a review and this has an additional and new feature. It involves discussions with the academic community to an extent that is unprecedented.

The Chairman: But this is done more or less on a basis of the so-called task forces, it is a one-shot operation, but you have no continuing staff?

Mr. Cadieux: There is something else. Each year the department is required to undertake, before it submits its estimates, a review of its priorities for the next five years and of its objectives within those five years for the next year. Therefore, for each year there is a very careful look at whatever it is that the department wants to accomplish in general in each area and in each country.

The Chairman: But this is done by the directors of the various divisions.

Mr. Cadieux: By the heads of the various divisions.

The Chairman: And of course by you and your immediate assistants. But again, coming back to my question, you have no continuing research staff which would have as more or less their exclusive responsibility the doing of research in support of your operation here or in support of your overseas services?

Mr. Cadieux: There is a research and planning unit.

The Chairman: How many people are there in that?

Mr. Cadieux: It varies.

The Chairman: What is its function in all this?

Mr. Cadieux: Its function is to engage in long-range review of departmental policies.

The Chairman: Could we have an additional memorandum on this? I do not think it would be necessary for you to come back, but I think it would be most useful for us to have as additional information the kind of research which is being done in the non-physical fields, in the field of the human sciences, generally, and the staff which is engaged in that operation.

Mr. Cadieux: Certainly.

Senator Grosart: Mr. Chairman, along that line, I wonder if the department has considered, as everybody else seems to have, getting a computer in, or an econometric model? I have a note here that in the University of Chicago they have constructed one called Maniac III, which is a computerization of balance-of-power components.

The Chairman: I think, if you go back to the last pages of the presentation we have received this afternoon, you will see that the department is beginning to think in those terms.

Mr. Cadieux: We are trying to find out whether we could use that.

The Chairman: They are lagging, though, as compared with the Bank of Canada, which

has gone "go-go" in terms of economic research.

Senator Grosart: Mr. Chairman, the figures that I gave in answer to Senator Aird's question have been added up by him, I see. Apparently they add up to 101. The French figure should have been 14 rather than 15. I just found that out.

Mr. Cadieux: That is close enough.

The Chairman: On behalf of the members of the committee I want to thank you and to thank also your colleagues for this very enlightening afternoon.

Au nom du comité je vous remercie infiniment.

The committee adjourned.

APPENDIX 37

THE SENATE

SPECIAL COMMITTEE

ON

SCIENCE POLICY

BRIEF

Prepared by

THE DEPARTMENT OF EXTERNAL AFFAIRS

OCTOBER, 1968

INTRODUCTION

The Department of External Affairs does not itself engage directly in any form of scientific research or activity but the increasing extent to which science is assuming an international dimension, the importance which the scientific element has assumed in questions under international discussion and negotiation, and the ever expanding number of international organizations concerned with scientific matters, have all led to an increasing involvement by this Department in the formulation and implementation of scientific policies in their international aspect. The role of the Department of External Affairs might be described concisely as assistance to science-based departments and agencies of the Government in the formulation of science policies by providing information and advice within its competence, liaison and co-ordination with related organizations outside Canada and participation in the international discussion and negotiation of matters having a scientific content. As part of its general responsibility for keeping the Canadian Government informed of significant political and economic development abroad, the Department of External Affairs provides information on scientific development likely to be of interest to science-based departments or agencies of the Government. Similarly it acts as a

channel for replying to certain requests from abroad
for information on scientific matters, and for facilitating exchanges of visits between Canadian and foreign
scientists and scientific bodies. This liaison function is carried out not only on behalf of the Federal
Government departments but on behalf of and with the
co-operation of the Provincial Governments. The Department also consults with science-based departments and
agencies and with CIDA concerning science-oriented
development programmes, with a view to ensuring that
funds and personnel are used in ways consistent with
our general foreign policy interests and objectives.

2. Although the Department of External Affairs employs a very limited number of scientific personnel (see paragraph 15), it is able, as required, to draw upon the resources of other departments and agencies having personnel with the required degree of specialized knowledge and skill.

ORGANIZATION AND FUNCTIONS

3. The statutory functions and powers of the Department of External Affairs are embodied in the Department of External Affairs Act (RSC 1952, Chap. 68), Section 4 of which reads, in part, as follows: "The Minister, as Head of the Department, has the conduct of all official communications between the Government of Canada and the Government of any other country in connection with the external affairs of Canada..." In

carrying out this broad role as the department directly responsible for the conduct of Canada's foreign affairs, the Department of External Affairs acts, with regard to scientific matters as in other areas, on behalf of and in the name of the Government of Canada. However, functional responsibility for the observance and implementation of international undertakings often lies with other departments of government. This is particularly true with respect to scientific policy, where responsibility for the administration and implementation of specific international agreements tends to rest with the department or departments technically qualified to carry out the required functions. The effective role of the Department of External Affairs in these circumstances relates chiefly to the provision of political guidance and of a formal channel of communications between the functional department and foreign governments or international organizations. The Department could not, therefore, be said to have "a policy toward science" or "science policy", except under the broadest interpretation of these terms. Nevertheless, it makes a significant contribution to the formulation of Canadian scientific policy in relation to its international responsibilities.

4. The scope and variety of the Department's interests and responsibilities is extraordinarily broad and is perhaps well illustrated by reference to the United Nations, where the following specialized agencies, commissions and committees within the UN family have an interest in scientific matters:

Food and Agriculture Organization, World Health Organization, International Telecommunication Union, World Meteorological Organization, Inter-governmental Maritime Consultative Organization, United Nations Industrial Development Organization, United Nations Educational, Scientific and Cultural Organization, International Atomic Energy Agency, Advisory Committee on the Application of Science and Technology to Development, United Nations Scientific Committee on Effects of Atomic Radiation. United Nations Disarmament Commission, United Nations Scientific Advisory Committee, Committee on the Peaceful Uses of Outer Space, Economic and Social Council (ECOSOC).

The UN family is not, however, directly involved in scientific research. Its scientific activities cover the political aspects of scientific research as in the case of the Committee on the Peaceful Uses of Outer Space, the collection and collation of scientific data and reports as in the case of the FAO reports on world agriculture, the establishing of international standards as in the case of the World Meteorological Organization, and in the encouragement of scientific research for the benefit of mankind in general, as in the case of UNESCO, or of developing countries in particular, as in the case of the Advisory Committee on the Application of Science and Technology to Development.

- 6. In addition to the large quantity of scientific data available to Canadian scientists by reason of our membership in the UN, Canada also has the opportunity to play a significant role in the formulation of international scientific policy insofar as the UN bodies provide policymaking forums. Our membership on the Committee on the Peaceful Uses of Outer Space and on the Committee to study the peaceful uses of the seabed and ocean floor are examples of forums in which Canadian scientists, assisted as appropriate by members of the Department, can contribute to the development of an international science policy.
- 7. Canada also participates in numerous other international organizations related in greater or lesser degree to scientific development or research. A number of bilateral cultural agreements have also been concluded in recent years which provide for exchanges in a wide variety of scientific disciplines. Moreover, many bilateral or multilateral international agreements to which Canada is a party, while not primarily related to science or scientific activities, are nevertheless concerned with scientific developments in some of their aspects. A list of those international and inter-governmental treaties and agreements, included in the Treaty Register maintained by the Department of External Affairs, is attached as Appendix "A"
- 8. As well as reporting to the Department of External Affairs in Ottawa on significant scientific developments in the countries where they are stationed,

Officers of the Department serving abroad participate directly in many international gatherings and engage actively in the negotiation of treaties or agreements related to science. In certain circumstances Ambassadors, High Commissioners or other senior officers in the Department may be chosen to lead Canadian scientific or sciencebased delegations at inter-governmental meetings or conferences. Foreign Service Officers often accompany Canadian technical or scientific representatives at interagency meetings to lend such assistance as may be required on the basis of their knowledge of the political factors involved, as well as to demonstrate the broad interest of the Canadian Government in the questions under discussion. Foreign Service Officers of suitable rank also act from time to time as Observers at scientific meetings or conferences, where it is deemed to be in the interest of Canada to be officially represented.

9. Within the Department, liaison and co-ordinating functions are carried out in a variety of ways, depending upon whether the subject matter is primarily scientific, political, military or economic in nature. Political and functional divisions maintain contact with Canadian diplomatic posts abroad and with those departments or agencies of government most directly concerned with a specific subject. Thus, since nearly every disarmament question has a scientific dimension either connected with weapons technology or with methods of verifying arms control agreements, the Disarmament Division of the Department of External Affairs has frequent need of scientific advice. The availability of technical advice from the Defence Research Board, the Department of Energy, Mines and Resources and from AECL and AECB in such matters as

civilian and military nuclear technology, seismology,
peaceful nuclear explosive services and chemical and
biological warfare underpin Canada's activity in disarmament discussions by enhancing the authority and
independence of its contribution.

- 10. The North American Defence and NATO Division co-operate with the Department of National Defence, DRB, and the NATO Science Committee. The Transport, Communications and Energy Division of the Office of Economic Affairs deals with the international aspects of atomic energy, space science, telecommunications and general science, and is closely associated in its daily operations with all the major science-based departments and agencies. Area political divisions provide reports from Canadian diplomatic missions to other departments, as appropriate, as well as furnishing advice and guidance on political aspects of scientific questions under consideration in the functional divisions and other governmental agencies. The Cultural Affairs Division is responsible for arranging and co-ordinating exchanges of scientific personnel with other countries in accordance with the provisions of Cultural Agreements. The Information Division deals with numerous enquiries concerning scientific developments in Canada and provides liaison between foreign scientific bodies, particularly in the medical field, and their related organizations in Canada.
- 11. The European Division represents the Department on the Visits Panel which provides liaison through our embassies between certain Canadian scientific agencies and their counterparts in East European countries.

In Western Europe this Division's interest arises from
the major political significance which scientific and
technological co-operation has for our relations with
the area, particularly with France, where recently cooperation in scientific and technological matters has
made enccuraging progress.

- 12. The Legal Division assists in the interpretation of treaties and international law as they are affected by scientific advances.
- 13. It will thus be seen that, with the exception of its purely administrative branches, there are few if any of the divisions of the Department which do not in some degree play a part in the Department's broad role of participating in scientific exchanges between the science-based departments of Government and other governments or international agencies. While this is but one function of the Department, the rapid growth of scientific knowledge and skills in Canada and the substantial support which Canada gives to the movement toward greater international co-operation in many scientific disciplines has proportionately increased the volume and importance of this work in recent years.

PERSONNEL POLICIES

14. Because of the increasing importance which science has played in the conduct of international affairs in recent years, greater attention has been paid to the question of the secondment of scientific personnel to certain posts abroad. The Department does not itself undertake any recruiting of Scientific Attachés, nor does it consciously recruit officers with a scientific background

for either of its two rotational streams, FSO and AS(FS). In consultation with interested departments and agencies, Scientific Attachés are selected by the Science Secretariat of the Privy Council and appointed by the Department to positions at specified posts abroad, where they are accorded suitable diplomatic rank, usually at the level of First Secretary (Scientific) or Counsellor (Scientific). The Science Secretariat also assists the Department of External Affairs in the allocation and coordination of duties. Scientific personnel remain on the strength of the Department only for the period of their tour of duty. A total of four positions have been established to date in London, Washington, Paris and OECD (Paris). It is expected that this programme will be expanded to meet growing requirements at other posts.

PERSONNEL ASSOCIATED WITH SCIENTIFIC ACTIVITIES

- 15. The following information is provided in accordance with Part II, paragraph 2.5 of the "Guidelines" for agencies of the Federal Government:
- (a) <u>Current personnel establishment and people on</u>
 <u>strength by category of personnel:</u>

	Establishment	Strength	
London	1 (Counsellor - Scientific)	Vacant	
Washington	1 (Counsellor - Scientific)	1	
Paris	1 (Counsellor - Scientific)	1	
OECD (Paris)	1 (Counsellor - Scientific)	1	

(b) None of the foregoing devote any substantial proportion of their time to administrative duties.

10/... flowely restrict officers with a science of the background

(c)

		Paris	OECD(Paris)	Washington
(i)	Country of birth	Canada	Canada	Canada
(ii)	Country in which secondary education taken	Canada	Canada	Canada
(iii)	Country in which University degree taken (bachelor, master, doctorate)	B.Sc & Ph.D (Canada)	B.A. & M.A. (Canada)	B.Sc. (Canada), M.A. (USA)
(iv)	Number of working years since graduat and Number of years employed in present	Charatenata	13	18
	organization	6 mos.	6 mos.	6 mos.

- (d) Total number of professional staff in each degree category for each of the years 1962 to 1965 inclusive and estimates for each of the years 1969 to 1973:

 Three: one Ph.D and two M.A.

 The positions for Scientific Counsellors were first added to the establishment of the Department of External Affairs during the current fiscal year, having previously been provided elsewhere. The development of a programme of appointments for future years is under consideration.
- (e) Percentage of turnover of professional staff in the three degree categories for each of the years 1962 to 1967: Not applicable.
- (f) Percentage of current professional personnel who, since graduation -
 - (i) have been employed by industry at one time: none;

continued and listson between the departments and agenci-

- (ii) have been on the staff of universities: one(33%);
- (iii) provincial departments or agencies: none;
- (iv) other Federal agencies: three (100%).

- (g) Number of staff in each degree category on education

 leave:

 None.
 - (h) Number of university students given summer employment in the field of scientific activities for the years 1962 to 1967: None.

EFFECTS OF SCIENTIFIC DEVELOPMENTS ON DEPARTMENTAL OPERATIONS

16. Because of the expanding size and complexity of its operations, the Department in recent years has increasingly taken advantage of scientific and technological developments to promote increased administrative efficiency and economy. It is anticipated that the adoption or the adaptation of new technologies will further improve departmental efficiency during the next decade, particularly in telecommunications, in the processing of passports and in information storage and retrieval. More broadly, however, it is expected that the impact of new scientific and technological advances and the consequential increase in the flow of scientific information; the effects upon political alignments and strategies of new knowledge and skills; the demands for scientific and technological skills by the less developed countries, will continue to proportionately increase the role of the Department in providing coordination and liaison between the departments and agencies of the Government of Canada and other countries and international forums. It is already apparent that the international implications of such technological advances as communications satellites will create new problems in international law which will require the services of

trained and experienced personnel. As already indicated in this brief, interest in and responsibility for dealing with scientific matters is widely spread throughout the various divisions of the Department and, as a consequence, it is anticipated that the Department's operations, functions and responsibilities will be increasingly affected by technological and scientific advances. It is not anticipated that the basic role of the Department will change, but it can be predicted confidently that the extent of its interest, in absolute or proportionate terms, will be substantially increased within the next decade. It is the Department's intention to meet the challenge through the adoption of new techniques and the training of its personnel to meet this increased demand. The Department expects to be able, in consultation with the Science Secretariat, to provide Scientific Attachés in accordance with the quality and quantity of the demand for such services, but will also continue to fulfil its basic function of providing political guidance and assistance to the departments and agencies having relations with comparable institutes outside of Canada.

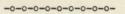
Appendix "A"

CANADIAN AGREEMENTS REGARDING SCIENTIFIC ACTIVITIES

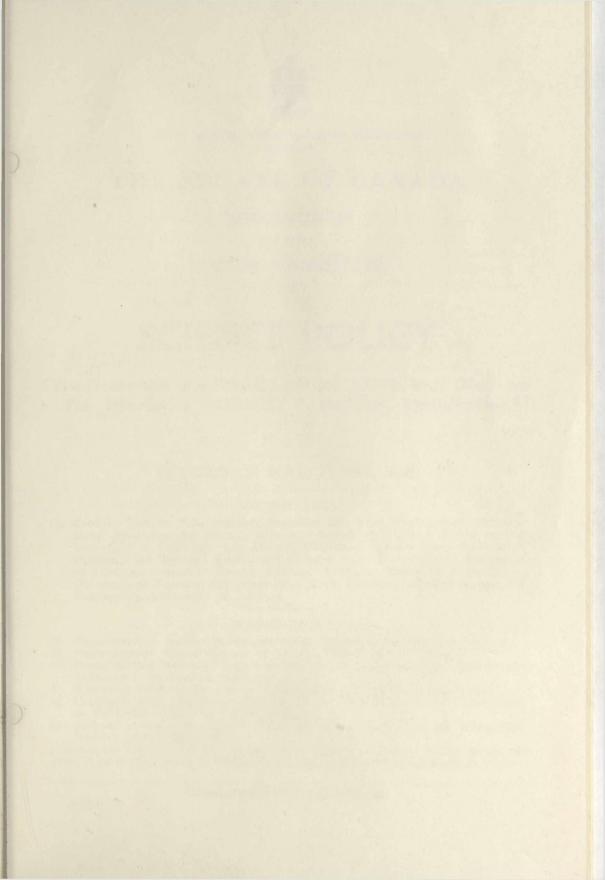
BILATERAL			
Country	Topic	Date	Canada Treaty Series Reference
Australia dud	Atomic Energy	1959, Aug. 4	1959 No. 18
Brazil	Culture	1944, May 24	1944 No. 15
Belgium Belgium	Culture Scientific Relations	1967, May 8	Not yet published
Denmark	Defence Science	1968, July 25	Not yet published
# Euratom	Atomic Energy	1959, Nov. 18	1959 No. 22
France France	Defence Science Culture	1962, May 25 1965, Nov. 17	1962 No. 7 1965 No. 21
Germany, F.D.R.	Atomic Energy	1957, Dec. 18	1957 No. 29
Germany, F.D.R.	Defence Science	1964, Aug. 28	1964 No. 18
Greece	Defence Science	1962, July 18	1962 No. 12
India India	Atomic Energy Atomic Energy	1963, Dec. 16 1966, Dec. 16	1963 No. 10 Not yet published
Japan	Atomic Energy	1960, July 27	1960 No. 15
Norway	Defence Science	1960, May 24	1960 No. 11
Pakistan	Atomic Energy	1959, May 14	1960 No. 14
Switzerland	Atomic Energy	1958, March 6	1958 No. 8
United States of America	Atomic Energy five agreements	1962, May 25	1962 No. 10
ibcrease the	Churchill Research Range	1965, June 14	1965 No. 9
Wil the Cover	Communications Satellites	1963, Aug. 23	1963 No. 13
national for	Ionospheric Research	1964, May 6	1964 No. 6
componication	Meteorological Satellite Station	1962, Dec. 28	1962 No. 21
"International	Meteorological Satellite Station	1964, Feb. 4	1964 No. 20

^{*} The European Atomic Energy Community

Country	Topic	Da	ate	Canada Treaty Series Reference
United States of America (cont'd)	Navigation	1964,	Sep. 16	1964 No. 19
п	Satellite Tracking	1960,	Aug. 24	1960 No. 19
"	Seismic Observations	1965,	June 29	1965 No. 10
"	Seismic Observations	1968,	June 27	Not yet published
п	Weather Stations, Pacific	1950,	June 22	1951 No. 36
n	Weather Stations, Pacific	1951,	Feb. 16	1951 No. 37
п	Weather Stations, Pacific	1952,	Feb. 22	1952 No. 33
п	Weather Stations, Pacific	1954,	June 28	1954 No. 12
MULTILATERAL				
Statute of the International Atomic Energy Agency		1956,	Oct. 26	1957 No. 20
Agreement concerning a Global Commercial Communications Satellite System		1964,	Aug. 20	1964 No. 24
Convention for the International Council for the Exploration of the Sea		1964,	Sept. 12	Not yet published
Convention on the International Hydrographic Organization		1967,	May 19	Not yet published
Agreement on North Atlantic Ocean Stations		1954,	Feb. 25	1955 No. 3



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First Session-Townty-eighth Parliament

THE SENATE OF CANADA

PROCEEDINGS

OF THE

SPECIAL COMMITTEE

ON

SCIENCE POLICY

The Honourable DONALD CAMERON Vice Continue

No. 30

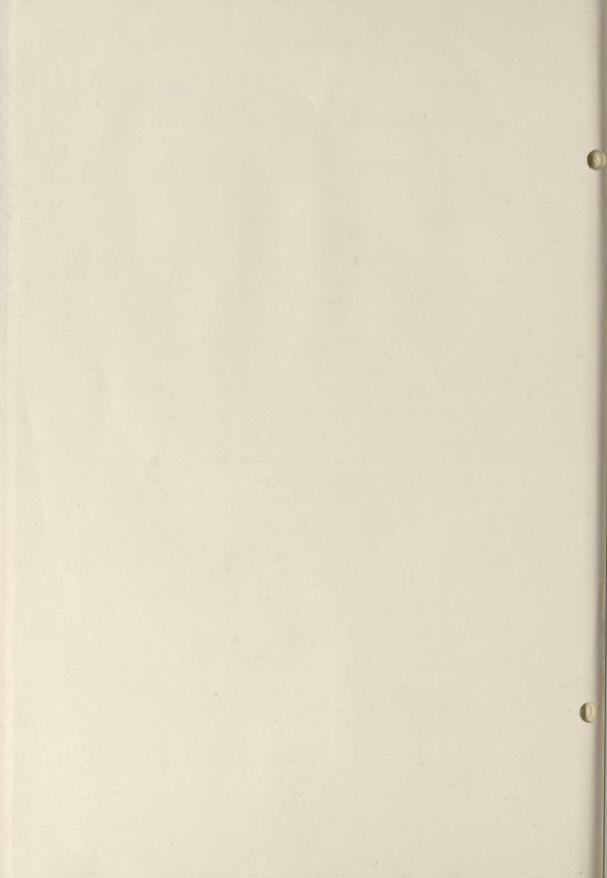
SATURDAY, MARCH 29th, 1988

WITNESSES

Sir Geoffrey Vickers, V.C., England; Prefessor Esic Vent, Pistanus of Organisational Behaviour and Ecology, Graduate School of Sevence Administration,
University of California, Los Argeles, California, U.S.A., Rebus, R. Belley,
Prefessor and Director, Believioural Sciences, Farmer of Bodistas, University
of Toronto; Francis G. Bregos, Associate Professor, Islandi of Sound Mars.
University of Toronto; and James Ham, Denn, Farmer et Apelles interest and
Engineering, University of Toronto.

APPENDICKS

- 15. Pency stricted "Schools Policy and Sprint Policy" to Nicellation Visioner
- O Device excited Charles Advants at Release Colonia as the Vice
- 46. Paper entitled Counties Transa to Bulleto area Survives, where Sheeten next
- 42. Highlights from wood shop remark to the the formation of the Russie Tonly
- 43. Address entitled "The Court of the product of the West of the Henometric Maurice Lamontonia, S.C.
- prepared for the Route Table and the section of Section of Section Policy, noder the Exercises of the University of Tangella deer, of Confile Mainerest Research Pand.





First Session—Twenty-eighth Parliament 1968-69

THE SENATE OF CANADA

PROCEEDINGS

OF THE

SPECIAL COMMITTEE

ON

SCIENCE POLICY

The Honourable MAURICE LAMONTAGNE, P.C., Chairman The Honourable DONALD CAMERON, Vice-Chairman

No. 39

SATURDAY, MARCH 29th, 1969

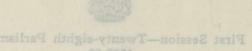
WITNESSES:

Sir Geoffrey Vickers, V.C., England; Professor Eric Trist, Professor of Organizational Behaviour and Ecology, Graduate School of Business Administration, University of California, Los Angeles, California, U.S.A.; Robin F. Badgley, Professor and Director, Behavioural Sciences, Faculty of Medicine, University of Toronto; Francis G. Bregha, Associate Professor, School of Social Work, University of Toronto; and James Ham, Dean, Faculty of Applied Science and Engineering, University of Toronto.

APPENDICES:

- 38. Paper entitled "Science Policy and Social Policy" by Sir Geoffrey Vickers
- 39. Paper entitled "Social Aspects of Science Policy" by Eric Trist
- 40. Paper entitled "Canadian Trends in Behavioural Research, a Brief Review and Assessment' by Thomas Philbrook
- 41. Address entitled "Social Aspects of Science Policy" by Dr. O. M. Solandt
- 42. Highlights from work-shop reports by the two Rapporteurs at the Round Table on the Social Aspects of Science Policy
- 43. Address entitled "The General Goals of Science Policy" by the Honourable Maurice Lamontagne, P.C.

prepared for the Round Table on the Social Aspects of Science Policy, under the auspices of the University of Toronto Harry M. Cassidy Memorial Research Fund.



THE SENATE OF CANADA

MEMBERS OF THE SPECIAL COMMITTEE

ON

SCIENCE POLICY

The Honourable Maurice Lamontagne, Chairman The Honourable Donald Cameron, Vice-Chairman

The Honourable Senators:

Aird	Grosart	Nichol
Bélisle	Haig	O'Leary (Carleton)
Blois Son Da TV	Hays MOMA T HOTE	Phillips (Prince)
Bourget	Kinnear	Robichaud
Cameron	Lamontagne	Sullivan
Carter	Lang	Thompson
Desruisseaux	Leonard	Yuzyk
Giguère	McGrand	CTITOLO
Carter Desruisseaux	Lamontagne Lang Leonard	Sullivan Thompson

Patrick J. Savoie,
Clerk of the Committee.

Sir Geoffrey Vickers, V.C., England; Professor Eric Trist, Professor of Organizational Behaviour and Ecology, Graduate School of Business Administration, University of California, Los Angeles, California, U.S.A.; Robin F. Badgley, Professor and Director, Behavioural Sciences, Faculty of Medicine, University of Toronto; Francis G. Bregha, Associate Professor, School of Social Work, University of Toronto; and James Ham, Dean, Faculty of Applied Science and Engineering, University of Toronto.

APPRICES.

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on vd bebroom how ORDERS OF REFERENCE

Extract from the Minutes of the Proceedings of the Senate, Tuesday, September 17th, 1968:

"The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That a Special Committee of the Senate be appointed to consider and report on the science policy of the Federal Government with the object of appraising its priorities, its budget and its efficiency in the light of the experience of other industrialized countries and of the requirements of the new scientific age and, without restricting the generality of the foregoing, to inquire into and report upon the following:

- (a) recent trends in research and development expenditures in Canada as compared with those in other industrialized countries;
- (b) research and development activities carried out by the Federal Government in the fields of physical, life and human sciences;
- (c) federal assistance to research and development activities carried out by individuals, universities, industry and other groups in the three scientific fields mentioned above; and
- (d) the broad principles, the long-term financial requirements and the structural organization of a dynamic and efficient science policy for Canada.

That the Committee have power to engage the services of such counsel, staff and technical advisers as may be necessary for the purpose of the inquiry;

That the Committee have power to send for persons, papers and records, to examine witnesses, to report from time to time, to print such papers and evidence from day to day as may be ordered by the Committee, to sit during sittings and adjournments of the Senate, and to adjourn from place to place;

That the papers and evidence received and taken on the subject in the preceding session be referred to the Committee; and

That the Committee be composed of the Honourable Senators Aird, Argue, Bélisle, Bourget, Cameron, Desruisseaux, Grosart, Hays, Kinnear, Lamontagne, Lang, Leonard, MacKenzie, O'Leary (Carleton), Phillips. (Prince), Sullivan, Thompson and Yuzyk.

After debate, and—
The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Thursday, September 19th, 1968:

"With leave of the Senate,

The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That the name of the Honourable Senator Robichaud be substituted for that of the Honourable Senator Argue on the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Wednesday, February 5th, 1969:

With leave of the Senate.

The Honourable Senator McDonald moved, seconded by the Honourable Senator Macdonald (Cape Breton):

That the names of the Honourable Senators Blois, Carter, Giguère, Haig, McGrand and Nichol be added to the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was—
Resolved in the affirmative.

ROBERT FORTIER,

ROBERT FORTIER,

MINUTES OF PROCEEDINGS

Senate Chamber
University of Toronto
Toronto, Ontario

SATURDAY, March 29th, 1969.

Pursuant to adjournment and notice the Special Committee on Science Policy met this day at 10.00 a.m.

Present: The Honourable Senators Lamontagne (Chairman), Belisle, Carter, Kinnear, Lang, Robichaud and Yuzyk. (7)

In attendance: Philip J. Pocock, Director of Research (Physical Science).

The following witnesses were heard and questioned:

Sir Geoffrey Vickers, V.C., England;

Professor Eric Trist.

Professor of Organizational Behaviour and Ecology,

Graduate School of Business Administration,

University of California,

Los Angeles, California, U.S.A.;

Robin F. Badgley,

Professor and Director.

Behavioural Sciences,

Faculty of Medicine.

University of Toronto;

Francis G. Bregha.

Associate Professor,

School of Social Work,

University of Toronto; and

James Ham,

Dean,

Faculty of Applied Science and Engineering,

University of Toronto.

(A curriculum vitae of each witness follows these Minutes.)

The Chairman, on behalf of the Committee, thanked the witnesses for their contribution to the Committee's studies.

The following, prepared for the Round Table on the Social Aspects of Science Policy, under the auspices of the University of Toronto Harry M. Cassidy Memorial Research Fund, are printed as Appendices:

- 38. Paper entitled "Science Policy and Social Policy" by Sir Geoffrey Vickers.
 - 39. Paper entitled "Social Aspects of Science Policy" by Eric Trist.
 - 40. Paper entitled "Canadian Trends in Behavioural Research, a Brief Review and Assessment" by Thomas Philbrook.
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 - 42. Highlights from work-shop reports by the two Rapporteurs at the Round Table on the Social Aspects of Science Policy.
 - 43. Address entitled "The General Goals of Science Policy" by the Honourable Maurice Lamontagne, P.C.

At 12.17 p.m. the Committee adjourned to the call of the Chairman.

ATTEST:

Patrick S. Savoie,

Clerk of the Committee.

CURRICULUM VITAE

Badaley, Robin Francis: I: Personal: Born: May 6, 1931, Westmount, P.Q., Canada: Married: Jean W. R. Duncan, Stocksfield, Northumberland, England, June 18, 1959; Children: Anne Duncan Badgley, Mary Elizabeth Badgley, Peter Francis Badgley. II: Educational Background: 1952 B.A. McGill University; 1954 M.A. McGill University; 1955 M.A. Yale University; 1957 Ph.D. Yale University. III. Positions Held: 1953-1954 Lecturer, Sir George Williams College, Montreal; 1955-1956 Assistant in Instruction, Yale University; 1957-1958 Instructor, Department of Sociology, Yale University; 1957-1958 Russell Sage Post-Doctoral Fellow for Research in Pediatrics, Department of Pediatrics, Yale University; 1958-1959 Assistant Professor, Department of Preventive Medicine, University of Vermont, Burlington; 1959-1962 Assistant Professor, Department of Social and Preventive Medicine, University of Saskatchewan, Saskatoon, Saskatchewan; 1962-1963 Acting Head and Associate Professor, University of Saskatchewan, Department of Social and Preventive Medicine, Saskatoon, Saskatchewan; 1963- Senior Member, Technical Staff, Milbank Memorial Fund. New York: 1963- Visiting Lecturer, Department of Epidemiology and Public Health, Yale University; 1963- Visiting Lecturer, Department of Sociology, Yale University; 1965- Lecturer, School of Public Health and Administrative Medicine, Columbia University.

IV. Papers given at professional meetings: 1957: 1. With J. V. Buerkle, "Couple Role-Taking: A Preliminary Analysis," Groves Conference on Marriage and the Family, Michigan State University, April; 1958: 2. "Social Bias in the Treatment of Pediatric Patients," American Sociological Association, Seattle, August; 1959: 3. "Altruism and Marital Adjustment," American Sociological Association, Chicago, September; 1960: 4. "The V.O.N. and the Public," Annual Meeting, Victorian Order of Nurses, Saskatoon, January: 5. "Marriage for Moderns," Y.W.C.A., Saskatoon, March; 6. Panel Discussant for a paper on "Quality Control in the Clinic Setting," American Public Health Association (Medical Care Section), November. 7. "Patterns of Uutilization of the General Practitioner in Rural Practice," Canadian Public Health Association (Medical Care Section), June, 1961. 1961: 8. "An Evaluation of the Co-ordinating Council on Rehabilitation (Saskatchewan) by its Member Agencies," Second Annual Congress of the Co-ordinating Council on Rehabilitation (Saskatchewan), Saskatoon, November; 9. Paper with R. W. Hetherington and J. W. Macleod, "Preliminary Report on a Survey of Saskatchewan Medical Students," Association of Canadian Medical Colleges, Quebec City, November. 10. Address: "The Integration of Therapeutic Services in the Community," Second Canadian Institute on Mental Health Services, Ottawa, January; 1962: 11. Paper: "The Individual Study as a Field Experience Assignment," Regional Nursing Supervisors Conference, Saskatoon, January; 12. Address: "The Ecology of Medical Practice," Seventh Post-Graduate Courses in Obstetrics, Gynaecology and Paediatrics, Regina, February. 13. Paper with R. W. Hetherington, "Social Class and the Utilization of Health Services in Wheatville," Canadian Public Health Association (Saskatchewan Branch), Regina, April; 14. Address: "Social

Sciences and Public Health," Canadian Public Health Association, Toronto, May; 15. Group Discussion Leader and Panel Speaker, International Conference on Health and Health Education, Philadelphia, July; 16. Group Consultant: Saskatoon Regional Conference on the Aged and Long-Term Ill, Saskatoon, September; 17. Panel Member: Annual Conference of the Milbank Memorial Fund, New York, September: 18. Paper: "The Public and Medical Care in Saskatchewan," American Public Health Association, Miami, October; 19. Paper: "Prospectus for Canadian Studies in Medical Education," Annual Meeting of the Association of Canadian Medical Colleges, Vancouver, October; 20. Consultant and Panel Speaker: Conference on Training for General Practice (College of General Practice of Canada), Toronto, November: 1963: 21. Address: "The Tragedy of Nursing Education," Saskatchewan Registered Nurses' Association (Saskatoon Chapter), Saskatoon, January; 22. Consultant: Regional Nursing Supervisors' Conference, Saskatoon, March; 23. Chairman and Panel Speaker: "Unmet needs in Education for Health Workers," Canadian Public Health Association (Saskatchewan Branch), Regina, April; 24. Participant: Round Table Conference on Medical Education in Latin America, Milbank Memorial Fund and Pan American Health Organization, New York, October; 1964: 25. Panel Speaker: "Planning, Implementation and Evaluation of Community Health Services," Canadian Public Health Association, Moncton, May; 26. Address: "Current Status and Review of Techniques Used in Studies of Health Manpower," Conferencia Inaugural, Estudio de Recursos Humanos Para Salud y Education Medica, Bogota, Colombia, August; 1965: 27. Address, with Marjorie Schulte, Behavioral Science and Medicine in Latin America: An Overview, Round Table on Behavioral Science and Medical Education, Sixtieth Anniversary Conference, Milbank Memorial Fund, April 5, 1965; 28. Address with Marjorie Schulte, Social Science Teaching Programs in Latin American Medical Schools, Round Table on Behavioral Science in Latin America, Sixtieth Anniversary Conference, Milbank Memorial Fund, April 7, 1965; 29. Address with Samuel Wolfe, Medical Care and Conflict in Saskatchewan, Thirty-Seventh Annual Meeting of the Canadian Political Science Association, Vancouver, June 11, 1965; 1966: 30. Rapporteur, Institute on International Medical Education, Association of American Medical Colleges, Washington, March 27-30, 1966; 31. Panel Speaker: "Health and Poverty." 36th Annual Meeting of the Eastern Sociological Society, Philadelphia, April 17, 1966; 32. Speaker with Robert W. Hetherington, V. L. Matthews and Marjorie Schulte, "The Impact of Medicare in Wheatville, Saskatchewan 1960-1965," Canadian Public Health Association, Quebec City, June 1, 1966; 33. Speaker with Robert W. Hetherington and V. L. Matthews, "Voluntary Health Related Behavior in Wheatville," Canadian Public Health Association, Quebec City, June 1, 1966; 34. Speaker, "The Social Scientist and Epidemiology, "Canadian Association of Teachers of Preventive Medicine, Montreal, June 3, 1966; 35. Samuel Wolfe, Robin F. Badgley, Richard V. Kasius, John Z. Garson and Reynolds J. M. Gold, "A Description and Analysis of the Work of a Group of Doctors," American Public Health Association, San Francisco, November 2, 1966.

V. PUBLICATIONS: A. Books and Monographs: 1. Robin F. Badgley (editor), Behavioral Science and Medical Education in Latin America, Milbank Memorial Fund, April 1966, 244 pp. (translated into Spanish); 2. Robin F.

Badgley and Samuel Wolfe, *Doctors' Strike: Medical Care and Conflict in Saskatchewan*, MacMillan Company of Canada, Toronto and Atherton Press, New York City, (1967); 3. Samuel Wolfe and Robin F. Badgley, The Family Doctor (in process).

B. Articles: 1. With J. Bullock, K. B. Ladd, L. S. Levin, J. R. Lezer and K. MacDonald, A Study of Tuberculosis Control in Vermont, University of Vermont, February, 1959. 2. J. V. Buerkle and Robin F. Badgley, "Couple Role-Taking: The Yale Marital Interaction Battery," Marriage and Family Living, February, 1959. 3. With K. B. Ladd, L. S. Levin and L. R. Lezer, Medical Care Needs-Islesboro, Maine, University of Vermont, April, 1959. 4. With K. B. Ladd, L. S. Levin and L. R. Lezer, A Study of Medical Care Needs-Islesboro. Maine, University of Vermont, April, 1959. 5. With K. B. Ladd, L. S. Levin, L. R. Lezer and K. MacDonald, A Study of the Burlington Visiting Nurse Association, Inc., University of Vermont, August, 1959, 101 + xiii. 6. With K. B. Ladd. The Demography of Burlington and Vicinity, University of Vermont, Burlington, October, 1959, 31 + ix. 7. "Analysis of 'Cost Study of Basic Nursing Education Programs in Saskatchewan," Proceedings of Conference Convened by the Board of Administration of the Centralized Teaching Program, Saskatchewan, January, 1960, 20 pages. 8. H. M. Parrish, Robin F. Badgley, and C. A. Carr, "Poisonous Snake Bites in New England," New England Journal of Medicine, 263: 788-793, October, 1960. 9. J. V. Buerkle, T. R. Anderson and Robin F. Badgley, "Altruism, Role Conflict and Marital Adjustment: A Factor Analysis of Marital Interaction," Marriage and Family Living, 23:20-26, Februarv. 1961. 10. "Sociology in the Medical Curriculum," Canadian Medical Association Journal, 84:705-709, April, 1961. 11. "Social Bias in the Treatment of Pediatric Patients," Pediatrics, 27:829-835, May, 1961. 12. "An Assessment of Research Methods in 103 Scientific Articles from Two Canadian Medical Journals," Canadian Medical Association Journal, 85:246-250, July, 1961. 13. With R. W. Hetherington, "Medical Sociology: A Selected Canadian Bibliography," Canadian Medical Association Journal, 85:88-89, July, 1961. 14. "The Cost and Scope of Ward Activities of Student Nurses," Canadian Hospital, 38:46-47, September, 1961. 15. "An Interdisciplinary Assessment of Health Education," Food for Thought, 21:26-31, September-October, 1961. 16. With M. A. Furnal, "Appointment Breaking in a Pediatric Clinic." 34:117-123. Yale Journal of Biology and Medicine, October, 1961. 17. With R. W. Hetherington, "Medical Care in Wheatville," Canadian Journal of Public Health, 52:512-517, December, 1961. 18. "An Evaluation of the Co-ordinating Council on Rehabilitation (Saskatchewan) by its Member Agencies," Co-ordinating Council on Rehabilitation (Saskatchewan), November, 1961 (mimeo), page 19, 19, With K. B. Ladd and L. S. Levin, K. MacDonald and H. M. Parrish, "How Good are the Records Your Agency Keeps?" Nursing Outlook, 10:118-119, February, 1962. 20. (editor): Proceedings of the Institute on Community Education for Health, University of Saskatchewan, April, 1962 (mimeo). 21. With R. W. Hetherington and J. W. Macleod, "Social Characteristics and Prediction of Academic Performance of Saskatchewan Medical Students," Canadian Medical Association Journal, 86:624-629, April, 1962. 22. "Community Education for Health in Canada," Canadian Journal of Health, 53:218-219, May, 1962. 23. "The Integration of Therapeutic Services in the Community,"

Proceedings of the Second Canadian Institute on Mental Health Services. pages 72-76, Ottawa, May, 1962. 24. (editor): Readings in Medical Sociology. University of Saskatchewan, August, 1962 (mimeo). 25. With R. W. Hetherington: "Medical Care and Social Class in Wheatville," Canadian Journal of Public Health, 53:425-431, December, 1962. 26. With R. W. Hetherington: "Health Services in a Prairie Town," Research Review, 1:30-33, Winter, 1963. 27. Discussion on Training for General Practice, Proceedings of the Conference on Training for General Practice (College of General Practice of Canada). Toronto, January, 1963, page 52. 28. With D. O. Anderson, R. W. Hetherington, and E. Riches: "A Prospectus for Canadian Studies in Medical Education," Canadian Medical Association Journal, 88:690-693, April, 1963. 29. "Social Sciences and Public Health," Canadian Journal of Public Health, 54:147-153, April, 1963. 30. "The Bedraggled White Plum", Canada's Mental Health, 11:6-11, May, 1963. 31. "The Public and Medical Care in Saskatchewan," American Journal of Public Health, 53:720-724, May, 1963. 32. "Contribution of Social Sciences to Health Education," Health Education Bulletin, 2:2-5, May, 1963. 33. "Tragedy of Nursing Education," The Canadian Nurse, 59:722-725, August, 1963. 34. With Samuel Wolfe, Medical Care and Conflict in Saskatchewan, Milbank Memorial Fund Quarterly, 43:453-479, October, 1965. 35. Medical Careers in Public Health: A Commentary, Milbank Memorial Fund Quarterly, 44:143-145, April, 1966. 36. With Alexander Robertson, Foreword. Behavioral Science and Medical Education in Latin America, Milbank Memorial Fund Quarterly, 44:9-12, April, 1966. 37. With Marjorie Schulte, Behavioral Science and Medicine in Latin America: A Selected Bibliography, Milbank Memorial Fund Quarterly, 44:27-51 (Part II) April, 1966. 38. With Marjorie Schulte, Social Science Teaching Programs in Latin American Medical Schools, Milbank Memorial Fund Quarterly, 44:187-197 (Part II) April, 1966. 39. With Marjorie Schulte, Social Science Teaching Programs in Latin American Medical Schools, Cuaderios Medico-Sociales, September, 1966. 40. A Commentary on the Social Scientist and Epidemiology, Proceedings of the Canadian Association of Teachers of Preventive Medicine, 1966. pp. 60-62. 41. Colin M. Smith, Robin F. Badgley and D. G. McKerracher, Study of Mental Illness: The General Practitioner, Appendix 1, Trends in Psychiatric Care, Royal Commission on Health Services, 1964, Ottawa, 1966, 237-245. 42. With Colin M. Smith and D. G. McKerracher, Study of Mental Illness: The Public, Appendix 2, Trends in Psychiatric Care, Royal Commission on Health Services, 1964, Ottawa, 1966, 247-250.

C. Magazine Articles, Reviews, Bulletins: 1. With A. D. Robertson, "Institute on Community Education for Health," Canadian Journal of Public Health, 52:84-85, February, 1961. 2. Review of J. Robertson's "Young Children in Hospitals," Journal of Health and Human Behavior, 1:152, Summer, 1960. 3. Review of A. Conway's "The Welsh in America," American Sociological Review, 26:666, August, 1961. 4. Review of S. D. Clark's, "Urbanism and the Changing Canadian Society," American Sociological Review, 27:444, June, 1962. 5. Review of S. Mudd, editor, "The Population Crisis and the Use of World Resources," Journal of the American Medical Association, 189:244, July 20, 1964.

VII. OFFICES, COMMITTEES, ETC.: 1. Senior Sterling Fellowship, Yale University, 1956-1957. 2. Russell Sage Post-Doctoral Fellowship, Yale University, 1957-1958. 3. Paper on "Couple Role-Taking: The Yale Marital Inter-

action Battery," with J. V. Buerkle was selected for short listing for the Burgess Award of the National Council on Family Relations, for the outstanding research contribution to the study of the sociology of the family, 1959-1960. 4. Member, Scientific Advisory Committee, Saskatchewan Association for Mental Retardation, 1959-1963, 5. Consultant to Chairman of Royal Commission on Health Services Study of Mental Health Services in Canada, 1961-1963. 6. Chairman, Research-Consultation Division and Member, Board of Directors, Co-ordinating Council on Rehabilitation (Saskatchewan), 1961-1963, 7, Honorary Consultant to the Medical Staff, University Hospital, Saskatoon, 1961-1963, 8, Member, Nominations Committee, Medical Sociology Section, American Sociological Association, 1961-1962. 9. Consultant, National Health Grants Program, Department of National Health and Welfare, Ottawa, 1961-1962. 10 Member, Executive Committee, Canadian Public Health Association (Saskatchewan Branch), 1962-1963. 11. Member, Subcommittee on Planning for Institute on International Medical Education, Association of American Medical Colleges, 1965-1966. 12. Editor, Milbank Memorial Fund Quarterly, 1963-13. Secretary-Treasurer, Medical Sociology Section, American Sociological Association, 1965-1968. 14. Advisory Committee for Evaluation of Programs and Patient Care at Harlem Hospital Center, Columbia University, 1965. 15. Member (Social Security Administration representative), Advisory Panel for the Cooperative Research and Demonstration Grants Program, Welfare Administration, Washington, 1966-1969. 16. Member, Review Committee, National Institute of Child Health and Human Development, U.S. Public Health Service, Washington, 1966-1970.

VIII. ASSOCIATIONS: 1. American Public Association (Fellow). 2. American Sociological Association (Fellow). 3. Association of Teachers of Preventive Medicine. 4. Canadian Association of Economics and Political Science. 5. Canadian Public Health Association. 6. Eastern Sociological Society.

ADDENDUM

VI. PUBLICATIONS: A. Books, Monographs, Chapters: 1. Robin F. Badgley (editor), Ciencias de la Conducts y Ensenanze Medica on America Latina, Milbank Memorial Fund, 1967, 268 pages. 2. Robin F. Badgley and Samuel Wolfe, Doctors' Strike: Medical Care and Conflict in Saskatchewan, MacMillan Company of Canada and Atherton Press, New York City, May 1967, 201 pages. 3. Robin F. Badgley, The Public and Medical Care in Saskatchewan, in Medical Care in Transition, Volume III, pages 60-64, U.S. Public Health Service Publication No. 1128, Washington, D.C. 1967. B. Articles: 1. Robin F. Badgley, Robert W. Hetherington, V. L. Matthews and Marjorie Schulte, The Impact of Medicare in Wheatville, Saskatchewan 1960-1965, Canadian Journal of Public Health, S8:101-108, March, 1967. 2. Robert W. Hetherington, Robin F. Badgley and V. L. Matthews, Voluntary Health—Related Behaviour in Wheatville, Canadian Journal of Public Health, S8:109-116, March 1967.

VII. PUBLICATIONS IN PROCESS: A. Samuel Wolfe, Robin F. Badgley, Richard V. Kasius, John Z. Garson and Reynold J. M. Gold, An Analysis of the Work of a Group of Doctors, Milbank Memorial Fund Quarterly, 46, January 1968. B. Robin F. Badgley and Samuel Wolfe, Medical Care and Conflict in Saskatchewan in E. Gartley Jaco (editor), Patients, Physicians and

Illness, The Free Press Division of the MacMillan Company, revised edition, scheduled for publication 1968. C. Robin F. Badgley and Samuel Wolfe, The Doctors' Right to Strike, in Ethical Issues in Medicine: The Role of the Physician in Today's Society, in E. Fuller Torrey (editor) Little, Brown and Co., New York. Scheduled for publication Spring 1968, Chapter 18. D. Robin F. Badgley, Margaret West and Richard V. Kasius, An Overview of the Colombian National Health Survey in Irving Kessler (editor) University of Johns Hopkins Press.

III. TEACHING ACTIVITIES: A. Lecturer, Department of Sociology,

IV. COMMITTEES, CONSULTANT, ETC.: A. Secretary-Treasurer, Medi-Public Service, Yale University, 1964-1968. C. Lecturer, School of Public Health and Administrative Medicine, 1965 to present. Colombia University.

IV. COMMITTEES, CONSULTANTS, ETC.: A. Secretary-Treasurer, Medical Sociology Section, American Sociological Association, 1965-1968 (extended ex officio to 1969). B. Member (Social Security Administration representative), Advisory Panel for the Cooperative Research and Demonstration Grants Program, Welfare Administration, Washington, 1966-1969. C. Member, Review Committee, National Institute of Child Health and Human Development, U.S. Public Health Service, Washington, 1966-1970. D. Editor, Milbank Memorial Fund Quarterly, 1968-1967. E. Member, Commission on the Canadian Public Health Association, 1967.

V. ADDRESSES: A. The Family Doctor: Preliminary Report of a Research Study, to Research Committee, Health Services Administration, New York City, June 1, 1967. B. Robin F. Badgley, Marjorie Schulte and Richard V. Kasius, Social and Economic Findings and Health Services in Colombia, International Conference on Health Manpower and Medical Education, Pan American Health Organization, Marscay, Venezuela, June 22, 1967. C. Social Science and Health Services Research, College of Medicine, McMaster University, Hamilton, Ontario, July 28, 1967. D. Panelist, Speaking of Books, Canadian Broadcasting Corporation, October 13, 1967. E. Robin F. Badgley, Carlos Herman Agualimpia, Richard V. Kasius, Alfonso Majia and Marjorie Schulte, Illness and Health Services in Colombia, Round Table on Social Science and Health Planning, Milbank Memorial Fund, October 18, 1967. E. Robin F. Badgley, Marjorie Schulte and Richard V. Kasius, Social and Economic Findings and Health Services in Colombia in Study on Health Manpower and Medical Education in Colombia, Volume III, Pan American Health Organization, Washington, D.C. 1968. F. Robin F. Badgley, Carlos Hernan Agualimpia, Richard V. Kasius, Alfonso Majia and Marjorie Schulte, Illness and Health Services in Colombia, in Social Science and Health Planning, Milbank Memorial Fund Quarterly Part II, April 1968.

Bregha, Francis J. Born in 1927, Prague, Czechoslovakia. Studied Law and Economics at Charles University and continued at the Faculty of Social Sciences, Laval University, where he graduated in Economics in 1951. Presently he is Professor of Development at the School of Social Work, University of Toronto. During his stay in Quebec, he published 'Deshumanisation du travailleur dans

l'univers communiste' and 'Etude comparative des lois provinciales du travail au Canada'. Between 1956 and 1960 he was editor of journals and book series dedicated to European reconstruction and unity, published in London, Paris, Rome and Munich. In this capacity he took part in the activities of the European Council in Strasbourg and of several international conferences. After having served for two years as economic advisor to the Prime Minister of the Province of Quebec, he went to Latin America as director for the Andean Region of the International Development Foundation. He lectured at most of Latin American Universities, founded 'Desarrollo y Democracia', a journal focusing on the problems of economic and social development and worked closely with the Peruvian, Chilean and Colombian governments in the implementation of programmes sponsored by the Inter-American Development Bank. He is executive secretary of a joint Canadian-American study group fo Latin America, member of the Executive Committee for the Caribbean (CIIA), member of the Society for International Development (Washington), director of International Development Foundation and member of the Board of University Settlement in Toronto.

Ham, James Milton. Dean of Applied Science and Engineering, University of Toronto. Born: Coboconk, Ontario, 1920. Education: B.A.Sc. Electrical Engineering (British Association of Advancement of Science Medal) S.M. and Sc.D. Electrical Engineering, Massachusetts Institute of Technology (Industrial Electronics Fellowship). Experience: Electrical Officer, Royal Canadian Navy: Assistant Professor M.I.T. 1951-52; Left Faculty of M.I.T. in 1952 to joint staff in Electrical Engineering at University of Toronto: Graduate research in automatic control: Department Head 1964-66: Dean of Faculty of Applied Science and Engineering, University of Toronto: Consultant on industrial automatic systems especially steel industry: Founded Associate Committee on Automatic Control of National Research Council; Member of Executive International Federation on Automatic Control: Visiting Scientist 1960 to U.S.S.R. at Institute for Automatic Control Honours: Fellow of Institute of Electrical and Electronics engineers: National Centennial Medal 1967: Fellow of New College, University of Toronto. Personal Interests: Russian literature, sailing, hockey (coached NTHL Atom Champs Confederation Year), pottery.

Trist Eric, O.B.E. Professor Trist, a graduate of the University of Cambridge. is presently Professor of Organizational Behavior and Ecology, Graduate School of Business Administration, University of California, Los Angeles, He also serves as Chairman of the Public Systems Committee, for joint programs with the School of Public Health, etc., and Chairman of the Socio-Technical Division, Western Management Science Institute. He is a part-time member (formerly Chairman) of the Human Resources Centre, Tavistock Institute of Human Relations, London. His professional career spans a period of almost forty years. In more recent years he has been Regents' Lecturer. Graduate School of Business Administration, UCLA; Development Consultant to the Canadian Centre for Community Studies, Ottawa; member of the College of Consultants, UNESCO, responsible for section on organization, support, and relation of social research to government policies; Visiting Professor, Division of Organizational Sciences, Case Institute of Technology, Cleveland; Visiting Overseas Trainer at the National Training Laboratory Summer Sessions at Bethel, Maine; Visiting Scientist, National Institute of Mental Health, Bethesda, Maryland;

Convenor, Joint Standing Committee of the Council and staff, Tavistock Institute of Human Relations; Fellow, Center for Advanced Study in the Behavioral Sciences, Stanford, California; member of the Management Committee, and Deputy Chairman and Chairman of the Committee on Human Resources, Organization, and Social Change, Tavistock Institute of Human Relations. He has been Adviser in Social Psychology to the British Army's Resettlement Scheme for British Repatriated Prisoners of War; Senior Psychologist, Lieutenant-Colonel, War Office Selection Boards; Rockefeller Research Fellow and Senior Clinical Psychologist, Institute of Psychiatry, University of London; and Lecturer in charge of the Department of Psychology at the University of St. Andrews. Dr. Trist has taught General and Social Psychology, Clinical Psychology, as well as Advanced Management Theory and Organizational Theory and Socio-Technical Studies. Prof. Trist's services on professional and scientific bodies have been widespread and international. To mention a few: he is a Founder Member of the British Sociological Association, of the Experimental Psychology Group of the British Psychological Association, and of the British Rorschach Forum. He is an Associate, National Training Laboratories, Washington, D.C.; member of the British Institute of Management, London Region; member, Comparative Administration Group, American Society for Public Administration; member of the Executive Committee, International Group for Studies in National Planning (Interplan), Syracuse, New York, and London School of Economics; Fellow of the European Institute for Trans-National Studies in Group and Organizational Development, Copenhagen; member of the Executive Committee (provisional organizing body) of the International Association for Social Psychology, London; member of the Executive Council of the Mental Health Research Fund. London; member of the Academic Advisory Board to the Centre for the Study of Collective Psychopathology, University of Sussex. He is co-ordinating Editor of the journal, Human Relations (London), and a former member of the Editorial Committee of the British Journal of Industrial Relations. Until 1966 he was Adviser to the Committee on Developments in the Next Thirty Years, British Social Science Research Council, and a member of the Psychological Committee, British Social Science Research Council. He is the author or coauthor of about fifty publications, most of them too well known to require listing here. His field of interest is the development of concepts and methods. on a multi-disciplinary basis, for the study of social change and the development of people in organizations of all kinds. Through the experience of the war-time activities of the Tavistock group his interest extended to include. as well as the small group, the larger organization and its relation to its external environment. He became interested in the development of a general theory of the enterprise considered as an open, socio-technical system rather than as a closed, social system. Some five years ago he was instrumental in establishing within the Tavistock framework an Institute for Operational Research so that this approach could be combined with that of the behavioral sciences. The experience led him, with Dr. F. E. Emery, to consideration of some new problems in human adaptation under conditions of uncertainty and interdependence, and also of the way in which social and psychological factors operate in networks of institutions rather than simply within a single organization. In the last few years also he has become concerned with questions of science policy in relation to social research and its organization and financing.

This field of work fits in well with his general interest in institution building in relation to large-scale social systems and emergent situations.

Sir Geoffrey Vickers, V.C. Sir Geoffrey Vickers, a graduate of Oxford, has had a distinguished career in business, law, and government in Britain. After World War I he qualified as a solicitor and practised as a partner in a well known firm of corporation lawyers in London. Throughout World War II he was Chief of Economic Intelligence at the Ministry of Economic Warfare, and a member of the Intelligence Committee of the British Chiefs of Staff, When the war ended he joined the British National Coal Board, first as legal adviser, and later as the member in charge of manpower, training, education, health and welfare. He was knighted in 1946. Sir Geoffrey has been a director of companies, and active in many public and professional bodies in Britain, including the Medical Research Council, the London Passenger Transport Board, the Council of the Law Society, and the Council of the Royal Institute of International Affairs. For many years he served as Chairman of the Research Committee of the Mental Health Research Fund. For three consecutive years in 1956 to 1958 he served as Chief Consultant to the Round Table on Man and Industry, organized by the University of Toronto School of Social Work, which resulted in publication by the University of Toronto Press of one of his books,

The Undirected Society.

As a student of and writer of sociological subjects, including the sociology of industry, Sir Geoffrey has to his credit publication of five books and many articles in learned journals. He has travelled extensively and has lectured and written on government and administration, public and mental health, and human ecology.

THE SENATE

SPECIAL COMMITTEE ON SCIENCE POLICY

EVIDENCE

Toronto, Saturday, March 29, 1969.

The Senate Special Committee on Science Policy met in the Senate Chamber, University of Toronto, at 10.00 a.m.

Senator Maurice Lamontagne (Chairman) in the Chair.

The Chairman: Ladies and gentlemen, this is the first time that the Senate Special Committee on Science Policy has sat outside the parliament Buildings in Ottawa.

It is most appropriate, I think, that we are meeting this morning in the Senate Chamber of the University of Toronto, but I want to assure Dr. Solandt and Dr. Bissell that our occupation of these historic premises will only be temporary and most peaceful. We shall be no more turbulent nor disturbing here than when we are sitting in our own Senate Chamber, and this guarantee should completely reassure the authorities of your university.

I would like first to thank Dr. Hendry, on behalf of the committee, for this most thoughtful invitation. When this invitation was first extended to us, most of the members of the committee believed that they would be able to attend this meeting today, but life—even for senators—is difficult to predict. At least five of our members are on missions abroad at the moment, and three others are sick though, I hope, not seriously.

This committee has been in operation, as most of you know, since March, 1968, although it went out of existence temporarily in the summer of that year as a result of the dissolution of Parliament.

Up to now we have received detailed briefs from all government research agencies, and we have heard most of them. We shall finish this phase of our inquiry in April. Already our proceedings, since we have been in operation, are about two feet thick.

In May we shall begin hearing evidence from the private sector, including universities, industry and professional and trade associations. We shall receive from that sector about two hundred briefs, which shows the great interest which exists in Canada at the moment in science policy.

We hope to be in a position to present our report in October, and for this reason, of course, we shall not be able to hear all those who will have sent briefs to the committee, but those written representations will form part of our record and will be most carefully studied by the members of the committee.

At the beginning of our investigation we decided to go to school, which was very much needed, and to invite a few people from Canada and abroad to discuss before us the broad issues of science policy. Most of these discussions were printed in a separate volume which has been made available to you here last Thursday. We have also taken advantage of several other occasions and opportunities to continue this learning process when distinguished visitors from abroad were coming to Ottawa. Today we have a similar occasion, and that is why we were so glad to accept Dr. Hendry's invitation.

We shall follow today our usual procedure. I will not waste any time in introducing our guests. You all know them very well by now, and their detailed biographies will be printed in our proceedings as usual. Each one of them will make a brief initial statement, after which we shall have the usual question period.

I will now ask Sir Geoffrey Vickers to initiate the discussion.

Sir Geoffrey Vickers, V.C.: Mr. Chairman, Honourable senators, I address you with a very great diffidence. I have only limited personal, first-hand knowledge of these matters in my own country and none, of course, in yours. I have had very little time to prepare this presentation, and in any case my views on these matters are affected by some unresolved doubts. So I shall keep closely to commenting on those general principles

which are referred to in the last paragraph (d) of your terms of reference.

I start from two preoccupations which might perhaps be stated. One is that I think that two basic changes are taking place which will affect the development of science. Until recently, just as all economic growth was deemed to be good wherever it occurred so long as it appeared in the GNP, so all growth of knowledge was deemed to be good wherever it appeared.

Just as in the one field that indifferent, uncontrolled growth is being increasingly qualified by the felt need to subordinate it to public policy, which in its turn is felt to need subordinating to basic human concerns; so I think the same kind of subordination to policy and to human concerns is bound increasingly to affect the development of science.

My other preoccupation is this, that the tasks of government are becoming and will, I think, increasingly become, tasks concerned with the regulation of the increasingly complex human systems, which will require increasingly more scientific study, and will thus emphasize a kind of scientific inquiry which has hitherto been only marginally present in our minds: something different, both from that pure research of which the paradigm in our minds is the discovery of new secrets of the physical world; and equally, or even more, different from applied science and technology—the discovering of new ways of doing things.

I think that the resources of science will become increasingly harnessed to this intermediate field of understanding the complex systems within which we live and of which we form part. I think that this will affect the matters with which your committee is concerned.

It seems to me to affect a question which has already been before you, of whether organizational and departmental science are to be regarded as linked to education or to technology.

Witnesses before you have already referred to the recent changes in my own country. The present linking of science and education has been criticized. It is too early to say whether it is right.

In my own brief experience before that time, I was aware of difficulties that arose when some parts of research money came from one place and others—those that went into the university field as part of education—came from another.

I can see the logic of linking science and education, but, of course, science is equally linked to many other fields of policy; and any division which links it appropriately in one way must create some artificial severance in another.

I feel that this matter of organization is very important. Linked with it, I think great importance attaches to the way in which the statistics of the research effort are themselves carved up. I read recently that in the United States they have recently ceased to try to distinguish the basic research quotients from the other.

It may be that the money devoted to this new section of inquiry which I have distinguished, a section which once we would have thought of as operational research but which has far outgrown any such label, may have again to be distinguished. I cannot offer any question as to what is the right solution for this, least of all in your country; but I would emphasize the importance of it, and I am sure that you are very much more familiar than I with the important implications of whether one particular field of policy is departmentally included here or there or split.

The means for deciding differences of policy within a single department are, in my country at least, very much greater than those available to determine differences which cross the boundaries of departments, especially where the issue is not large enough to get to the Cabinet table. I understand that at least until two years ago—and I think this is still the same—the new techniques of policy programming and budgeting in the States have not begun to make any impact on the overcoming of departmental boundaries when considering policies which covered several of them.

Then a further question which preoccupied me greatly when I think of this, is the extent to which, and the manner in which public policy should influence the way in which science money is spent—so the directions in which it is spent, the disciplines on which it is spent, the activities on which it is spent.

Traditional views of academic freedom greatly resent the imposition of any policy decisions in this field which are not taken by scientific and academic bodies. It is extremely important that acedemic bodies should retain absolute freedom of what they teach and what they do in the fields where they do it; but for the reasons I mentioned earlier it will be, I am sure, increasingly important that the direction of the effort and the field of the effort should be more and more responsible to public policy.

That does not shock me, nor present itself to me as any from of political dictation to some isolated, separate academic estate; because it is just as proper that the scientific community should be responsive to public policy as that the political power should be responsive to scientific need, including scientific need for independence.

Then this again, Mr. Chairman, is affected by one's views of the future of the institutions in which science is going to be done. This is outside your terms of reference perhaps but, nonetheless, some assumptions about it have to be made, and I find this is a matter of considerable doubt.

Universities are protean institutions; they differ considerably from what they were in the Thirteenth or even in the Nineteenth century, and no doubt they will continue to change. Nonethless, one of the most striking aspects of the contemporary science knowledge is the growth of multi-disciplinary institutions outside the universities which are unquestionably doing science: both large organizations directly maintained by the government, large organizations directly maintained by industry, and semi-autonomous non-profit-making undertaking of a new kind which are playing an increasingly important part.

My feeling is that this extra-university science will grow, and that it should grow. I would like to think that we could look forward, and look forward at no distant date, to a world in which the institutions in which science is done fall into two powerful categories: these non-university bodies, greatly enlivened, greatly relieved in their activities by the fact that they are not so tied to disciplinary boundaries as primarily teaching institutions are bound to be, but nonetheless largely dependent for their revenues on contracts for the work they do; and, on the other hand, a university set-up primarily concerned with education and the pursuit of knowledge, which is nonetheless much more marked than it is now, in its teaching as well as its research, by the need to focus on and to be responsive to contemporary problems.

I would hope that in that set-up the nonuniversity bodies would also take some part

in teaching, as to-day they frequently are unable to do; just as I would hope that the university side of the picture would take some part in problem-oriented research.

The only other comment I would like to make in concluding, Mr. Chairman-and I hesitate not because I am in doubt as to what it is but to try to find a polite way to say it-I mentioned earlier that the time had come when the priorities in seeking new knowledge would have to become more responsive to a policy which itself reflected human concern. That means that there must be some spontaneous, not necessarily formal, direction, to the way in which knowledge is sought. This means that not all new knowlege is to be equally esteemed and equally pursued. This is a justifiably sacred cow to which great respect should be paid. Nonetheless, I think the animal should be carefully examined for two reasons: partly because choices must be made in the apportionment of legitimate funds; and also because every country, other than the giants, must now accept the fact that it cannot do everything, and should be greatly thankful for the fact that in the pursuit of knowledge it is more easy to leave to others what one cannot do oneself, but with the assurance that it will become available free, than in any other form of human activity.

These choices do not affect the giants, because there is no one else to do it for them. They do not affect the dwarves because they do not do it anyway, they cannot do it anyway. They do affect those sophisticated middle-size powers like your country and mine, which can do a lot and which are unfamiliar with the making of these politico-scientific choices.

This is a matter which, merely because it is difficult and sensitive, should be grasped and carefully considered, and I do not believe that it is either insoluble or, in its essence, really frightening.

That, Mr. Chairman, is all I can offer, I am afraid.

The Chairman: Thank you very much, Sir Geoffrey. Now we will hear a statement from Professor Trist.

Professor Eric Trist, Professor of Organizational Behaviour and Ecology, University of California, Los Angeles: Mr. Chairman, honourable senators, Sir Geoffrey and I agreed last night that we would not compare notes, and that if I was going to say over

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again some of the things that he has been saying—and I am going to do that—that perhaps that would reinforce the points.

I feel very concerned indeed about the position of the medium and smaller advanced countries, that I do not think we have a choice but to be science-based societies, for two reasons. I do not see how we can stop the world from becoming more complex and more uncertain. Therefore, we have got to learn to be much more flexible, innovative and adaptive, if we are going to build into ourselves the capability for choosing among alternative futures; because, as we all know now, there is not one future-it does not exist; there is a set of possible futures. We do not know all members of the set, and we shall not have too much information about any that are open to us, but the more that we can get the better to make these choices. That is one reason.

The other reason is economic; that nations like yours and mine, I think, have a tough struggle ahead to keep up our economic growth, to keep up our distinctive competencies alive and growing; to select them, looking at what other nation states are doing with their economies, so that we find, if you like, the right group of ecological niches in which to grow economically. For the advanced countries this means the science-based industries more and more; because if we succeed at all in bringing the developing nations along, they are going to take over the known technologies, the intermediate technologies, and if we do not push ahead with the very advanced ones then we are just going to occupy a place further and further back in the race.

So I do feel that science, and what society does with its science, and its relation of that science to technology, and the relation of that technology to what the economists—I think correctly—now call "innovation" in this sense of getting products on to the market: this is of supreme importance.

The two kinds of innovation, to me, go together: the innovation and adaptive capability towards the future, and the innovation required to keep us going in the increasingly competitive, economic world. When one sees that Canada is such a country with a small, high-quality population, it must be extremely precious to you what you do with that, being an advanced country with a small population, and many routes open to you in the future.

I mention the small population as a critical factor, because it affects how you share your

institutional arrangements. How many centres of excellence can you have in various areas of science, including the social sciences, in a country like this?

I have been for some time convinced that the time is past when one can think of having all the resources one needs in one place, in one institution; that one cannot possess them, but one has to learn to share parts, but you can have centres of excellence which are distributed in various places, of course internationally as well; but within one nation one can build up competencies that are not all just centred in one research institute or one university. We have to build up a critical mass of competence and creativeness in the areas which a society is going for, place its bets on. I believe that we are only at the beginning of at least learning to build institutions which will do this.

Coming from that to a point that Sir Geoffrey made about this new type of field of investigation of complex problems, that is at the heart of my own interests. I have called these areas "domains" because they join the concern of a society and the concern of sciences together in a big area of investigation, whether it is to the physical sciences end, or the social sciences end, or a mixture of both.

You will have all of these in Canada. These really are ecological problems. They are not just problems of small areas or one organization; they are what Michel Chevalier has called meta-problems, and they mean that we have to assemble quite large and varied sets of resources if we are going to devote the competence to investigate them and bring that investigation to the policy-makers.

I think the decision-making structure for opening up these domains is different from the decision-making structures we are familiar with in science. We use, and have some competence through, history. The scientists themselves can review the fields of their own pure knowledge and, with some kind of very complex dialogue—part of it in publications, part of it in visible ecologies—they come to know very well often what are the next experiments to make and the next investigation to do.

If one goes to the opposite extreme and looks at the users of science, whether they are government departments, industrial firms or cities, that have special problems to which they want answers, then it is they that are the dominating group in the decisions, and

the scientists are really working in their interests, but in these complex problems we are joined together in a different way.

To use Sir Geoffrey's own concept of appreciation, the insights, resetting of the problems, the perception of them, has to grow up, I feel, between the political leaders, the administrators, the representatives of industry and labour, and the scientists. We have somehow got to build groups of people who will perceive the structure of these domain problems, and this is an ongoing job that will never end, because the problems change and so on. We have got to be pre-pared, I think, to invest much more time. People are all busy, but what is more important than to spend time doing this kind of thing? This has really scarcely begun. That is why I feel it is so important to distinguish what I call domain-based enquiry both from fundamental research and from applied research. Obviously such domain-based inquiry feeds into both, but its recognition, I think, is important.

As regards organizational form, I would just like to run over it briefly and give some suggestions about that which my Institute in London—the Tavistock Institute—made in its first form in its report on "Social Research and a National Policy for Science" in 1962 and 1964; of which I have been thinking more in my role as consultant to UNESCO on the policy implications of the social sciences and problems of their organization and support. I suggest that there are three basic patterns which have institutional consequences.

What I have called Type A are centres of professional social science activity with associated research and development establishments to undertake work on immediate practical problems. They are profession-based and linked to user interests. They are located in government departments, or they may be consultant groups. One that I am very interested in in the United States is the Organization for Social and Technical Innovation, for example. Without these, user organizations remain without agents able to identify areas of scientific knowledge relevant to their problems. They are also without social science professionals in continuous contact with administrators. In such centres research problems are highly determined by the use of clients' needs, and they express what I have come to call the research-service mix. It is an output mix.

The opposite of that are centres of basic research associated with major teaching

facilities, located within universities usually, as autonomous departments based on a discipline of knowledge, perhaps more than one such discipline, and undertaking both graduate and undergraduate training, and maintaining science itself. Here the research problem is determined by needs of theory and method, and this is what I would like to call the research-teaching mix. This is the familiar thing which has been the great discovery since the 17th century.

Now, the third, which Sir Geoffrey has referred to: centres of applied research. domain-based research, associated with advanced research training. These were sort of resultant of the other two. I call them Type C. They are the necessary link between user organizations and universities concerned with basic work. They may be located within the boundaries of the universities, university centres and institutes, or outside of them. such as my own institute in London. They may be national centres or not. They are centred on these large problems; they are interdisciplinary. The problems are generic rather than specific. Here is a very important aspect: they accept professional as well as scientific responsibility for the programs, the projects they undertake. They contribute both to theoretical development and to the improvement of practice in the use of science. They express what I would like to call a researchapplication mix.

I think we need all these types of science output and all these types of organization. If one starts to think of building up the science capability of the nation, one has to think of several kinds of knowledge-output mix, several kinds of institution, and things that we have only begun to dream about.

I would like to add one special point about the social sciences, because I think it has created great confusion in the past: that the relation of theory and practice, pure and applied, in the social sciences as compared with the natural sciences, is, I think, fundamentally different; that in the sciences of man we cannot and would not experiment very much.

In the natural sciences the great secret has been to extract the problem out of its setting in nature; construct conditions, control it, manipulate it, repeat it—all these things. We cannot do that very much in the social sciences. We can in special areas, psychology and other disciplines, we can do it up to a point; but on the whole we have to reach the

data in their natural settings in society. We other hand, it is made infinitely complex have to learn, therefore, to reach it. It is not easy. As a friend of mine used to say: "You cannot stop a man in the street and say 'I want to take out your appendix for the sake of pure science knowledge". He will not let you do it. The big thing about the data in the social sciences is that we need that permission in order to reach them. So that the social scientists must get access to their data, and I think they can only do that by proving themselves in some kind of professional relationship with organizations and people. It is an analogue of what medicine has learned in taking clinical responsibility. I think more that my social science programs bear the equivalent of the Oath of Hippocrates. You see, this is the fact, that neither perhaps we ourselves as social scientists, nor does our society, with reason, trust us too much yet. Why should they? We have to earn the right to be trusted with the serious problems of man.

If the social sciences do not proceed to study the serious problems of man, they will be left with trivia on the edges.

All these serious problems of man are value-laden problems, heavily defended problems in the personality and organizations and so on; and if we are to make any contribution we have to earn the right in dialogue with our political leaders, our business and labour leaders, people in the community, everyone. We have to earn the right. We have no special privilege, except that we can apply the scientific method, if we can get to the data, and bring something back which we can feed back.

This means that what I call the social engagement of the social scientists represents a strategy for advancing the base of fundamental knowledge in these sciences, as well as contributing to the betterment of society; that the tasks are joined together in a special way. It is that thought that I leave with you, Mr. Chairman.

The Chairman: Thank you very much. Mr. Badgley.

Mr. Robin F. Badgley, Professor and Director, Behavioural Sciences, Faculty of Medicine, University of Toronto: Mr. Chairman, honourable members of the Senate, ladies and gentlemen, by comparison with other speakers during the past two days of this meeting, the role of the rapporteur is rather easy, since there is no formal presentation. On the because the job of the rapporteur is to attempt accurately to reflect as much as possible the general tenor of the meeting.

Another generic interpretation of the word "rapporteur", is to be mesmerised by eloquence, and certainly during the meeting there have been many who have spoken with deep conviction. I hope Professor Bregha and I have not fallen into this particular trap.

I would remind you, Mr. Chairman, that being a rapporteur is very much like an artist: it has not yet developed to the status of science. If one of the hallmarks of science is an attempt to reflect data with some accuracy, then perhaps this is an exercise in that direction.

Perhaps Professor Hendry erred in one respect in this meeting, but only in one: he chose two social scientists as rapporteurs, whereas perhaps we should have been complemented by a natural scientist.

The theme of this particular session is "Speaking Out", and we see it as our job to speak out selectively on your behalf.

The major question that concerned all of the roundtable discussion sessions was the discussion of the relationship between science and society. Some of the basic assumptions which do not appear in our report have been underscored this morning. Let me just reiterate two of these. First, it was widely assumed that government at all levels had a major and almost unquestioned position in providing support to science. Secondly, this has been brought out by several speakers this morning much more eloquently than I can phrase it: it was assumed that science should be part of society; that the quiet, small voice of the public should be accurately reflected in major decisions concerning science.

Rather than reiterate the report, Mr. Chairman, I would like to submit it for the record and to pick out two or three highlights. My colleague, Professor Bregha, will take up additional issues.

Turning to the specific structure of science policy, there were four specific recommendations which emerged. One of the key recommendations was that at a national level a broadly representative committee should be established which would represent the public, represent the various disciplines and all scientific backgrounds, which would operate independently of parochial professional interests and also free from political obligation.

be added to the staff of the various government departments, and that they should be given more adequate resources to fulfil their functions.

The third point, which is related to a and the interpretation taken from the meetings seemed to suggest that in every instance these advisory panels should consist of various professionals.

Finally, as was brought out in several of the discussion groups, it was recommended that the public, in the form of key nonprofessional leaders, should be represented on each of these committees at the various levels.

One of the major discussion points, if not one of the latent themes of the workshops, was the question of a dialogue between the natural and the social sciences. Professor Bregha and I, in interpreting the reports of the chairmen, were tempted on occasion to incorporate some of the objectives which were used, but we refrain from so doing.

It was recommended that there should be broader inter-disciplinary involvement basic teaching programs of all scientific backgrounds, whether these were in the social sciences, biological, medical or other sciences; that there should be greater inter-disciplinary involvement in the establishment of research projects, not when these were in full force but in their incipient stages; finally, that there should be an independent inter-disciplinary critique of research involving various professional backgrounds.

The final point I would like to make, Mr. Chairman, concerns the allocation of resources. This again was the point which was discussed in many of the groups. It was recommended almost unanimously that there should be greater emphasis given to the training and research in various social sciences.

Mr. Chairman, I will terminate my remarks here, and leave some of the other points for Professor Bregha.

The Chairman: Thank you very much. Professor Bregha.

Mr. Francis Bregha, Associate Professor, School of Social Work, University of Toronto:

Secondly-and this was brought out in the Mr. Chairman, honourable senators, ladies previous discussion-it was recommended and gentlemen, on the first day of this that scientists in increasing numbers should roundtable, a plea was issued for humility. May I assure you, Mr. Chairman, that two days later and in my present situation, I am experiencing an almost obsessive feeling of humility.

The most important impression which I subsequent one, is that government advisory brought from the workshops yesterday was panels, consisting of professionals from vari- the feeling that science indeed is becoming ous backgrounds should work closely together, more and more a critical variable in our society. My fear is not that science is getting out of reach for society, but that important segments of our society are getting beyond the reach of science. In this perspective, the burning of a computer becomes not alone a political act but basically a symbolic rejection of what the computers stand for, namely science and technology.

It seemed, indeed, while we were summing up the conclusions of the ten groups, that we do live in an era of accelerating confrontation between man and technology. While it was recognized that technology, because of international competitiveness and the difficulty of controlling it in one single country may indeed be very difficult to tackle, and while it was also recognized that the adjustment of man to technology may be an exceedingly painful and difficult process full of failures, a challenge nevertheless emerged that personally I consider the greatest challenge to social sciences coming out of this roundtable. It is a challenge, or invitation if you wish, to stop counting the social casualties which keep falling in a flotsam and jetsam way in the flow of history, and to start devising in a more serious way those alternative futures about which Sir Geoffrey and Professor Trist have been talking in the last two days; setting our eyes for the long-term horizon, creating options for individual fulfilment and individual achievement beyond the tradional area of the labour market. That a strong and progressive policy would be needed for such a departure, I have no doubt.

One point which has been made originally at one of your initial meetings-and I would like to come back to this point because I do not believe we have covered it sufficiently in the last two days-was the remark made that the Canadian contribution to international science may, in the end, be more important than our present contribution in material aid to the underdeveloped countries. With your permission, Mr. Chairman, I shall elaborate how this could be done.

[Translation]:

Experts all agree that the gap separating rich nations from poor nations grows wider daily, and dramatically. In fact, most of the developing countries have already entered upon a period of grave crisis. The outcome of such periods of crisis cannot fail to have an effect upon the security and prosperity of Canada. The efforts of industrialized countries such as our country, are dispersed, tainted with neo-colonialism, or look too much like makeshift rescues. Aid, which is already insufficient from the outset, is badly distributed, badly used and more often than not ineffective.

Now, it seems to me that a striking example of the social application of Canada's scientific policy would be to take an interest in the problem in order to discover where the weaknesses lie, what causes this lack of imagination that makes the results of development aid so unsatisfactory.

Our country has a superior level of science. This was demonstrated to us within the past two days. Yet we share certain experiences with the Third World in the matter of development. Communications, transportation, the mining and forest industries, construction of ports and of airports, electrical energy and, more recently, the construction of subways and the development of educational television—all these are examples where Canadian science and Canadian techniques could make a truly unique contribution.

And so I take the liberty, Mr. Chairman, of suggesting to the Special Senate Committee that it ponder the possibilities of creating a mechanism of exchange and study; perhaps an institution beyond simple coordination is the answer, so that Canadian industry and universities, and the various governments, as well as the national councils that exist already at the Federal level, may define the most promising fields for the aid that Canada is considering giving to the poor nations. The Canadian International Development Agency would no doubt be the first to benefit from such a forward step, since action of that kind would enable it to see more clearly how to carry out its task. Thank you, Mr. Chairman.

[Text]

The Chairman: Merci beaucoup.

Ladies and gentlemen, you have ben sitting here since nine o'clock. I would propose a ten-minute break.

(SHORT RECESS)

The Chairman: I am glad to say to Dr. Solandt that we have as one of our members

on this committee a Governor of the University of Toronto, and I thought that it would be most appropriate this morning if he would initiate the discussion.

Senator Lang, would you ask the first question?

Senator Lang: Thank you, Mr. Chairman. It is certainly a great pleasure for the committee to be at the University of Toronto, and I think perhaps it is not my predilections that are bringing forth that statement, but I think it is probably shared by all of us here.

We have in this forum an opportunity to hear scientists deliberating amongst themselves and not primarily directing their attention towards what sort of recommendation or recommendations we as a committee may or may not bring in in the long run. I think in that way we get a better feeling of the environment of the place.

Working in reverse, if I may, I would like to ask the rapporteurs—one or both of them—if they might elaborate somewhat upon the recommendation No. 1 contained in the paper to which they referred, namely the constitution of a national body, a "watch dog" committee, to be established for science and society, which would operate independently of political or specific parochial professional considerations.

I do this at the outset, Mr. Chairman, because I think it is in this area that we, as a committee, are specifically seeking advice. Our constant preoccupation is to structure in some way or another the various ideas that are coming forward to us from the witnesses we have heard.

It appears to me that to conceive of such a watch-dog committee operating independently of political or parochial professional considerations is probably easier than constructing one. It might be of use to is if the rapporteurs could elaborate on the discussion as it pertained to the actual personnel and operations of such a committee.

Professor Bregha: Not being in the group where this point came up, I can only interpret the conclusions as transmitted in writing by the recorder.

The Chairman: You were not in that group either?

Professor Badgley: No.

The Chairman: Who was in that group who could speak?

Professor Bregha: It was in the group of think, was the notion that as a country we Dean Ham.

The Chairman: Could you speak on this if you were to come forward?

James Ham, Dean, Faculty of Applied Science and Engineering, University of Toronto: This idea came up in at least our group, and I can suggest one manifestation of it which might surprise the Honourable Chairman, Senator Lamontagne. This was the suggestion that such a body might be indeed a radically transformed Senate.

Some Hon. Senators: Oh, Oh.

The Chairman: I wonder if this answer satisfies Senator Lang.

Senator Lang: Too radical, Mr. Chairman.

The Chairman: Would you like to add something? I think this answer is really too short.

Dean Ham: Mr. Chairman, speaking, if I may try to, on behalf of the group of us, the sense was perhaps to see this through indeed the activities of your own committee; that there was, I think, a sense among us that this committee that you have might be a microcosm of a larger activity which would indeed provide an opportunity for criticism of really the way it is in a large sense, not simply within the bounds of science policy but really the whole pattern and texture of the national scene.

Now, to try to constitutionalize this in some federal body related to the government would, of course, make it very difficult to obtain that virginity or freedom from political influence and parochial professional interests which has been suggested. Indeed, I cannot believe that any of us feels that such a purity is achievable in human affairs; but the notion of a conception of a Senate body that might do this was one.

The idea originated from the industrialists among us, and at that point there was no clarity about this. Various words were bandied about, words like a national academy for society, as distinct from a National Academy for Engineering, National Academy Science and so on.

So the group had no great vision of what this might be, but thought that in the context of Dr. Solandt's remarks about the possi-

lack a forum for blunt criticism of one another in an inter-field sense. It was with this idea.

The Chairman: I thought at first it was a bit unfair that at a time when we are trying to reform the scientific community in Canada, that the scientific community would turn on us and try to reform us.

Senator Lang: If I might for the moment direct a question to Sir Geoffrey Vickers: I think very rightly, sir, you underline a fact of modern political life that there is a growing awareness that the indiscriminate search for scientific knowledge must in some way or another be subordinated to a public interest or a paramount public concern.

Of course, I think we can readily recognize the dangers inherent in such a concept, but I do not think that detracts from the reality of it, and I think to-day in Canada this is an awareness that is emerging.

In your remarks you referred to the fact that scientific effort is now becoming more diffuse; it is no longer concentrated in governmental centres or university centres, but now spreading to private sector and nonprofit corporations and multi-disciplinary bodies.

It seems to me that as that is a fact, we may be moving closer towards a more broadly diffused scientific approach which in all likelihood could become more divorced than before or than it is now from recognition and an attunement to public concern.

Are those two factors a dichotomy in our present situation?

Sir Geoffrey Vickers: I think, sir, that a multiplication of effective centres for scientific work would not necessarily lead to greater indifference to public policy or to human concern. I think that would depend very much on the extent to which these human concerns were in fact shared by the public, including the members of these bodies.

After all, these bodies may exist, but normally bodies of this kind will respond only to the appeals of clients; and in a situation such as that into which we are moving the clients will themselves, in greater or lesser degree, share the common concerns and motivations.

How long this kind of dialogue will in fact bility of their being a Science Council and a serve both to canalize effort in the more Social Science Council, the real idea here, I important directions and to preserve the independence of view which is needed, only time can show. One can say that the more perfect the dialogue, the better that object will be achieved, but I do not think there is any better way to do it so that that development would not alarm me.

Senator Lang: I might suggest that there are people who would maintain that the interests of a client in the scientific field are not necessarily consistent with the interests of society, and I think perhaps it was in that way that I was ...

The Chairman: Senator Lang is a lawyer.

Sir Geoffrey Vickers: Yes, I would agree that if the field became dominated or if the more active part of the field was supplied by organizations which depended for their living on satisfying particular clients, those clients being pre-selected by being those who could afford to employ that kind of organization: then, of couse, you might well have a very dangerous amplification of particular voices and a dangerous distortion of particular important foci of scientific power. I entirely agree with the anxiety you express, sir.

Senator Lang: If I may, for a moment, Mr. Chairman, refer to some remarks of Professor Trist, where I think he may have left us with a conundrum: he stated—and I think probably correctly—that the social sciences to-day are not trusted by the community sufficiently to enable them to deal with the serious problems which confront the community, and that the social sciences to-day must somehow prove themselves in the trust of the community.

I can conceive that this involves a chicken-egg proposition, if your remarks preceding these are correct, Professeor Trist; and the difficulty of the social sciences attaining the acceptance necessary for them to carry out their full functions, I could see, would be a problem not easy of solution by the scientists alone, but which involves some sort of educational program or conditioning program on the part of some bodies other than themselves and within the community.

Would you comment on that?

Professor Trist: I think that in my own research I felt something growing in this field, that originally I felt very much, when I was working with organizations that I was coming in to help or something like that, that they were clients in that sense.

As time has gone on, I find myself now involved with organizations or larger sets of organizations where they and we really are beginning to do things together. I sense a change in my view of relations. I will give you one example.

My Institute in London, in conjunction with an institute that started in Trondheim and is now in Oslo, were asked by the Norwegian Confederation of Employers and the Norwegian Confederation of Labour to do research on industrial democracy in Norwegian industry, and then the government joined the party later.

The research is planned in a committee that consists of two elected employers from their organization, two elected trade unionists from their organization, the general secretaries of both, one or two people from the government, one or two of my senior employees and colleagues, and one or two of us. This has grown up. I do not know, in a sense, often, who is the social scientist and who is not; but these sort of things are beginning where you get groups of people coming into these relationships who really are working together. This is the kind of thing that happens, how mutual understandings grow. There is the joint responsibility for what happens.

I was talking in the coffee break about some work we did in Britain where we got related, as an institute, to the National Joint Consultative Council of the Royal Institute of Architects, Quantity Surveyors, and the National Building Trades Employers on research in communications in the building industry. This was very tough going, but we had a little group again from them and us that somehow planned the thing.

I have had very much the same experience in Canada with one of your large industrial firms that is related to my university in the United States. This is going on in many countries, I think; that there is a growth of relationship between the people who are coming forward from organizations, or even wider things than organizations, and social scientists. It is all a bit selective at the moment, but I think there is a learning process that has started.

Again, some of the experiences in France with the French regional planning commissions and their relations with social sciences in France is very worthwhile study in this respect.

So I think this is going to be an emergent thing; it will not be either us or they but a we-they thing. It is all beginning to resolve as we all get to know how to work together.

I would suggest that some of the cases where joint research of this kind has been done in the settings of central societies, it would be well worth going into. I do not think one can just answer the thing out of one's head; one has to look at the growing tracts of experience.

The Chairman: Can I suggest you might come back later on because time is flowing.

Senator Robichaud: Thank you, Mr. Chairman. First, may I say that I am sure you spoke for all of us when you complimented Dr. Hendry and those responsible for calling this roundtable on the social aspect of science policy.

You referred to our temporary takeover of this Senate Chamber. I may say that for all of us members of the Senate who are accustomed to deliberating in the atmosphere of the red chamber, we shall now be in a better position to judge the effect of our brief stay in this blue chamber. What effect it will have on our possible reform remains to be seen.

I noted with interest the recommendation on page 5 of the "highlights from Workshop Reports" presented this morning, referring to the allocation of resources, and particularly to the recommendation that greater emphasis be given to training and research in social sciences. We are also pleased to be able to mention that science is to be part of our society.

Yesterday the Globe and Mail reported Dr. Soldandt's proposal for the setting-up of a separate Social Science Policy Council. As reported in the Globe and Mail, Dr. Solandt suggested that a Federal Social Science Council be set up to contribute to the formation of national science policy. It states that Dr. Solandt at one time was enthusiastic about the idea of dissolving the existing Science Council and constituting a new one with equal representation of the natural and social sciences; but he finally selected the setting-up of a separate Social Science Policy Council. He also stated in his presentation that it seemed to him that the social sciences must be brought into policy formation at the highest level quite soon.

Now, Mr. Chairman, I would like to have the benefit of the panel's views on this most important proposal.

Professor Trist: In Britain we have had a Social Science Council now for some three or

four years. That was brought into existence through the report of the Committee on Social Studies under Lord Heyworth, which was set up at Lord Butler's suggestion. The reason for it was that it was felt that unless the social sciences had a show of their own, at least for a time, that they would not get quite so much attention, their distinctive problems not so much attention; that if they were all in with the natural sciences, the traditional dominance would be too great.

I do not know whether this is a permanent or a temporary solution, because you notice when you separate people, when they start making relations, often you have to do that.

In the United States this has been debated, as you know. There are two schools of thought: a National Foundation for Social Research like the NSF, or to build a big part of the NSF to do the same thing. They are very split about it. I think on the whole they want to keep everything in the NSF, would be my sense of it.

You will find various solutions in the different countries around Western Europe. It is, I think, a matter of very delicate perception of what is the situation in your own country as to which of these two tracks you take. I think for Britain we were certainly right to have a separate one.

Sir Geoffrey Vickers: If I might make one or two additional comments on that one, I think that whenever you see that a council exists of this kind, you cannot tell from the look of it how far it influences policy. You can be sure that it gives some money away, but how far it causes anything to occur that would not have otherwise occurred, or exercises any influence other than by merely choosing between what comes before it: this is something you can only know by having a very close look at it or being inside it.

So the extent to which these councils are in fact, as it were, policy bodies, is not always apparent from the look of them.

The other point I would like to make is that this particular field is fragmented, and difficult to make other than fragmented. In spite of our Social Science Research Council, I think I am right—and I know Mr. Trist will correct me if I am wrong—that all the industrial human relations stuff is still done—I think I am right, am I not?—in what used to be the DSIR.

Professor Trist: Not quite.

Sir Geoffrey Vickers: It is not. Is any still done there? It is hard to say. May I just point out that on the industrial side, it is very hard to distinguish social enquiries from other organizational and other enquiries.

The other point I would like to add is that there was, in addition to this, some attempt to set up yet another council to deal with environmental studies, feeling that this domain of the environment was one which would be unduly fragmented if it did not have a council itself. That did not result in the setting up of a council, but it did result in the setting up of a centre for environmental studies as a kind of half-way house.

Professor Badgley: Just briefly complementing, Mr. Chairman, some of the comments of Professor Trist and Sir Geoffrey Vickers: there seemed to be in the various workshop sessions a constant theme of revolving around the difficulty in dialogue between the natural and social sciences. I am rather diffident to attempt to interpret from the various workshops the extent to which the views which Professor Bregha and I have attempted to summarize here, accurately reflect the opinion of all present; but there did seem to emerge, at least, a thread of agreement that, given the imbalance in the allocation of public resources and training which hitherto have been allocated in large part to the physical, medical, biological sciences, that if the social sciences were indeed to make a major contribution additional funds would have to be allocated for both training and research in these areas.

Professor Bregha: It may be of interest to the members of the special committee that the suggestion regarding training actually included training at elementary and high school levels; so that the appreciation for social sciences could be developed at much earlier age than is presently being done.

This, I believe, was in the group of Dr. Rose, where a sort of analysis of present curricula in high schools was mentioned, and a disproportion between natural sciences and social sciences has been pointed out. The recommendation then was that greater importance to social science should be given early, and certainly at high school level.

Senator Robichaud: Mr. Chairman, my second question might be directed to Professor Trist. I know that some of us find it most difficult to determine exactly what the present student generation really wants.

Professor Trist, at your presentation at this roundtable group on Thursday on page 2 of your paper, you pointed out that in several countries the present student generation is turning away from science. However, on the same page you also indicated that science is a core value in the culture of our society.

My question to you would be: Is science accepted as a core value of our culture, say, particularly in North America; is there any clear evidence of this? Also, what are some of the other core values associated with science that play some inter-active role with science?

Professor Trist: You could not have asked me a tougher question. I have been stuck with the drift in the students in the University of California, Los Angeles, from the physical sciences and engineering into the school where I am, which is a business school, which is a mixed establishment of social and operational research sciences. The more adventurous people seem to be coming into these complex areas. That is one of the things.

Then a lot of people, feeling that they are just disenchanted with the scientific game in any of its names, just want to drop out of it. They feel that science has created, or been a big factor in creating, the world in which they are so alienated, and for which they hate us so much. That is the feeling I have had from my own students.

As to the notion of science being a core value, we in the west are the only civilisation in the world's history since the 17th century, that has had a continuous science process going. It has escalated, as we all know. So that on the evidence that science has built itself up as it has done, that is what I meant by being a core value.

I think it is associated with values of truthseeking, freedom, everything that happened in the Renaissance and in the Reformation; all that set of values I would associate with science, with the emphasis on mastery and achievement which grew up in relation to the Protestant ethic, all that too; a very great valuation on the logical and analytical qualities of the mind, and of thus becoming independent people, individuals and so forth.

I think all those values have gone together; that there are other sets of values to do with collaboration, co-operation and non-intellectual forms of relationship, which may have to be looked at as well. That is another story, but that is what I meant in my remarks senator.

Senator Robichaud: Thank you.

Senator Belisle: Mr. Chairman, can I ask a supplementary question?

The Chairman: Yes, Senator Belisle.

Senator Belisle: Having in mind what you said this morning in your opening remarks, I would like to say that it is not only a pleasure to be here and not only will we leave this place in good order, but I personally question whether we should even ask questions: because when I glance at this audience I see so much experience, so much talent and so much sagacity, that I felt that just having the opportunity of rubbing shoulders with them means we shall go back to Ottawa much wiser and much richer.

Having heard what our honourable colleague said at the back, one could add to what Senator Robichaud said about the blue chamber that we Conservatives who are very happy to be sitting in the blue chamber have no objection whatsoever if Mr. Chairman wants to relay the message to the Prime Minister that we could have more of you people in the red chamber.

The Chairman: You are slightly out of order now.

Senator Belisle: My question is this. In view of the idealistic revolution going on in all our universities, is it wise for governments to continue to contract their research, or most of their research, to universities, or should they do most of their research in their own labs or facilities?

Sir Geoffrey Vickers: It may seem absurd that a visitor should venture to comment on that, but it might be of interest to your committee if I mentioned a brief exchange I had recently in New York on this subject, with someone that was not a student but was in touch with student views. I was questioning what seemed to me a ridiculous idea that a university should speak as a university on political issues, should speak up, for instance, against national policy which these particular students wish to protest. When I said that seemed to me an absurdity, I was answered by the fact that universities did not mind as entities undertaking government research. The research, of course, was more research of a kind to which they objected.

I have been thinking for a long time about the logic or illogic of these two views. It have this student unrest in the campus. It has seemed to me to have logic enough to have a not put anything in place for these students,

bearing on the honourable senator's question. that I think that if universities act for government in a contractual way, in a way which identifies then with the nature of the contract, and if that contract has any political significance, they do render themselves open to this kind of charge, or at least render themselves liable to give this kind of suggestion to the student body.

Senator Belisle: Mr. Chairman, my question was not only in the political context; it was also in the context of values, because many scientists have a different value of values.

The Chairman: Do you have any comment? I suppose that this silence means that the panel agrees with you.

Sir Geoffrey Vickers: I would have thought that insofar as it was a question of preserving the scientist's individual freedom, he would be as embarrassed if he were in an organization directly organized by the government as if he were in a university; indeed rather more so, because there are options available to a government when placing contracts between universities, whereas any scientist working in a government establishment is committed to do what it requires.

Perhaps I still have not fully appreciated the force of the senator's question.

The Chairman: Perhaps you would like to come back to this a little bit later. Senator Carter.

Senator Carter: I had one little question set up for Professor Trist, but I really want to follow the line of questioning raised by Senator Robichaud.

This conference has been about the social aspects of science policy, and we have here this morning a little pamphlet headed "Science and Society". I have been wondering, listening to what took place this morning, reading what I could of the positional papers, if we are not looking at this problem through the wrong end of the telescope.

Society can be thought of in many terms. We can think of society as a human family, or as a civilization, oriental as aginst western; and even in western society we started out based on certain values. That is our western democratic society.

Science since the 17th century has laregly dissipated those values, and that is why we and we have now reached a point where we have become frightened of science, because we see science getting out of control and possibly bringing society to the brink of destruction.

So should we not start out with some concept of society which will provide a framework which will shape our ideas and our scientific effort? That is my first question. Should we not approach this problem first with a definite concept of society?

Professor Trist: I think, senator, that I would like to split the question into two points.

The fact that science has now become a matter of public concern, that it has become a policy matter: it does look as though, because of everything that has happened, society through its political system is going to start regulating the scientific enterprise. That, I think has happened; that is why we are all here.

So that a rather new process has started and science policy is very, very recent. We have not much experience of it yet. We know it has terrible dangers, but we are somehow constrained to start it.

The question of a concept of society, I think you mean where are we going to find an alternative set of values that people are going to believe in and will accept. On this, I think something has to emerge; it has to grow. We cannot just make values up; they are going to arise.

I think one of the exciting things at the moment is the search for new values that is going on all over the place. A lot of it is damaged search, imperfect search, and a lot of it is very wild, but it all has a meaning in this direction.

Some of my colleagues and I think that we in the social sciences have been very slow really to set up a discipline, as it were, which focuses on the study of values, to have a science of plurality, if you like, a science for the study of values.

It is coming. We do not know much about it in social science terms yet, but one of the things that worries us a lot is that the values in the past have changed rather slowly through the generations, and that we may now be in the situation where we will have to evolve new values in modern societies more quickly than we as humans have done in the past.

You are asking questions which open up very, very big issues, and I think they are very good questions. I do not know the answer; I do not know how well we are going to come out of this one, myself, as a species.

The Chairman: I think Sir Geoffrey would like to comment on this.

Sir Geoffrey Vickers: If I might add a comment, I would have thought that only a society can determine for itself its values, and can agree upon them insofar as it can.

I think we are clearly in an acute crisis, because political and economic forces require regulation on a scale which is almost inconsistent with any satisfactory social participation; and many countries are showing the vociferous tendencies that this produces.

The passionate search for a socially satisfactory entity to belong to, even though that is much smaller than is consistent with our current means, either of regulating society as a whole or of distributing goods and services: that is one part of the dilemma.

The other, of course, is the rate of change, to which Mr. Trist has referred. These are the difficulties which set the problems which each society as it now exists, I think, has got to solve, and its own political process is the only process by which it can be solved.

Senator Carter: I have other questions but I will give somebody else a chance.

The Chairman: Ask another one.

Senator Carter: I would like to pursue this for a long time, but I can see it is going to take a long time to develop answers.

The Chairman: Certainly another long weekend.

Senator Carter: I will come back to a practical question, much as I am reluctant to depart from this. Professor Trist this morning spoke of two new aspects of scientific activity. One was innovation, and the other was problem-oriented research with a view to decision-making.

Now, we have a problem to-day with television. Television has had a tremendous impact on society. It is educational, but there are some people who think that television is also contributing to delinquency, and that has become an area of social concern.

I would like Professor Trist to develop his ideas a little further as they would apply to this particular problem, this area of concern of the impact of TV on society as it is expressed in the problem of delinquency. How would you go about that? How would you arrive at your decision-making process?

Professor Trist: A training colleague of mine, Dr. Fred Emery, says the coming of television represents a change of the human condition as big as if man had grown a second head; that we have a very big thing on our hands now that we have a new medium.

I feel very shy about making any remarks about television in Canada, since you have in this country, I think, a person who understands the impact of that meduim possibly more than anyone else. This is Marshall McLuhan's country.

You see, the medium can be used either way—for very great good or very great harm. The sort of research that social scientists have done on the effects of television and other media so far has not been very good. There have been a few dribbles of it here and there. It is very, very hard to get evidence of the effects.

Until recently I thought it was overemphasized, because people were not taking enough account of the real things inside people's deep minds and so on and in children. All these fantasies of aggression, horror and terror, they are all there inside us anyway. They just see them on the television screen.

On the other hand, if the media, through the needs of advertising, are seeming to be sanctioning violence, if they somehow get into young children and adolescents the notion that it is a pretty good thing to be violent and aggressive and to do all these things: then I think, if that message gets through, there is a sort of a tacit understanding that in spite of all the laws and all the things to the contrary, that this is the way it is, then I would be concerned indeed about the harm. I cannot say, as a social scientist, that I know very much about it, but for me it would be a matter of trying to examine the hypothesis of how far in the perception of the receivers of the medium they felt there was a tacit social sanctioning of the values which we explicitly reject in our official morality as a society: that we turn it upside down by something that gets through, and it is very much more powerful if this gets through sub-verbally than simply in words or even in sound.

I think the danger is there all right, but I would need to think about the sort of research that we might do to help to answer you. I do not think it has been done yet.

The Chairman: Unfortunately we have only ten minutes more. Senator Kinnear.

Senator Kinnear: Thank you, Mr. Chairman. I would just like to ask a very short question. I would ask Sir Geoffrey about priorities. It is a word we hear so many times, every day, and I begin to wonder if there is such a thing as a priority.

He said priorities are human concerns he would put at the top. I wondered what he considers the first human concern he would call a priority. I think of it in terms of what Dr. Jean Boucher said this morning, thinking of pollution as it affects our everyday lives.

I had many supplementary questions, but there is not time. I would like him to tell what he considers the first priority of human concern to-day.

Sir Geoffrey Vickers: I certainly would not be able to answer that question for Canada, but I am not sure that it can be answered in general terms at all. Problems tend to define themselves in the concrete, and I think that it is only possible in a concrete situation to determine between one thing and another.

This is avery unsatisfactory reply, but I believe myself that there are quite logical and radical reasons why it is impossible to rank-order priorities in the abstract, independently from a particular situation that has been previously defined.

Perhaps some other members of the panel can do better.

Senator Kinnear: I thought of the pollution situation in Canada.

Sir Geoffrey Vickers: I have no idea how high the problem of pollution in Canada ranks by comparison with other things. You see, the other things would be all quite disparate. That is why, until the collision of interest and the choice between resources presents itself in some kind of frame of reference, I think it is almost impossible to say in the abstract what would be more important than what.

Senator Kinnear: Thanks.

The Chairman: Senator Yuzyk.

Senator Yuzyk: I want to puruse a line of reasoning here regarding social science, because it is very evident that social science is behind, and is not able even to cope with many of the problems that we have; and we do not have any co-ordinating body on social science in Canada.

My question is this. I should state first of all that we do have a Science Council of Canada; we do have an Economic Council of Canada. When we are dealing with problems of society we do not have any council.

The Chairman: Do not forget the Canada Council.

Senator Yuzyk: Well, Canada Council has nothing to do with policy-making.

The Chairman: No.

Senator Yuzyk: And recommendations, and this is what I want to bring up to date.

If you think it is worthwhile to establish such a Social Science Council of Canada, do we have enough consensus of opinion among the social scientists that in a body of this kind they would be able to pursue certain studies and come out with definite recommendations such as the natural scientists do, regardless of the fact that the scientists are chemists, physicists, biologists, because they do have certain views that they propose; would this help put the social scientists in a position to present these views and thus make the views of society and various segments of society come to the fore for the consideration of the government?

Professor Trist: I would think that you would get very different outcomes, very different results in different areas of the social sciences. I think you would get different lines of recommendations offered by different groups of social scientists. That might be a very good thing, to have the dialogue of alternative views presented in what, after all, are relatively new fields of knowledge—offered to political leaders and administrators; and to develop that kind of dialogue, I think, would have a very big back-stroke effect on the development of the social sciences themselves.

I would be even more interested if some of these councils, or whatever they are going to be called, were really, what I would like to see, domain-centred bodies, quite a few of them really, where all the relevant interest groups participated in the dialogue to build up these appreciations.

I think we might formulate the problem in the wrong way if we just sort of put social scientists in the position of being expert witnesses and put them in a box. I know that is one thing that one can do, but there are other options in building this thing up.

I hope that in this country, where you have come to a most intense consideration of these matters now and have had a chance to look at what many other countries have done and where there were mistakes being made: that you might perhaps keep open a large number of alternatives in searching how best to do this, and discuss this with the social scientists of Canada and many others.

The Chairman: As you have noted, the program says that I am to speak at twelve-fifteen, so for me this is a very good reason, as Chairman, to call this meeting to a close—if I want to speak; but before doing so I think I can safely say that some of you, fortunately or unfortunately, will never come closer to the Canadian Senate than you have been this morning. Others who are more fortunate may be called to join us as colleagues when we have been reformed.

In any case, in closing this meeting I want again to express the gratitude of the members of the committee to Dr. Solandt and to the University of Toronto for inviting us to meet with you today.

I want also, of course, to thank our guests, especially Sir Geoffrey and Professor Trist, for having consented to appear before us and to give us the benefit of their views and their wisdom. Thank very much.

The committee adjourned.

APPENDIX "38"

SCIENCE POLICY AND SOCIAL POLICY

Sir Geoffrey Vickers
A background paper
prepared for the Round Table
on the Social Aspects of Science Policy,
under the auspices of
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1. The New Demands on Science

I believe that the most important task of science in the next decades will be not to speed technology but to provide a guide and a critique for policy, especially social policy. I believe that the primary object of science policy should be to fit science for this double task. In this paper I describe the changes which seem to me to call for this change of role and the problems which it poses.

The broad outline of these changes is now so clear that I do not think I need spend much time in establishing it. Briefly, the problems of the Western world are increasingly problems of regulation, rather than of operations, and the environment which demands and at present defines regulation is the social, rather than the physical environment. Even where problems of regulation present themselves in physical terms, such as pollution, urban disorganization, population explosion and pressure on resources, these are symptoms of self-defeating human activities and can be dealt with only by social and political means. We do not lack the power or the knowledge needed to change one physical state into another. Whatever can be done by applying energy to material things, we are able and all too prone to do. What we lack is the understanding and the ability to govern the unstable world we have thereby made and so to impose on its future course anything like the shape of our aspirations. Hence the change in the demands which I think will be made on science. Whether science will respond to these demands will depend partly on science policy and partly on the limitations of science itself.

2. Science Policy, Its Right and Necessity

A preliminary question arises. How responsive is science to public policy. How responsive should it be? We are accustomed to rate highly the independence of science, to suppose that its fruitfulness is proportionate to its independence. Technology is indeed a servant, concerned to find better way of doing whatever society wants to do. But science, we say, is not a servant but a mentor.

Some measure of independence is indeed important to science but even this can exist today only in so far as public policy provides for it. Science is no longer the pursuit of the leisured rich. It is a professional activity, carried on in a variety of institutions; in universities, in the research departments of industry and government and in a few other partly independent organizations. The freedom of its practitioners depends partly on their professional ethic, which in turn is greatly affected by the character of these institutions: and this in turn is deeply influenced by the amount of public money spent on them, the way it is distributed and the return expected. How large is the total volume? How consistent is the policy? How much money goes in by way of research contract and how much by way of general grant? By what machinery is it distributed between institutions and between faculties? How much of it carries restrictions on the publication and communication of results? These are potent influences on the feedom and the future of science.

They are not the only influences, still less the only threats. On the contrary, it is, I believe, only to public policy that science can look to preserve its independence. The other pressures are stronger, less visible and far less easy to call to account.

The most obvious of these is the pressure of technology. Although there is a clear logical distinction between science and technology, they have in practice become entwined in a mutually exciting system, in which technology is increasingly the senior partner. This was not always so. Until less than two centuries ago, many technologies attained astonishing levels by methods almost wholly empirical, whilst science pursued its speculative

way with little influence from technology. But today the demands of technology increasingly determine the volume and direction of scientific enquiry, both by the questions they raise and by the support they offer. Consider the stimulus and directive to scientific enquiry which has stemmed in the last two decades from the technological development of atomic energy, space explorations and communication.

Yet it is misleading to regard these demands as stemming from technology as such. Science and technology together are only a sub-system of our society, dependent on two more potent variables which are equally interlocked. One I will call the entrepreneurial system; that singular arrangement, peculiar to the contemporary Western world, whereby autonomous corporations, often of enormous size, supply the goods and many of the services of an exploding society, as a by-product of their own inherent urge to grow. The other, the governmental system, supplies the rest of the society's essential services (from sewers to diplomats) and does what it can to regulate the whole; but as it owns virtually no income-producing assets and carries on little income-earning business, it is wholly dependent on the entrepreneurial sector for its revenues. The entrepreneurial system is equally dependent on the governmental system, as the largest employer of labour, buyer of goods and supplier of services, no less than as the source of all formal regulation. So this mutual relation is also mutually exciting. I will not pause to analyse it further but it is well to remember that it is novel and unique. The violent expansiveness of science and technology in Western cultures is largely due to their association with this larger system.

Finally, the growth and direction of science is influenced by the culture of our societies, to which in turn it contributes. The attraction of science as a career, the prestige of one branch of science as against another, express and reinforce cultural valuations. The growing prestige of research today, as against executive action in business or politics, may well be due to the fact that, in a society where all other values are confused and suspect, the increase of knowledge as such is the only value which remains unquestioned.

I suggest then that we should not be misled by outmoded habits of thought into regarding science policy as such as being in principle a threat to science, merely because it represents the intrusion of government into what was once an independent field. Dangerous though it may be, it is much less dangerous and potentially far more useful than the other pressures to which science is subjected, not least through the demands which government makes on it not in the name of science policy but as the greatest user of science and scientists.

3. Science Policy, Its Proper Objects

What then are the scientific interests which it is the proper function of public policy to preserve and promote?

The first interest is that science should continue. This is not to be taken for granted. Only familiarity blinds us to the uncanny strangeness of the process by which any part of the human heritage is handed on from one transient generation to the next; and this is nowhere stranger than in science, where a body of knowledge so large, so difficult and so rapidly changing is transmitted, enlarged, revised and used by a single ongoing process. The first requirement obviously is a set of institutions of appropriate capacity, a career structure which will keep these institutions appropriately staffed in competition with all rival claims on scientists, and a policy of selection and support which will keep an appropriate stream of new entrants flowing into and through these institutions and out again to take the places of earlier generations and to meet the new demands, including the staffing of the institutions themselves.

I would insist first on the unwelcome fact that this is now a field of policy. For many centuries learning was a privilege, bought by the rich, sought by the dedicated, given away and endowed by the charitable; but only recently has it come to depend on government policy, regulating by conscious choice the claims of education, as against other priorities and of one branch of education as against another. In consequence, although far more is spent on education that ever before, the sense of shortage is far more acute. This sense of shortage will grow ever sharper, as aspirations rise relatively to opportunities; and the need for conscious choices-policy choices—will rise accordingly. These choices will decide the place of science in general education, the resources devoted to different branches of science, the distribution of resources between teaching and research, between undergraduate and post-graduate education, and between different types of education, even the salary and other differentials which determine the career structure of science education. The levels at which these decisions will be taken, and the extent to which they will be taken by scientific, rather than by political institutions is itself a matter of policy.

The market regulator of supply and demand cannot replace these political choices by summing a host of individual preferences. Even where it still operates, as for instance where a critical shortage of teachers or practitioners in some scientific field reveals some significant degree of relatively poor reward, the signal is far too belated to regulate supply efficiently. In any case, I think we should decline to accept the distrust of political choice, as against market choice, which is still so often expressed. It seems to me to characterize people who have more faith in their economic than in their political institutions. Where collective choices have to be made, public debate takes the place of market bargaining in summing individual preferences. The better the democratic process, the more fully the result will reflect the priorities which the debate has engendered in the public mind-not, be it noted, the priorities which ruled there before the debate began. The political debate is a creative and a normative process. If we did not believe this, how could we justify the time we spend on it?

A further proper public interest is that ongoing science shall provide the knowledge and skills which that society in the future will most need. This sense of future need will govern many of the political choices just described. I have already suggested that these needs are changing. The change is already apparent. Twenty years ago, for example, science was being asked to solve a number of basic physical problems incidental to the use of atomic energy as a source of power. Today the unanswered questions concern the level of radiation twenty years hence, its human effects and the corresponding obligations to begin now to control the generation of radioactive waste. The second set of questions arises directly out of the first but they are different in character. They require an understanding not of atomic structures but of social and political systems. They have no obvious technological answers. And they involve a calculus which is not only economic but ethical. (1) It may be queried how far science is qualified to answer this kind of question. To

this doubt I will return. In any case, this is the kind of question on which governments increasingly seek guidance: and in response. science is increasingly turning its powers of analysis and measurement to the complex systems which are the field of government the balance of policy, such as economy, ecological problems of urbanisation and pollution, political problems of defence and social integration. The last decade has seen the birth of new techniques for analysing and simulating these complex situations and for comparing the disparate coasts and benefits of multi-valued solutions. For good and ill, these will surely grow.

They point to a third public interest which is a proper goal of public policy and one which needs to be specially guarded. In so far as public policy is based on findings backed by the authority of science, its critics must either accept those findings or produce rival ones equally well validated. The more massive the scientific effort mobilised by the policy maker, the harder it will be for the critic to confirm of challenge the basis on which it is made, even if the facts are not shrouded in official secrecy. It should therefore be a major principle of scientific policy to ensure that the resources of science are sufficiently uncommitted to the service of government to provide their own independent critique. (2)

How far this is possible only time will show; but its importance is already apparent from unhappy experience. Too many sciencific predictions, bases of government policy, have already been shown to have been wrong, so soon as they became open to criticism by independent scientists. One classic example was the estimate of damage from radioactive fallout from atmospheric nuclear tests. Scientists, it appears, are no less fallible than their fellow men, once they are withdrawn from the criticism of their fellow scientists and enclosed in the goal-centred activity of an operating team. (3)

If indeed science becomes a trusted instrument for analysing and predicting the course of social systems, radical consequences will follow for the democrtic process. For it will mean that not only government but also the critics of government policy and the proponents of rival policies should have access to the information, the methods and the skills which are available to government. Failing this, both halves of the dialogue will be weakened. The policy makers will ignore the criticisms of a public which they deem to be

uninformed and the public will be unconvinced by pronouncements which they cannot

There is, of course, much information, officially collected, which is equally available to government and to the public. There will, no doubt, be more, Electronic date banks can multiply hugely the information now available in printed statistics, and retrieval systems can make it more readily available to all. But this, though it will be useful, will not of itself redress the balance between the policy maker and his critics and constituents. Policy making relies increasingly on models and simulations of complex situations, so designed that digital computers can be used to compare the outcomes of alternative policies. Critics are likely to quarrel not with the computations but with the models and the assumptions on which they are based; and these may be far more deeply buried than they have been in the political debates of the past.

4. Natural Order and Man-made Order

Science is an omnibus word. It connotes a large and expanding body of knowledge; a growing body of people and institutions concerned to extent it, apply it and pass it on; a respected method (or complex of methods) for extending and verifying knowledge; a faith that the world is regular and knowable by these methods and hence faith in scientists as experts in knowing and finding out; and a distrust of any other claim to knowledge. All these connotations have entered deeply into Western culture and affect what society expects of science and scientists and what they expect of themselves and of society.

This bundle of meanings contains some inconvenient implications. The word science, until less than two centuries ago, meant any organised body of knowledge. It has been appropriated by what we now know as the sciences, nearly all of which depend on highly developed skills and techniques. In consequence, the non-scientist holds concerning science two beliefs which are hard to reconcile. On the other hand, science is difficult, esoteric, dependent on rare and specialised skills. Its findings can only be taken on trust. On the other hand, science seems all-embracing, so that knowledge not scientifically validated-or at least not vouched for by scientists—is either of doubtful status or not knowledge at all. Many people, I think, would be embarrassed if they were asked to state and justify those of their beliefs which were not phenomena but equally under the urge to

validated by science and they might expect that any list to which they finally had to confess would be matters of faith, rather than reason—as if there was some difference of kind between those hypotheses which science has adopted and the much wider system of assumptions by which we regulate our daily lives. This concept of scientific knowledge is the unhappy legacy of a remarkable history.

In the three centuries since Descartes, the physical and biological sciences have produced an organised system of hypotheses about the natural order which is deeply impressive in its coherence, its comprehensiveness and its correspondence with observed facts. As recently as 1700 this system of thought was lacking to a degree which we today can hardly imagine. The possible objects of human attention seemed to be divided into "corporeals" and "incorporeals". Everyone agreed that solids and liquids were corporeal; but beyond that point everything was confusion. Air, heat, light, life, thoughtwhich of these apparently "incorporeals" belonged to the material world? What was the status of the others and what their mutual relations? The early 18th century lacked even the conceptual framework within which to frame such questions. Two hundred and fifty years later matter had been first distinguished from energy and then related to it. Organic forms had been both differentiated from and related to the inorganic world by a physics and chemistry which had met at the atomic level and returned, through biochemistry, to the level of molecular biology. The whole domain of matter and energy had been so ordered as to make it possible to ask even those questions which had not been answered. Whatever surprises may be in store in the field of sub-atomic physics, I see no reason to doubt that this representation of the material order is reliable so far as it goes. (4)

Viewed as the creation of three centuries of scientific thinking, this is a triumph both for the experimental and for the logical sciences. For it is not, as is sometimes supposed, a monument solely to the experimental method. The same period which saw such great advances in the techniques of experiment and observation, witnessed also a phenomenal rise in the logical sciences; both logic itself and all the branches of mathematics. These have produced a marvellous instrument for representing complex relations and working out their implications. Science proceeds not only under the impulse to comprehend still unexplained

remove from its own conceptual structure whatever is anomalous, arbitrary or even inelegant.

This triumph in representing the natural order has hugely increased faith in science and in the scientific method. In consequence, science now exercises an authority such as no combination of doctrine and institutions has exercised since the heyday of the mediaeval church. This authority has extended even to areas which science has not yet ordered or shown its ability to order.

Descartes drew a sharp distinction between mind and matter. For him, only the material world belonged to the natural order. But even in his own generation voices were to be heard, suggesting that mind, no less than "mechanically". matter, was explicable Between these dissenters from Cartesian dualism there soon appeared a schism which is at least as sharp and important today. Some understood by machines no more than their current ideas of machines could include. Others were prepared for an indefinite enlargement of the concept of the machine. These last had to fight on two fronts, as they still must-against the reductionists, not for certainty in terms of the concepts they already have; and against the descendants of Descartes, hostile to anything that might blur the sharpness of his dichotomy. I shall have more to say later about the current form of this controversy.

Descartes' dualism has lost its hold; even for those still loyal to it, the empire of matter has widened. Since Darwin, man, for most people, has been seen as part of the natural order. Even his uniquely human mental processes have been regarded as natural products of evolution. I personally accept this view; but I do not accept the conclusion which is sometimes built on it. "Science" so the argument runs "knows how to explore the natural world. Man and his works are part of the natural world. Therefore science knows how to explore man and his works".

This argument, it seems to me, is fallacious, if it be taken to mean that man and his works can be understood in the terms which peculiarity of man to impose on his experience and on all his works, especially on his relations with the other men, an order which is of his own making. Each individual is nursed into humanity through a culture which is itself the product of human history.

his own unique experience. Each suffers, participates in making and is changed by the developing culture which conditions his own and his children's generation. Whatever view be taken of his ordering process, it is different from that which is built into the natural world. No one has yet succeeded in expressing it in terms of the natural order and I do not think that anyone ever will. It needs a distinguishing name. The order, political, economic, social and cultural of which each of us is part is a man-made order. Each of us is, himself a man-made order, an individual and social artifact.

The study by mean of the man-made order of which they are part is beset with difficulties and lighted by insights which do not attend the study of the natural order. These oddities specially need to be acknowledged and can usefully be acknowledged today, partly because of the dominant importance of the man-made order and partly because advances in the physical sciences have supplied a bridge which was not available to Descartes.

5. Information and Meaning

Little more than two decades have passed since science distinguished information from energy as a respectable scientific concept. The distinction had always been tacitly acknowledged but to distinguish it formally was, I believe, as important a step as was the distinction of matter and energy in the previous two centuries. And just as matter and energy, once fruitfully distinguished, proved later to be surprisingly related, so energy and information may some day be brought within a common conceptual framework. But today the need is to clarify the distinction and make room for information concepts in a natural order which was formerly conceived solely in terms of matter and energy.

Biologists have always been aware that organisms rely on at least two types of information system; those which regulate the growth, development and functioning of the creature itself and those which regulate its relations with its surround. And it has been obvious that the second were mediated by signals received through the senses. But of these, the internal systems involved many physical and chemical interactions which could be explored without introducing information concepts; whilst even the latter could be analysed without making daring assump-Each tests this inheritance in the alembic of tions about learning, so long as specific responses, whether natural or conditioned, could be lined with specific stimuli. In any case, information concepts were still lacking.

Meantime, communication engineers were busy improving the technology of transmitting signals in human communication systems; and their language affected the concepts of biology. It became common to compare the central nervous system with a telegraphic communication system, having exchanges which coupled afferent with appropriate efferent messages. But this left untouched all the major problems of learning, interpretation and meaning.

This preoccupation with transmission was the context in which information theory was born. Its originators were engineers and mathematicians concerned with problems of transmission, such as channel capacity and signal-noise ratio. They could take for granted the process of interpretation which makes information informative.

But in another context communication engineers soon had a much wider interest. In designing automatic processes, such as the controls of anti-aircraft guns and homing missiles, industrial process controls and space satellites, they were designing not merely transmission systems but senders and receivers also. They were thus involved with the interpretation of messages—at first the simple triggering of an action by an order, as, for instance, the response to a thermostat, but soon more complex responses, involving the storing of information and the carrying out of logical operations on it, producing further information to be stored and processed. The resources of the digital computer as a logical engine opened new practical possibilities for devising self-controlling assemblies, and at the same time supplied new words and concepts which extended far beyond the fields in which they were born. The models of the communication engineer were already in some respects beyond those which had previously had to serve the needs of neurophysiology, psychology, ethology and the social sciences, and the new concepts fertilised them all.

Of these concepts, the most familiar, feedback, has two implications, of which the more important has not yet, I think, been suffifrom course generates a signal which triggers hended." (7)

some corrective action. The idea is of very general application, and serves to describe the means by which many different kinds of system hang together and learn from experience.

But far greater interest, I think, attaches to the nature of the signal itself. Error is not a simple concept; it implies deviation from some norm. No signal informs us of error, unless we have a standard of comparison. The standard may be set from outside the system. Like a ships' course, or built in, as into the controls of a ship's stabilisers or it may be learned from experience. In human terms, it may be an intention or an expectation or an obligation. But without some standard of comparison the "fact" has no significance as information, though it may serve to trigger some action with which it is specifically linked.

Thus information is, as Professor D.M. MacKay has pointed out, (5) an incomplete concept. It informs only a mind equipped to give it meaning by comparing it with some standard. Its meaning is a joint function of the signal and the receiving mind, which are mutually related as are a lock and a key.

To realise the key role played by such standards in giving meaning to experience focusses attention on the process by which such standards are evolved. This would seem to be central to the development both of personality and of experience. It is a circular process; emergent standards order experience and are in turn moulded by the experiences which they order. The process is familiar in many fields. It is exemplified by a child learning to distinguish and name objects and by a medical student learning to make a diagnosis. It is exemplified in the growth of the common law, and in the development of scientific theory. It is exemplified equally in the growth of moral codes, aesthetic canons and political interests. All judgments, perceptual and conceptual, scientific, ethical, political and aesthetic involve ordering some part of experience by reference to standards distilled from past experience, which are themselves further changed, however imperceptibly, by their further use. (6) The process was elegantly described in general terms as long ago as 1879 by G. H. Lewes: "...the new object presented to sense or the new idea ciently recognised. To most people, I suppose, presented to thought must also be soluble in feedback suggests "control by error", as old experiences, be re-cognised as like the ... exemplified by the automatic pilot. Deviation otherwise it will be unperceived, uncompremeaning to experience is the man-made world. Its existence has always been assumed by scientists, since without it science could not exist. None the less, it is, I believe, of great importance that science should have explicitly identified the point at which the man-made world takes off, as it were, from the natural order and the nature of the medium in which this human "making" takes place. (8)

The change has many implications which it would be inappropriate to follow here. It transcends both the dualism of Descartes and the reductionism of Laplace. It illuminates the nature both of facts and of "values", as well as the much debated relation between them. It offers a model of the ordering mind and the valuing process which accommodates all the different kinds of value which we are accustomed to distinguish. In the context of this paper, its importance lies in the light it sheds on the differences between the physical and social sciences and hence between the responsibilities of their respective practitioners.

6. The Status of the Social Sciences

I believe that the urge to understand is as valid and as fruitful in the man-made world as in the natural world and that the attitude. the faith and the methods of science have no less a contribution to make to its satisfaction. But it is all the more important on that account to use the insights which science has already given us to understand the differences that are involved, when men turn their attention to themselves and their societies.

The most obvious effect is on the scope for Classically. experimental method. this requires repeated observations of situations, whether experimental or natural, in which all the relevant variables are known and are either constant or changed only in known ways. If the advancement of science depended wholly on these conditions, it would have moved much less fast and less far than it has: for they are often lacking in complex situations and necessarily lacking in the study of a single historical process.

This matters less in so far as the course of an historical process can be predicted or understood from an understanding of its nonhistorical constituents; as, for example, the

Thus science is at last approaching a con- course of events which leads to an avalanche cept of the natural world sufficiently sophis- in a particular snow slope can be explainedticated to accommodate scientists, let alone though seldom predicted-in terms of invaripoliticians, judges, poets and business men, ant laws. This, however, is far less possible in For this structure of standards which gives the man-made order than in the natural order, partly because the individual constituents of the man-made order are themselves such varied historical systems, but chiefly because man-made orders are shaped and held together by communication, which depends for its meaning and effect on contexts given by culture and history. Analysis has proved a most powerful tool in exploring the natural order, because so many of the secrets of physical interaction are found at the molecular, atomic and sub-atomic levels. We cannot assume that the same will be true of man-made orders; there is much evidence that it is not. Nor can we rely on statistical methods to bridge the gap, useful as they are. The regularities which they disclose are also liable to be vitiated by historical change.

Warren Weaver (9) described the classical achievements of science as limited to two fields which he called organised simplicity and disorganised complexity. The regularities of the first can be expressed as invariant laws, those of the second as statistical laws. But what of the field of organised complexity in which we effectively live? This is the field which system theory seeks to comprehend and model. And to it science is bringing, as it has always brought, illumination, coupled with an associated threat. The illumination comes from that combination of method and attitude which, at its best, is the surest guide to the human mind in its search for truth in any field. The threat is from the dominant urge to extend the empire of science by beating the questions posed by human experience into a shape which the current concepts of science can express and its current techniques can handle.

contemporary expression of this ancient threat is the dominance of the digital computer, both as a technique and as a conceptual model. It seems to me clear beyond reasonable doubt that the human mind, in its more important activities, does not function as a digital computer. This has been argued urbanely by D. M. MacKay, polemically by Hubert L. Dreyfus and doubtless by others and I find it convincing. This is not to say that analogue computers may not one day make up the deficiency; once again, "mechanists" and "vitalists" make common cause against those who realise that their concept of a machine is and must forever remain openended. Meantime, the heady excitement of the new tool invites the policy maker to limit his questions to those which this essentially moronic instrument can answer; to over-value its assured but always conditional answers, by comparison with his own more doubtful answers to more radical questions; and finally to distort his conception of the problem itself. It has been suggested that the singular lack of success which has attended American operations in Vietnam—perhaps the only aspect of that controversial event on which nearly everyone agrees—may partly reflect the fact that it is the first war to have been fought with the benefit of the computer. (10)

It is, I believe, certain that the situations which governments must try to regulate can never be modelled or predicted or understood to the extent or in the way in which science can model and predict and understand the natural order. But this does not mean that science is less useful in the context of the man-made order or that the politician must at some point reject the methods of science and rely upon some obscure and radically different faculty, commonly called intuition. There is, I believe, no such gulf between the methods of science and of common sense. Science also is intuitive. Science also has to use even its most tentative hypotheses, however unconfirmed and unsatisfactory, until it can confirm, correct or replace them. Science also must have regard to the coherence of its hypotheses with the rest of its conceptual system, no less than with their power to explain or predict event. The methods of science are the methods by which men cooperate to gain, preserve and refine their understanding of anything to which they turn their attention, including themselves and their societies.

Yet two major differences affect the social sciences, and science policy must take account of them.

In exploring the natural order, scientists have seen themselves as discoverers. Believing that the natural order was regular and knowable, they have set themselves to represent, in terms accessible to the human mind, an order which they believed to be already inherent in reality. When rival theories computed, they believed that time would show which most nearly approximated to the real. There was one and only one right answer waiting to be found. Though philosophical doubts have often arisen as to the kind of knowledge which science yields, it has not

been supposed that the human mind could impose on the natural order a pattern of its own devising. On the contrary, one of the missions of science has been to disabuse the human mind of these illusory hopes.

The social order, by contrast, is indeed to some extent man-made and capable of being remade by man. So at least most men inescapably believe; if they did not, there would be no governments for scientists to advise and no science policy to focus this conference. There are indeed many man-made orders at every level from the personal to the international, all in constant change. And even where these changes are not deliberate (as, of course, most of them are not) they are the product of human cultural history, which, as is generally believed at least in Western cultures, cannot be expressed as a mere function of non-human changes.

The function of the social scientist remains formally as distinct from that of the policy maker as is the physicist's from the engineer's. But the subject of his study is not only the man-made order but the ordering process itself; and to this process he cannot help making his own contribution. The economic man, for example, was supposed (at least in retrospect) to have been merely a set of hypotheses about the behaviour of men in a perfect market, comparable with Newton's hypotheses about the behaviour of matter in a frictionless world. In so far as they proved to have predictive value, these assumptions claimed the same authority as any other scientific hypothesis. But the parallel was imperfect in two major respects. It mistook for invariant aspects of human nature the characteristics of a peculiar culture, which was in rapid change and was destined to change still faster, because of the activities which economic hypotheses would speed. And further, it ignored the effect which the economic man would have on the course of affairs which he was invented to predict. For nearly two centuries he has powerfully moulded the expectations which Western men have entertained of themselves and each other. And he has proved so useful to economists that they are reluctant to part with him, even though he becomes ever less useful and less realistic. He has been displaced partly by his own success. Like the model so beloved of experimental psychologists, he was a hungry rat; and men, as they grow more affluent, behave ever less like hungry rats. On the other hand, his success has fortified his hold on life, especially among his creators.

model the man-made order are more expendable than they like to believe.

This difference between the natural and the man-made order involves one still more radical difference between the roles of the physical and the social scientist. The social scientist is necessarily a critic of the order which he studies, as the physical scientist can never be.

The physical scientist devises a conceptual system which reflects the regularities of the natural order; and the technologist, using the knowledge which this system yields, manipulates the natural order, not by changing but by using its laws. The distinction between scientist and technologist is clear, and so is the relation of both to the natural order. But the social scientist observes a situation in which rival orders are fighting for dominance. The standards which give meaning to experience are not only facts but artifacts, sometimes even what Professor Seeley (11) has called fidefacts-standards which are made effective simply by being believed. In making these explicit and drawing out their implications, social scientists cannot help taking part in the ongoing exercise of mutual persuation which helps to determine not only the shape of the future but even the meaning of the past. The meaning of last year's revolution, for example, will not be known until history reveals its future outcome and this is partly a function of how it is regarded now.

Controversy still centres on this issue: it is not to be disposed of in these few words. But I think a conference on science policy should recognise that, in fostering the social sciences, governments not only speed the developments of conceptual systems more adequate to describe the social milieu and its contemporary problems. They also call into being an informed body of critics, whose innovating insights will affect, as well as reveal the system which they describe.

And this, if it is a risk, is one which I think should be taken. As the scale of interaction rises and the pace of change quickens, the scope for government becomes increasingly limited by the difficulty of understanding the situation in which it is acting. And this limitation affects not governments alone but the governed also. Both need all the enlightenment that science can give them and this cannot be relevant, unless it comes from scien-

The concepts which social scientists use to course of events. The voice which savs "Let me show you where you are going" speaks in the indicative mood and expresses an objective view: but the aspects of the future which it chooses to describe are and should be selected by an impassioned concern for the dominant human values of its time and place and by a sense of the area in which both the scientist and his fellow men can and should take a hand in the moulding of their destiny.

Notes and References

- (1) The fullest discussion known to me of this issue is by Dr. E. F. Schumaker in the Des Voeux Memorial Lecture, given at the 1967 conference of the National Society for Clean Air. See also Dr. C. J. Watson's letter to the London Times of October 25, 1967.
- (2) Dr. Donald N. Michael discusses this in The Unprepared Society (New York: Basic Books, 1968).
- (3) For a more detailed discussion of this and other illustrations see Professor Barry Commoner. Science and Survival (London: Gollancz, 1966).
- (4) See S. Toulmin and J. Goodfield, The Architecture of Matter (London: Hutchinson, 1962).
- (5) D. M. MacKay, an unpublished contribution to a Wenner-Gren symposium, September 1962, "Communication and Meaning-A Functional Approach".
- (6) The point has often been made. I am specially indebted to Professor Woodger's Biological Principles and to Bruner, Goodnow and Austin's Study of Thinking. The evidence concerning the formation of perceptual schemata is summarised in M. L. Johnson Abercrombie's Anatomy of Judgment.
- (7) G. H. Lewes, Problems of Life and Mind, 1879, quoted in M. L. Johnson Abercrombie's Anatomy of Judgment.
- (8) I have expanded this argument in Value Systems and Social Process (London: Tavistock Publication and New York: Basic Books (1968), ch. 9).
- (9) Warren Weaver, "Science and Complexity," American Scientist, Vol. 36, No. 4 (1948).
- (10) Andrew Wilson, The Bomb and the Computer (London: Barrie and Rockliff
- (11) J. R. Seeley, The Americanization of the Unconscious (New York International tists who are deeply concerned with the Science Press, 1967).

APPENDIX "39"

SOCIAL ASPECTS OF SCIENCE POLICY

Eric Trist

A background paper
prepared for the Round Table
on the Social Aspects of Science Policy,
under the auspices of
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Positive or Negative Science Policies: A
choice

Since the Scientific Revolution in England in the 17th century the cultural process we know as science has been proceeding at an exponential rate. Its effects on technology have transformed not only Western societies but the world environment. Having altered man's conception of the universe and of himself it has altered also his chances of survival. For it has enabled him to produce the weapons to destroy himself, the medicine to jeopardize his food supply by overpopulation, and industrial products irreversibly to despoil his habitat. By the same token it has given him the means of passing beyond the state of bondage to which he has been historically accustomed to a society where the quality of life could be of a different and higher order.

Few would care to predict which of these destinies will be ours or what dangerous and unstable mixtures of the two we may have to endure before (if ever) saner balance is struck. Science, through which the 19th century so confidently thought we could control the world, is seen in the latter part of the present century as the means through which we are making the world uncontrollable. As Sir Geoffrey Vickers* has put it, "we have reached the end of free fall". The world which our scientific culture has been making is no longer auto-regulative. This scientific culture has begun to disturb a number of the balances in the social and bio-physical ecology on which as a species we have depended.

* Sir Geoffrey Vickers, Value Systems and Social Process (London: Tavistock Publications, 1968). The forces unleashed have become too powerful to be contained simply by the natural interplay of other forces.

To understand why this is so requires an appreciation of what has become the salient characteristic of the contemporary environment, namely, that it is taking on the quality of a turbulent field. This turbulence arises from the increased complexity and size of the environment, total together with the increased interdependence of the parts and the unpredictable connections which arise between them as a result of the accelerating but uneven change rate. This turbulence grossly increases the area of relevant uncertainty for individuals and organizations alike. It raises far-reaching problems concerning the limits of human adaptation. Forms of adaptation, both personal and organizational, developed to meet a simpler type of environment no longer suffice to meet the higher levels of complexity now coming into existence. My colleague, Dr. F. E. Emery, and I attempted to describe this quality in a joint paper some years back.* He has recently elaborated the analysis then made in a report to the British Social Science Research Council on "The Next Thirty Years".** My own recent thoughts are set out in Part I of the Supplement as they would take too long to present here.

The root question concerning the social aspects of science policy seems to me to be this. Can science, which has been the sine qua non among the factors leading us towards a less unregulable world, be the sine qua non also in leading us towards a more regulable one? A negative answer would have as a consequence advocacy of a negative science policy—a withdrawal of resources from science and its disestablishment as a core value in the culture of our society. A positive answer would have as a consequence advocacy of a positive science policy—the invest-

^{*}F. E. Emery and E. L. Trist, "The Causal Texture of Organizational Environments," *Human Relations*, 18, 1 (1965).

^{**} F. E. Emery, "The Next Thirty Years: Concepts, Methods, and Anticipations," Human Relations, 20, 3 (1967).

ment of increased resources in its already extensive domain and its even firmer establishment as a core value.

Whatever else it may claim to be the present is the age which has brought science into politics. Positive science policies are becoming more common and more comprehensive in ever more countries. The escalation of government scientific expenditure during the 60's has been greater than in other fields. Yet there are signs in several countries of a turning away from science in the present student generation. A number of places, for example, in science and technology have not in recent years been taken up in British universities. We cannot take it for granted that our societies will continue to support positive scientific policies.

One of the consequences of government supplying the bulk of R & D funds is that the ordinary citizen will have an increasing say, however indirectly, in the affairs of science. For, in democratic countries at least, the continuation of a government depends on the support of the majority of the citizens. Their intuitive appraisals of scientific, as of more familiar, issues must be taken note of. This is an aspect of science having become political which has been less discussed than that of some constraining of scientific choice as regards what the scientist may himself do. It is an innovation, however inadvertent, that constitutes a safeguard.

I suggest that Western societies, and in the longer run others, will not continue to support positive science policies unless the world view of science can be shown to be reconcilable with human values. Ordinary Western man-who is far from ill-educated now and will become better educated-requires evidence that science can at bedrock be trusted to work in the human interest. I also believe that the increased complexities of the contemporary environment cannot be understoodfar less their instabilities controlled or their potentiality or beneficent change realisedwithout the assistance of a science developed beyond its present capabilities. The costs of abandoning a positive science policy would be penal. The case, however, for continuing a positive policy must be made. It cannot be taken for granted. It can only be made, in my view, on the basis of the social aspects. This paper will attempt to outline this case.

New Concepts of Science

Three changes have occurred which have made science more 'human' than it seemed

several decades ago. These are the abandonment of the belief in total explanation, the abandonment of reductionism and the appearance of an integrative, in addition to an analytic, strategy.

The scientific world view which prevailed in the 19th century, and which still haunts the popular image of science, was not reconcilable with human values. For a model based on mechanism, atomism and determinism scarcely depicted a world which men could live in when all other possible worlds were ruled out. The coming of the relativity and uncertainty principles upset this view in the physical sciences. The more sophisticated concepts that have followed have removed the dogmatism from science, putting a limit on the realm of scientific explanation. Michael Polanyi* has summed the paradoxical result up as follows:

"The current situation in the philosophy of science is a strange one. The movement of logical positivism, which aimed at a strict definition of validity and meaning, reached the heights of its claims and prestige about 20 years ago. Since then it has become clearer year by year that this aim was unattainable. And since (to my knowledge) no alternative has been offered to the desired strict criteria of scientific truth, we have no accepted theory of scientific knowledge today.

"Take Ernest Nagel's widely accepted account of science. He writes that we do not know whether the premises assumed in the explanation of the sciences are true; and that were the requirement that these premises must be known to be true adopted, most of the widely accepted explanation in current science would have to be rejected as unsatisfactory. In effect, Nagel implies that we must save our belief in the truth of scientific explanations by refraining from asking what they are based upon. Scientific truth is defined, then, as that which scientists affirm and believe to be true.

"Yet this lack of philosophic justification has not damaged the public authority of science, but rather increased it. Modern philosophers have excused this unaccountable belief in science, by declaring that the claims of science are only tenta-

^{*} Michael Polanyi, "The Growth of Science in Society", Minerva, 5, 4 (1967).

tive and ever open to refutation by adverse evidence. And this has added to the authority of science. It was taken to show that, while scientific knowledge was supremely reliable, scientists were at the same time supremely open-minded, setting thereby and example of incomparable modesty and tolerance."

This means that the scientist can no longer lay claim to the whole truth. There are other forms of understanding. This situation had to exist before scientists, professionals, administrators and politicians could collaborate in relations of mutual respect. It is a necessary condition for a positive science policy.

Next, the advent of open system and information theory in biology upset the principle of reductionism. Other options than physical models are now available to explain the 'living'. Moreover, these advances, being in themselves limited, are assisting the social sciences in further finding their own conceptual identity. All these steps are apprehended as being within science, which seems more self-consistent if less unified. Science, as an inquiring system,* has liberated itself from the domination of the physical sciences. As Sir Geoffrey Vickers has said of the distinctive domain of the social sciences:

"In the human species this responsiveness has become the basis for a further development so far-reaching that it needs to be distinguished as a third stage, because it introduces not only a new means of mediating change but even a new dimension in which change can be mediated. This new dimension is the conceptual system whereby humans represent, interpret, value, and increasingly create the world in which they effectively live. The new mediator is human communication, notably dialogue and the internal procedures which have developed with its use. The conceptual system thus developed is a psycho-social artifact, of which the conceptual world created by science, with its attendant procedures, is the most stable, coherent, and explicit example. But business, politics, and other human activities have their own partly autonomous systems; and in each individual from birth to death is to be found, in self-directing Science, it would seem, can come to homo sapiens without disestablishing him from his human estate. The scientist need no longer be feared as necessarily advocating the wrong "design principle" as Emery* has called it. Emery's exposition of difference between the principles of the "redundancy of parts" (the inanimate model) and the "redundancy of function" (the animate model) is given in section III of the Supplement. Only the second can avoid an Orwellian world.

The appearance of an integrative strategy has shown that science has become able to cope with the reality of wholeness as well as that of elements. So long as it seemed to insist that only elements were real it did violence to a "truth" intuitively grasped in human experience. The integrative strategy has emerged in terms of the "systems" concept. Ross Ashby** gives the following account:

"Until recently the strategy of the sciences has been largely that of analysis. The units have been found, their properties studied, and then, somewhat as an afterthought, some attempt has been made to study them in combined action. But this study of synthesis has often made little progress and does not usually occupy a prominent place in scientific knowledge.

"The rule 'analyse into parts, and study them one at a time' was so widely followed that there was some danger of its degenerating into a dogma; and the rule was often regarded as the touchstone of what was properly scientific.

"Perhaps the first worker to face squarely up to the fact that not all systems allow this analysis into single parts was Sir Ronald Fisher. His problem was to get information about how the complex

and self-limiting development, an individual system as unique as his genetic code but containing initially far more possibilities than can be realized. These developments, individual and social, know springs and forms of change which have no counterpart in the purely responsible organization of other creatures. I will label the new mediator of change 'appreciation'."

^{*} C. West Churchman et al. Experiments on Inquiring Systems, Report of the Social Sciences Group, Space Sciences Laboratory, University of California, 1967.

^{*} F. E. Emery, "The Next Thirty Years: Concepts, Methods and Anticipations," Human Relations, 20, 3 (1967).

^{**} Ross Ashby, "General Systems as a New Discipline", in General Systems Yearbook, 1968.

system of soil and plants would react to fertilizers by giving crops. One method of study is to analyse plant and soil into a host of little physical and chemical subsystems, get to know each sub-system individually, and then predict how the combined whole would respond. He decided that this method would be far too slow, and that the information he wanted would be obtained by treating soil and plant as a complex whole. So he proceeded to conduct experiments in which the variables were not altered one at a time. "At first, scientists were shocked; but second thoughts have convinced us that his methods were sound. Thus Fisher initiated a new scientific strategy. Faced with a system of great complexity, he accepted the complexity as an essential, a non-ignorable property; and showed how worthwhile information could be obtained from it. He also showed that this could be done only if the worker accepted the need for a new scientific strategy.

"What I have said is, of course, equivalent to saying that whereas physics and chemistry, given a system, promptly breaks it to pieces in order to study the parts, there is arising a new discipline that studies the system without breaking it to pieces. The internal interactions are left intact, and the system is, in the well known words, studied as a whole."

Russell Ackoff* adds:

"In the last two decades we witnessed the emergence of the 'system' as a key concept in scientific research. Systems, of course, have been studied for centuries, but something new has been added. Until recently scientists and engineers tended to treat systems as complexes whose output could be expressed as a simple function of the outputs of the component parts. As a consequence, systems were designed from the inside out. Increasingly researchers have come to deal with systems whose output cannot be expressed as a simple function of component outputs and it has become more productive to treat them holistically and to design them from the outside in."

The systems concept has had a double origin, for it arose in "systems engineering" as

well as in theoretical biology. The sharing of a common concept has enabled pure and applied science to merge their activities in a way not previously possible. Disciplines of a new kind have arisen, such as operations research (sometimes called "system analysis") which deal directly with technological and social systems in the complexity in which they exist. This is a capability which science did not have at an earlier period. It has greatly increased its usefulness to those concerned with the management of human affairs just as the other advances mentioned have reduced the likelihood of its leading them into error.

New Concepts of Policy

If science has been changing so has policy. While the former has become more policy-aware the latter has become more science-aware. They have become "directly correlated"* in response to the increased uncertainties and interdependencies of the contemporary environment. These have had two effects on policy-making which have made it seek to become more "science-based":

- (i) the greater uncertainty requires more future-orientation;
- (ii) the greater interdependence requires more comprehensiveness.

When the change-rate was slower, policy could be largely corrective, acting after the event. With a faster change-rate, it has had to become more anticipatory, acting before the event. This relates it to planning. The task of government now extends from regulating the present to creating the enabling conditions for future. This entails deciding which resources to commit ahead in what proportions so that this future may take place in one of the more desirable of its alternative forms. Such a task cannot be carried out without an extensive information base which can only be brought into being and maintained through the use of a wide range of sciences. Moreover, this task continuously challenges these sciences to develop new concepts methods.

An account of what is involved is given in the last section of Part I of the Supplement with special reference to the economic and social fields. The first requirement is a more informed picture of the present, that state of

^{*} Russell Ackoff, "Games, Decisions and Organisations," in General Systems Yearbook, 1959.

^{*}For the concept of directive correlation see G. Sommerhof, Analytical Biology (London: Oxford University Press, 1950).

which becomes more unknown the faster and more uneven the change-rate. Disaggregated as well as aggregated statistics and indicators are needed for short-run projections, the identification of high risk areas and the separation of the least from the most changing parts of the society. Beyond this, techniques have to be developed for detecting and interpreting emergent social processes and for constructing models of alternative futures.

When the sub systems of society were less interdependent, policies could be more discrete and separate agencies could administer their own programmes with minimum reference to each other. The greater degree of interdependence has changed this situation. Diffuse problems now arise affecting several sections or indeed the whole of a society and these problems tend themselves to be interconnected. Examples would be poverty, obsolescence, urban decay, pollution, regional disparity, water and other natural resource management. Michel Chevalier* has called these "meta-problems". His analysis is presented in Part I of the Supplement. The causes and boundaries of these problems cannot be established without research.

The implications for policy have been stated, with reference to the United States, by Lawrence Frank:**

"The Federal Government now provides a wide range of professional and technical assistance, with many direct subsidies and special tax allowances and concessions to business, finance, industry, transportation, and communication-indeed, to the whole range of free enterprise. This assistance to private business has been explained and justified as promoting prosperity and advancing the national welfare. But assistance and services to individuals and families have been strongly resisted and only reluctantly provided since there is no adequate rationalization for such extensions of government activities. The need for a political theory for this emerging "Service State" is, therefore, especially urgent.

"The Service State, not to be confused with the Welfare State with its aura of

charity and philanthropy, is oriented to the enhanced "well-being" of everyone, as Halbert Dunn has expressed it. It marks the acceptance of human conservation as the basic democratic task; each year sees the enlargement and extension of services furnished directly or financed by the Federal Government and reinforced by state and local agencies. These services embrace medical and health care, improved housing and urban rehabilitation, educational facilities and programs from early childhood into adult years, plus the improved care and support of the indigent, the handicapped, the impaired, and all others incapable of fending for themselves in our money economy.

"Each addition and enlargement is made as a separate program with no coherent and systematic commitment, no political theory to justify and rationalize these enlarged government activities, and no statement of policy for their extension and administration. We are improvising and operating by a series of piece-meal programs.

"This implies the need for an over-all, comprehensive policy that will assert the criteria for choices and decisions. With a clear statement of policy, those who make social decisions can be guided, as if by 'an unseen hand' when exercising their autonomy to integrate their efforts by collaborating with others who are responsive to these same criteria. Without a statement of basic criteria for national policies, the various specialized programs and the separately located authority of governments and private agencies will continue to plan and execute their separate and often irreconcilable programs."

This orientation makes it apparent that we are moving towards another type of society than that to which we have been accustomed. This is often referred to as post-industrialism.* There is, however, no guarantee of our safe arrival. Not only are the interdependencies greater—they are differently structured. Frank points out the value-confusion over welfare but does not bring out its changing relation to development. An analysis of this, in system terms, is presented in Part II

^{*} M. Chevalier, "Stimulation of Needed Social Science Research for Canadian Water Resource Problems," Privy Council Science Secretariat, Ottawa, 1967.

^{**} Lawrence Frank, "The Need for a New Political Theory," Daedalus, 96, 3 (1967).

^{*} Daniel Bell, "Notes on the Post-Industrial Society (I & II)," The Public Interest, Nos. 6 & 7, 1967.

of the Supplement. Research by the social or whatever group of sciences is most appropriate is needed on all such problems. The changes in the policy field demand a new mobilization of the sciences. This could not be effected had not the changes in science itself which were described in the previous section taken place.

entists, professionals, administrators political representatives all become involved to the texture of their relationships different what it is in fundamental research where user-interest domainates, administrators political representatives all become involved to the texture of their relationships different what it is in fundamental research, where user-interest domains the policy field demand a new problem-oriented domain is the science in the policy field demand a new problem-oriented domain is the science in the policy field demand a new problem-oriented domain is the policy field demand a new problem-oriented domain is the policy field demand a new problem-oriented domain is the policy field demand a new problem-oriented domain is the policy field demand a new problem-oriented domain is the policy field demand a new problem-oriented domain is the policy field demand a new problem-oriented domain is the problem-oriented domain is the policy field demand a new problem-oriented domain is the policy field demand a new problem-oriented domain is the policy field demand a new problem-oriented domain is the policy field demand a new problem-oriented domain is the policy field demand a new problem-oriented domain is the problem-oriented domain is the problem-oriented domain is the policy field demand a new problem-oriented domain is the policy field demand a new problem-oriented domain is the policy field demand a new problem-oriented domain is the policy field demand a new problem-oriented domain is the policy field demand a new problem-oriented domain is the policy field demand a new problem-oriented domain is the policy field demand a new problem-oriented domain is the policy field demand a new

Problem-Oriented Research Domains

The changed relationship of science and policy and the changes that have been taking place in each have led to the emergence of a new type of scientific activity. This still tends to be confused with more familiar types and needs spelling out. The spectrum of scientific activities has usually been thought of as including fundamental or basic research, applied research and development work. The economists have recently added another term: innovation. This refers to the additional activities that must be undertaken before the benefits of R & D can be realized in goods and services effective in the market place. The concept of innovation is also applicable to the non-market sector as will be shown in the last section of this paper. If the ends of the spectrum are now clearer there is something blurred in the middle. For some time the term "problem-oriented research" has been struggling into existence not knowing whether it should be subsumed under applied research or represent something different. I will attempt to show that it comprises a distinct category whose recognition has central importance for science policy and its social aspects.

If fundamental research is discipline-based, problem-oriented research may be said to be domain-based. A domain of inquiry links a group of sciences to a major sector of social concern. The problems are generic rather than specific. They may be said to constitute meta-problems. They require endeavour leading to cumulations of findings rather than "solutions". These findings contribute simultaneously to the advancement of knowledge and to human betterment. The development of a domain is jointly determined by the social and scientific interests concerned. From the policy standpoint such a domain has the characteristics of futureorientation and comprehensiveness. On the scientific side it involves the integrative strategy. Disciplines across the entire range of the physical, biological and social sciences tend to be drawn in. Their weighting and salience, however, vary enormously between domains, which have very different centres and evolve very different configurations. Sci-

and political representatives all become involved. Yet the texture of their relationships differs from what it is in fundamental research. scientific interest where dominates. applied research, where user-interest dominates. The relations of the different types of actor in a problem-oriented domain is that of collaboration. Bound together by common commitment to the overriding purpose they have to recognize the complementarity of their contributions and respect each other's authority. Novel problems of decision-making and mutual responsibility are posed which are neither fully understood nor always well worked out.

Domain-based problem-oriented research has experienced difficulties not only in securing recognition as a distinct activity but in finding appropriate organizational settings. This is scarcely surprising since it represents the confluence of key emergent trends in both science and policy. The following account by Don. K Price* of the struggles of oceanography to acquire a suitable home among the agencies of the United States government will illustrate.

"Oceanography was the first large-scale federal scientific program. It began when Thomas Jefferson founded the Coast Survey in 1807 and employed a Swiss scientist, Ferdinand R. Hassler, to bring scientific instruments from Europe and begin the job of charting the seas for the guidance of navigators. Oceanography is a field of basic and applied science in which a great many federal departments and agencies have long been involved. But, for purposes of my story, the contemporary oceanographic program began in 1956, when a group of government oceanographers decided that their activities needed to be greatly built up. Indeed. the part of the story that I propose to tell begins in March 1961 when President Kennedy included an expanded oceanographic program in his first budget, and it ends twenty months later when he pocket-vetoed the Oceanography Act of 1962.

"An idea of the scope of the expanded program is given by the various reports and testimony presented to Congressional committees. At least fourteen operating

^{*} Don K. Price, The Scientific Estates (Cambridge: Harvard University Press, 1965).

agencies were concerned, as well as the staff agencies in the Executive Office of the President.

ing not merely with a field of science, but a major problem in government organization. As Harrison Brown, chairman of

"The Navy, which had already revolutionized its strategic doctrine by developing the Polaris submarine and missile system, wanted more knowledge of currents and other ocean phenomena, both to increase its offensive capabilities and to defend against enemy submarines and their missiles.

"The Geological Survey had its eye on the offshore oil on the continental shelf, and the Bureau of Mines on the promise of vast mineral resources in the ocean depths.

"The Bureau of Commercial Fisheries was intrigued by the possibilities of increased protein supplies and even new kinds of food for an overpopulated planet. The Bureau of Sport Fisheries and Wildlife hoped to develop new recreational opportunities.

"Medical researchers talked with excitement about the search in the oceans for new biological compounds that might give clues to the biochemistry of sanity and insanity—might even provide a clue for cancer. The Public Health Service, though it soft-pedaled such speculation, was concerned about pollution of our seafoods and our beaches and harbours by sewage and chemical wastes, as was the Atomic Energy Commission about the disposal of nuclear wastes.

"Several agencies were interested in oceanographic research because of their roles in aiding navigation. The Coast and Goedetic Survey has the job of mapping the shores and currents; the Weather Bureau makes forecasts; the Corps of Engineers maintains harbours; and the Coast Guard keeps the sea lanes clear of dangers to shipping.

"Finally, there were the established research and development programs. The Maritime Administration carries on studies to adjust the design of ships to oceanic conditions; the Smithsonian Institution conducts basic research; the National Science Foundation and other agencies make grants to universities and other institutions for a wide variety of investigation relating to the oceans.

"The advocates of a comprehensive federal program knew that they were deal-

ing not merely with a field of science, but a major problem in government organization. As Harrison Brown, chairman of the Committee on Oceanography of the National Academy of Sciences, told a Senate committee in 1960, the decision to be made on the organization of the oceanography program 'far transcends oceanography itself'. He noted that the undertaking because of the way in which it cut across the programs of many operating agencies, typified the 'problem of decision making, concerning science and technology in Government.'"

No systematic attempt has yet been made to describe problem-oriented research in terms of the domain concept or to relate such domains to the discipline-based fields of fundamental research or the user-prescribed missions of applied research. Obviously, one type of work can give rise to the others. If the overall scientific enterprise were to be mapped in domain terms, fundamental and applied work would be included, where relevant, under domain headings. The Table below is a trial exercise in this direction.*

Problem-Oriented Research Domains

Domain	Notes
Medicine	Biological sciences related to medicine; biomedical engineer- ing; clinical and epidemiological studies, including psychological and social aspects; appraisals of health care systems and services.
Agriculture	Agricultural sciences and technology; the rural economy; psycho-social studies of the changing rural society.
Natural	Conservation; recreation; earth
Resources	sciences; oceanography.
Space	Relevant sciences and technology; uses of space.

Human Resources

The development and deployment of the individual educationally, vocationally, etc.; the educational and employment and career systems and their linkages at all phases of the life cycle; relation to leisure.

^{*} Expanded from Table 5 in Social Research and a National Policy for Science, Council of the Tavistock Institute of Human Relations, Tavistock Pamphlet No. 7, 1964.

Domain Notes Relating the biological, psycho-Family and Household logical and sociological aspects with those of the economic and material environment. Community Similar aspects at the community level of analysis, whether and urban or rural, local or re-Regional gional; the concept of the 'built environment'—the relation of physical to social planning. Linking legal, sociological and Law and psychological studies of social Society regulation in all fields: legislation, courts, police, offenders, prisons, and rehabilitation, etc.: civil, industrial, matrimonial law, etc. 9....... Technology Several sub-domains would be and Industry required; type of technology giving one possible basis, but technological considered in relation to economic, market, organizational, and human aspects. A constructional B mechanical, automotive C electrical

Developing Cultural, racial, economic problems, etc.

Advanced Including the whole range of 'international studies': political, legal, economic, cultural, technological, organizational, etc.

chemical

electronic

nuclear

Such a listing may serve to disclose the multiplicity and pervasiveness of problemoriented research domains in the scientific enterprise of a modern society. Britain is the reference country in what follows. The most clearly identifiable and most commonly recognized items are in the first group centred on the biological and physical sciences, medicine and agriculture being the timehonoured members. Natural resources are only beginning to be regarded as a comprehensive domain. Space is sometimes perceived as a domain, sometimes as a series of missions. The next group, centred on the social sciences, is the least recognized; many alternative bases of conceptualization would be proposed. The "appreciations" in this area are neither well developed nor in agreement. The industrial list would give rise to questions of how much should be financed by industry or by government, and what carried out where. Competing views would disclose the extent to which the boundaries and roles of the public and private sectors remain unsettled. Only with respect to the last group, concerned with improving knowledge and understanding of other countries, would an apperceptive concensus reappear, but there would now be wide differences as to the degree of importance to be ascribed.

A first annotation has shown that the relationship between science and society expressed in a problem-oriented research domain is a sensitive indicator of the prevailing value system. A scrutiny in terms of resource allocation would confirm this. But the list is incomplete. The area which has consumed more scientific resources than any other among the nations on the winning side in World War II has been left out: defence. This is the area which gave rise to the concept of mission. One may ask how far defence research is domain rather than mission-oriented. Less, perhaps, than one might be inclined to assume. One may ask also how far defence has dominated the whole field in concept as well as in resource consumption.

Despite the ambiguities revealed, there is accumulating evidence that field-determined, generic, problem-oriented research expresses the critical relation between science and society in the transition to post-industrialism. This appears to be so in Eastern European countries as well as in the West. A comparison of Czechoslovakia and France will illustrate, with special reference to the social sciences.

In Czechoslovakia a state plan for scientific research 1961-5 was worked out by the Academy of Sciences, the State Commission for the Development and Coordination of Science and Technology (SCDCST), the State Planning Commission and the Ministry of Finance.* The plan was presented in terms of sixteen "complex projects", some of which represent directions of basic research, while others are problem-oriented. Each complex project was divided into a number of "fundamental projects", of which there were 95—in turn divided into "main problems", of which

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^{*} UNESCO Science Policy Division, Science Policy and Organization of Scientific Research in the Czechoslovak Socialist Republic, UNESCO Paris, 1965.

there were 370. These constitute the basic planning units. Work on a main problem is shared by several research establishments, each of which tackles a "partial problem". For each complex project a "collegium" of 8-10 members is appointed, which is the appropriate collegium of the Academy if the project is in an area of basic research. Otherwise, a new collegium is created. If the project is more technological than scientific, the collegium will be responsible to the SCDCS, though it may still be headed by an academician. Its members include chairmen of its fundamental projects and others drawn from appropriate academic, administrative and political fields. The collegium sees that the political, economic and cultural objectives of the plan are attained and appraises overall performance. For each fundamental project there is a more expert body to evaluate and improve the quality of solution of the main problems comprising the fundamental project. It endeavours to keep these in step. For each main problem a co-ordinator links the establishments concerned with its execution and the council of the fundamental project.

Of the sixteen complex projects in the 1961-5 plan three are centred on the social sciences:

- (a) The role of schools and education in the "transition from socialism to communism" (equivalent of the transition from industrialism to post-industrialism):—fundamental research in the psychology of learning and the sociology of education; a philosophical and sociological analysis of educational theory; problem-oriented research into methods of instruction and curricula design; and on the relationship of education, training and occupations, including studies of the biological and physiological aspects of work.
- (b) Conditions affecting the performance of the economy during the transition:—a variety of projects in theoretical, institutional and applied economics; work in industrial sociology and organization theory; a component concerned with the social function of science.
 - (c) Social and cultural change during the transition:—a mix of sociological, political and philosophical studies with contributions from history and ethnology.

In addition, several of the other complex projects involve the social sciences in callaboration with the biological or physical sciences:

- (a) The healthy development of new generations;—ecological and social factors in physical and mental development, with attention to the psychiatric aspect.
- (b) Nature conservation and healthy natural environments—a co-operative effort between urbanists, technologists, biologists, sociologists and economists.
- (c) Improved material and cultural standards through the greater social effectiveness of capital investments:—studies in building economics, town planning, etc.; and an analysis of cost-benefit criteria.
- (d) The automation of complex systems:—fundamental work on information theory and its application to the social sciences, as well as the social and psychological consequences of automation.

The generic field-determined nature of these projects compels inter-disciplinary collaboration first among the social sciences and then between them and the biological and physical sciences.

In France a more explicit social science policy is in operation under the Ve Plan than elsewhere in Western Europe.* The objectives, priorities and instrumentalities of a strategic program for accelerating the development and application of the social sciences have been systematically worked out and implementation begun. The overriding objective is to build up a comprehensive understanding of the totality of factors affecting economic and social development-psychological, sociological and biological as well as economic and technological. The posture is multidisciplinary and problem-oriented. The aim is to provide a social science capability which will influence national policy. This cannot be done, as the planners see it, by narrowly conceived short-term projects but by thematically conceived and broadly coordinated long-range programmes. The priorities can only be established in the action frame of reference.

Four principal "orientational" themes have been selected and several programme areas identified in each:

(a) Under processes of economic and social development one programme will

^{*} Délégation Générale à la Recherche Scientifique et Technique, (DGRST). Rapport du Groupe «Sciences Humaines» de la Commission de la Recherche, Préparation du V° Plan, D.G.R.S.T., Paris, 1965.

examine the conditions and consequences of technical innovation and another will consider the relation of standards of living to ways of life. A third will be concerned with the administrative capabilities which facilitate development, and a fourth with urban and regional problems.

- (b) The development of human resources includes one broad programme area in manpower studies and another on psycho-social aspects.
- (c) Education is given major emphasis with programmes in learning and motivation; new teaching methods; curriculum content in relation to the obsolescence of knowledge; and the training of future teachers.
- (d) The mutual understanding of societies is concerned with problems of communication by all methods and media and at all levels of human interaction; also with the conditions of socio-cultural 'equilibrium' and 'disequilibrium'.

To balance this total programme is another concerned with 'free' fundamental research. This is centred on the humanities rather than the social sciences though logic and mathematics are singled out. Additional are the "Actions Concertées". The first of these is an intensive study of R & D establishments. Others are on programmed learning and the use of space in cities. Finally, there is a scheme for examining neglected aspects of communication and adaptation in groups undergoing changes in life-style through technical and economic development.

In recommending how all this is to be put into effect, the DGRST laid stress on bringing into being special centres in user-organizations, particularly government departments, with the double function of coordinating the projects undertaken and relating the research workers to the executives. The key centre would be set up in the office of the Prime Minister, at the elbow of the Commissariat Général du Plan, under the title of the Centre de Coordination d'Orientation des Recherches sur le Développement Économique et Social (CCORDES).

Social and technical development and innovation

The counterpart at the more concrete level of the fusion of social and scientific interests in a problem-oriented research domain is the action-research programme or project carried

out by a research group in collaboration with a client system. The client system may be an industrial firm, a public agency in any field or a wider authority embracing a large number of these. The research group may contain any mix of disciplines—whatever is appropriate to the task in hand.

The strategic significance of this type of work derives from the extent to which new institutions have to be built and old ones renewed during a time of social transition as great as the present. Government now intervene in the operations of society to an extent previously unknown. New Schemes need piloting up; their operations monitoring and evaluating. There is a growing demand in the field of social action for an equivalent to industrial development work and also of product innovation in the sense of the diffusion of a proven pilot throughout the wider system intended. Much of such work is technological as well as social, i.e. socio-technical in the sense of the concept originally introduced in the Tavistock studies of the British mining industry.* It involves design.

The theory of the collaborative relationship and of the practical engagement of social science as a strategy for advancing the base of fundamental knowledge is summarized in Part IV of the Supplement. To proceed in this way releases processes of social and organizational learning which permit innovations to be accepted an adaptive changes to take place which would not otherwise be possible. I will illustrate from projects of which I have personal experience.

The action-research group with which I was associated in the British Army during World War II, and which later founded the Tavistock Institute, developed a form of operational field psychiatry—a sort of psycho-social equivalent of operational research. As the tasks undertaken became more complex psychologists, sociologists and anthropologists were added to the team. Interdisciplinary collaboration was achieved in an action frame of reference. The method developed had depended in the first place on a free search of the military environment to discover points of relevant engagement. The 'right' had then to be 'earned' to have a critical problem which could not be met by customary military methods referred to the technical team for

^{*} E. L. Trist et al. Organizational Choice: Capabilities of Groups at the Coal Face under Changing Technologies (London: Tavistock Publications, 1963).

investigation and appreciation. This appreciation would next be discussed with appropriate regimental personnel and a likely countervailing strategy jointly worked out. The feasibility and acceptability of the plan evolved as well as its technical efficacy would be tested in a pilot scheme under protected conditions and technical control. As the pilot proved itself the scheme would become operational, control being handed back to regimental personnel, the technical team 'retreating' to advisory roles or removing their presence entirely except for purposes of monitoring and follow-up. What was learned was how to take the collaborative role in innovating special purpose service organizations with builtin social science capability in a large multiorganization of which the social science professionals were themselves temporary members-the army-under conditions of war.

A brief but comprehensive account of the many different types of activity undertaken was published at the time*. One of the most instructive, from the point of view of engagement with large-scale social systems, was that concerned with the civil resettlement of repatriated prisoners of war. For this purpose twenty transitional communities, designed on data contributed by the repatriates themselves, from their own experience, were brought into existence, run very largely by specially trained regimental personnel. There were never more than two or three psychiatrists in the whole organization. There were equally small numbers of psychologists and sociologists. Looking back on this experience, what impresses me most is not so must the development and maintenance of the transitional communities themselves, which followed on from the two Northfield Experiments** as the enormous scale of the effort that had to be made towards the environment, both military and civilian. Without this the necessary sanctioning decisions at the highest level of government would never have been obtained; the repatriates themselves would never have been convinced that the scheme was worthwhile and volunteered to attend Civil Resettlement Units in large numbers; and the participation of some four thousand

civilian organizations, especially industrial firms—a quite crucial factor—would never have been obtained.***

A recent example is a project on communications in the British building industry begun in 1963 as a joint undertaking of the Human Resources Centre of the Tavistock and its newly founded Institute for Operational Research.**** The initial relationship was with the National Joint Consultative Council of the Royal Institute of British Architects, the Royal Institute of Chartered Surveyors and the National Federation of Building Trades Employers, to whom the problem had been brought through a resolution having been passed in one of its own branches. The Council then approached the Institute, having decided that the problem was one which required social research whose relevance to its needs it had already begun to explore. A small steering committee was set up to work closely with the research team during the pilot phase of the project. In the course of their joint meetings the idea was conceived of reporting back the initial findings to a residential conference, designed on small group principles, convened by the Council and attended by some 80 key influentials from all sections of the industry, the professions connected with its, and the trade unions and government departments concerned. This event took place some six months after the inception of the pilot phase and was the first occasion on which a comprehensive gathering of those having to do with the industry had taken place-its basis being far wider than the Council itself.

The conference, held in a Cambridge College, committed itself unanimously not only to further support of the particular project in question but to take the first steps towards setting up an industrywide research institution to promote a variety of projects in an industry notable for its lack of research interest and now facing rapid technological change and growing crisis in its relations with society. Trustees were appointed and a

^{*} J. R. Rees, The Shaping of Psychiatry by War (New York: Norton, 1945).

^{**} W. R. Bion and J. Rickman, "Intra-Group Tensions in Therapy," Lancet ii (Nov. 1943), and H. Bridger, "The Northfield Experiment," Bulletin of the Menninger Clinic, 10, 1946.

^{***} A. T. M. Wilson, E. L. Trist and A. Curle, "Transitional Communities and Social Reconnection: A Study of the Civil Resettlement of British Prisoners of War," in G. E. Swanson, et al., eds., Readings in Social Psychology, 2nd edition, (New York: Holt, 1952).

^{****} G. W. Higgin and W. N. Jessop, Communications in the Building Industry (London: Tavistock Publications, 1963), and C. Chrichton, Ed., Interdependence and Uncertainty, (London, Tavistock Publications, 1966.)

ly emotional reactions experienced under protected conditions.

Some eighteen months later the pattern of forces in the wider environment had changed in ways that could not have been anticipated, partly by actions of the outgoing government, partly by uncertainties created by the incoming government and partly by changes in the general economic situation. The committee lost any sense of a relationship with a potential comprehensive support base and the trustees felt unable to raise additional funds. The resulting anxieties and conflicts were 'worked through' in the small group composed of the leaders of the research team and the steering committee so that damage was averted to the long-range institution building aims-the strengthening of the industry's general research capability and the development through this of greater powers to collaborate among its conflicting and dissociated interest groups. A 'realization' report was produced of what had been done so far, a shorted version of which the Committee published with a restatement of the aims of the Cambridge Conference. The circulation of both this and the report on the pilot phase have been unusually large, overseas as well as in the U.K. while one or two small project activities have continued on Government research funds, some wider impact has also been made. Moreover, the options have been left open for a joint search to be undertaken to find a new basis for continuing the innovative concept which represented the commitment of the Cambridge

A further example is the Industrial Democracy project in Norway* which has now been proceeding for some seven years as a collaborative enterprise between the Norwegian Confederations of Employers and Trade Unions and the Trondheim Institute of Industrial and Social Research and the Human Resources Centre of the Tavistock Institute. At a later stage the Norwegian Government joined the consortium of sponsors while the Trondheim Institute had to set up a new cen-

considerable sum of money raised. A tre in Oslo and the socio-technical group at representative research committee was the Graduate School of Business Administrabrought into existence which in turn delegat- tion of the University of California, Los Angeed certain of its members to work closely les, has also been drawn in. As with the with the research team. In such a steering Building Project this project has required a group key problems can be identified and like- sustained effort in institution building so that every step would be sanctioned not only by those directly concerned but by those potentially concerned.

The problem arose because of a sudden increase in the Norwegian trade unions of a demand for workers' representation on boards of management. What is remarkable is that the two Confederations should have requested the assistance of social scientists in order to gain a better understanding of what would ordinarily have been treated as a political problem. A thorough analysis of the economic, cultural and political features of Norwegian society was necessary as a background. Since the Norwegians needed to relate themselves to the experience of other countries it is doubtful if a solely Norwegian team would have been credible, but it is certain that a foreign team would not have been acceptable except in relation to a Norwegian Institute which had earned the right to be trusted with such an explosive problem.

The first phase of the project involved a field study of the main enterprises in Norway which included workers' representatives on their boards. The findings, having been reported back to the joint steering committee set up by the sponsors, were widely discussed not only throughout the two Confederations but in the press. The redefinition of the problem obtained in the first phase set the stage for the second which has been concerned with securing through socio-technical experiments, improved conditions for personal participation as "a different and perhaps more important basis for democratization of the work place than the formal systems of representation". The third phase, recently begun, is concerned with the diffusion of organizational earnings from these experiments.

Since this diffusion would be mediated through consulting engineers into the bulk of Norwegian industry which consists of small firms it was necessary to find a means of entering the consulting engineering systemthrough an engineer who had found his own way to a socio-technical approach—Dr. Louis Davis of UCLA. Moreover, the diffusion process has been assisted both in Norway and other countries where similar socio-technical

^{*} E. Thorsrud and F. E. Emery, "Industrial Conflict and 'Industrial Democracy'," in Operational Research and the Social Sciences, ed., J. R. Lawrence (London: Tavistock Publications, 1966).

innovations are now proceeding (Sweden, Eire, and the U.K.) by arranging an interchange of visits by managers and shop-stewards of the firms concerned and also by officials of the relevant trade unions.

The idea of applying the methods of science to social development and innovation is now spreading in a number of different contexts, though it still encounters profound resistance. Russell Ackoff has summed up the position as follows:

"In the democratic societies with which I am familiar, there is almost an innate abhorrence of social and economic experimentation. We think it demeans the subjects and threatens with the possibility of excessive public control of private lives. Yet, curiously enough, no other type of society manipulates and varies the form and content of its control over its members as much as a democratic one. Democratic nations constantly change taxes, tariffs, interest rates, zoning rules, laws, regulations, transportation and communication systems, metrics and even the clock. The major aspects of experimentation-manipulation and control—are already widely practised in such societies. They even attempt to measure the effects of changes in public policy on national performance. But here is the rub: they usually do not let the design of the evaluative procedure affect the way the public is controlled or manipulated. The evaluators are called in after the fact, when it is too late to do an adequate job of evaluation and when the possibilities of gaining understanding are almost completely destroyed. For example, in industry we have found that no amount of retrospective analysis of advertising and sales can yield as much understanding of their relationship as can even a very simple experiment in a few market-places.

"In the United States we have just missed a marvellous opportunity to perform useful experimentations in connexion with our so-called "Poverty Programme". Instead of designing these programmes as experiments to inform us how to reduce or remove poverty, we assumed we knew the answers. Only when the failure of such programmes was obvious was any effort made to determine what their effect had been. By then it

was too late. Instead of changing our methodology we have only changed our programmes. There is little consolation in knowing that we won't make the same errors twice.

"Science and other subsystems of our nation-system must become the subject of experimental study...If experimental designs are used as a basis for the allocation of national resources to science and technology, feedback can lead to adaptation, and gradually improving policy making can be expected while basic understanding of science, if not the nation, is being accumulated."*

The increasingly unregulable world which science has been bringing into existence can best be brought back into a more regulated state by applying the methods of science to the change processes occurring within it. This entails engaging in social or operational experiments of many different kinds but always sanctioned by those concerned. In this way errors and unintended effects are more likely to be picked up before it is too late. So far as all participate all will learn and the values of science will be diffused into the society which will itself embody the social aspects of its science policies.

Supplement to SOCIAL ASPECTS OF SCIENCE POLICY

Eric Trist

I. Analysis of the Contemporary Environment (modified from the author's contribution to "Appraising Administrative Capability in Development", a methodological monograph prepared by Interplan for the Public Administration Division, United Nations, 1969)

II. Systems Aspects of Welfare and Development (from the author's paper "The Relation of Welfare and Development in the Transition to Post-Industrialism", prepared for the Seminar sponsored by the Canadian Centre for Community Studies, 1967).

III. An Active Role for the Social Sciences and Choosing a Design Principle in Relation to Values (from F. E. Emery, "The Next Thirty Years: Concepts, Methods and Anticipations", Human Relations, 20, 3, 1967).

^{*} Russell Ackoff, "Operational Research and National Science Policy," in *Decision Making in National Science Policy*, ed. Anthony de Reuck (London: Churchill, 1963).

IV. The Search for a Policy for the Social Sciences (concluding section of the author's report to Unesco on the Organization and Financing of Social Research. Restricted until publication in "Main Trends of Research in the Sciences of Man", Unesco, Paris, 1969).

Supplement to SOCIAL ASPECTS OF SCIENCE POLICY

Eric Trist

I. Analysis of the Contemporary
Environment

The Task Environment

It is necessary to distinguish between the immediate operational or task environment and the more remote, general or contextual environment. The task environment consists of all organizations, groups and people with whom the organization has specific relations, both on the input and output sides, even though it may not be aware of their complete range. The contextual environment consists of the relations which the entities included in the task environment have to each other and to other systems not directly entering the world of the organization's own transactions. Events in the contextual environment may at any time obtrude into this world, constructively or destructively, predictably or unpredictably.

The task environment of an organization (or larger system) includes the complex array of government groups, private organizations, ethnic minorities, voluntary associations and miscellaneous publics that serve as its clients and suppliers, controllers and controllees, supporters or adversaries. It may also include foreign clients and suppliers, lenders, investors and donors, large and small power blocs and their organizers and transnational organizations. Even when the agency and country are small, the task environment is large.

To be able to deal with great environmental complexity is as important an element in administrative capability as any other. Yet it is one of the most neglected and one also of the most difficult to improve. Typical weaknesses in agencies involved in development programmes are hostilities or communication gaps between them and

(a) various private, cooperative or other non-governmental sectors,

(b) community leaders throughout the country, regional and local as well as national.

(c) the interests and desires of unorganized people, many of which they cannot articulate.

The scale of the effort required to develop these relations is substantial. It is usually under-estimated. These relations must also be actively and continuously maintained. This too often is not realized. Coercion does not succeed except in the short run under crisis conditions. There is no substitute for building wide-spread, enduring support in the task environment. This means a big investment of resources, and thorough examination of the opportunity costs involved, political and human as well as economic.

In nations with mixed economies planimplementation organizations must include means for enlisting the cooperation of the private sector. In all economies, improved capabilities are required on the part of both national leaders and civil servants for developing widespread participation in plan formulation. This is easy to say but difficult to achieve. It is costly, time-consuming and trying of patience. Temptations to take short cuts are at the elbow of my administrator. The chief gain from widespread participation is that we get an idea, otherwise unobtainable, of the acceptability—and hence the "implementability"—of programmes. acceptable to the population concerned, a programme must be intelligible in terms of its needs, goals, values and habits of thought. Otherwise any proposed change or innovation will mystify and confuse; so threaten; and so cause either opposition or disengagement.

So if plans are to be implemented, their objectives and attainability as 'formulated' must be perceived and accepted as 'right' and as 'for real' by the key individuals, main interest groups and publics concerned in their implementation; and the experience of those concerned must be seen by them to have 'effects'—namely, it must be taken into account in modifying the plans as originally formulated and in framing new plans. Otherwise, those concerned cannot be expected to develop any deep commitment to the plans they are supposed to implement and make work as an integral part of the new round of their everyday lives.

The Contextual Environment

The state of the relations between the contextual environment, the task environment and the internal world of the organization has administrator. He must distinguish between:-

(a) processes that go on within the organization—the area of internal interdependencies—such as interdepartmental conflicts, status problems, organizational dilemmas, morale or efficiency problems.

(b) the exchanges between the organization and its task environment—the area of transactional interdependencies, from either the input or the output directionthe type of problem discussed in the preceding section.

(c) processes through which parts of the environment become related to each other, constituting what may be called its causal texture*—the area of interdependencies that belong within the environment itself. These processes are contextual, i.e., ecological.** They involve characteristics of and forces in the wider society.

The processes which connect parts of the environment to each other are often unlike those connecting parts of the organization to each other, or even with those which relate the environment to the organization. A major fallacy has been to assume their identity.

An internally well-managed organization making a good product or rendering an excellent service does not just for these reasons succeed in the market place or continue to meet a salient need in the non-market sector. Nor for these reasons alone will its input requirements, human, financial or material, remain available to it in the accustomed quantities on the accustomed terms. Moreover, the contextual conditions determining its transactions may be affected by a wide range of factors. Though some of these may be foreseeable, others are difficult, still others impossible, to anticipate. We may instance a change of government, a change in the terms of trade, new legislation, a strike in another industry, a revelution in another country, a distant war, a period of increased financial uncertainty, a drought or other natural

Since there is an accelerating and uneven change rate in the world generally and communications have become so explosively effective, the contextual environment is becoming more and more important for those who administer programmes in development planning. Future states of the administrator's own organization and its task environment are likely to be even more affected than ever by the wider societal field both national and transnational. The administrator must, therefore, equip himself with more information and new methods.

The contextual environment is international as well as national. Increasingly, events and trends have distant effects which are rapidly felt. The environment of national planners and their counterparts in operating agencies is characterized by the slow and painful emergence of a new world society. This world society is characterized by interdependent nations, world-spanning organizations, diffusing technologies, urban world centres and world-oriented elites. This growing interdependence is facilitated by increasingly rapid systems of communication and transport.

This same inter-dependence increasingly makes conflicts more likely while the more rapid means of communication make the spread of conflicts more likely. People all round the world now compare themselves with each other, especially those more privileged and advantageously placed. Expectations rise and the sense of relative deprivation grows.

Increased inter-dependence also creates countervailing tendencies toward separatism. A need is felt to ward off the contextual intrusions not only because of their increasing frequency but because they are only too apt to be alarmingly dissonant from the familiar and near. The rise in nationalism, and "subnationalism", may be accounted for in part by this. The multiplication of small nation-states and of separatist regions in larger states has already created severe problems for development administration. Attempts at federation have on the whole been discouraging. Devel-

constantly to be borne in mind by the disaster, a population explosion, a new medium such as television, an alternative technology, a change in the educational system or of policy in an international agency, or the attitudes of the oncoming generation, which may lead to shifts in values or fashions regarding the relation between traditional structure and modernization.

^{*} F. E. Emery and E. L. Trist, "The Causal Texture of Organizational Environments", Human Relations, 18, 1, 1965.

^{**} Eric Trist, "The Relation of Welfare and Development in the Transition to Post-Industrialism' Western Management Sciences Institute, University of California, Los Angeles, 1968.

opment administrators must recognize the tionalism and modernism, and judge both their strength and degree of reality as they frame and execute policies and programmes.

Environmental Change: turbulence

The degree of change now taking place in the contemporary world as a whole is of an order as great as that which occurred when large-scale societies with written languages first arose on the basis of agricultural settlements. This ushered in what Kenneth Boulding* has referred to as the era of "civilization" which, having lasted some 5,000 years, is in his view beginning to give place to a new type of social order. Those who are developing the study of the future are at present attempting to explore possible forms which this new order might take. Since the "Futuribles" project of Bertrand de Jouvenel** began but a few years ago Institutes and Commissions concerned with the multidisciplinary study of the future have sprung up like mushrooms in almost all of the advanced countries-and in some of those which are less advanced. This is in itself evidence of the intensity of the current need to prepare for what lies ahead.

Noting that the most critical single change which occurred during the period of "civilization" was the transition from pre-industrial to industrial societies. Daniel Bell*** has won acceptance for the term "post-industrial society" to indicate the type of social order which would seem to be emerging. In post-industrialism the available technology will eventually be such that the production of economically required goods and services will no longer absorb most of the energies of most of the people. Though post-industrialism in a fully developed state is unlikely to be reached anywhere in the world for a considerable number of years, the existence of an irreversible trend in this direction is already powerfully affecting ever widening classes of events and larger masses of people, both consciously and unconsciously.

This trend is proceeding far more rapidly co-presence of opposite needs for autonomy and far more unevenly than had been and relatedness, bigness and smallness, tradi- anticipated, within as well as between countries. If the gap between the developing and the developed countries is widening so is that between generations. In the most advanced countires, certain parts of the society are already in or approaching an early phase of post-industrialism, while many others remain in various phases of industrialism, and still others are pre-industrial. Under some conditions, these different parts are interspersed: under others they are separate. In many critical respects it is social scatter rather than social cohesion which is increasing.

With the means of communication now available (especially television), a diffuse consciousness of this total state of affairs is spreading, making reactions more rapid in hoth unstructured publics and organized interest groups, and altering the threshold of what people will tolerate. The problems created are of a type and on a scale which call more than ever for planned intervention. But too many of the attempts so far made have had poor success. Meanwhile, new forms of violence and estrangement are appearing. Whatever their differences, serious analysts of the contemporary scene show uncommon accord in thinking that the transition to postindustrialism is likely to be fraught with hazards as difficult to surmount as any yet encountered by man, both in the societies which first confront it and, through them, in the less developed parts of the world.

The difficulties arise because there is a continuous and accelerating, though uneven, change in the overall environment, deriving ultimately from advances in science and technology: and the advances in communication particularly make this evident to all humanity. The contemporary environment is more than ever in history a turbulent field.**** This turbulence arises from the increased complexity and size of the total environment together with the increased interdependence of its parts and the unpredictable connections which arise between them as a result of the accelerating but uneven change. This turbulence grossly increases the area of relevant uncertainty for individuals and organizations alike, and raises far-reaching problems concerning the limits of human adaptation. Forms of adaptation, both personal and organizational, developed to meet simpler

Michigan Press, Ann Arbor, 1956.

** Bertrand de Jouvenel, The Art of conjecture, Basic Books, New York, 1962.

^{*} Kenneth Boulding, The Image, University of

^{***} Daniel Bell. Penguin Survey of the Social Sciences, Penguin Books, London, 1965. The term was originally suggested by David Riesman. "Leisure and Work in Post Industrial Society", in Mass Leisure, Ed. E. Larrabee and R. Meyerson, Glencoe Free Press, 1958.

^{****} Emery and Trist, op cit.

types of environment no longer suffice to meet the new higher levels of complexity. The order of change represented is so great as to constitute a *transformation*.

Michel Chevalier* has drawn attention to the new type of diffuse social problems which arises under conditions of these complex turbulent environments. He refers to such problems as meta-problems. Not only have the problems themselves developed far wider ramifications through the increased connectedness in the causal texture of the environment but this quality of diffuse extension is also becoming more widely perceived. "Society has come more and more to perceive and articulate a new kind of problem. It is not only a matter of putting related problems together; new knowledge and expectations have caused a fusion, an interrelation of problems into a class of meta-problems. And society, once having perceived a meta-problem, begins also to perceive that courses of action to relieve it are inter-related. In fact, some comprehensive attack is now the only strategy acceptable to society." He refers to poverty, environmental pollution, and bi-lingualism and bi-culturalism as issues now widely recognized in Canadian society as being meta-problems. A rendition of this list for developing countries might read as follows: poverty, population, multi-lingualism and multi-culturalism. Others have analyzed a number of "systems" problems which are just beginning to attain meta-status in the United States. This exercise should be carried out for developing countries. It would bring out points of resemblance and difference both between them and more advanced countries and among themselves.

In complex turbulent environments, development administrators must recognize metaproblems and deal with them as such. This constitutes a second transformation. Unless this is realized by those responsible for formulating and executing policy, they will go on treating comprehensive meta-problems piecemeal as a series of discrete and isolable problems. They cannot in this way bring about the required collaborative "engagement" between political and interest group leaders, agency administrators and the numerous organizations and diffuse overlapping publics whose needs their policies are framed

to meet. The separateness of the programmes will perpetuate the myth of the independence of the client systems. Effective solutions to meta-problems depend on the collaboration of all concerned. Coercion cannot be effectively exercised: the higher level of complexity calls for a new mode of administrative regulation.

We may put it another way. With the single organization, however large, which usually has one general objective, together with a limited number of more specific objectives reconcilable through compromise, we have become reasonably expert. This is so whether these organizations be armies, industrial enterprises, churches, government agencies, or voluntary associations. But in handling organizational interdependences, where objectives are many, and priorities and conflicts less easily reconcilable we remain, by comparison, novices. It is these interdependencies, however, and their relation to the unstructured publics which constitute the overall society, which create the meta-problem. We remain novices because we have been used (except in times of crisis such as depressions and wars) to a society in which, by and large, the ecological problems have taken care of themselves—as indeed they were expected to do in the ethos of preindustrial and industrial societies alike. We need in all societies to develop a new institution-building capability in the area of organizational inter-dependences. This constitutes a third transformation.

With the increasing salience of complex turbulent environments auto-regulative processes, to use a term of Michel Crozier's,** are breaking down. We can no longer depend on them. In the opinion of Sir Geoffrey Vickers*** societies in all parts of the world are in danger of falling into "ecological traps".

Future Orientation and the Administrator's Active Role

It may be inferred from this turbulence that the maintenance of sufficient stability in the contextual environments has become a major requirement of administrators.

This has created what may be called the planners' dilemma: the greater the degree of change, the greater the need for planning,

^{*} Michael Chevalier, Stimulation of Needed Social Science Research for Canadian Water Resources Policy, Privy Council Science Secretariat, Ottawa, 1967.

^{**} Michel Crozier, The Bureaucratic Phenomenon, Tavistock Publications, London, 1964.

^{***} Sir Geoffrey Vickers, Value Systems and Social Progress, Tavistock Publications, London, 1968.

otherwise precedents of the past could guide the future; but the greater the degree of uncertainty, the greater the likelihood that plans right today will be wrong tomorrow.

Yet the only chance of maintaining a sufficient degree of stability in a complex turbulent environment lies in administrators taking the active rather than the passive role. With auto-regulative processes becoming less and less dependable, the passive role no longer constitutes an option.

This analysis shows why in relation to environmental change development planning and administration have become necessary in the contemporary world. It shows also that they may not be regarded as an already acquired capability but as an unmastered art representing a new form of the political process (in all nations whatever their stage of 'development').

Although the views of the future held by the administrator become critical, these should in the first place be based on an informed picture of the present. This entails preparing such forms of economic and social accounts as are feasible, with suitable "disaggregation". Sample survey data on attitudes, beliefs and customs should be added if possible, and systematic use of informants and panel discussions with opinion leaders in all sections of the society. This is the approach suggested in "The State of the Nation".*

The existence of strong pressures toward and uneven rates of change makes imperative the taking of regular readings on The State of the Nation. Unless this is done, the administrator is likely to make false assumptions about the real state of affairs in critical sub-systems of his society. "Just what is the status quo?" is a question that must be taken seriously. Such readings can serve three purposes:

- (a) The preparation of short-run projections based on whatever forecasting techniques are feasible.
- (b) The identification of high-risk areas, whether regions of the country, minority groups, processes of uncontrolled urbanization, externally vulnerable parts of the economy, special foci of conflict, etc.
- (c) The separation of unchanging parts and aspects of the society from those

exhibiting certain degrees of change. These may be considerably different from what they are assumed to be, once the surface is penetrated.

A second and related aspect of future orientation concerns the early detection of emergent social processes and the assessment of their implications. Emery has made some cogent suggestions:

- (a) "When the emerging system is relatively very weak, it will tend to manifest itself only in the parasitical effects it has on the energies of the host system—in symptoms of debility. These latter will find it increasingly difficult to mobilize energy (people) for their functions and there will be a slowing down of their responsiveness to new demands. The balance of forces may oscillate so that these symptoms occur in waves and make the functioning of the existing social systems less predictable.
- (b) "When the emerging system is stronger but still not strong enough to displace the existing system we can expect to see symptoms of intrusion. What breaks through are social phenomena, like the swarming adolescents at Margate (and other coastal resorts of Britain) several years ago (or 'black power' and urban black riots in the United States), which are clearly not just errors in the functioning of the existing systems. At the same time, because of the relative weakness of the emerging social systems, they will usually only break through because of the existing systems. Their appearance will not obviously reveal the shape of the emerging system.
- (c) "When the emerging system has grown to be roughly in balance with existing systems, there may be mutual invasion (as in the 'revolution' triggered by the student riots in France which challenged de Gaulle's regime).

"At this stage, it should be obvious that there is a newly emerging system but mutual retardation and the general ambivalence and lack of decisiveness may still lead the new system to be seen simply as a negation of the existing system. The methodological task is to identify, in the chaotic intermingling of the systems,

^{*} Bertram Gross, The State of the Nation, Tavistock Publications, London 1966.

characteristics of the new system which are not simply an opposition to the old."*

A third aspect of future orientation concerns the modelling of "alternative futures" as a guide to decision-making. Only in very recent years has the concept of the future been replaced by that of alternative futures. If the change from singular to plural reflects the raised level of uncertainty it suggests also that the greater openness which the more rapid change rate occasions gives some scope for choice. The basic rationale of an activity such as development administration is to take the active role and to make the desirable futures more likely than the undesirable.

The replacement of the blueprint by the scenario as the guiding fiction of the planning process constitutes a new appreciation which has altered the "cognitive structure" of development administration. We have learnt following Gabor** that we must invent the future because we cannot predict it. The gain in this new approach lies in the separation of models whose properties can be known from realities whose properties can at best be only partially known and from eventuations whose probabilities are not calculable.

The construction of models of this type is a rigorous discipline. We have to make explicit entire set of starting assumptions involved, including those concerning values. Simulation with the aid of the computer can bring to light many unintended effects. Recent suggestions concerning social observatories and urban laboratories may shortly allow large numbers of people to envisage more of the implications of alternative courses of action than they can at present. A new technology is coming into existence which will enable the political process to become both more informed and more participatory-if we so will. The development administrator should equip himself or some of his key subordinate units to use this technology.

II. Systems Aspects of Welfare and Development

In this section we shall remove the concepts of welfare and development from their everyday connotations and attempt to estab-

* Emery, F. E., "The Next Thirty Years: Concepts, Methods and Anticipations", Human Relations, 20, 3. 1967.

** D. Gabor, Inventing the Future, Alfred A.

Knopf, New York, 1964.

lish their basic characteristics as general properties of open systems. This will entail (a) distinguishing the system states to which each refers; (b) considering additional factors which must be taken into account in relation to social as compared with biological systems; (c) similarly with reference to larger rather than smaller social units; (d) explicating the relations of the two concepts to each other under different sets of conditions; (e) this last with special reference to the implications of system complexity when associated with rapid and uneven change.

In the relations of the system (whether organism or organisation) to its environment welfare and development are complementary states which are positive for the adaptive process. They have thresholds (standards) which must be determined empirically. The attainability of states above the threshold raises a further set of questions, which need not detain us here, except to note that in the case of man the limits remain unknown. Below the threshold welfare and development turn into their opposites—states which are negative for adaptation and survival

a. Welfare or well-being, to continue to function well, refers to states of a system under conditions which maintain the steady state. Its opposite, ill-fare or ill-being, to be dysfunctional, refers to states of a system under conditions which do not permit the steady state to be maintained. This set of terms therefore is concerned with the 'statics' of adaptation-with stability (not to be confused with stagnation which is a state of illfare) and with the regulation and maintenance of stability.

b. Development, or progression, to continue to advance, refers to processes by which a system reaches higher order steady states of a more adaptive nature. Its opposite, deterioration, or retrogression, refers to processes by which the system returns to states of a lower order (stable or unstable) which are maladaptive. This set of terms, therefore is concerned with the 'dynamics' of adaptationwith positive change leading to the establishment of widened and preferred orders (not to be confused with negative change which leads to disorder or to greater constraint). Development involves discovery and innovation. It is concerned with the regulation of growth.

properties is complete between biological and opposites. social systems or between social units of dif-

Both biological and social systems contrib- ferent social magnitudes, we may nevertheless ute since man belongs to both. Without essay a first list of properties basic to states assuming that the isomorphism of system of human welfare and development and their

Welfare (Well-being)	Ill-fare (Ill-being)	Development (Progression)	Deterioration (Retrogression)
Intactness	Impairment	Maturation	Arrest
Robustness	Vulnerability	Learning	Retardation
Self-regulation	Breakdown	Extended adaptability	
Integration	Dissociation	Cultural accumulation	Stagnation
Independence	Dependence	Product accumulation	Waste
Interdependence	Isolation	Environmental	Contraction
Coordination	Scatter	expansion	
Cooperation	Conflict	Innovation	Obsolence

ment we may transfer the concepts of maturation and learning but add those of actively transforming the environment (through technological change) and the cumulating information (through cultural transmission). These points are of course related to the fact that the socio-cultural systems which the biosocial human individual forms with other such individuals have an altogether higher order of openness from those formed by other species. The thresholds (standards) themselves change, as the norms which determine expectations change with society.

In relation to socio-cultural systems, welfare and development share a common set of dimension. These represent categories of value such as those proposed many years ago by Spranger:

- a. economic
- b. social
- c. political
 - d. scientific
 - e. aesthetic
 - f. religious.

As we pass from bio-social to socio-cultural States of welfare/ill-fare and of developsystems, in relation to welfare we may trans- ment/retrogression exist in some such multipose the concept of the intact functioning dimensional set as universal attributes, organism (organization) as constituting the however much emphasis may vary between necessary conditions, but add that of a higher societies and among individuals and groups order of intra-population interdependencies as within a society. Certain thresholds of proviconstituting the sufficient conditions for main- sion tend to become established through the taining the steady state. In relation to develop- operation of social norms as rights; certain thresholds of performance as duties. In the "progression" from pre-industrial, through industrial, towards post-industrial societies, each of these dimensions has tended to establish itself as a domain within which welfare and development rights may be asserted and duties expected. Moreover, the thresholds have tended to be set at higher levels.

> Welfare and development share in common referents at all orders of social magnitude:

- a. the individual.
- b. the family and various forms of kindship system.
 - c. formal and informal organizations.
- d. communities, i.e. ecological systems: local, regional, national.
- e. transnational entities—even the world as an emerging interdependent system.

States of welfare/ill-fare and of development/retrogression exist in social units at all system levels as well as in all socio-cultural dimensions. The levels are qualitatively as well as quantitatively different as regards the types of relationship they involve. Their welfare and development requirements pose problems which are correspondingly different, and which may be in conflict. Nevertheless, they are inter-dependent, the degree varying with the complexity of the environment. If in pre-industrial societies the kindship system tends to be the most salient component of the social structure, in industrial societies it is formal organizations; while in post-industrialism it would appear that ecological systems are likely to take this role.

The relations of welfare and development take three principal forms: when development is a function of welfare; when welfare is a function of development; when welfare and development are inter-dependent functions. The form of these relations is determined by the types of environment with which a society, or a relatively autonomous part of it, are directly correlated.

- (a) Development as a function of welfare. This state expresses the relation which obtains under conditions of the more placid environments where the maintenance of stability is the principal requirement for adaptation. This state is typified by pre-industrial societies, particularly in their earlier and simpler forms:
- (i) Welfare is maintained by autoregulative processes operating through the kinship system, which plays the role of a "leading", or pivotal, part.
- (ii) Development measures are required to maintain established states of welfare when auto-regulative mechanisms can no longer cope in face of internal and external threats. Development processes under these conditions are not auto-regulative but involve taking the active role. Modes of intervention in these societies, however, are characterized by the use of coercive methods, illustrated in the rise of autocratic regimes and regular armies.
- (b) Welfare as a function of development. This state expresses the relation which obtains as the environment becomes more dynamic, when internally generated growth (resulting from technological change) is now the principal requirement for adaptation. This state is typified by industrial societies.
- (i) Development is maintained by autoregulative processes operating through the market system, where enterprises now play the role of the leading part.

- (ii) The welfare of increasingly numerous classes of people and segments of the society, however, is no longer autoregulative. The maintenance of their welfare requires the taking of an active role. Modes of intervention in industrial societies cannot remain solely coercive if disturbances of a revolutionary type are to be offset. Legislative reform based on "democracy by consent" makes its appearance.*
- (c) Welfare and development as interdependent functions. This state expresses the relation which obtains as Type 4 conditions become salient in the transition to the post-industrial society. Adaptation now depends on the ecological regulation of the interdependencies in all their dimensions of the innumerable sub-systems which characterize large societies undergoing rapid but uneven change.
 - (i) The welfare of sub-systems now inherently involves their development; otherwise the accelerating change-rate soon renders them obsolescent—when they fall into states of ill-fare.
 - (ii) Sub-system interdependence also increases so that states of ill-fare in a relatively few sub-systems (especially if their position is crucial) can produce widespread dysfunction in larger systems. The development of particular sub-systems is dependent on the welfare of other sub-systems to a greater extent than when the degree of inter-dependence is less.
 - (iii) Unevenness in a change-rate widens the range of outcomes, so that social segmentation increases. The number of groups perceiving themselves, or being perceived, in sub-threshold states becomes greater as the expectations which set the thresholds rise and as the sense of "relative deprivation" grows.
 - (iv) The effects of these contradictory trends are magnified by an increase in the number, diversity and size of subsystems, which raises the overall level of complexity.
 - (v) This, in turn, raises the level of uncertainty. It now becomes less possible for a given sub-system to remain directively correlated with a relatively closed set. Each member of the immediate set to which a sub-system belongs

^{*} H. Clegg, Industrial Democracy, Oxford: Blackwell, 1960.

tends to be linked with a growing and changing number of other sets, which cannot be completely identified. These sets tend, moreover, to be related to each other in different ways, and often belong to different "universes". It therefore becomes harder to predict if, or for how long, a particular sub-system will continue to develop, or remain in a state of welfare.

The meta-problems created in this situation the limit within which auto-regulative processes can adaptively operate with respect to either welfare or development, so that an active role becomes generally required.

As this need to take the active role becomes more general it changes the quality of the society. Hence the need to distinguish post-industrialism from industrialism. Hence also the relevance of Lawrence Frank's contention that a new political theory is required.*

With the passive role no longer constituting an option, the central issue becomes the character of the active role. There are two main and opposite directions in which this role can develop. One, modelled on the principles of the physical sciences, would lead towards a more engineered society. The other, modelled on the principles of the sciences of life, would lead towards a more organic society. It has become possible to state the choice between these two models in system theory terms, as Dr. Emery has attempted in his 1967 paper quoted in section III of this supplement.

Our analysis may now be extended as follows: that at the higher level of complexity which characterizes the transition to postindustrialism a higher quality is required in all primary social units. By primary social units is meant the set of concrete social resources which exist in the life-space of the individual, i.e. the people and institutions with which he directly interacts and to which he contributes his own resources; his family, his work-place, the school his children attend, the particular community in which he resides, the services and amenities actually available to him: in sum, all those entities which compose his primary social world. The quality of these resources, in his case, determines for the individual his "quality of life", on which his welfare and development

alike depend. The objective of taking the active role is to bring into being ecological systems able to maintain primary social worlds of high quality throughout a society. How to do this has now become the overriding question as we move towards post-industrialism.

III. An Active Role for the

Social Sciences and Choosing a Design Principle in Relation to Values

"It should be clear by now that, with planning, the social sciences can play an active role in the next decades, not simply a passive one—they can seek to modify directively their social environment in order to help men better to pursue the ends they desire and not be left to adapt passively to whatever blindly emerges. Insofar as the social sciences are concerned simply to adapt to the next thirty years, then planning for the future would be based on extra polations of the sort that 'by the 1990's x proportion of the population of size X will be in schools; given the past rate of increase in educational psychologists per ten thousand students, we must plan for a supply of ...' This sort of approach would leave unconsidered whether it might not, for instance, be better to develop a theory of pedagogy or a re-organization of industrial culture that would radically change the multiple effects of the educational psychologist or the pre-eminence of schools as places of learning. Paradoxically, the problem of making predictions would be easier if the social sciences stuck to a passive role. By actively seeking to enhance man's ability to control himself and his institutions, the social sciences are more likely to contribute to genuine unpredictable novelty. Men would have greater control, but the manner in which they would exercise it would be less obvious than if they continued as at present.

"The distinction we have been trying to make has been rigorously made by Sommerhoff in terms of 'adaptation' and 'directive correlation.'* Adaptation refers to the responses available for dealing with emergent environmental circumstances. The concept of directive correlation encompasses adaptation in that it allows for that system of causal relations in which the environment is actively influenced to determine the kinds of responses that will subsequently be adaptive.

"Passive adaptation is restricted to initial conditions of an environmental nature, i.e., it

^{*} Lawrence K. Frank, "The Need for a New Political Theory," Daedalus, 96, 3, 1967.

represents a stimulus-response relation. This, that men can form between themselves and relation. As Angyal* phrases it, '... the stimulus prompts the response. The response is mainly determined by the intrinsic tendencies of the organism ... (it) is essentially an autonomous function' (p. 36). The stimulus for its part is, with respect to the organism, embedded in and predictive of heteronomous processes. An object or event in the environment has stimulus qualities only insofar as it is part of such a coupling of separate systems. This, however, represents only one form of directive correlation. The other is the form of coupling that occurs, for instance, when a man lights a fire. In this case, his wit and action sets off an environmental process that enables him by appropriate responses to pursue goals of warmth, cooking, of visual contact, of security, of distillation, etc. Making fires is not only an adaptive response to the sun going down but can be a starting condition (a cœnetic variable, from the Greek cœnos-beginning) for a range of other purposive activities.

"To be applied to the next thirty years of the social sciences, this simple model of directive correlation would have to be elaborated because (a) the key environmental processes are people who are capable of directively correlating their activities with the social sciences, (b) in any real situation the social sciences will be involved in more than one other process, and (c) the time scale involves a hierarchy of directive correlations within which the goals of the earlier ones are the starting conditions of the following.

"However, the active role of the social sciences in the coming decades is not reconcilable with the social sciences seeking to determine the future of man. Unlike the other sciences, the social sciences cannot be indifferent to their subject matter. They cannot, in fact, expect to survive, let alone grow, unless they pursue goals that are shared by their chosen objects of study. No matter how cunning or devious the social scientist became, it is almost certain that his subject matter would eventually outmanoeuvre him, as no physical particle could.

"The survival and growth of social science presupposes a role in which it enhances the range and degree of directive correlations

we hasten to add, is not a simple cause-effect their environment. Specifically, this might mean increasing the range and efficiency of the responses they are able to make or extending men's awareness of the goals they might successfully pursue. In each of these ways the social sciences can contribute to men's ability to choose and to make the next thirty years.

> "This contribution is only meaningful if, in fact, men have some ability and some desire to shape the future. We assume this to be the case, allowing only that (a) men can only proceed from the objective conditions of the present, (b) they tend to pursue only those goals that seem to be achievable, (and hence may often be blind to possibilities that have newly emerged), and (c) the means they choose may frequently have unanticipated consequences for other goals.

> "The choice is really between whether a population seeks to enhance its chances of survival by strengthening and elaborating special social mechanisms of control or by increasing the adaptiveness of its individual members; the latter is a feasible strategy in a turbulent environment and one to which western societies seem culturally biased.

> "We have stated that choice is unavoidable. What makes it unavoidable is what we might clumsily call a design principle. In designing an adaptive self-regulating system, one has to have built in redundancy or else settle for a system with a fixed repertoire of responses that are adaptive only to a finite, strictly identified set of environmental conditions. This is an important property of any system. as an arithmetical increase in redundancy tends to produce a log-increase in reliability. The redundancy may be achieved by having redundant parts but then there must be a special control mechanism (specialized parts) that determine which parts are active or redundant for any particular adaptive response. If the control is to be reliable it must also have redundant parts and the question of a further control emerges. In this type of system, reliability is bought at the cost of providing or maintaining the redundant parts, hence the tendency is toward continual reduction of the functions and hence cost of the individual part. The social system of an ant colony relies more upon this principle than does a human system, and a computer more than does an ant colony. The alternative principle is to increase the redundancy of functions of the

^{*} Andras Angyal, Foundations for a Science of Personality, Harvard University Press, Cambridge, 1958

cial control mechanisms, but it does entail effective mechanisms within the part for setting and resetting its functions-for human beings, shared values are the most significant of these self-regulating devices. Installing these values of course increases the cost of the parts. The human body is the classic example of this type of system although it is becoming more certain that the brain operates by means of overlapping assemblies based on similar sharing of parts.

"Whatever wisdom one attributes to biological evolution, the fact is that in the design of social organization, we have a genuine choice between these design principles. When the cost of the parts is low (in our context, the cost of individual life), the principle of redundant parts is attractive. The modern Western societies are currently raising their notion of the value of individual life, but a chance in reproductive rates and investment rates could reverse this. There is, however, a more general principle that favours the western ideal. The total error in a system can be represented as equal to the square root of the sum of the squares of all the component errors. It follows that a reduction in the error of all the components produces a greater increase in reliability than does an equal amount of reduction that is confined to some of them (e.g. to the special control parts). We are certainly not suggesting that this principle has been or is even now a conscious part of western ideologies. Some sense of it does, however, seem to have reinforced our prejudice toward democratic forms of organization."

Restricted until publication in "Main Trends of Research in the Science of Man". Unesco. Paris, 1969.

> IV. The Search for a Policy for the Social Sciences

The Need for Planning

The right of the social, along with the biological and physical, sciences to a place among 'the sciences' is no longer disputed. Neither is their utility. These are no longer real questions. The real question is: that the demand for the development and utilization of the social sciences is rising at so rapid a rate that there is doubt whether it can be effectively met. Given the present state of some of the disciplines, present patterns of however 'co-ordinated'. Otherwise, there

individual parts. This does not entail a pres- organization and training, and present levels sure toward higher and higher orders of spe- of financial support and manpower resources, the chances of effectively meeting it are nonexistent—unless efforts are made to introduce planned change on a substantial scale.

> Concern over this has led to a search in a growing number of countries for a policy for the social sciences. In several Western European countries bodies at the national level have come into existence concerned in one way or another with co-ordination and planning. In other countries, including the United States, surveys of the situation are under way to appraise national social science capability. In Eastern Europe policy-planning bodies which include the social along with the other sciences have been in existence for some time. Not until recently, however, have they been faced with the prospect of allocating resources on a substantial scale.

> In the advanced countries the search for a policy for the social sciences is becoming intensified, since the resources they consume are now large enough to become publicly visible-however small they may be in comparison with those allocated in the natural sciences, or however short they may fall with respect to need. Moreover, expenditure on the social sciences is rising faster in some countries than expenditure on all other sciences combined. Social science expenditure has, however, started from an incomparably smaller base.

> In addition, governments, directly or indirectly, supply the bulk of the funds. The social sciences have become politically accountable. In the United States social science has become 'big science'. Tactical deployment of resources on such a scale by uncoordinated means shows diminishing returns. For the sake alike of their development as sciences and the realization of their value as resources strategic planning of social science activities has become necessary. The difficulties and dangers of attempting this without doing more harm than good are immense. Very little experience is yet available; and any planning process is liable to serious error. The number of alternatives is considerable. It will take some time to discover which are to be preferred in different societies.

Some Dangers of Planning

Multiple sources of funds and multiple centres of decision-making should be retained.

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would be cause for serious alarm. Toleration of different viewpoints is a 'must' for the development of the social sciences. So many questions of theory and method remain unsettled that openness of mind is an overriding requirement. The fashioning of effective policies depends on an open dialogue, continuously maintained, between social scientists in all disciplines and all types of social science organization and policy-makers both inside and outside government in all major domains of social action. A cluster of inter-related and inter-acting bodies with complementary roles, rather than one organ, seems to be what is emerging in countries attempting science planning in any field.*

There is danger that too great a proportion of available resources will be invested in projects limited to present concerns (both theoretical and practical) rather than be anticipative of future needs. If the social sciences are to take an active role in permitting better choices to be made among alternative futures, how to discern future needs becomes a central issue. Though this is beginning to receive attention, a number of difficult conceptual and methodological problems will require solution before much progress can be made.**

Institution Building

The three output mixes which have been distinguished merit study by policy/planning bodies for the purpose of building the most adaptive types of social science institution:

- (a) the research/application mix in which research—usually but not necessarily of an inter-disciplinary kind—on generic field-determined problems is undertaken with students taking junior roles in on-going programmes involving clientele systems;
- (b) the research/teaching mix in which basic research—usually but not necessarily within one discipline—can proceed in areas not involving engagement with clientele systems and where students can make original contributions at an earlier stage;

* For the idea of a cluster of organizations rather than a single organization being involved in planning processes even when these are highly centralized, vide Bertram G. Gross, ed. (142) 1967, Action Under Planning, and The State of the Nation, 1966, by the same author, (141)

tion, 1966, by the same author, (141)
**Cf. F. E. Emery, 1967, The Next Thirty Years:
Concepts, Methods and Anticipations. (140)

(c) the research/service mix, where the focus is on more concrete problems but where there is scope for students to gain experience as 'internes'.

Basic university departments are appropriately centred on (b) with some (a) and a little (c); professional schools on (c) with some (a) and a little (b); special institutes (whether within or outside universities) on (a) with some (b) and a little (c). All three partterns are necessary; but unless their objectives are kept distinct, dysfunctional interference occurs, and findings, students and clients all suffer. A good deal of such interference goes on at the present time. One objective of social science policy would be to develop a balanced system of complementary institutions which would remove this.

Decision-making structures are likely to be, and should be, different for the research/application, the research/teaching and the research/service mixes. In the research/application mix the most effective choices are likely to be the outcome of complex 'appreciations' which grow up between groups of social scientists, client organizations and representatives of broader sections of the society. Such processes could lead to the establishment of a number of applied research councils (titles will vary) concerned with developing strategic relations between the social sciences and major sections of a society. The research/teaching mix would be handled by bodies responsible for continuously reviewing the most promising avenues of fundamental research. Paradoxically, unfashionable innovations may be most effectively nurtured by user-interests concerned with the research/service mix. Some of the most promising new ideas arise in this area. They do not consume much in the way of special resources in their early stages and may go on quietly as an adjunct of service until enough headway has been made for support to be sought in terms of one of the other two mixes. This is the common way in clinical research.

Developments have been held back by the confusion which has persisted concerning the relations of pure and applied research. These are different in the social and the natural sciences. In the latter the required data can be abstracted from their natural settings to a far greater extent than in the social sciences. Moreover, their 'permission' does not have to be asked before they can be used. Except in

special areas the social scientist must gain access to his material in its natural setting in ways which are acceptable to those concerned. This means that engagement in problem-oriented research represents a major strategy for advancing the knowledge base in the social sciences.

The effective development of the social sciences towards the needs of the future requires the establishment of genuinely programmatic research sustained over long time periods on carefully selected themes by institutes with the stability, scale and 'requisite variety' of resources to enable them to commit their members to such objectives. For reasons alike of the state of the social sciences and the needs of societies a good proportion of these programmes should be in areas of generic field-determined problem-oriented research. At present there is too great a dispersion of research effort in small and unstable organizations. This has caused a random accumulation of projects rather than an evolving cumulation of findings. Amongst other reasons this has been caused by the persistence of a tradition of academic individualism among research workers. Echoing this grant-giving bodies have tended to prefer the apparently reduced risk of backing a large number of small projects to the apparently increased risk of giving support to a limited number of large but strategically selected programmes. A main task of social science policy would be to put this situation right and to create the 'enabling conditions' for strategic programmes to be undertaken.

Problems of Manpower

Overall arrangements in a country's total 'social science system' require to be planned so that maximum free movement of scientific personnel becomes possible between organizations centred on any of the three mixes. Scientific personnel should also be able to circulate freely between organizations which primarily form part of the academic world and user-organizations which employ social scientists but belong primarily to the operational world. Otherwise, the requisite variety of career paths will not be available to permit a body of social scientists to come into existence large enough or flexible enough to meet the rising demand. There will be a dysfuncresearch; and a similar dysfunctional separa-

demic world and the user-organizations which contain the clientele systems critical for the development of the knowledge base. Adverse effects of these kinds exist in most countries at the present time, quite often to a serious degree

A shortage in social science manpower must be anticipated, both with respect to quantity and quality. Universities should be encouraged to expand their teaching facilities in the social sciences and governments and other sponsors to provide the funds. The best results may be expected from the establishment of comprehensive schools of social science, including the full range of the basic disciplines, at both undergraduate and graduate level. Multi-professor, as opposed to single professor, departments are to be preferred. A central objective would be to establish a minimum number of centres of excellence which could attain 'critical mass'. The highest priority in many countries would be to introduce accelerated forms of graduate training.

Professional as distinct from basic education requires parallel acceleration. Only through the extension and enlargement of the social professions will the social sciences be applied in user-organizations. effectively These professions are of two kinds: those directly deriving from the social sciences, such as administration and education: those depending on a substantial ingredient of the social sciences, such as engineering, medicine, law, architecture, urban and other forms of planning. Many of the key decisions concerning the future will be made by members of these professions. It is essential that social science understanding be built into their education.

Small Countries

The smaller the country the more severe become the problems of scientific choice. It is not practicable in small countries for social research to develop in more than a limited number of directions. Countries with less than 5 million inhabitants represent the extreme case; but any country with less than 20 million inhabitants faces serious dilemmas. Even considerably larger countries cannot 'do tional separation between teaching and everything'. These dilemmas persist even when the country concerned is among the tion between the types of research going on more advanced. If more complex and sophisoutside and inside universities. There will ticated resources are now available the probalso be a severe splitting between the aca- lem still remains of using them to achieve

'critical mass' in more than a limited number of areas.

One direction of solution would be to establish regional linkage between a group of countries with close affinities in culture, language and geographical setting. The number of centres of excellence available to the region as a whole could then be maximized. Given their traditions, small countries often display a 'distinctive competence' in particular research areas. These are the foundations on which to build 'comparative advantage'. Small countries may offer the best environmental opportunities for the pursuit of certain classes of problem. With respect to these they may become world centres.

Small countries may offer greater leeway for innovation once the break with academic traditionalism has been made. The enormous professional machines characteristic of large countries may hamper innovation. It is noteworthy that a country such as Norway has become conspicuous in peace research, crosscultural studies in political science and action research in industrial democracy. The ecology of such developments merits study. What socio-environmental conditions produce the greatest amount of social science originality per capita?

Developing Countries

In the decades immediately ahead the social, rather than the natural sciences are to

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be envisaged as playing 'the leading part' in increasing the overall scientific capability of the developing countries. Progress in the physical and biological sciences can for the time being be left to the more advanced countries. Resulting technological benefits can to a great extent be 'bought in'. What developing countries must achieve for themselves is a fundamental understanding of all aspects of the 'development' process. For this the social sciences represent the critical resource. Moreover, professional personnel must be trained in sufficient numbers to implement what is learnt in change programmes which are selfdetermined. On this background greater natural science capability can be more effectively utilized.

The role of the more advanced countries is to assist in building up the required social science and plan-implementation capability of the developing countries. At the present time, too many of the most promising social scientists and professionals from these countries stay too long in the universities of the more advanced countries. Quite a number remain permanently. Too much of the social research being done in the developing countries is being carried out by research workers from the developed countries. This trend needs to be reserved through international cooperation.

APPENDIX "40"

CANADIAN TRENDS IN BEHAVIORAL RESEARCH A BRIEF REVIEW AND ASSESSMENT* THOMAS PHILBROOK**

A background paper
prepared for the Round Table
on the Social Aspects of Science Policy,
under the auspices of
the University of Toronto
Harry M. Cassidy Memorial Research Fund,
27-29 March 1969, Toronto, Canada

The startling fact of social and behavioral research in Canada is its tremendous growth in the last decade. This growth is revealed in the sheer increase in the number of social and behavioral scientists in Canada, the amount of money being directed to this kind of research, the mushrooming of research institutes and the breadth of research interests and concerns now being routinely pursued. The first part of this paper is devoted to a brief description of some major features of this growth. The second part is an assessment of these growth trends, with special emphasis on the relationship between social and behavioral research, on the one hand and social policy at the governmental level on the other.

Underlying this review and assessment are two themes. First, that there is a consuming interest evident in the phenomena of change in all its forms. Second, that one of the dominant problems facing behavioral research in Canada lies in developing organizational forms which provide a climate congenial to its conduct and financing.

The Canadian Scene

Since a large proportion of the behavioral and social science research community is located in the universities, its growth closely parallels the considerable expansion of university programs in recent years. There now is in the universities a substantial pool of behavioral scientists actively pursuing research interests, individually and in teams. Such a pool was simply not present ten years ago.

Another outcome of university growth has been the establishment of a full range of behavioral science departments on almost every campus across Canada. From the research standpoint, this development has meant that it is possible to find academicians interested in various sub-disciplines and skilled in specialized study areas. One finds now, for example, experienced family sociologists, demographers, economitricians and so on. Nonetheless, Canadian universities still have a long way to go before they acquire the range of specialized talents to meet the present research demands. Right now, most university departments are still trying to fill out the basic staff complement necessary to undergraduate and graduate courses in these fields. They have not really begun to staff for specialized research needs—and perhaps never should.

The growth in the number and type of behavioral science departments with concomittant increase in enrollment is providing a fairly large supply of young people capable of filling positions of research associates and assistants. For the most part, these people are trained to the B.A. or M. A. level; the output of Canadian Ph. D's in the behavioral sciences is still relatively small. In fact it does not

^{*}This is a preliminary draft which does not contain the documentation and references to research studies that form the basis of this assessment. The final version will, of course, be fully documented.

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even meet purely academic demands let alone research and policy requirements.

Finally on the university scene, the course selections and departmental orientations are becoming more slanted toward training in research. Methodology and statistics courses, basic to the development of research skills. are becoming common. Similarly, most students can now obtain some research experience, either within their university or in government, before entering graduate school. A frequently pertinent question is the degree to which these courses carry specific Canadian content and reference. I think we may expect that as behavioral research steps up in Canada it will become increasingly possible to offer more courses with high Canadian content

The shortage of manpower for behavioral science research is also characteristic of other scenes. In government, tight budgets, spending constraints and staff freezes have worked at present to slacken the demand for researchers. Yet even with these constraints, research or research/programming positions requiring behavioral science qualifications are still difficult to fill. In the private sector, where search in the behavioral sciences is playing a role of increasing importance in the management of large corporations, a similar pattern prevails.

Immediate supply and demand problems aside, growth also typifies the trends in behavioral science research outside the university. Economists were the first of the social scientists to be brought into federal government. Their entry began back in the thirties and mushroomed in the late fifties and early sixties. All economists in the federal government, of course, do not engage in research; yet a substantial proportion of them do and probably most have had experience in research. The economist, incidentally, can be found in almost every department and research establishment of the federal government.

Although few in number sociologists are becoming quite popular in Ottawa. Other behavioral scientists are also becoming common on the federal scene and the traditional disciplines are to be found scattered throughout all departments. These range from planners and political scientists to researchers in education and social work. The newer fields that have a high social science emphasis such as systems analysis, operational research and communications are also increasingly represented and demanded.

In all, these behavioral scientists have a considerable role in shaping research trends in these disciplines. Although their main input is not so much in research per se, the impact on research done by private consultants and university researchers is great. Not only do they initiate studies and influence departmental, and in some instances overall government, research policy, but they also play a role in allocating research funds and in applying research results to policies and programs.

While the federal government may be the single largest employer of behavioral scientists in Canada, they are also well represented in the provincial governments and in the large urban municipal governments. Like their federal counterparts, these behavioral scientists as officials do not influence research by doing but chiefly by buying and using. Chief among the sellers of applied research are the private consulting firms.

The model most of these firms strive to follow is one that is generally present in the United States and other western countries. Typically, the firm will seek to build a multidisciplinary staff composed of specialists from the traditional and the new systems-oriented fields of behavioral science. Some attempt is usually made to link these professional behavioral researchers to specialists in physical resource fields and engineering. The work is organized on project lines and emphasizes a team approach. The firm will endeavor to draw its business from both the public and private spheres. It will also try to do some specialized research and advanced development work, funded internally from profits set aside for this purpose. There naturally are variations from this model, but regardless of the variations it is actively followed.

There are two other important institutions in addition to private industry, consulting firms, government establishments and universities, through which behavioral research is conducted. There are the nongovernmental organizations such as the Canadian Welfare Council, the National Planning Association, trade associations, Canadian Association for Adult Education and so on; and there are the newly emerging behavioral research institutes. The voluntary organizations engage in behavioral research on an in-house, grant or contract basis. The research almost always has a direct relation to the association's special interest although some are going further afield by taking an interest in research as an

organizational function in its own right. At any rate, the promotion and conduct of behavioral research has become fashionable for these associations, its pursuit is constrained chiefly by limited funds.

Behavioral sciences research institutes are appearing on university campuses everywhere in Canada. The research focus of these institutes ranges from psychology (McGill) and survey research (York) to anthropology and Atlantic area studies (Memorial). Some have produced a number of studies and monographs; they all seek to merge some aspects of the consulting firm model with the traditional academic structure. In spite of the rapid increase and serious intentions of these institutes most have limited funds and no endowments and frequently exist more on paper than in fact.

In the previous section, I have stressed factors that revealed the growth of behavioral research. Growth of course is relative. Looking at the same scene, the Economic Council of Canada, in its Fifth Annual Review found it necessary to conclude that the social sciences "... remain relatively underdeveloped in Canada" (p.53). It sees them as underdeveloped chiefly in relation to the amount of financial support given and in relation to the social problems confronting us. There are no doubt few in the behavioral science community who would disagree with this. However, the significance of this statement lies not in what it says about the behavioral sciences but in the public recognition by a senior government agency of the importance of these sciences in the social life of Canada. In short, it legitimizes them.

Central to the social aspect of science policy is the shape and direction of behavioral research. There are two major questions that must be addressed when the shaping process of research—in a broad view and as a social activity important to the nation—is examined. First, what are the factors that have shaped research activities in the past? Second, what are the factors that ought to shape the direction of research in the future? These are two questions that link the assessment of trends in research to the making of science policy and ultimately to the use of research and amount of support.

By way of transition two points need emphasis. First, as noted in the beginning of this paper, one basic problem in the conduct of behavioral research is its institutionaliza-

tion, particularly in the university setting. By and large we try to fit research institutes, or more generally the organization for the conduct of research, into the traditional university structure. This creates a serious problem because increasingly the interdisciplinary and team-work model is the accepted model for research. The point is that neither the university structure nor the method of financial support are designed to accommodate this model. At this point in time, I would suggest that the research organization tail ought to wag the university and funding dog. (The phraseology is not meant in an uncomplimentary way.)

Second, behavioral scientists and the buyers and users of the research are becoming increasingly concerned with its social purpose and action. This is revealed in the selection of research topics, e.g. problems of economic development, mobility, teaching the disadvantaged, developmental administration and so on. These topics have, of course, theoretical and basic relevance to a discipline, but increasingly they are being slanted towards matters of social-economic policy and change. This slanting is not being done solely by the users of research but also by researchers in the proposals they submit and the interests they express. Similarly, there are a substantial number of behavioral scientists becoming involved in action projects at the local level; regional development planning and organizational change. Their motivations and specific interests vary greatly. Nevertheless, these interests do reveal a movement away from the older view of research for research's sake.

The trend towards behavioral research institutes and social action interests of researchers is contributing greatly to the formulation and implementation of social policy, especially that dealing with change. The nature of this contribution is best shown in the linkage between the conceptualization of policy and research. There is, however, seldom a direct link. Research generally enters in the middle of the policy formulation process one that might transpire over a five to ten or more year period. In sum, new policy pronouncements influence trends in selection research topics; the resulting research has an impact on the further shaping of policy and in turn on the specification of what research ought to be done.

Social Development and Research Trends

The emerging concept of social development nicely illustrates this policy process and the ways in which it shapes research trends. Recent years have seen an increasing application of the term social development to government legislation, policies, programs and, indeed, tax measures. While widely used, the term lacks clear and specific meaning. Its use still depends largely on the semantic goodwill holding between users. Nonetheless, a measure of agreement about the meaning of social development has emerged. Underlying this agreement is an exchange between policy and program definition on the one hand, and empirical research in the social and behavioral science on the other. This exchange is financial, administrative and substantive.

First, social development has been generally recognized as a special form of social change characterized by planned intervention, normally by a public or governmental agency, into the lives of individuals and regions. The purposes of these interventions are usually to secure improved modes of living for individuals or groups within specified communities or regions. What the nature of these improvements is, is a contentious issue but one which a range of economic and social studies are helping to clarify.

Second, these improvements are inevitably stated in broadly economic terms. Hence, we have training programs designed to increase earnings and employability, or industrial incentives to improve local economics. In some cases, the means are indirect, when for example the focus of action is in bettering publicly provided amenities and services, e.g. health, education, and employment services. Generally speaking, the social side of program objectives of this kind are seen as the program benefits to individuals while the economic benefits are those accruing to the society or economy at large. However, the calculation of benefits to individuals seldom achieves quantifiable precision and is always fraught with contentious value and methodological assumptions about what these benefits are and just what is to be measured. This stands in contrast to the seemingly concrete character of economic benefits.

There has been a substantial amount of research into the means and program elements within this second area of agreement. Studies, based mainly on data from the Dominion Bureau of Statistics and National

Revenue, have been done on patterns and distribution income. Similarly, research on the effects of training on wages is being done along with numerous on the delivery, administration and integration of a broad range of social services.

Finally, there is a large body of work being carried on in both public and private sectors, on costs and benefits of programs and further refinements in the methods of calculating them.

A third element found in social development programs is a focus on low income segments of the population. Not only does this focus coincide neatly with the increasing of income and employment as legitimate objectives of public programs but it tactitly upstages a whole range of social concerns from the problems of discrimination and cultural differences to those of administration of justice, welfare and social services generally. Perhaps more fundamental from the perspective of value assumptions underlying programs, the income and employment objectives create an illusion of homogeneity within the low income strata a one dimensional social class system in which an individual's life chances are largely, if not fundamentally, determined by his income and employment positions.

Probably one of the most thoroughly researched and validated propositions in the social sciences is that which conceives the class structure as multi-dimensional. Certainly one of the major dimensions of a class structure is wealth which in modern societies is largely determined by an individual's occupation. But other dimensions, such as power, prestige, culture and community of origin play an equally significant role. Moreover, the class position of an individual or strata within society is determined not so much by a single dimension but by the combination of dimensions and inter-relationship between them. In short, to approach social development or the problems of poverty from a perspective based solely, or even chiefly, on income and employment, tremendously over simplifies the analysis of these problems and the credibility of proposed solutions or programs.

These three points of general agreement equate social development thought, policy and programs with anti-poverty measures. Through this equation, generally accepted efforts to improve personal income, productivity and employment at the lower end of

these scales can be conveniently linked to more contentious issues of social reform and inequalities. Such a linkage has the advantage of presuming an economic payoff to social change and social expenditures which are, in turn, justified on moral or general social welfare grounds. Yet it is hardly reasonable, conceptually or factually, to expect sensible or workable programs to be created from an idea of social development which restricts itself solely to the consideration of the lower income strata of a population. Programs are, of course, put into operation but because of the poverty of the initiating ideas they suffer from operational incompleteness that almost invariably necessitates expedient repair.

It would seem evident that social development is a far broader concept than the linkage to anti-poverty measures would allow. The concept of it as a special form of social change gives a more realistic scope. When social change is seen as generally pervasive in modern societies and occuring at an accelerating pace then the full breadth of social development begins to emerge. It means that the objectives of social development exert a significant influence on the direction and course of social change in society. It means that social development policies and programs are not relavant solely to the disadvantages of a particular strata or region but to groups and institutions that are widely and either favorably or unfavorably represented throughout society. It may mean, and there is a good deal of evidence and theory to substantiate this, that to obtain meaningful changes among the lower socio-economic classes requires subtle and complex changes in the upper levels of society. These changes relate especially to the conduct of organizations and institutions and. thereby, to the ideas and values which shape this conduct.

The older reformist and simplistic notions of income redistribution, cooperative movements and private charity seen as ways of improving conditions for the poor have little relevance to contemporary change and social policy. Underlying these notions is a tacit rejection of the multi-dimensional class structured urban society with its complex organizations and scientific technology; a rejection of the very changes and pressures that call for responsive social policy.

In sum, this brief description and assessment pictures a growing and dynamic situation. The number of behavioral researchers in all institutional settings have increased greatly in the last decade. This is parallelled by a rise in the number of research institutes and other organizations that are annually producing a quantity of empirical studies and surveys. It should also be mentioned that nearly every behavioral science discipline now has its own Canadian journal if not professional association. Canada is thus developing, belated though it may be, a substantial behavioral research community. It is one that can make a major contribution, through research and counsel, to our society.

To many however, Canadian research in the behavioral sciences is not developing fast enough. What is needed, these concerned observers feel, is greatly increased financial support for research. This paper has argued that that policy prescription while necessary is not adequate. It fails to take into account the emerging interests of behavioral scientists and the problems they face in doing research. It is these interests and problems that shape research trends.

The emphasis on added financial support to behavioral research, I feel, leads to doing more of the same. Such an emphasis is too undirected. What we should be doing is endeavoring to shape more carefully the trends already latent in behavioral research.

This can be done by taking into account, through grants, contracts, and policy, the demonstrable interests of researchers in the phenomena of change and their willingness to work in areas contributing to its direction. To do so we must face squarely the problems of organization. By and large, I have argued, these present forms of organization are not geared to large-scale research oriented toward social purpose or action.

In the last section, I have tried to show the way in which social policy and research interact. Research trends are shaped through this interaction. By this example and many others that could be described, it is possible to establish a social science policy more sensitive to research trends and needs. Policy formulated in such a way could better contribute to the building of a more human society in Canada.

APPENDIX "41"

SOCIAL ASPECTS OF SCIENCE

POLICY
Dr. O. M. Solandt
Remarks, delivered at the Round Table on the Social Aspects of Science Policy, under the auspices of the University of Toronto Harry M. Cassidy Memorial Research Fund, Research Fund, 27-29 March 1969, Toronto, Canada

March 27, 1969.

I have so many things that I would like to say to you and so little time to say them and they are all so inter-related that I hardly know where to begin. The old-fashioned sequential method of presenting what I have to say seems most inadequate for the subject and the occasion. I wish that I could suddenly immerse you in what I want to communicate so that you could absorb it all at once. I even consulted that arch enemy of linear information transfer, Marshall McLuhan, but got no help. I will just have to try to start at the beginning and hope to get to the end in time. What I have to say will be telegraphic in style and incomplete in content but I hope it will convey to you my principal concerns about the social aspects of science policy. There is no time to argue about definitions of science and of policy. I will use 'science' to include the whole of man's organized knowledge about himself and his world and 'policy' to mean an authoritative statement of purpose or, even more explicitly, an outline of a general strategy aimed at achieving stated goals.

Certainly throughout the industrialized world men now realize how powerfully advances in science and technology can change their lives. They have also come to recognize that some of these changes are good, some are bad, and many are equivocal. As a result some people regard the scientist as the great leader of the modern age while others consider him to be the source of much if not all the evil of our times. The one thing on which most people agree is that our social customs and institutions are not changing nearly fast enough to adapt confortably to these changes in technology.

As a result of this concern most of the industrialized nations how now set up some

mechanism through which scientists can advise the government on the formulation of a national science policy. In almost all cases this body has dealt primarily with the natural sciences and engineering and only indirectly with social sciences. It is almost as if we had decided that the best way to make up for the slow adaptation of our social systems was to control the rate of discovery and application of new scientific knowledge. Discussions of science policies seem largely to overlook the distinction that Sir Geoffrey Vickers makes in his paper between natural order and manmade order. Man has made tremendous strides in getting the most out of his natural environment by adapting his own activities to the order that he finds in the natural world. The Apollo flights are probably man's most spectacular achievement in this direction. On the other hand, we have given far less attention to the man-made order that we have created and that we can learn to change to meet our changing needs.

If mankind behaved we would expect to find him devoting the larger part of his exploratory efforts to trying to find out how to adapt the man-made order to make best use of the continual stream of new knowledge concerning the natural order that comes from scientific research. Unfortunately, this is not true; we spend more and more time and effort exploring the natural world and converting the results of our discoveries into usable technology which further perturbs our already turbulent man-made order.

My experience suggests that this is more than merely a neglect of social sciences. It is an actual revulsion from them not only by the natural scientists and engineers but also by politicians and voters. The natural scientist is

viewed by many with fear and distrust both because of the terrible weapons that he has discovered and because so many of his discoveries such as the computer lead not merely to benefits for some but also to feelings of insecurity for many. Similarly, the social scientist is viewed with suspicion by the natural scientist partly because in studying human behaviour he is tending to probe some of the sensitive areas of natural science. After all natural science has been built on man's ability as an observer and a critical examination of his performance can raise some difficult questions. In addition, many natural scientists and engineers are doubtful about man's ability to apply the scientific method to social problems. They feel that there are too many variables and too much that seems totally unpredictable. I do not share this pessimism. Social problems are usually more complex and difficult than physical ones but careful study will increase our understanding of them.

The ordinary man in the street often distrusts social science because it seems to be prying into his private life. The politician fears social science because it may undermine his position as the interpreter of the will of the people. Clearly one of our most urgent problems is for the natural and social scientists to establish a common ground from which will grow a new and broad study leading to a better understanding of human ecology. This must include not only a study of the interactions of the natural and social sciences but also a study of how knowledge in both of these fields effects society and how it can be communicated effectively to voters and especially to political leaders. Such an improvement in mutual understanding can be achieved and is possibly our most urgent need.

My own view of our present position may be naive but it is certainly definite. I feel very strongly that man is not using his vast knowledge of the natural world nearly as effectively as he could. His failure to exploit this knowledge lies mainly in his unwillingness to study social organizations and to understand how to adapt them to change. What we need to do is to find out how to devise a social structure which can not only make immediate and effective use of our present knowledge of the natural world but can also adapt rapidly to future additions to our knowledge. Obviously, such a social structure will only come as a result of a

major program of research in the social sciences that will provide us with a better understanding of the man-made world to match our growing knowledge of the natural world. All this must be achieved in a society that gives increasing emphasis to human values. The goal that I see is a society that is prosperous and efficient because it embraces science as an integral part of its culture and uses technology efficiently and concurrently to use this prosperity as a basis for creating the 'just society' that we talk about.

As the Science Council has struggled with the problems of advising on a national policy for the natural sciences and engineering, we have become more and more convinced that the principal blocks to progress are institutional and organizational. Starting at the top: there is no effective focus for bringing the knowledge of sciences both social and natural, to bear on either the day-to-day or the longer term problems that face the Government. This does not mean that the Government does not use science in its work. The Canadian Government has on the whole done quite well in this field but there is a lack of coordination and planning for the most effective use of science. At the next level, we find the rigid structure of Government departments interfering with the free evolution of mission-oriented teams. In addition some Government agencies such as part of the National Research Council lack clearly defined missions.

In the universities the fragmentation of knowledge and effort by the rigidities of the departmental structure are serious. Those of you who have lived in universities may have come to accept these sub-divisions as essential but they come as a shock to any student of organization. They are beginning to break down but far too slowly.

In industry the situation is no better. Only a few Canadian firms make effective use of the knowldge in the natural sciences and engineering that is readily available to them and fewer still make any use of similarly available knowledge in the social sciences.

Our short range goals seem quite obvious. We must devise in Canada a means for providing well thought out advice that will enable the government to formulate an intergrated policy for the use of science both natural and social in the interest of the nation. In an ideal world this advice would be given to the government. The government would then formu-

late and state its policies and each major Canada must get itself better organized and policies. Unfortunately ours is a very imperfect world and we cannot wait to do things in such a logical sequence. Universities, government agencies and industries must each begin by re-examining the ways in which they use science and formulating their own provisional policies for using it to greatest advantage. Hopefully, the Science Council and of her advisory bodies at the next level of organization will be able to take all this work into account in formulating their advice to the government. Science policy whether for the natural sciences and engineering or for the social sciences must be made at the political level. Science is just one of many factors that leaders must take into account in allocating scarce resources of money and manpower. It is up to the scientific community to ensure that the politicians have before them and thoroughly understand the best possible advice on the contributions that science can make to national goals when they are making these hard decisions.

At this point in preparing my speech I was just about to say that speaking from the biased viewpoint of a natural scientist I feel that there is a great need for a more integrated outlook on the part of social scientists. On thinking that over, I am not sure whether I am really a natural scientist or not. I was trained in physiology and medicine which certainly border on the social sciences. I spent a great part of my working life on operational research and I have always defined 'operational research' as an attempt to apply the general principles and methods of science to the solution of problems arising during the operation or functioning of complex systems of men and machines. During all this period. I have been just as much concerned with the functioning of the men in the systems as with the machines. In fact, it seems to me that this attitude, if more widespread, might begin to solve many of our problems. Our whole modern society can be regarded as an infinitely complex system of men and machines. We spend far more time understanding the machines and their mechanism that we do on understanding the men and their interactions with the machines so maybe I'm not as prejudiced as some. Nonetheless, I will admit bias in suggesting that, before we can make real progress in a team attack on the problems of science policy, the social science community in

segment in society would then devise sub- think through its problems of contributing policies consonant with the broader national toward the formulation of science policy. This conference is not only clear evidence that you are aware of this need but it will also make an important contribution toward understanding what remains to be accomplished. In saving this, I do not want even to suggest that the natural scientists and engineers have solved all their problems but they are struggling valiantly with them. Both branches of science will go ahead more rapidly as they begin to work together more closely and better understand each other's problems and viewpoints. As I am sure you are all well aware, an important new area of contact between the branches is now opening up, especially in the United States. Several large aerospace, electronic and systems research groups are exploring the possibility of applying their accumulated skills and techniques to helping in the solution of pressing social problems. This is a very important development but it has its dangers. I hope that social scientists, where they have an opportunity, will cooperate fully with these enthusiastic newcomers but will warn them of the pitfalls and difficulties of research in the social sciences. I am sure that they have much of value to contribute but fear that they have an unfortunate tendency to oversimplify complex problems in order to make them fit their elegant analytical tools. There is nothing more troublesome in research than a scientist who has solutions and is looking for problems. You must try to convince them that the complexities are an essential part of the problems and that models must be firmly based on carefully collected and analysed facts.

> When the Act to set up the Science Council of Canada was being written, science was defined as the 'natural sciences and engineering'. This definition was removed so that the Council could, should experience show that this would be a good idea, include the social sciences as well. I have been gently pushing to have the social sciences included but have met with very little enthusiasm either within the Council or outside. It seems to me that the social sciences must be brought into policy formation at the highest level quite soon. There are two obvious ways of doing it. One would be to dissolve the existing Science Council and reconstitute a new one with equal representation of the natural and social sciences. At one time, I was quite enthusiastic about this idea but have gradually come

around to the view that a second possibility would be more desirable. This would be to set up a social science policy council exactly parallel to the existing Science Council which would then have an appropriately changed name. At the same time, provision would be made for ensuring coordination between the two bodies. This could be done by having a small executive committee with equal representation from the two councils which would meet regularly to coordinate actions. In addition, I think the staffs of the two councils should be co-located in the same building and the two councils should meet jointly at least once a year.

Such an arrangement might well be more effective than a single council at the present time since the kinds of change that are needed in the two branches of science are quite different and there is nothing to be gained from them trying to keep exactly in step in evolving new strength in their respective fields. Such an arrangement would also give time for the two groups to get to know each other in less intimate circumstances than if they were pushed together in a single council.

In addition to this cooperation at a top level we could begin immediately, and in fact

effective organizational structures for the set-

are beginning, some collaboration on specific mission-oriented tasks. For instance, a recently completed study of the support of research in the universities was done in collaboration with social scientists and humanists and covers all fields of research. Also, in examining problems of cities in order to recommend a point of attack, we are working closely with social scientists. There are many other areas which collaborative action. research and in application of existing knowledge, could be extended immediately. But though these practical problems are important. I would think that a systematic examination of the institutional rigidities of modern society may prove in the long run to be more productive. I hope and believe that a great deal of discussion at this round table will be focussed on these institutional problems and that out of the discussions may come some effective proposals for action. We must aim to remodel the institutions of our society at almost every level so that they will not only be better adapted to the use of science for the welfare of man but will also be better adapted to the never-ending change that we know science will continue to induce in our society.

APPENDIX "42"

PARTICIPANTS SPEAK OUT

Highlights from Workshop Reports

Rapporteurs:

Robin F. Badgley
Francis J. Bregha

March 28, 1969

Science policy depends on social policy. Canadians, the participants concluded, have paid insufficient attention to defining social policy with respect to the major historical forces now changing and disrupting our society, forces which are evident in much of the frustration and alienation most visibly expressed by young people, and perhaps, ultimately, caused by advances in science and technology.

We recognize, in summarizing the discussions of the several workshop sessions, the difficulty in accurately representing the numerous points which have been voiced, but we have depended for our general conclusions on the reports prepared by the chairmen and the reporters of the workshops.

GOALS AND POLICY

Starting from the premise that science should provide "a guide and a critique for social policy", a major recommendation was made that science should assist in the articulation of a people's needs and aspirations. The goals should be more than a mere statement of general aims, but should reflect the specificity and feasibility of attainment, the ability to be communicated to all interested groups, and should include a provision for a regular re-assessment.

The goals and their formulation should focus on the following questions:

- (a) what is their relation to the science policy expected to implement them?
 - (b) what are the priorities?
- (c) what is the co-ordination machinery for their implementation?

Because of the gap between the concern expressed in the formulation of goals and the policy supposed to implement them, there is a pressing need for a co-ordinating body on the munication was desirable. More attention than hitherto should be given to devising flexible, effective organizational structures for the setpressing need for a co-ordinating body on the

national level, particularly to identify the major research requirements and to plan the overall strategy.

Science policy, in its descriptive and prescriptive aspects, should respect free inquiry and encourage private research because many scientists feel divorced from those who formulate ultimate policy decisions, special concern was expressed for adopting an overall policy that would enhance the transmission of accurate scientific information to political leaders.

PROCESS

While the importance of goals for science and public policy was generally recognized, many were concerned about the necessity of refining the process of setting goals. This process should involve all scientists, frame relevant questions for public discussion and provide a monitoring of implementation, so that the process of feedback would permit appropriate modifications in the setting of goals.

Many were concerned about the time span required by such a process as well as about the interval between the setting and the achievement of goals. Social scientists, it was suggested, should be able to plan for 25 to 30 years, instead of being forced into crash programs resulting from inefficient past policy decisions.

STRUCTURE

Recognizing science policy as the implementation of social policy, the participants agreed that a greater degree of interdisciplinary planning, co-ordination and communication was desirable. More attention than hitherto should be given to devising flexible, effective organizational structures for the setting of goals, the formulation of public poli-

cies, their monitoring in establishing the allocation of scarce resources.

Specific recommendations about the structural or institutional setting in which science should be integrated with public policy included:

- (i) A national body—a "watchdog" committee should be established for Science and Society which would operate independently of political or specific parochial professional considerations.
- (ii) Scientists in greater numbers and with adequate support and resources should be added to all government departments. This step would ensure ready access by policy decision makers to expert advice as well as ensuring confidentiality of such advice.
- (iii) Prestigious non-governmental advisory panels consisting of professionals of various backgrounds should be established.
- (iv) On each of the foregoing advisory committees, representatives of the general public should be present which would alert the scientist of whatever background to the perspective of the citizen, and concomitantly, result in education of the public in scientific affairs.

QUALITY CONTROL

Although scientists are not exclusively responsible for the consequences of science, they bear a unique responsibility. Because of their ability to predict the consequences of their research which may not be readily apparent to the layman, scientists should adhere to the norm of openness by bringing the possible social consequences of their endeavours to the attention of the public. The creation of a critical journal for the study of the social consequences of technological progress and scientific innovations should be considered, in

addition to frequent interdisciplinary meetings dedicated to the same purpose.

INTERDISCIPLINARY COLLABORATION

The dialogue between the social and natural sciences constituted a major theme of the Round Table. Discussion revolved around the current status, the conceptual relevance, the methodology and the relevance for application of the various sciences. Despite divergent viewpoints, there was a thread of consensus that the social sciences, in Henry David's analogy, were "the best other science that we had", and as such, were an indispensable force in examining the impact of government policies.

There was unanimous agreement that there should be a broader interdisciplinary involvement at all levels—in scientific training programs, in the formulation of research projects at every stage of development, in the establishment of interdisciplinary institutes, in the critical appraisal of research enterprises and in the evaluation of public policy.

ALLOCATION OF RESOURCES

Given the vastness of our social needs and the scarcity of resources devoted to their study, the participants urged a re-examination of the priorities in allocating public funds for basic research. More specifically, it was recommended that greater emphasis be given to training and research in social sciences. It is only on the basis of a comprehensive view of our rapidly changing society that sound public policies can be formulated. The allocation of public research funds does not favour the social sciences. While in no way seeking to diminish the funds going to research in natural sciences, participants urged that increased federal funding should be given for training and research in the social sciences.

APPENDIX "43"

THE GENERAL GOALS OF SCIENCE POLICY

The Honourable Maurice Lamontagne, P.C.

Address

delivered at the Round Table on the

Social Aspects of Science Policy,

under the auspices of
the University of Toronto Harry M. Cassidy

Memorial Research Fund,

27-29 March 1969, Toronto, Canada.

It is very difficult to have a useful discussion on the goals of science policy without first reaching some common understanding on what ought to be the general relationship between science and society, between the scientist and the politician. The debate on the moral and social responsibility of the scientist is an old one. It dates back at least to the Hippocratic Oath, as Sir Karl Popper noted recently. It was renewed with great vigour after the first atomic explosion and the Viet Nam War has kept it very much alive. The debate on the responsibility of government towards science and the scientist is much more recent, but perhaps even more far-reaching.

It was precisely at the height of the first and old debate, after World War II, that the State began to offer substantial sums of money for scientific research and that a rapidly increasing number of scientists began to seek or at least to accept the grants and the jobs offered by government. Thus, while discussion in academic circles was concentrated on modern versions of the Hippocratic Oath, the seeds of the second debate were being sown by the new and unobtrusive connivance of the politician and the scientist. It is not my intention here to even attempt to make a serious contribution to the discussion of that topic. Don K. Price, among others, has done this remarkably well again in a recent article entitled "Purists and Politicians". I only want to recall briefly, through an analogy, the changing character of the relationship.

The "Mariage de Raison" Between the Politician and the Scientist

The new alliance between the scientist and the politician appeared at first to the scientist as a convenient "mariage de raison". He was himself in the role of a new wife still free to pursue her old and only true love but lavishly supported by a busy husband involved in the strange and dubious activities of politics. This curious marriage was a happy one for many years, at least in Canada. Dr. Steacie could say in 1958: "We are, in fact, one of the few countries which has recognized the fundamental fact that the control of a scientific organization must be in the hands of scientists". And he added that NRC had "enjoyed far-sighted treatment from the governments of the day which have left it free from many of the normal aspects of government control and interference." This freedom and generous support also applied to most other government research establishments and assistance programmes.

In recent years, however, the mounting cost of research together with other pressing financial problems have forced the government to review its own role as the benevolent and unsuspicious husband, in the "mariage de raison". For instance, it refused to pay for certain pieces of equipment such as the intense neutron generator, not so much on the ground that it would not have been nice to have them in the household, but because they were just too expensive. The expenditures of the Canadian government devoted to scientific activities have nearly tripled in the last ten years and reached about 600 million dollars in 1967-68. Such a big science budget could not

be left free from "the normal aspect of government control and supervision".

Moreover, it became evident that the true love of the scientist was not always pure and that it could produce offspring which had a tremendous impact, good or bad, on economic prosperity and the general well-being of societv. Governments began to realize that they had discovered a hen with golden eggs. Indeed, one of the main features of the third technological revolution. appeared in the late 1950's, as that science and technology had become key factors of economic growth, higher productivity and social improvement. The anticipation of tremendous new potentialities for war and peace marked the beginning of the international scientific race which is likely to go on forever. No country will want to opt out of that race, unless it is prepared to face the consequences of a widening technological gap, to sacrifice its growth and affluence, even its security and survival.

What happened in recent years was quite paradoxical and unexpected. Initially, the scientist had reluctantly accepted the "mariage de raison" proposed by the politician. As years went by, however, he had become more secure and convinced that he had succeeded in negotiating an acceptable relationship with the government, which enabled him to get funds and remain free. After a long period of happy marriage, he now discovers that it is the politician who is becoming reluctant and who wants to re-define the relationship. At the beginning of married life, the politician had not interfered because he was under the impression that the scientist was inexpensive and not too fertile, in terms of practical results. But the researcher made the fatal mistake of becoming more fertile and more expensive. Thus, he was forcing the politician to exercise a greater control over the science budget and to look more closely at the research output to make sure that it served the public interest. In other words, the scientist through his own practical achievements, is now obliging the government to have a science policy. And he finds that he has become the prisoner of an alliance which he would probably not have accepted at first but that he cannot break any more because he needs public support to remain a scientist.

Under the new circumstances, the days of the "mariage de raison" between the politician and the scientist where both parties

could ignore each other, are over. The new relationship will become an imposition or, let us hope for the benefit of society, a love affair. But, for this to happen, the politician will have to respect the scientist and his work, to listen to his advice and his criticism. The scientist will have to accept the fact that research has become a political activity in the noblest sense of that expression, that it must be guided by national goals and subjected to a systematic policy review in the light of those objectives. Not only should he accept this new situation passively, he should also be prepared to participate actively in the formulation and the endless re-definition of those goals. In other words, the politician and the scientist must learn to become partners, not only to live together but to work together and help each other to better serve society. This integration of the scientist in society with his new responsibilities will provide to him, I am sure, a much more rewarding challenge than the classical search for the truth in the ivory Tower of the Republic of Science. The researcher must and will remain a scientist but he will become also a citizen with important social functions to fulfil.

The Innovation Process and Science Policy

There should be, however, no misunderstanding about the implications of this new challenge. It means, in particular, that the role of science is to serve the best interests of society and that the goals of science policy lie outside the purely scientific field. The scientist should, of course, be consulted about them. He should also as Sir Karl Popper suggests, "Consider it one of his special responsibilities to foresee as far as possible (the intended and) the unintended consequences of his work and to draw attention, from the beginning, to those which we should strive to avoid" or to maximize. But, in the last analysis, the formulation and the selection of the goals of science policy properly belong to the political process.

Among those objectives, there is one which is mainly cultural and particularly close to the scientists. That is the support for basic and free research as a sector of high culture. It is widely recognized that in an advanced society, the government must encourage basic science as a disinterested intellectural activity which cannot be justified by any reason other than that it satisfies human curiosity. In this sense, basic science belongs to our cultural life and must be supported for the same rea-

sons that music, literature and art receive financial assistance. In addition, good basic science, although this is not its purpose, can often be most useful to applied research. A good deal of the technology developed since World War II originated from basic research done before that war. It should be quite clear that apart from broad budgetary considerations, this sector of science policy should be left to the scientific community, provided it is willing to apply exacting criteria of scientific merit and excellence.

With the exception of this contribution of science to culture, the major interest that society has, and therefore what the government should have in science and technology centers, in my view around the innovation process. It is through this process that society either benefits or suffers from the applications of science. It will suffice, for my purpose, to define innovation as the introduction for the first time in the world of a product, a service, a method of production or a policy. It can be economic or social; it can mean change or adjustment to change. The innovation process is highly irregular. It may begin with a discovery of basic science or originate in the creative mind of a good craftsman or a grass-root politician. In its longer sequence, it involves two main but separate stages: the scientific research and the development work preceding and including innovation and the diffusion of the new development within the economic and social system, through the innovator himself or his imitators. Science policy must be concerned with these two stages.

Qur society gets the practical benefits of science and technology from the rapid and widespread diffusion of innovations. This is true even if the new development partly or fully originates from abroad. Thus, one of the most prosaic but also most important objectives of science policy is to develop a national capability and eagerness to absorb innovations. This goal, probably because it is prosaic, has been unduly neglected in Canada; the fact that it has been actively pursued in Japan largely accounts for the fantastic growth of that country during the post-war period.

I would like to mention here only two programmes which are essential to attain this objective. First, it is necessary to develop and maintain, within our society, a balanced superstructure of scientific manpower, including managers, competent enough to sustain

our national research effort but also to use the results of R and D, whether originating at home or abroad, for the economic and social advantage of the nation. To satisfy this need, scholarships are required to fill certain gaps and grants to free research in universities are necessary. Nowadays, it is essential for a university student to be exposed to research and for a good teacher to be also a good researcher. For instance, Dean Leclair of Sherbrooke University told the Senate Special Committee on Science Policy that all faculties of medicine in Canada would have to close, for reasons of incompetence, if the Medical Research Council were to stop its financial assistance to research.

This sector of science policy is closely related to education and training. That is why it should remain an area of free research and why, within each programme, the criterion of scientific merit should prevail. And it should apply not only when an application is considered but also when a project is reviewed and completed. It would however, be highly desirable if research projects in each field could be fitted into a national pattern or plan. Moreover, the various research and training programmes must be appraised and coordinated in the light of broad national requirements. Otherwise, some academic disciplines, like the social sciences, may be neglected and unable to meet the needs of our society and the supply of scientific manpower may become unbalanced, as it may be now in Canada.

Secondly, our national capability to absorb innovations and to innovate could be greatly enhanced by a central information service on science, technology and innovation. Such a service should be a look-out institution: it would gather pertinent data on new developments, both at home and abroad, disseminate that information within our country, and make sure that this information will be properly evaluated and used when practical. As I said before, what is important for our growth and well-being is not so much to innovate ourselves but to be able to quickly absorb and exploit useful innovations. Our inability to do that in the past has caused delays in our industrial development which are well known to economic historians. The proposed look-out institution would not only be useful for this purpose but it would also put us in a much better position to define the direction and content of our own research effort.

I have briefly reviewed two major objectives of science policy. It should enable pure science to enrich our cultural life and develop a national capability to absorb and diffuse innovations quickly. Between these two extreme goals, there is another one which consists in improving and sustaining our ability to innovate. There are at least three reasons why a country must innovate or contribute to the process leading to innovations. First, if a nation has the right to imitate and apply to its own needs the new developments initiated by others, it has also the obligation to contribute to the international pool of discoveries. Secondly, there are usually important national gains to be derived from being first in introducing an innovation. Thirdly, a nation has always specific features and problems requiring special attention and therefore, it must innovate to meet its particular situation.

The Social Mission-Oriented Aims of Research

The sector of mission-oriented research and development is certainly the most important in terms of private and public expenditures in Canada. It covers the bulk of scientific activities pursued by government and industrial establishments. In this respect, at least, we are surely meeting our international obligations. But our concept of mission-oriented research may not have served our national goals as well. It is not sufficient to define this type of research merely by its subject-matter. as being confined to a sector or a problem. such as forestry, health, agriculture or urban environment. But some government research establishements seem to interpret their mission only in this way, so that they view basic research sought for itself or applied research as being as essential to fulfilment of their role, provided it is within their field of interest, as more practical development work leading to tangible results. This is probably why Canada spends a much higher proportion of its science budget on research as opposed to development than the United States and the United Kingdom.

Mission-oriented research and development should not be limited only by its special subject-matter. It should also be governed by its goal which is economic and social innovation. This is precisely what distinguishes it from

essential part of the role of mission-oriented research agencies. It is an instrument or a means which should be utilized only when it can be useful and when there is good reason to believe that it will lead to innovation. To say that the essential purpose of mission-oriented research is innovation, defined in its broad sense to apply both to the market place and to the nonmarket sector, may sound trivial. However, this proposition when accepted as a major goal of science policy, has in my view, a lot of significance.

If the justification for this type of scientific activities is to lead to and produce innovation, it follows that the merit of mission-oriented programmes and the performance of agencies initiating them must appraised in that light. This means that in measuring the output of these establishments. only the value of the innovations which they have introduced or helped to develop must be taken into account. The results of basic and applied research, although they may have scientific merit and enrich our cultural life. should not be considered as part of the output of these institutions, unless they are used by someone else in the country to innovate. These results are at best by-products and they may be a good indication, if they are much more important than practical applications, that the agencies concerned have lost sight of their innovation-oriented mission. For this reason and others, the number of articles produced in these establishments and published in scientific journals is not necessarily a very good measure of their output and their performance.

It would be interesting to look at this sector of our science effort with the perspective of the innovation process. We might find that innovations made in Canada have been very costly when compared with the total investment devoted to mission-oriented research. We might also discover that this relative failure is not due to our lack of creativity as much as to the absence of opportunity to innovate in industry and to the deviation of government research agencies from their true mission.

If this criterion of economic and social innovation is valid, it should not only be applied "ex post", to appraise the past and current performance of our mission-oriented curiosity-oriented research, where scientific research effort. It should also, and above all, achievement is an end in itself. Thus, basic or be used "ex ante", to plan our future scieneven applied science does not constitute an tific activities, to decide their direction and content and to determine our priorities. Proper planning in this field requires answers to at least three questions. First, what chances do we have to innovate if we continue or initiate a research programme, given our own know-how as compared with that of other countries? Secondly, if our chances are good, what are the probable economic and social benefits to be derived from that innovation in relation to its costs? Thirdly—and this is most important-what are the most pressing economic and social areas where we must innovate to meet our particular situation, because nobody else is going to do it for us? The first two questions are mainly related to fairly specific projects and programmes and to innovation in the market place. The third one refers generally to what Michel Chevalier has described as "meta-problems" and to innovation in the non-market sector. It covers the broad area surveyed by the Science Council in Report No. 4 and defined by Professor Trist as "problem-oriented research domains".

I do not intend to review, at this late stage, what has been said about this new but most important sector of science policy. Before concluding my remarks, however, I would like to underline two points in this connection which have some relevance to the Canadian scene and to our current national debate on science policy. They are rather obvious but perhaps they need to be re-stated as we reach the end of our proceedings.

First, our new interest in problem-oriented research should not make us forget that there are other important sectors of our science effort and policy which also require our sustained attention. This danger may have arisen inadvertently from the special emphasis put by the Science Council on mission-oriented research. The Council will soon examine, I am sure, other aspects of our scientific activities and, as a result, I hope that the scope of our national debate will be extended. We must re-appraise the encouragement given to fundamental science, to scientific excellence and to research in Canadian universities. We should review our scientific manpower training programmes in the light of our future needs. We must discuss the desirability of establishing better information services and look-out institutions specialized on science, technology and innovation. We have to look very seriously at the weakness of our industrial research effort and try to remedy this situation. We should re-examine the tasks and the activities of specialized research agencies

in government, which at present receive the big share of our support to research. In other words, what we need is a careful and continuing review of all aspects of science policy.

Secondly, to come back to problem-oriented research, it is widely recognized that it requires a multi-disciplinary approach and, as Professor Trist says, an integrative strategy, not only when it is carried out but also when its specific goals are defined, when its domains are identified and its priorities selected. At these various stages and in varydegrees, problem-oriented research requires the joint effort of natural, life and social scientists. But in Canada, there has been no serious attempt yet to organize this joint effort. The occasions given to our scientists from different disciplines to meet and work together have been extremely rare. The dialogue between them has not even begun. except at this Roundtable which, I believe, has established a precedent in Canada.

When this meeting of minds really begins to take place in our country—and the sooner the better—I hope that it will not degenerate into a "dialogue de sourds" which has been so aptly described recently by Andrew Shonfield as follows:

"When social scientists and natural scientists meet to discuss the future one is struck by the way that each group adopts towards the other a "mock-humble accusatory tone, the accusation being that the other's role is the decisive one. The social scientists say: 'If you would only tell us clearly what kind of technological changes we can expect, we could begin to analyze how society is likely to change.' To which the natural scientists answer: 'Never you mind about us; all we need are some marching orders.' Given enough time, modern technology has an almost limitless capacity to invent-so long as society decides that a sufficient volume of resources is to be put at the disposal of any particular programme. So you just tell us what is wanted by society: that is going to be the decisive factor in shaping the future ... "

I believe that such a debate between scientists in Canada would be useless and sterile. Our scientific elite will have to work closely together in all stages of research and to maintain a constant dialogue if we are to solve our "meta-problems", to plan intelligently and to shape the society of the future so that it will

knowledge of society, rather than of technology, that the major insights about the world a quarter of a century away are likely to come".

And yet, while the natural scientists have agreed to participate actively in the formulation process of science policy and seem prepared to have a love affair with the politician, the social scientists remain remarkably silent in the current debate and appear reluctant to get involved in the reshaping of our science effort

This lack of participation, which is most regrettable, may be due to several causes. It may be that social scientists have developed an inferiority complex over the years, as a result of the achievements of natural scientists or that they want to remain pure in order to exercise their role of critics, more objectively. The "mariage de raison" that they have contracted with the politician, which dates back only to the creation of the Canada Council in 1957, is perhaps too recent, to be converted into a love affair.

The politician may also be responsible for this vacuum. Very few active social scientists have been appointed on the Canada Council or on the Economic Council. They are not represented on the boards of government

lead us not only to affluence but to happiness research establishments and they have been which is more important to human beings. excluded from the Science Council, although And in this common venture, the social scien- this Council must give advice on the social tist will have a crucial role to play because, goals of science policy and on the broad as Shonfield points out: "It is out of the research domains requiring special attention. This lack of representation may be caused by a simple oversight or, more likely, by suspicion. The government may fear that by inviting social scientists to participate fully in the formulation of science policy, it will also, as Sir Geoffrey Vickers said, "call into being an informed body of critics" which may be more negative than constructive.

> Whatever the reasons which account for the absence of social scientists from the process of science policy formulation, I feel that this isolation must cease. A new deal must be negotiated between the politician and the social scientists. Perhaps we should not expect that a love affair will develop between the two, but if they do not agree, on at least a practical working relationship, our science effort will remain unbalanced and the social aspects of science policy will be neglected. If society is to get the full benefits of the national research activities that it helps to finance. a new alliance between the natural scientists. the social scientist and the politician will have to be arranged and I hope that this Roundtable will mark the first phase, in the building of that essential partnership. If it does, we will have another reason to be grateful to Dr. Hendry for having organized

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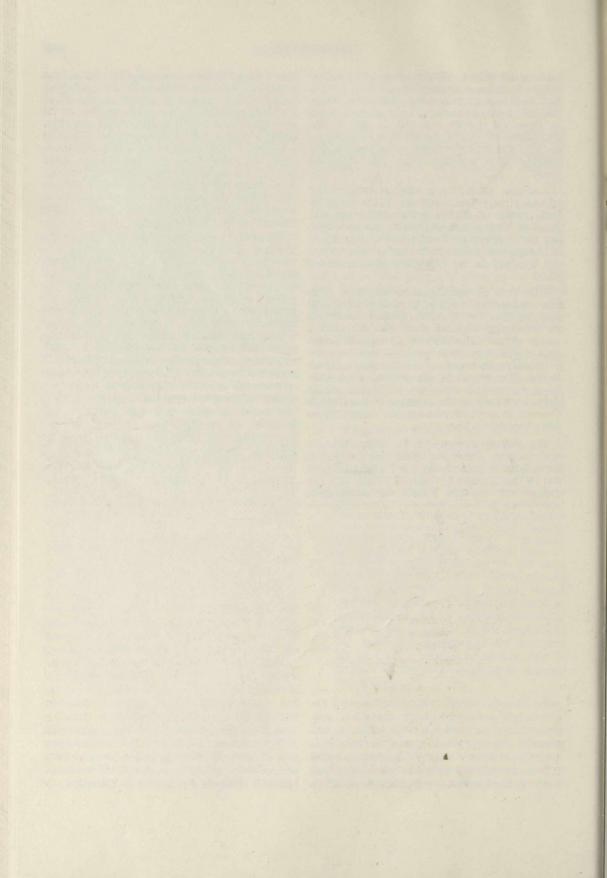
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First Session-Twenty-eighth Parliament

1968-69

THE SENATE OF CANADA

PROCEEDINGS OF THE

SPECIAL COMMITTEE

ON

SCIENCE POLICY

The Honourable MAURICE LAMONTAGNE, P.C., Chairman
The Honourable DONALD CAMERON, Vice-Chairman

No. 40

WEDNESDAY, APRIL 23, 1969

WITNESSES:

Department of Regional Economic Expansion: André Saumier, Assistant Deputy Minister (Programming); R. J. McCormack, Chief, Canada Land Inventory; Roger Tomlinson, Chief, Regional Information Systems; and Guy Morton, Consultant to the Geographic Information System.

APPENDICES:

- 44.—Brief submitted by the Department of Regional Economic Expansion (formerly Department of Forestry and Rural Development).
- 45.—Brief submitted by the Department of National Revenue, Customs and Excise. 46.—Brief submitted by the curator of Contemporary Art, National Gallery of
- 47.—Brief submitted by the Royal Canadian Mounted Police.
- 48.—Brief submitted by the National Museum of Natural Sciences.

Canada.

THE SENATE OF CANADA

MEMBERS OF THE SPECIAL COMMITTEE

ON

SCIENCE POLICY

The Honourable Maurice Lamontagne, Chairman The Honourable Donald Cameron, Vice-Chairman

The Honourable Senators: MedasmonoHeadT

Aird Nichol Nichol Bélisle Haig Blois Havs Bourget Kinnear Cameron Lamontagne Carter Lang Desruisseaux Leonard McGrand Giguère

O'Leary (Carleton) Phillips (Prince) Robichaud Sullivan Thompson Yuzyk

Patrick J. Savoie, Clerk of the Committee.

ORDERS OF REFERENCE

Extract from the Minutes of the Proceedings of the Senate, Tuesday, September 17th, 1968:

"The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That a Special Committee of the Senate be appointed to consider and report on the science policy of the Federal Government with the object of appraising its priorities, its budget and its efficiency in the light of the experience of other industrialized countries and of the requirements of the new scientific age and, without restricting the generality of the foregoing, to inquire into and report upon the following:

- (a) recent trends in research and development expenditures in Canada as compared with those in other industrialized countries;
- (b) research and development activities carried out by the Federal Government in the fields of physical, life and human sciences;
- (c) federal assistance to research and development activities carried out by individuals, universities, industry and other groups in the three scientific fields mentioned above; and
 - (d) the broad principles, the long-term financial requirements and the structural organization of a dynamic and efficient science policy for Canada.

That the Committee have power to engage the services of such counsel, staff and technical advisers as may be necessary for the purpose of the inquiry;

That the Committee have power to send for persons, papers and records, to examine witnesses, to report from time to time, to print such papers and evidence from day to day as may be ordered by the Committee, to sit during sittings and adjournments of the Senate, and to adjourn from place to place;

That the papers and evidence received and taken on the subject in the preceding session be referred to the Committee; and

That the Committee be composed of the Honourable Senators Aird, Argue, Bélisle, Bourget, Cameron, Desruisseaux, Grosart, Hays, Kinnear, Lamontagne, Lang, Leonard, MacKenzie, O'Leary (Carleton), Phillips (Prince), Sullivan, Thompson and Yuzyk.

After debate, and—
The question being put on the motion, it was—
Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Thursday, September 19th, 1968:

"With leave of the Senate,

The Honourable Senator Lamontagne, P.C., moved, seconded by the Honourable Senator Benidickson, P.C.:

That the name of the Honourable Senator Robichaud be substituted for that of the Honourable Senator Argue on the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was-Resolved in the affirmative."

Extract from the Minutes of the Proceedings of the Senate, Wednesday, February 5th, 1969: With leave of the Senate,

The Honourable Senator McDonald moved, seconded by the Honourable Senator Macdonald (Cape Breton):

That the names of the Honourable Senator Blois, Carter, Giguère, Haig, McGrand and Nichol be added to the list of Senators serving on the Special Committee on Science Policy.

The question being put on the motion, it was-Resolved in the affirmative.

ramud bas all leplayed to able at a ROBERT FORTIER, Clerk of the Senate.

MINUTES OF PROCEEDINGS

WEDNESDAY, April 23, 1969.

Pursuant to adjournment and notice the Special Committee on Science Policy met this day at 10.00 a.m.

Present: The Honourable Senators Lamontagne (Chairman), Aird, Belisle, Bourget, Cameron, Grosart, Haig, Kinnear, McGrand and Robichaud.—(10)

In attendance: Philip J. Pocock, Director of Research (Physical Science); Gilles Paquet, Director of Research (Human Science).

The following witnesses were heard:

DEPARTMENT OF REGIONAL ECONOMIC EXPANSION:

André Saumier, Assistant Deputy Minister (Programming);

R. J. McCormack, Chief, Canada Land Inventory;

Roger Tomlinson, Chief, Regional Information Systems; and

Guy Morton, Consultant to the Geographic Information System.

(A curriculum vitae of each witness follows these Minutes.)

The following are printed as Appendices:

No. 44. Brief submitted by the Department of Regional Economic Expansion (formerly Department of Forestry and Rural Development).

No. 45. Brief submitted by the Department of National Revenue (Customs and Excise).

No. 46. Brief submitted by the curator of Contemporary Art, National Gallery of Canada.

No. 47. Brief submitted by the Royal Canadian Mounted Police.

No. 48. Brief submitted by the National Museum of Natural Sciences.

At 12.45 p.m. the Committee adjourned to the call of the Chairman.

ATTEST:

Patrick J. Savoie, Clerk of the Committee.

CURRICULUM VITAE

Saumier, André, Assistant Deputy Minister (Programming) with the federal Department of Regional Economic Expansion, was born in Montreal in 1933. He received his secondary education at the Collège de Saint-Laurent of the University of Montreal. He obtained his B.A. cum laude in 1951 from this university and was first of his year. He carried out studies in medieval philosophy in Rome (Italy) where he obtained a licentiate cum laude in 1956. Then, he attended the University of Chicago where he passed with success his Ph.D. exams in sociology in 1958. A scholarship of the Canada Council enabled him to write his Master's thesis in 1959 and to obtain the Master of Arts degree in sociology from the same university. On his return to Canada, he teached sociology and philosophy during two years at the Collège de Saint-Laurent and conducted several research projects at the Faculty of Arts of the University of Montreal. Afterwards, he went to Harvard University (Boston, U.S.A.) where he secured the title of Master of Business Administration in 1962. In 1962, he accepted the position of Research Director with the Socio-Economic Research Group of the Battelle Memorial Institute, Columbus, Ohio. He left this post in 1963 to become the first research director of the Canadian Council on Urban and Regional Research, which had been established shortly before through a major grant from the Ford Foundation. In 1965, Mr. Saumier left the Canadian Council on Urban and Regional Research to become Assistant to the Director General of the General Investment Corporation of Quebec, an investment company organized in 1964 by the Government of Quebec and some private interests. In January 1967, he was appointed Assistant Deputy Minister of the Federal Department of Forestry and Rural Development. Mr. Saumier is a lecturer in urban sociology at the University of Montreal since 1965. In 1966, he was president of the Quebec Welfare Council and of the Montreal Chapter of the Community Planning Association of Canada. He is vice-president of the Canadian Film Institute and member of the Cinematheque Canadienne. He is also, since 1967, a member of the Board of Directors of the federal farm Credit Corporation. Mr. Saumier is member of several scientific associations, including the American Sociological Association and the Regional Science Association. He is the author of articles published in Canadian and American magazines and he has contributed to several books, including "Planning the Canadian Environment" and "Une ville à vivre".

McCormack, R. J. Born near Bancroft, Ontario, Mr. McCormack served as a navigator with the R.C.A.F. He graduated with a B.Sc.F. from the University of New Brunswick in 1950 and from Michigan State University with a M.Sc. in 1951. From 1951 to 1957 he was a research officer with the then Forestry Branch of the Department of Northern Affairs and National Resources working largely on the growth and yield of red and white pine on the various

site classes on which they occur in Ontario and Western Quebec. From 1957 to early 1964 he was a consultant to an air survey company and worked on foreign assignments in Asia and South America. In 1964 he joined the Federal Forestry Department and was seconded to ARDA to co-ordinate the National Forest Land Capability program of the Canada Land Inventory of ARDA. Since July of 1967 he has been Chief, Canada Land Inventory. In addition to his responsibilities for program co-ordination, Mr. McCormack is Chairman of the National Advisory Committee on Forest Land, federal member of the Federal-Provincial Steering Committee for Newfoundland Special Resources Project and member of various national and international resource committees.

Tomlinson, R. F. Geographer, Born in Cambridge, England in 1933. Served in Royal Air Force, Flying Officer-Pilot-3 years. Educated in England and Canada. Graduated from Nottingham University, England; Acadia University, N.S. and McGill University, P.Q. Led Nottingham University Glaciological expedition to Norway in 1955, 56, and 57. Came to Canada in 1957 on \$3,000 McGill Research Scholarship. Spent first 1½ years in Labrador—Ungava. Taught geography at Acadia University 1960-61. Joined Aerial Survey Company. Became Chief Resource Management Division. Carried out data gathering and analysis for many and diverse geographical investigations varying from agricultural potential survey in Somalia to traffic flow studies in Montreal. Wildlife range studies in the Barrenlands to Coral Reef studies in Bermuda. These included work on behalf of the U.N. and Canada External Aid. Became specialist in air photo-interpretation. While with aerial survey company initiated research in methods of handling geographical data so that the companies surveys could be used. Learnt programming and related computer techniques. Joined Government under contract in 1964 to develop computeroriented systems to handle data resulting from Canada Land Inventory. Conceived, developed and directed research leading to the general purpose Canada Geographic Information System. Currently: Chairman International Geographical Union World Commission on Geographical Data Sensing and Processing. The other six members are U.S.S.R., Germany, Israel, India, U.K., and U.S.A. Chairman Canadian Committee of Photo Interpretation and Remote Sensing.

Morton, Guy M. B.Sc. Mathematics and Natural Philosophy, University of St. Andrews 1956. 1957-1958, Programmer on 704 at Avro responsible for Computer System to simulate Avro Arrow Air Conditioning System. 1958-1959, Joined IBM, September 1958. Worked on 705 Centre at Confederation Life in Toronto on system to centralize and automate accounting and inventory systems for Canadian Oil. 1959-1962, Transferred to Ottawa, July 1959. From 1960 to 1962 was lead systems engineer at DBS responsible for installation of 705 III, 1401 and document scanner. 1962-1963, Was responsible for installation and setting up programming and operations sections of IBM 1401 datacentre. During this time was responsible for: Systems design and programming of Freimart Inventory Control System; Systems design and programming of complete accounting system for Morrison-Lamothe Bakeries; Systems design and

report on procurement in lead shipyard for DDP. 1963-1964, Studies feasibility of fingerprint searching on computer and prepared report on findings. Acted as 'Freelance' Systems Engineer. 1965-1966, Responsible for systems design of Canada Land Inventory Geo-Information System: Presented Reports to Gimrada and Acic on feasibility of computer mapping and field intelligence; was promoted to advisory systems engineer July 1965. 1966, Successfully demonstrated 1360 multiprogramming to Department of Finance. 1967, Promoted to Field Systems Engineering Manager, responsible for 20 Systems Engineers. 1968, Appointed Account Manager. Has submitted two papers to the IBM systems engineering symposium and both were accepted. Mr. Morton has also published two internal IMB confidential technical reports.

THE SENATE

SPECIAL COMMITTEE ON SCIENCE POLICY

EVIDENCE

Ottawa, Wednesday, April 23, 1969

The Special Committee on Science Policy met this day at 10 a.m.

Senator Maurice Lamontagne (Chairman) in the Chair.

The Chairman: Honourable senators, after the Easter holiday we are back into business. This morning we are meeting with the representatives of the new Department of Regional Economic Expansion. I understand that most of our witnesses and guests this morning are ghosts. They have only their former titles and not new ones.

In any case, we have with us this morning M. André Saumier, Assistant Deputy Minister (Programming) in the Department. He was connected formerly with ARDA. We have Mr. R. J. McCormack at my left, who is the Chief of the Canada Land Inventory. On my extreme right is Mr. Roger Tomlinson, Chief of the Regional Information System; and on my extreme left, Mr. David Levin, who was formerly connected with the Atlantic Development Board.

All these agencies have been brought under the same roof with the creation by Parliament of this new department of Regional Economic Expansion. I think that the bill was sanctioned only a few weeks ago, just before the recess.

Without any further introduction, I will ask Mr. Saumier to make an introductory statement.

[Translation]

Mr. André Saumier, Assistant Deputy Minister, (Programming) Department of Regional Economic Expansion: Mr. Chairman, first of all, I should like to thank you, on behalf of the Department of Regional Economic Expansion for your invitation to appear before your Committee.

[Text]

Mr. Saumier: I was saying that I was thanking the honourable Senator Lamontagne for his kind invitation to the Department of Regional Economic Expansion to appear before this committee.

We do so with a degree of apprehension, for two reasons. First of all, we are aware of the list of illustrious scientists who have been meeting with your committee and I dare say that in many ways the kind of problems we will be talking about might not be so gripping. On the other hand, the Department of Regional Economic Expansion, is, as you mention, just recently born, so it cannot yet claim to have a definite scientific policy of research policy. This is one of the many problems we have to face and we hope that such a policy will emerge in due course.

Confronted with this difficulty when it came to preparing a brief for your committee, we thought that we might write some obituaries for our former selves-since the department is to some extent, or was, I should say, a conglomeration of hitherto separate agencies.

You will find in the documents that have been transmitted to you a statement from each of these agencies, some of which still exist legally, such as the Prairie Farm Rehabilitation Administration; and some of which do not exist any more, such as the Atlantic Development Board.

We have tried to give you in these brief reports-which are in many ways now mostly of historical interest-an over view of what these various agencies have been doing.

On the other hand, we wondered whether there was not one project in the department which would be particularly significant from the point of view of your committee. It seemed to us that what possibly might interest most of the committee would be a project which would be novel, both in con-Senator Grosart: Mr. Chairman, the trans- cept and in scope; and a project at the same lation system is not working. time which would be in some ways, or would

represent in some ways a first for Canada, I do say, with some feeling of pride, a first for Canada in the world. As it turns out, we have such a project over which during the last few years a fairly large amount of money has been spent, in the region of millions of dollars. This is a project which has a very clear research component, both from what we might call the conceptual and the softwares point of view. It is a project which should have a very considerable bearing on planning in Canada and which should also have a considerable bearing on planning in other countries.

This is the complex which we can call the Canada Land Inventory — Geographic Information System, one supporting the other and feeding it and enabling the other to be manageable and useful.

Therefore, with your permission, Mr. Chairman, I would like without further ado to ask Messrs. McCormack and Tomlinson, who are respectively responsible on the one hand for the Canada Land Inventory and on the other hand for the Geographic Information System, I would ask these two gentlemen to proceed to give to the members of your committee a brief explanation of what they have been doing, of the significance of their work, and of their prospects for the future. All of us, of course, are at your disposal to answer any questions which you, Mr. Chairman, or the members of your committee may feel they would like to ask.

I may add that the second part of the explanation will take the form of a film which we have here, but we will not proceed with the film right now.

The Chairman: This form of presentation will interest Senator Grosart very much. He is interested in these new forms of presentation.

Mr. R. J. McCormack, Chief, Canada Land Inventory, Department of Regional Economic Expansion: Mr. Chairman and honourable gentlemen I will assume that you will have read the summary for the Canada Land Inventory which appears in the brief under the red cover. I will merely elaborate a little upon it and perhaps set the background for it.

Early in the life of ARDA we felt the need of a land classification system which would permit programs, both provincial and federal, to be formulated to fulfill our then mandate, largely land consolidation, farm enlargement and resource oriented programs to raise the income level and increase employment opportunities in rural areas. A systematic land capability survey had previously been recommended by the Special Committee of the Senate on Land Use in Canada and by the Resources for Tomorrow Conference. ARDA being new and having no vested interest in any of the particular resource sectors felt they could co-ordinate such a program in large part because of their demonstrated need.

The Canadian Council of Resource Ministers strongly approved and on October 3. 1963, the Government of Canada approved the undertaking, under ARDA of this comprehensive land resource inventory. It was decided in a calculated way that rather than ARDA undertaking the project they would encourage the provinces to do so; the departments in any particular sector of the federal Government would also be encouraged to assume the responsibility for their particular sector. This meant that ARDA merely became a co-ordinating and financing agency. This was an interesting development in many respects because it got you out of all of the narrow interests fighting each other or fighting ARDA to retain their departmental mandates and jurisdictions.

I must add in fairness that this procedure is not the easiest way and we knew even then that it would not be the easiest way administratively. However, the benefits far outweigh the difficulties.

The first need was for a soil capability program for agriculture because in those daysthis is 1963—we felt that we would have a primary need for agricultural information in a program which was to have an agricultural orientation. After a series of meetings with the provinces, federal and provincial departments of agriculture, we decided to undertake a soil capability program for the "settled areas" of Canada. As you can see by the map in your brief, the red line indicates the area in which we are carrying it out-roughly a million square miles. After much negotiation, ARDA agreed to finance this program at 100 per cent, but only for additional costs. By additional costs, which may be jargon to you we mean any positions, equipment, materiel that had to add to their present establishment in order to carry it out. In the case of the soil capability for agriculture program we supported the establishment of new positions and acquisition of equipment in both federal and provincial agricultural departments.

I do not want to go into great detail, but it soon became obvious that it is all very well and good to say on the basis of agricultural capability what submarginal lands should come out of agriculture. You had to know also to what use they should be put once they are out of agriculture; thus we decided to support the classification of lands for alternative uses. The same arrangement was maintained, that is, the provinces assumed the responsibility for the work and the appropriate federal Government department accepted responsibility for the technical input and coordination through ARDA.

Thus in addition to agriculture we undertook programs of land capability for forestry; recreation which as you know, is assuming a major role in land use; wild life, including both unqutates (hoofed animals) and water fowl; and later sports fish which has a definite and distinct impact on recreation programs.

Of course we realized we would have to compare potential or capability with present use in order to bring about programs to correct land use practices; thus present land use mapping was undertaken. The four western provinces undertood the land use mapping of their provinces; for Eastern Canada, that is Ontario east, the Department of Energy, Mines and Resources assumed responsibility for the mapping of present land use.

It may be worth mentioning, as a background again, that we believed that the one to 250,000 scale would be adequate for planning and this is the scale we were originally prepared to support. In our meetings with the provinces they took the attitude that they wanted a much larger scale. A compromise was arranged in which we agreed to support the mapping and gathering of the data at a scale of one to 50,000, or close to one mile to the inch, for the base maps and these would be generalized for publication at one to 250,-000. As I recall, you have received examples of the soil capability for agriculture, forestry and recreation. These series of maps are being published at the rate of approximately 150 a year.

I do not want to presume upon Mr. Tomlinsons' presentation, but I will put the geographical information system into context with the Inventory. It soon became obvious that this massive amount of data—roughly 20,000 maps at the one to 50,000 scale—would be extremely difficult if not virtually impossible to utilize fully without some computerized

system to handle it. We felt the need for such a system very early in the program and undertook largely by means of contracts, to devise a system which could input maps on magnetic tape. Our interest of course was primarily to enable the multiplicity of comparisons of data which we would need. The program is still ongoing. We operate under an authority of \$18 million from the Treasury Board. Even our estimates five years ago will not prove too far out.

The other phase of the program which I should explain is the land use planning phase. Once the data began to accumulate each of the provinces felt that they would like to utilize the data to undertake land use planning projects for land use rationalization and development in various areas. and still feel that the \$18 million would be very unwisely spent unless and until actual land use planning were carried out in the provinces, not on an academic basis, but in a real sense of utilizing these data for development plans. In November of 1967 a policy was announced of support for land use planning projects either in association with special rural development areas, such as the FRED areas, or for other ARDA rural development areas, as in northern Alberta or as in the case of British-Columbia, for land use development. Just this week we have received the first map showing a land use plan-a macro plan if you wishthat is blocking land by potential uses from British Columbia and I have asked the secretary to distribute it to you. This illustrates one use of the data in formulating a land use plan. If any of you are from B.C. this is a bit of a hot political document, but fortunately it is not hot politically from our point of view. The B.C. ARDA Cabinet Committee and the Deputy Minister's Committee have announced that this will be the basis of their land alienation program in the Prince George special sales area and, as you can imagine, they are getting many representations—presumably those who are happy are not saying anything and those who are unhappy are.

Mr. Chairman, this is roughly supplementary to the brief. I will be pleased to answer questions, but other than that I do not plan to say anything more.

The Chairman: Thank you very much. Would you like to add something, Mr. Tomlinson?

Mr. Saumier: Before Mr. Tomlinson speaks, I would like to say this. In other words, what

we are in the process of assembling under the CLI, the Canada Land Inventory, is a unique body of data reflecting both present land use throughout the settled parts of Canada and desirable or potential patterns of land use. We have this now for a large part of the country and the effort will shortly reach its conclusion. At that point we will know what the present land use patterns are in Canada. We will know what sales for these same areas and the potential for agriculture, forestry and so forth. This efforts as was mentioned by Mr. McCormack, is done not by ARDA; it is done through a joint effort of the federal and provincial governments. This will result or will yield to these several governments for the first time in the history of Canada a complete coverage of both the actual and desirable land use patterns.

One might say that the next step is to try to transform the present land use patterns into the most desirable land use patterns as revealed by the various potential capabilities. I think it is fair to say that it is the first time that any country that we know of has been able to carry through this kind of massive effort.

The next step, then, in implementing the policy implications of this massive research exercise is first of all in the abstract to reconcile the alternative land uses for a given piece of land. It is quite clear that the same piece of land, while theoretically suitable for perhaps agriculture, forestry and recreation, cannot be used for three or four purposes at the same time and therefore somebody must make a decision as to its use. This therefore is the essence of the policy decisions which have to be made by governments following this research, and this kind of decision, as has been indicated by Mr. McCormack, was reached recently about a small area of British Columbia. In time that process gradually increase, and I assure you that this kind of decision-making by government is not all an easy process.

The second step, having defined the actual land use and taking into account the possible conflicting uses of land, is to move from one to the other. This is something again which does not happen by itself. It may require, for example, taking land away from agriculture and then you have to offer alternatives to the people who are farming. It may include recreational development or forestry development. There is a whole series of shifts, physical, social and economic which must take a large country. We have relatively few peo-

place. The next step is to arrive at detailed land use planning to know exactly what this particular small piece of land should be used for, and then you set in motion a series of processes whereby you will make it possible to realize in the real world the kind of desirable land use pattern that these investigations have shown to be worthwhile.

Underlying all this is, of course, as was said by Mr. McCormack, the need to have an instrument which can accept all the data generated by the CLI, analyse it and manipulate it. It was mentioned that we have 20,000 maps and so on and Mr. Tomlinson will shortly address himself to that point. What the geographic information system has done is to go beyond the requirements of the CLI itself. It goes away beyond that in that it can handle any kind of geographically based data. It is a system which has been designed essentially not so much by the collecters of data as by the users of this data. This is a fairly significant difference. It is a system which is action oriented and is designed to analyse data in a way which is acceptable and useful to those who have to reach decisions based on this data.

Having said that, I would like to ask Mr. Tomlinson to expand on the geographical information system.

Mr. Roger Tomlinson, Chief, Regional Information Systems, Department of Regional Economic Expansion: Mr. Chairman and members of the committee, my presentation this morning will be in two parts; the first part will be a brief film which takes 22 minutes and which will give you some idea of what is meant when we speak of a Geographical "Information System." Following the film there will be an equally brief presentation by a past member of our staff on the research which has gone into developing the capabilities of handling information that you will have seen in the film.

As a note of introduction I can say that the development of methods to handle the masses of information which are portrayed on the maps has been very much a research task. There was no methods of handling information or maps that were significant to us prior to the start of this research. The research has had a uniquely Canadian character to it in that Canada is a very large country spatially. When we have to have a look at and understand the land of Canada, we have to gather a lot of information on maps because it is such

ple in Canada particularly trained geographically-minded people to analyse this information. Because of this there is an obvious Canadian research task of devising methods of handling map data. This Canadian problem has been tackled. The answers were conceived in Canada by totally Canadian staff. Something like 450 man-months of research are now involved in this project.

While we had the most obvious and pressing need for this type of research, the techniques which have been developed can be exported to any other country which needs to look at and analyse its resources data in an efficient manner. The technologies which we have developed are definitely exportable to any country which has an interest in understanding and developing its resources. I think it is true to say that the techniques that we have developed are two years ahead of any comparable development anywhere in the world. Recently in Australia I had the pleasure of hearing a delegate from the United States who was in charge of a similar sort of operation in the United States army stand up and say it is impossible to take two maps, put them in a computer and compare one with the other. I had the privilege immediately afterwards of standing up and inviting him to Canada to watch it being done. It was a very pleasurable moment.

We have had remarkable international interest in the work we are doing. Recently UNESCO has contacted the UNESCO representative in Canada and have asked if they can sponsor a conference in Canada in 1970 on geographic information systems based on the work we are doing here. The Australian Government has sent one of its people on a six-months' leave of absence to work with us here on an exchange visit. France is making diplomatic approaches to us now for a similar exposition of this particular work. I think that without any more ado we will move on to the film so that you can perhaps better understand what we have done.

(Showing of film)

Mr. Tomlinson: The second part of the presentation on the Canadian Geographic Information System will be given by Mr. Guy Morton, consultant to the Geographic Information System. I want to try to outline the nature of the research task that lies behind the system that gives you the capabilities that you have seen on the screen, and I think that if Mr. Morton tells us a little about how the system actually worked and how it actually

takes the maps and turns them into numbers, you will realize and better understand some of the problems that have been overcome and some of those that still remain to be overcome.

Mr. Guy Morton (Consultant to the Geographic Information System): Mr. Chairman, members of the committee, the Canada Geographic Information System is a computer system to read, store, analyze and compare maps. These maps may be census maps, soil maps, recreation maps or really any other kind of map since the type of map is not of consequence to the system.

The system can be thought of as basically being in three parts—the input procedure, the map reduction system which puts the data in a form used by the third part which is the retrieval system. I hope to be able to give you some idea of the complexity of this system by briefly describing each of these sections to you in turn.

Figure 1 shows a schematic of the input procedure. It shows that three types of data are taken off the original source map. First, a scribed map which contains the boundary information. Secondly, a numbered overlay, which in the broad sense shows the location of each of the areas of the map; and thirdly, the classification data which indicates the actual classifications of the areas depicted on the map. These three map derivatives pass through respectively a drum scanner, an x-y digitizer and an encoder and are later combined on magnetic tape in the computer to form the input to the map reduction system. Maps to be placed in the data bank are first scribed onto a clean sheet of scribe-coat with only the lines on the map being so transferred. This is done so that the map scanner will pick up those lines only and not any other information off the map.

Figure 2 shows a section of a scribed present land use map. After having been scribed the map is mounted on the drum scanner which was developed by IBM to meet the needs of the Canada Geographic Information System. The scanner consists of a drum on which a map can be mounted, the associated controls and a moveable carriage which slowly moves the scanning head across the back of the revolving drum. The scan head detects the intensity level of light reflected from the map every 1/250 of an inch and records this information as a series of bits which consist of ones and zeros written on magnetic tape. If the head "sees" a line then

a one bit will be recorded on tape otherwise a zero bit is recorded. The net result of the scanning operation then, is a magnetic tape on which, for every 1/250 of an inch square on the map surface, it is known whether a boundary line was present in that small square or not. A normal full size map sheet takes approximately 10 minutes to scan in this manner.

After the map has been scribed but before it is actually read on the scanner a numbered overlay is prepared. Each area on the map is given a unique but sequential number and this number is written on a transparent overlay. At the same time the corresponding classification or describtion for each area is transcribed to a data sheet. The scribed boundary map with the transparent numbered overlay is then placed on a d-Mac cartographic x-y digitizer where the four reference corner points of the map and the co-ordinates of one point per map area are digitized. This point can be any point within the map area or "face". We use the word face within the system rather than area so that the word area will be unambiguous, meaning only the measurement, for example, acres. The output from the digitizer consists of a reel of tape on which are first the four corner points of the map, then, for each face within the map, the unique identifying number for that face and the co-ordinates of a point within the face.

The classification data sheet which was prepared at the same time as the numbered overlay is then transcribed onto magnetic tape via an NCR encoder.

We have now captured on tape all the data from the source map and are ready to enter the second part of our procedure—that is, the data reduction system.

The map reduction or data reduction system performs the following functions: it converts the input data into a manageable form; detects cartographic errors; calculates areas and adds maps to the data bank. These functions are performed by nine major programs or phases with some interspersed sort programs and print programs. These nine phases are called, with a great deal of imagination, Phases 0 through 8.

I want to go through each of these very briefly to give you some idea of the complexity of the research that has to be gone into for each system.

Phase 0 is an edit program which ensures that the digitizer and encoder data are valid.

For example, it checks that the four reference points from the digitizer are possible for the given latitudes and longitudes of the map corners and it also checks that a digitizer point and classification data have been given for each face of the map.

Phase 1 is the most complex program of the system. The input to Phase 1 consists of the scanner tape and the output is a segment tape which contains each segment of the input map described in x-y co-ordinates. In addition, Phase 1 has assigned an arbitrary number to each face of the map, this number being known as the "colour" of the face and each segments is identified by the colours of the faces on both sides of it. Later these colours will be matched with the also arbitrary face number assigned it during the input preparation phase and hence the correct classification will be able to be assigned to each face of the map.

The output from the scanner is a "map image" made up of a series of zero bits or one bits on tape. The number of bits per map is very large. For example a 30 inch by 30 inch map would be comprised of approximately 56,250,000 bits. Since this amount of information is much more than can be held in the computer at one time, Phase 1 begins by dividing the map into much smaller sections. One of the major problems encountered and dealt with by Phase 1 is the handling of information which lies right on the border between two sections and the correct processing of such information from one section to another.

To give some idea of the methods used by Phase 1 I would like to briefly describe two of the functions performed by Phase 1-cloud elimination and line following. Figure 3 shows a very small portion of a map highly magnified. The lines on the map are actually only eight thousandths of an inch in width. When scanned each scanner square which falls on the line will be output as a one bit and each one which does not fall on line will be output as a zero bit. Phase 1, when it is about to process this part of the map, will read the scanner tape and will spread the map out in core so that in the core of the computer we do have a true map image which will look somewhat like figure 4 except that I have not written in the zeros for the zero bits. As you can see instead of being a single point wide the lines are made up of clouds of points.

This is so because the scanner spot size is four-thousandths of an inch, half the normal line thickness.

The reduction of these lines to lines of single point width is what is meant by cloud elimination. The first calculation performed is one of very simple arithmetic. Visualize, if you will, a sheet of graph paper. If you think of it as being made up of a number of small squares, this is analogous to the output from the drum scanner where, for each small square we have a certain value, i.e. either zero or one. If, instead of thinking of it as made up as small squares you think of it as a series of lines which intersect at points, then you will see that each point is surrounded by four squares. We begin by calculating a value, called the V-value, for every imaginary intersection in the map image. This value is the sum of a number of bits in the four surrounding squares and thus may range in value from zero through four. Figure 5 shows the result of having done this to our small map. You will notice that the higher the Vvalue the nearer to the centre of the line the point lies and the smaller the V-value the further away it lies and therefore if we choose only points with high V-values we first of all choose points near the centre of the line and secondly eliminate the other points. We start this process by selecting a suitably high V-valued point. Having selected this point we then follow a path of high V-value doing two things:

- 1. "Marking" our V-value image to indicate that we have already processed this path; and
- 2. creating a new map image elsewhere in core with only the selected points.

Figure 6 shows this first path selected through our map by this process. You will notice that the value of the point has now changed. It now ranges from 0 through 7. These values are really direction codes which indicate the direction of the next point along the path. You will also notice that no attempt was made to find that we had gone through an intersection. In fact, the line is traced until one of three things happen; either

- (a) we reach the edge of the section
 - (b) we reach a line which has been previously traced or
- (c) we reach an end of a line which does not go anywhere, i.e. if it is an area map, it is an error.

Having, in our example, reached the edge of the section we go back to the V-value table and find another suitable starting value to trace the second path. Figure 7 shows the boundary trace map image after all the paths in the hypothetical map have been traced. You can see that we did find the intersection because when one of our paths was traced it met a line which had been previously traced. Having successfully eliminated the clouds of points it is now time to do the line following. This is accomplished by going from intersection to intersection following along the boundary trace map image using the direction codes which have already been placed there. As each line is followed the x-y co-ordinate of each point in the line is output into a segment table. Also at this time the map is coloured, that is, the unique number is assigned to every face of the map. As this is being done several points which lie on the map border can be determined and these are used to give a first approximation to the location of the corners of the map. If the colouring process uncovers the fact that a small gap or gaps exist in the lines these would now be corrected and the map, or that section of the map anyway, recoloured.

To recap, Phase 1 performs the following functions:

- (a) cloud elimination
- (b) line following
- (c) colouring
- (d) the closing of small gaps in the lines
- (e) finding the approximate location of the corner points of the map.

Having been given the approximate corner points of the map by Phase 1, Phase 2 then determines their actual locations. The location of these corner points will be used by Phase 3 as we shall see shortly. In addition, Phase 2 performs transformations on the digitizer coordinates. The co-ordinate system used by the digitizer is Cartesian and its origin is in effect arbitrary. The transformation performed by Phase 2 is to change those arbitrary Cartesian co-ordinates into a co-ordinate system comprised of latitude and longitude, which we call the Geodetic Co-ordinate System, or GCS.

Using the corner points found by Phase 2, Phase 3 performs a similar transformation to transform the map image into GCS. Both the Phase 2 and Phase 3 transformations also include a colinear transformation to eliminate such things as paper distortion and to correct for the fact that the scanner, unlike the digitizer, does not produce a true Cartesian coordinate system because the scan head in fact traces a helix over the surface of the drum.

As a result of these transformations also, both the map image data and the digitizer data are in the same co-ordinate system, therefore allowing Phase 3 to perform the second of its tasks which is to apply the classification data to the correct faces on the map. Phase 3 performs another very important function. A simple calculation reveals that an average density map will occupy approximately 200,-000 bytes of storage just for the boundary data alone, if the boundary data was stored in the simple x-y co-ordinate system output from Phase 1. A compact notation for segment storage has been devised which can effectively cut this number down by at least an order of magnitude, and hopefully much more. This compact notation is a code based on direction changes between co-ordinates and the distance between co-ordinates, using a sequence of two bit codes to describe these changes in direction and distance. Finally, Phase 3 applies a "frame grid" to the map. For convenience, our geodetic co-ordinate system which spans the whole of Canada, figure 8, is divided into a number of processable regions called frames. We could not hope to process the whole of Canada at one time. We would have to divide it somehow into processable areas. Each frame is a "square" in the geodetic co-ordinate system. That is, it has the same number of degrees or seconds in the north-south and east-west directions. The smallest frame, called the unit frame, is a square of just under 14.4 seconds to the side. The sequence in which these frames are stored in the system is of some interest. It is very hard to devise a method of storing twodimensional arrays which is what a map is in a one-dimensional medium. Starting at the origin of the co-ordinate system, which is out in the Pacific, the first four unit frames are in sequence as shown in figure 9. These four unit frames are equivalent to one larger frame-with f-factor 1. The first 16 unit frames are formed by subdividing the first four f-factor 1 frames each in the same manner as the first one was subdivided. In addition, the sequence of the first four f-factor 1 frames is such that it follows the same pattern as the first four unit frames. This building block concept is repeated until the whole co-ordinate system is filled. As shown by this slide each one of these frames is 14.4 seconds on each side. Figure 10 shows the first 256 unit frames which are equivalent to the first f-factor 8 frame. The reason that there are several frame sizes is to allow flexibility in choosing the best one for a given application. for agriculture and forestry, land suitability

Currently in the Canada Land Inventory System the frame factor used is 5. This frame is 7½ seconds on each side. Figure 11 shows an f-factor 5 frame and how it could be subdivided into frames of smaller sizes.

Up until this stage the system has been dealing with disconnected segments. Phase 4's main task is to pull all these segments together so that once again they form faces, to calculate the areas of these faces and the location of their centroids and to output the data in a more cohesive and final form. While doing this Phase 4 performs two other functions. It discards small faces or lines which were picked up by the scanner from dirt or other marks on the surface of the map and also outputs a list of any errors which it finds. These errors can be of a cartographic variety, that is, there have been lines missed or gaps left in the lines, or they may have been errors caused in the digitizing and encoding process. For example, leaving a face unclassified completely or giving one face two different classifications will cause an error. This error list is used to correct the errors and these corrections are recycled through Phase 4 thus producing valid output. At the completion of Phase 4 we effectively have a data bank. Its main drawback is that we have still kept the map concept. In other words data could only be retrieved on a map by map basis. Therefore, although the major work of the data reduction system has been accomplished one major task remains. This is the function of Phases 5 to 8, which put the data into the data bank, examining the borders of adjacent maps to remove map border lines which separate the same area on two or more maps. When this has been done the actual master files for each of the coverages is updated.

In order to reiterate what map reduction does, because this is really most of the research that has had to be done, map reduction eliminates clouds from the lines. It follows the lines and it removes distortions caused by paper or by the helix of the scanner. It transforms all the co-ordinates into the GCS system and it colours the faces. It detects any cartographic errors and calculates the areas and then puts the map into the data bank.

A coverage is defined to be all the data of the same type over a given region. Current coverages are present land use, soil capability for recreation, wildlife, administrative and political. As we shall see later these coverages can be combined to form a more complex coverage or can be subdivided to form coverages of smaller regions. Each coverage in the data bank is comprised of two sets of data, which can be stored on magnetic tape, or disk. The image data set, or IDS contains the compact notation of all the boundaries in the given coverage. In our provinces these are basic coverages. Each face in the coverage is uniquely identified within the IDS, each record in the IDS being one frame.

The descriptive data set, or DDS, carries the descriptive information for each face within a coverage. This descriptive information contains the classification data associated with each face, and also the area and centroid of each face. Each face in the DDS is identified by the same number as was applied to that face in the IDS, and with each face in the DDS is also a list of the IDS frames in which the face appears. This allows us to match descriptive information with boundary data, and, of course, vice versa. It is worthy of note that the DDS can be used to answer most inquiries and can, in fact, be processed in a much smaller computer than the associated IDS.

One of the most basic requirements of any map processing system is the ability to compare two maps of the same region-comparing, for example, the present land use of a region with its capabilities. This is done in the system by making a composite map of the region from two or more existing coverages. This function we call overlay. As an example of how much more complex the result of an overlay is than either of the two original coverages figures 12 and 13 on this slide show hypothetical soil class maps and present land use maps. The next slide shows the result of the overlay of these two maps. The result of an overlay is a new coverage comprised once again of an IDS and a DDS which can be acted upon by the system in exactly the same way as an original coverage including, of course, the ability to use the new coverage as an input to another overlay operation. A very much simplified schematic of the overlay operation is shown in figure 15 where a forestry coverage and a present land use coverage are combined to form a composite DDS and IDS. The schematic also shows that the composite DDS can then be assessed by what is termed an assessment program to produce desired results.

The assessment program is the means by which data is retrieved from the system. To make this retrieval of information easier than otherwise might be the case the system has been structured in such a way as to make the format of the data within the data bank "transparent" to the user. Standard routines are included in the system to read the data bank and in many instances frequent inquiries will be able to be answered by means of request forms. In other cases small computer programs are of course required. Assessments can be performed either on simple coverage DDS's or composite DDS's.

Before running an assessment it is, of course, necessary to define the area of interest. This can be done in a variety of ways. First, we may overlay the coverage of interest with the administrative boundariesprovince, county, lots, etc. or we can overlay it with the census boundaries to give us results by enumeration area or enumeration district. We can also overlay with arbitrary figures—circles or polygons. This type of area definition, for example, will be used to answer an assessment on finding all types of land of a certain class within 50 miles of say Quebec City. Also areas can be defined by drawing a map of that area and using that map as an overlay to the original coverage.

Finally, although the output from the system will normally be a report, plotted output can also be provided. Development work is currently underway to make this plotted output as meaningful as possible.

I trust that I have been able to give you some idea of how the Canada Geographic Information System works, and also some idea of the magnitude of the task of converting one field of human endeavor to computer endeavor.

Thank you.

The Chairman: Mr. Saumier will add a word or two and then we will go into the discussion period.

Mr. Saumier: Mr. Chairman and gentlemen, we have tried to show you the complete system which starts with an administrative mechanism of a very complex nature involving federal, provincial and inter-departmental co-operation in retieving data about land use and on the other side a computer based system to analyse this data, compare it and make it available to the decision makers who ask a number of very complex questions from

the assembled data. The whole CLI geographic information system package is a unique accomplishment of Canadian research and technology. It is something essential to administrative decision making and it can also be applied to any kind of situation of the same type whether in Canada or elsewhere. We thought this particular research would be of interest to you and to your colleagues. That is why we have taken some time to explain it to you and we thank you for bearing with us these matters.

The Chairman: Senator Grosart.

Senator Grosart: Mr. Chairman, I'm sure we are all very much impressed with this presentation of the Canadian Geographic Information Service and with the fact that it is a unique contribution of Canada in this field. I am not sure that all of us could write an examination on it at the moment. There are many, many technicalities involved but for myself I can say that I am very much impressed with this achievement.

Now I wonder if I might ask first of all if I am correct in assuming from the brief that total cost to date has been 13.8 million dollars. It is not clear in the brief whether the section headed "budget" refers only to research or to the total land inventory program.

Mr. Saumier: The total budget for the land inventory program as approved some years ago is about 13 million dollars.

Mr. McCormack: Up to March 14th of this year that figure is correct.

Senator Grosart: That is for the entire program and not merely for research components?

Mr. McCormack: We only assumed the cost of the geographic information system up to April 1, 1968, so that the 1968-69 costs of that system are not in there, but all the rest is.

Senator Grosart: Could you estimate the cost of the ancillary amounts expended by the provinces?

Mr. McCormack: It would only be an estimate, but the provincial contributions by way of staff salaries and equipment would be something in the order of one-third to one-half of that amount in addition.

Senator Grosart: This 18 million was approved when?

Mr. McCormack: In 1964.

Senator Grosart: Of course there were very small expenditures prior to that.

Mr. McCormack: Virtually none. In fact to be honest with you Treasury Board had approved prior to 1964 an amount of approximately \$3 million, because we realized as did they that the first approval was merely a preliminary, and this \$18 million was a subsequent submission based on more information.

Senator Grosart: What percentage of the total project is now completed to this finished map stage?

Mr. McCormack: Well, I could give you a rough percentage.

Senator Grosart: For the red line area.

Mr. McCormack: Between 50 and 60 per cent of the area. It is only fair to add that certain sectors are virtually complete. For example present land use is virtually complete and the section dealing with agriculture is about 80% complete. That section dealing with capability for recreational is 75 per cent complete and this includes all provinces in Canada. In total it would be between 50 and 60 per cent complete.

Senator Grosart: What would be a rough estimate of the total cost for the whole region, I think you use the word "face" to bring every "face" to the point of completion of the B.C. map?

Mr. McCormack: If I may elaborate on that, senator, you have moved into another phase. This goes from having the basic data into land use planning. This is macro planning or blocking on a large scale. I would think you could do land use planning in Canada at the macro level for something in the order of about \$500,000 each for the larger provinces and something in the order of \$300,000 each for the smaller provinces which would mean about \$1,000,000 for the Maritimes and about \$4,000,000 for the larger provinces.

Senator Grosart: So most of the work is done?

Mr. McCormack: No, we have only been in this land use planning phase, in other words, utilizing the date for actual planning, for a little over a year. In fact, a large part of this work has been done as a basis for the FRED program in Prince Edward Island. Macro planning is being done in Nova Scotia. Some

micro planning-and this is why I like to keep a distinction here—is being done in the Musquodoboit area of Nova Scotia as well.

We have a project before the Treasury Board for \$300,000, to undertake a macro plan in New Brunswick.

It has been started in Quebec and Manitoba, and it is well under way in British Columbia. Otherwise, the other provinces have not as yet taken it on.

Senator Carter: Have you done any in Newfoundland?

Mr. McCormack: No. Are you from Newfoundland, senator? Would you like to know the setup in Newfoundland? It is a little bit different. We originally undertook the inventory, in the Province of Newfoundland, under the Canada Land Inventory. In late 1965 in fulfillment of one of the articles of Confederation in which the Government of Canada agreed to update their resource data to a level of the rest of the provinces, a special agreement was signed to undertake the capability studies, plus a forest inventory on both the island and Labrador. This is an eight-year program, which began in 1966, so we do not expect to complete Newfoundland and Labrador, even under this arrangement, until 1974.

Senator Grosart: If I may move from that—not that I do not regard it as very important, because obviously this is a tool of the whole of the operational activities of the new department...but there are some other questions that come out of the brief. The first comment I would make, Mr. Chairman, is that we do not have here a clear concept of the total research effort of the department as it existed formerly. I know this is difficult. I have tried to trace it through the briefs of the various component instrumentalities, but without any great success. I wonder if we could have, in due course, a tabular statement of the total research activities-by people, and by dollars?

The Chairman: This would have only a kind of historical interest, as you understand.

Senator Grosart: I was just going to comment on that, Mr. Chairman. The reason I have been interested in it is that the minister, in discussing the new department, has made it very clear, as I read his statement, that the research establishment will be a very important part of the new department. I would like that we are, as somebody said, dealing with lation stage; then we flush out these broad

an obituary situation and I also remember that there is an old maxim that one should speak only well of the dead.

However, the activities of these various components have been very very seriously criticized in the past, largely on the grounds of lack of pre-research. I am not going into details. The minister himself has admitted that one of the reasons for the new department is to get a much higher degree of coordination interdepartmentally and project by project.

Very serious criticism was made recently of the whole operation in the Monetary Times. I will read only the first paragraph:

The federal Government has finally gotten around to admitting what the critics, the opposition parties, and the provincial premiers have known all along: the regional development program is a mess.

I am inclined to think that is an exaggeration, but the stress everywhere is on the fact that there was inadequate preplanning research.

I would like to know-and I ask not in any critical way-if this has been taken into amount and is a major factor in the setting up of the new department.

Mr. Saumier: The answer to that is quite clearly yes. There will be in the new department a large research group or planning group, which will be headed by an assistant deputy minister, whose name will be announced very shortly. This will be a group, large in size and, we hope, high in competence, which presumably will go quite a long way towards satisfying the preplanning research which you have in mind.

The Chairman: What would be the composition of that section?

Mr. Saumier: A deputy minister—Planning; a director of economic analysis; a director of social and human analysis; and a director of plan formulation.

In other words, the whole concept of the new department-if I may say so, in parenthesis—is not to make research or prepare plans or implement plans, but to cause action to be taken.

So we visualize the department as a process where we start with a large broad range of analysis on the economic or social in due course to compare the two. I recognize side and then move into a broad plan formuwhatever federal and provincial agencies are involved in these.

So, on the research side, we will have, we hope, the staff and the structure which will enable us to say to them that the plans we prepare are backed up by some analysis of the situation to be corrected.

Senator Grosart: May I ask if you will, within the department, develop a national resource use plan?

Mr. Saumier: Whether we will develop a national resource use plan is a question which at this time is a little difficult to answer. If one reads our department legislation carefully, it shows that the main thrust of the department should be in what the legislation calls "special areas" which suffer from particular problems. So we will be judged, I would think, by the impact of our efforts in these special areas.

It may be that, in order to have more meaningful action in special areas, somebody somewhere will have to develop a national resource use plan or a national plan in some other sectors of some kind.

Whether this development will be done by our department or by some other agency, or conglomeration of agencies, is a point which remains to be seen in the future.

As you know, the Economic Council, as I recall, is entrusted with the preparation of certain broad economic perspectives. When these perspectives are being developed-and they are being developed-we will of course be in a position to use them, and so forth.

Senator Grosart: A vital question, which has come out of the attempt to do something about regional development in the past, has been that you may have been picking the wrong areas. I do not see how you can assure yourselves that your choice of development areas is valid, unless you have a master plan, such as was recommended, as you well know, in the Resources for Tomorrow Conference.

The Conference affirmed the following needs: to complete a countrywide assessment of resources supplies which may be set against long term assessment of resource needs.

It has been pointed out, for example, in ARDA, and I think also in FRED, the main beneficiaries in terms of total funds have

plans into the negotiating stage and then been Ontario and Quebec, and not the soimplement the plans, in co-operation with called have-not provinces. Would you care to comment on that?

> Mr. Saumier: The comment I can make is that, first of all, take FRED, if I may. We have, as you know, a very large FRED plan for the Island of Prince Edward. We have a very large FRED plan for the Gaspe area and a very large one also in the northeastern area of New Brunswick and one flood plan in Manitoba for the interlakes so the large inputs of FRED have been by and large in what we might call eastern Canada, east of Three Rivers.

Senator Grosart: A famous phrase.

Mr. Saumier: That is right. From that point of view I think it can be fairly said we have devoted our attention under FRED to eastern Canada. Under ARDA you will appreciate, Mr. Chairman, that the formula or I should say maybe the amounts of money which are placed at the disposition of each province under ARDA-what we call the provincial allotments under ARDA-is determined by a formula which takes into account the population, income and so forth in the rural areas. Therefore obviously, as you have a larger rural population, you are bound to have larger amounts of money. As you have a smaller rural population you are bound to have smaller amounts of money so in some way the fact that the rural population, for example, let us say Prince Edward Island, is much smaller than the rural population of the Province of Quebec as reflected in the fact that the ARDA allotment for PEI is considerably less than the ARDA allotment for Quebec.

Senator Grosart: Do you see any validity in the criticism made by the Economic Council that it would not be difficult to pick out a good many projects where the actual result was to spend a dollar of federal money to give a farmer 50 cents.

Mr. Saumier: Mr. Chairman, I suppose the senator is referring to the Buckley Tihanyi Report which I have to point out is not a report of the Economic Council. It was paid for by the Economic Council, but as all these reports point out, the opinions of the writers are not necessarily those of the council.

Senator Grosart: I might say I do not fully accept that. We have the same thing with the Science Council. My view is that any such council publishing such a report should repudiate any parts of it with which it does

not agree. I think this is sort of an escape clause that is being used by the Economic Council and by the Science Council to put out information which is useless unless it is assessed by the issuing authority that pays for it. The Economic Council did issue this report. That is an aside, but it is my own view on this. I hope this Science Policy Committee will not be guilty of that.

Mr. Saumier: Mr. Chairman, when it comes to assessing the value of the Buckley Tihanyi Report one has to keep in mind that it was based by and large by studies and evidence up to about 1966. The essential comment that the Buckley Tihanyi Report makes is that they thought, in the opinion of the two principal researchers, that too much emphasis had been given to resource development per se and too little emphasis had been given to what one might call human development. This is a conclusion to which we have come, ourselves, within the ARDA administration and this is why for example in 1965 the name of the legislation was changed to Agricultural and Rural Development Act. Along with this name and this change in name we try to bring about a changing focus or away from resource development and in the narrow sense of the term into what we might call human development in the broader sense of the term.

The Chairman: Previous to that you were limited by the legislation.

Mr. Saumier: Yes, to resource development projects. The main conclusion we came to was that by and large problems of rural poverty would not be resolved by resource development projects and that having a to keep those maps of these data up to date? resource development project in no way made sure that the undeprivileged rural population would at all benefit from this project. This is why this has led us to change our emphasis from programs trying to develop resources only to programs, first of all, which try to develop resources and people. More and more this is a clear case. For instance in the FRED program, there is a combination of the ARDA program which puts maximum emphasis of problems of human adjustment within the area or outside of it.

Senator Grosart: As reflected in the new name of the department-Regional Economic Expansion—the emphasis I presume is on economics.

Mr. Saumier: If you look at it you will see

the legislation, itself. It says economic expansion and social adjustment.

Senator Grosart: Finally, Mr. Chairman-I know other senators will have questions, I have mentioned these criticisms in the past, but as I say, not to defame the dead, but to hope or to suggest that there will be a very well researched master plan now within the department. To me this is the most important aspect of the very great powers that have been given to the minister in the department, to which personally I do not object. I think a minister needs these kinds of powers if he is going to get the results that are expected from the Department. I leave that suggestion with you.

The Chairman: Senator Robichaud.

Senator Robichaud: Thank you, Mr. Chairman. The question will be brief as I have to leave for an engagement. May I first say that I am in complete agreement with a statement we heard in the first film when it said that to make decisions we need facts. We know it is a fact that governments need all data available before making decisions. Notwithstanding all the information available quite often and sometimes rightly so the decisions taken by government are subjected to questioning by many. My first question would be what is being done? We were shown how these data are accumulated, but what is being done to keep such data up to date for the various maps that are being computed, because it could be that as land use or population changes in certain areas that information already computed becomes obsolete and could lead to wrong decisions. What is being done

Mr. Saumier: Mr. Chairman, I think it is fair to say that we have not yet come to crossing that bridge. What we are engaged in now is the process of assembling the data. The question you raise is one which is most legitimate, because obviously we are not interested in building up a historic archive of data. We want data which can be kept constantly up to date. How this will be done is a question which we will have to address ourselves and I would think this would be within about a year or so when the present effort will have come to its conclusion.

Senator Robichaud: My second question, Mr. Chairman, would be directed to the present operation of ARDA or particularly of the FRED fund or rural economic development. there is a double mandate. It is reflected in We all recognize that for years surveys have

In 1966 I believe the Atlantic Provinces Research Board requested a certain firm to make a survey of the economic research relating to the Atlantic region and the chief purposes of this study which, as I have said, was commissioned by the Atlantic Development Board and was to review on a selective basis an economic research relating to the Atlantic provinces. I know in this report that 107 of such research studies were made and some were classified and distinguished. This was the kind of study that was made under FRED.

We know that the federal government signed an agreement with the province of New Brunswick for a program under the Fund for Rural Economic Development in the fall of 1966. Since then, judging from the publicity which has been given to this program, every time we open a New Brunswick newspaper particularly referring to the north shore where this program is being applied we see that groups have met, that they had committees making studies but we are still waiting for the implementation of the program which has been under way now for almost three years. As far as I can see referring to north-eastern New Brunswick, and I apologize for being regional in my remarks, there are two projects, a road project and a marine project which have been under discussion for many many years. I have been in politics for 15 years and I know that these matters have been coming up for discussion before every election. One of them deals with a road joining Gloucester and Restigouche. What is FRED doing in that area and what is being done to implement the programs which I understand involve some \$90 million.

Mr. Saumier: This is a very, very far-reaching question and I will try to be as brief as I can in answering it. The basic assumption upon which the FRED program for north-eastern New Brunswick was built, and we must recall this here, is that the area is characterised by sever under-employment and unemployment so the basic assumption was that a certain number of jobs should be produced in the area specifically by the Bathurst-Belledune complex. Therefore certain mechanisms were contemplated to make sur that the jobs taxpayer's money has been spent for the becoming available would be filled by the maintenance and operation of these studies people of the area as opposed to being filled and committees and this sort of thing. What

been made in certain areas. I am referring traditional pattern in under-privileged areas. particularly to the Atlantic provinces. Studies In another field what has happened has been have been made as well as economic surveys. that the quantity of jobs created in that complex has not reached the proportions that had been foreseen in the project which had been made by the planners and researchers at the time the agreement was being prepared. So that in consequence the whole effort of the plan has had to be correspondingly slowed down because there is no purpose in moving people from situations of rural poverty into situations of urban poverty. As a matter of fact, and some of your colleagues may know this, we are now in the process of reviewing and revising the agreement concerning northeastern New Brunswick. A few days ago I was looking at the first report of the consultants who are helping us in this assessment and who are looking at the prospects for the future of this Bathurst-Belledune mineral complex and they came to the same conclusion we came to four years ago that the prospects are excellent for considerable expansion but the timing of the expansion is very uncertain. This is one of the root problems we have to face whenever we put together a plan of this kind. It is not within the power of the government to cause an expansion of this complex because it depends on international situations and international markets. When international markets face an increasing demand situation these industries expand. If for a number of reasons developments proceed at a slower pace and if you are left without the wherewithall to provide the opportunities for people, which is one of he main points of the new legislation, Then we have to find something which transcends this complication by helping us develop in a broader area. Taking the case of north-eastern New Brunswick the plan now encompasses a rather small boundary. There are developments going on outside the boundary but because we were limited by the legislation which provided the fund for rural economic development we were not in a position to take action and move the people from the area narrowly defined to areas outside it where certain development opportunities were in existence or could have been stimulated. This is one of the things which the new legislation will enable us to overcome.

Senator Robichaud: I would say a large percentage of the funds spent so far of the by people from outside the area which is a can be done to control such expenditures? Mr. Saumier: In the case of north-east New Brunswick most of the funds spent under the plan has been in connection with education. There has been a massive school construction program in the area. Federally most of the funds have been spent under the manpower programs. In fact there has been very little spent on research under the program. The only major research program we have had and which will cost about \$100,000 is the research going on now designed to evaluate the impact of the plan so far and which will provide guide-lines for a better agreement which should be forthcoming within the next few months.

Senator Robichaud: Has any effort been made to avoid duplication of effort with the Atlantic Development Board in making surveys? I am referring to a project for the southern part of the province which is concerned with the construction of a large fishery port. At one time I believe there were three different surveys under way by three different agencies for the same purpose. What is being done to avoid this type of duplication?

Mr. Saumier: One of the prime purposes of this new department is to try to avoid this type of duplication. For that reason the Atlantic Development Board is part of the new Department of Regional Economic Expansion and this should help somehow to reduce what you refer to as duplication of research. One must however keep in mind that a large number of research projects are initiated by the province and it is not within the power of the federal government to prevent provinces from launching such projects as are of interest to them.

Senator Robichaud: Is this with federal participation or without federal participation?

Mr. Saumier: Where there is federal participation such things are easier to control, but where there is none we have no way of preventing duplication.

Senator Bourget: What kind of liaison do you have between federal agencies and the provinces ?Is there an advisory committee to work with the different agencies or somebody who decides what kind of projects should be implemented?

Mr. Saumier: Are you referring to activities under the new department or activities of the government at large?

Senator Bourget: Well, since you work with the provinces we would like to know if there is a co-ordinating committee to look into the kind of projects to be implemented.

Mr. Saumier: The ultimate and I might say the main purpose of the new department is to provide the federal government with a unified voice when it comes to regional development programs. It is our hope to foster within the provinces the emergence of a program which has the same effect for the provinces. But I think one has to face the fact that in any kind of complex operation, such as the federal or the provincial government, no one department can rightfully claim to play an overall co-ordinating role. Each one is set up by its own authority and each one has its own mandate. What we can best hope to achieve is at least to be informed of what is going on and then possibly to cause the Government to take steps which will reduce the degree of duplication which may arise otherwise.

Senator Bourget: So that the federal agencies have representatives with the provincial committees?

Mr. Saumier: This is a question which is difficult to answer in the abstract, because each situation has to be dealt with in its own way. The way we work is that in the case of a complex problem, to set up these committees, federal-provincial in nature, and in which a number of federal and provincial departments are represented. This is a way of trying to make sure that we are aware of all the efforts undertaken by both the federal and provincial governments involved.

Senator Bourget: How much of your research is done by universities or by private organizations, and how much of the research also is done in the house?

Mr. Saumier: If this question, Mr. Chairman, relates to the new department, I do not think it is possible to give an answer to it, because the new department has not been established for more than a few weeks and so we have had hardly any research within the department as such.

If you refer to the agencies which have been brought into the department, this question has to be answered on an agency by agency basis and we have tried to provide in the material submitted to you some indication as to the relevant breakdowns. I would hesitate to make a guess as to exactly these proportions, and I would think that in the

material we will submit in answer to Senator Grosart's questions, some of these queries will in fact be answered.

Senator Grosart: At the end of Table 3 in your report, it is mentioned that the branch responsible for ARDA and FRED has no research personnel. Who would be doing the research then? Would it be an outside private organization?

Mr. Saumier: By and large, under ARDAand again I have to stress that the ARDA organization as such has been absorbed within the department as a whole-under ARDA, a very large part of our research was done by the provinces themselves, or by consultants hired by the provinces, in which case, in either case, we are paying a varying share of the cost. In ARDA, we have basically two research mandates, one under the ARDA regulation itself and which enabled us federally to do some research, although it was relatively a small amount. Then, under the ARDA agreement, which enabled us to finance in part the cost of research undertaken by the provinces. Most of our research effort has been of the second kind. In fact, the large majority has been of the kind where we made a contribution to provinces to enable them to undertake certain pieces of research which appeared both to the province and to us as being worthwhile and interesting.

Exactly how this research is conducted in individual cases—at some points, for example, the CLI itself, which a major piece of research, it has been done in house. In the case of the Geographic Information System, it has been done mostly through consultants. This varies from case to case. It is very difficult to arrive at a generalization as to whether it is done mostly in house, or mostly in federal, or mostly in provincial, or mostly in consultants, and whether they are federal or provincial consultants.

Senator Bourget: But in all cases, whenever the province puts forward a project of research and when the federal Government shares in the cost, it has to be approved?

Mr. Saumier: Indeed, yes.

Senator Bourget: I read in Tables 2 and 3 that the research expenditure on FRED planning, before the ARDA program, was one of the most important projects has been Gaspé-Quebec. I suppose that has to with BAEQ.

Mr. Saumier: That is correct.

Senator Bourget: Could you tell us briefly, what kind of projects so far have been incorporated in that particular project?

Mr. Saumier: The BAEQ project?

The Chairman: For those who do not know that project, I might add that it covers not only the Gaspé but the Lower St. Lawrence.

Senator Grosart: And the National Park.

Mr. Saumier: The BAEQ project—that is, that of the Eastern Quebec Development Bureau—was essentially a private non-profit corporation set up provincially or by a number of associations active in the area, to engage in the process of research leading to the preparation of development plans for the Gaspé. The total cost of the studies done by the BAEQ—the complete report of which covers about ten volumes—was roughly \$4 million, of which \$2 million...

Senator Grosart: Excuse me, how does that \$4 million figure compare with the \$1.3 million given for research expenditure on Table 2?

Senator Bourget: Table 3 also mentions \$1.6 million, from 1965 to 1968.

The Chairman: This was started in 1963.

Mr. Saumier: This was the first phase. If you look at the answer on Table 3, you will see there \$1.7 million as well.

Senator Grosart: That adds up to a little more than \$3 million.

Mr. Saumier: About half of this money was spent on research projects as such, located at various sectors, trying to assess their potential, and so forth. Roughly another half was spent on what is called the social animation process, trying to make people of the Gaspé and Lower St. Lawrence aware of the problem and involved them in an analysis of their own situation, so that they would be sensitized to the need for change in the area. The outcome of the research of the BAEQ, as I said, was a very large and significant report, which served as a background material, basic material, for the preparation of the Gaspé-FRED agreement, which was signed about a year ago between the federal and provincial Government.

This Gaspé-FRED agreement is now in the process of being implemented. Of course, as to be expected, there is some difficulty, but on the whole, this whole agreement is working fairly well.

Senator Bourget: There has not been any practical results so far, as far as BAEQ is concerned?

Mr. Saumier: The practical result has been the signing of the agreement and then the implementation of the agreement. Last year, under the agreement we spent, as I recall, some \$5 or \$6 million and this year we are going to spend about twice that much, or a little more.

Senator Bourget: Is that for studies again?

Mr. Saumier: No, this is for actual projects.

The Chairman: The signing of the agreement was about a year ago-the object of the agreement was the plan.

Senator Robichaud: What specific projects have you undertaken on the Gaspé coastthere was \$5 million last year and \$10 million this year.

Mr. Saumier: There is, for example, what is called the accelerated manpower program. There is certain tourist development which will hopefully take place in a number of centres. There is a consolidation program whereby a number of farms are in process of being bought and consolidated. There is a marginal parishes program, whereby some marginal parishes or marginal settlements will be closed down and the people moved elsewhere. There is a whole raft of projects. If the members of the committee are interested in securing more information, we can provide it for them on this topic.

Senator Grosart: Is the Newfoundland relocation program regarded as successful?

Mr. Saumier: This program is one which is...

Senator Grosart: A provincial program.

Mr. Saumier: The main input federally has been through the Department of Fisheries and I must confess I would be hesitant to speak here for the Department of Fisheries. But my impression is, from conversations with Fisheries officials, that while they are the first ones to admit that this kind of program inevitably runs into sizeable difficulties, nevertheless we feel that for its duration it has been quite successful.

Senator Robichaud: May I ask what is preventing the Department of Regional Developments from taking over this program? I understand that, when first undertaken a few are to be carried on in the new department?

years ago, one of the main reasons why it was done by Fisheries was because the Fisheries Department had...

The Chairman: It was ARDA.

Senator Robichaud: They were prepared to implement it and they had the organization to do so. But it was understood at the time that within two or three years it would be transferred to ARDA. What is preventing this transfer? I know that funds are being used for resettlement by the Department of Fisheries and they are preventing the department from getting involved in some other project on account of the million and a half or over million voted every year for implementation of this resettlement program.

Mr. Saumier: Mr. Chairman, when discussions were held with the Department of Fisheries as to ARDA taking over the department what had been anticipated at the time was that at some point there would be a FRED agreement with Newfoundland and that the fisheries resettlement program would then become part of this FRED agreement. For a number of reasons, which I expanded upon when I was a witness before the House Committee on Regional Development, this FRED agreement with Newfoundland did not come to pass. We are now working again with Newfoundland on the preparation of regional development plans.

Senator Carter: You mean there is no ARDA agreement with Newfoundland? Is that what you are saying?

Mr. Saumier: I am sorry, there is an ARDA agreement with Newfoundland, but not a FRED agreement.

Senator Carter: FRED has disappeared has it not?

Mr. Saumier: Yes, FRED disappeared so now there is no agreement with Newfoundland. We are working very actively towards a regional development plan of some kind for Newfoundland and I would think that when this plan is finalized then the fisheries resettlement program will of course have to be taken into account. If it appears desirable for it to be and if you want it to be closely integrated or absorbed by the plan this will be done. Whether this will come to pass only time will tell.

Senator Grosart: Mr. Chairman, I wonder if I might ask which of these current agencies In the table of contents, we have ARDA and FRED, the CLI and the Regional Information System, ADA, Atlantic Development Board and Prairie Farm Rehabilitation Act which are still alive.

Mr. Saumier: Mr. Chairman, I think I will have to make clear a distinction between what I would call legislative survival and administrative survival.

Senator Grosari: The latter is much more important.

Mr. Saumier: Let me take the two, one after the other. From the legislative point of view the ARDA Act and therefore the ARDA agreement is still in force. The fund or Rural Economic Development Act has been—I do not know the technical way—abolished.

Senator Grosart: It faded out.

Mr. Saumier: It has been repealed by the new legislation. The Canada Land Inventory and the Regional Information System were ongoing programs, not departments acting upon any particular legislation. Those are being carried on. The Area Development Agency, as far as it was set up under certain sections of the Department of Industry Act, has also been abolished and its parent legislation repealed, but another piece of legislation which is the Industrial Incentive Act is still remaining and will be replaced, hopefully, as our minister has indicated, by a new piece of legislation dealing with the problem of industrial incentives. The Newstart Program was an administrative section of the Department of Manpower and Immigration and it has now been absorbed within the department. The Atlantic Development Board Act has been repealed and the Prairie Farm Rehabilitation Act is still in force. From the legislative point of view some of these are still in force and some are not. From what we might call the administrative point of view all of these various groups have been melded into the new department. Of course, there is a continuing ARDA legislation which is administered by the department, but there is no longer, for example, the specific rural development branch within the department. The responsibility for it is now diffused within the whole department. None of these agencies are any more identified as such within the department. There is no ARDA branch or area development branch or Atlantic Development Board branch.

Senator Carter: What will happen to the projects that were continuing under FRED and under ARDA?

Mr. Saumier: These projects are all continuing. The FRED agreements of course are being honoured and will continue to be honoured. The ARDA agreement is still in force. All the projects which have been started are continuing. The effect of the repeal of certain pieces of legislation is to prevent, technically speaking, certain kinds of projects from being implemented under a particular legislation, but the overall departmental legislation has been cut in such a way as to be able to absorb effectively all the activities of the previous diverse agencies. There should be no hiatus at all or no break in the activities of the department.

Senator Carter: The Atlantic Development Board had a fair rating going. Is your department continuing these?

Mr. Saumier: Indeed.

Senator Grosart: Under the ADA or the advisory board?

Mr. Saumier: Well, the Atlantic Development Board which was to some extent decision-making by itself has been abolished and these decision-making powers have been entrusted entirely to the department of the advisory capacity and have been taken over by the Atlantic Development Council.

Senator Grosart: What area development instrumentalities, particularly in the industrial incentive field, are left now with the Department of Industry, Trade and Commerce?

Mr. Saumier: I would think, Mr. Chairman, although I would not be able to say with complete assurance, that as far as I know the Department of Industry, Trade and Commerce has no longer the authority to make grants to industries.

The Chairman: Not in designated areas. They are certainly making grants for other purposes.

Mr. Saumier: That is right. The ADA legislation enabled the then Department of Industry to make capital grants to new industries or expanding industries in designated areas. This power is within the Department of Regional Economic Expansion.

The Chairman: The other incentive programs for research technology will be gone

within the new Department of Industry, Trade and Commerce?

Senator Grosart: What about ARDA and PAIT? Surely they still have the power to say that they not only consider the incentive to the particular industry, but also to the particular region. Is that a matter of interdepartmental discussion?

Mr. Saumier: When you say, sir, incentive to a particular region, if you talk about capital grants to industries to establish new plants as far as I know this now is not entirely within the new department and the Department of Industry, Trade and Commerce does not have such grant-making capacities. They have other grant-making capacities for research purposes such as the PAIT programs and others which the Department of Industry was carrying outside the specific mandate of the area development agency which is now wholly transferred to the new department.

Senator Bourget: Would the new legislation have more freedom to designate vast areas?

Mr. Saumier: More freedom, yes.

The Chairman: You are responsible for delegating these areas?

Mr. Saumier: That is right.

The Chairman: This has been taken over from Labour?

Mr. Saumier: From Industry.

Senator Grosart: The old Manpower Department.

The Chairman: But previously I think Industry did not have the power to delineate these regions. This was a responsibility of the Department of Labour.

Mr. Saumier: They had to work very closely with the Department of Labour and then with the Department of Manpower and Immigration because the statistical basis upon which the delineated area was provided by the NES areas and the CMC areas. Under new legislation this likely will no longer be as close. In other words, we will not be limited by the boundaries of the CMC.

The Chairman: Which were very artificial.

Mr. Saumier: In some cases indeed.

Senator Grosart: The power to designate is given to the minister or the Governor in Council.

Mr. Saumier: We have now two powers to designate, one under the departmental legislation whereby we designate special area and the other—

Senator Grosart: You mean the minister?

Mr. Saumier: Let me think. I should know that. This has to be approved by the Governor in Council and also under the present ADA this has to be—

Senator Bourget: Did you say also the Newstart Program has taken over the responsibilities of the Manpower Department regarding the retraining of unskilled labour?

Mr. Saumier: The Newstart Program, sir, was strictly speaking an experimental program and still is. It is a program designed for the purpose of defining and testing in selected experimental areas new methods to train people for productive employment. So the Newstart program is not a program which is applied at large but is essentially an experimental program where we try to define areas where there are populations or people which are suffering from particular handicaps when it comes to retraining them for productive employment.

The purpose is to define new methods that are practical for handicapped persons. This is a laboratory approach.

Senator Bourget: You do not see any problems there?

Mr. Saumier: No.

Senator Bourget: It is limited.

Mr. Saumier: Very limited to very small areas and very specific purposes. It is a research program, essentially. Of course, when it comes to retraining people, you have to test in reality the methods which researchers and specialists may think practicable, but the testing areas are, geographically and population-wise, very small.

Senator Bourget: Did you get some help from the Department of Manpower?

Mr. Saumier: Yes.

Senator Grosart: If I may revert to my earlier question, the witness just said that Newstart is largely a research operation. Strangely enough, it is the one agency mentioned in the brief that does not give us any kind of run-down of its research personnel, which was one of the reasons I asked that question, because, if I may just put this on

record, Mr. Chairman, my count, from the brief only, is that ARDA and FRED have no people on staff, and I am speaking now of a professional research people. We have the statement that research is not the responsibility of any particular unit. I am aware of the fact that there are contractual arrangements and that a great deal of this may be provided by outside professional research. In the land inventory field we have a total of 413, of whom 59 are federal; in the area development field we have four; in Newstart there are 58; the Atlantic Development Board has 16 and PFRA has 31.4.

My question was whether that was the whole picture and whether we could have it broken down.

Mr. Saumier: Yes, sir, I will provide that data for you.

Senator Grosart: The disciplines in which these professional people are skilled would be helpful.

The Chairman: How do you plan to organize this new research operation you are undertaking in relation with other departments? Let us say, for instance, how you will relate this new operation with the research being done in agriculture or in the Department of Fisheries or even in the Department of Manpower and Immigration, because it would seem to me that these are the three other research operations which are very close to your field of interest.

Mr. Saumier: Let me put it this way, sir. I do not believe that it is the primary purpose of the new department to engage in what we might call basic research. The new department is not a research department but is an action department. Therefore, the test we have to apply to any research project that we may get involved in is what is the bearing of this research program on certain problems we have to solve now or in the near future.

Having said that, I must temper that statement by saying we have to be in a position to anticipate problems before they arise, so that we will not always be running from one crisis to another. Obviously, in order to anticipate problems one has to be able to take a fairly broad perspective. In order to provide this broad perspective, there will undoubtedly have to be some sort of continuing basic research on the overall economic trends and so forth, but this will be a fairly small portion of the departmental program. When it comes to what we might call, for lack of a

better word, action research, which is research directed to specific problems, the nature of the problems we are investigating will dictate a kind of co-ordinating mechanism we will establish with other departments. If it is research on a broad area basis, in an area where there is a substantial amount—in fishing and forestry, for example—clearly, when we set up our research program and our action programs, we have to work very closely with the departments who have the competence and expertise we need to bring to bear on these problems.

The first temptation that any new department has to resist most vigorously is to think in some way it can become a repository of all wisdom and of all knowledge. We have to remain rather small, and one of our prime purposes must be to be in a position to tap existing knowledge and expertise wherever these exist. This encompasses, in the first instance, the existing federal departments. This is a statement I think everybody will applaud. How this in fact will be done is one of the most difficult organizational problems which confronts the department, just as it is one that confronts any agency entrusted with a co-ordinating role—how to set this up, and to establish links with other departments, to make sure the accumulated knowledge and expertise available in these departments are effectively used, and to prevent our launching projects to provide information that is already extant and available. This, I daresay, will be a continuing organizational problem, and I personally doubt whether we will ever see the day when this problem will be completely overcome. It is a continuing problem for any large organization, and a particular problem of a new department, and this is one of the main challenges, from the organizational point of view, awaiting us, as to how to organize ourselves to achieve this.

Senator Grosart: When introducing the bill, the minister was fairly optimistic on that and said:

We have had a variety of programs operating independently, with too little co-ordination between them. This approach has obviously not worked. It may have stopped the gaps between regions from widening but it has not narrowed them.

This legislation will, therefore, firmly charge the new department, and myself as its first minister, with the central responsibility for federal regional develop-

ment programs. This is the only way to secure the co-ordination of federal effort which is essential to the achievement of the most effective results.

The Chairman: What we were discussing a moment ago was not implementing regional programs, but really the organization of research, and this is not what the minister was referring to, it seems to me.

Senator Grosart: I thought it was what Mr. Saumier referred to, because he spoke of the difficult problem of co-ordinating the work of other departments.

The Chairman: Co-ordinating research.

Mr. Saumier: The same applies when it comes to co-ordinating action.

The Chairman: Although I do not believe very much in interdepartmental committees, perhaps it might be useful for you, at least in terms of research, to have some kind of interdepartmental committee with these various departments so that you have an occasion once in a while to know what the others are doing, and also to fill in the gaps, because very often in these fields we are doing so little good research that gaps are more probable than is duplication.

Mr. Saumier: I can assure you, Mr. Chairman, that there will be a multitude of interdepartmental committees. I would like at this moment to point out one area of research where we possibly have been most interdepartmentally involved, and this is in respect of the Canada Land Inventory. The whole research effort is really an interdepartmental effort. The staff of AIDA are, as an estimate...

Mr. McCormack: There are only three permanent members of AIDA. The rest are seconded.

Mr. Saumier: Yes. The whole work is co-ordinated by the Canadian Land Inventory.

Senator Carter: You said that the AIDA legislation had been repealed and replaced by other legislation coming under the Department of Industry.

Mr. Saumier: No, sir. This is a very complex matter. The Department of Industry Act provided, if you like, an organizational locus for AIDA. In order to remove it from the Department of Industry and locate it within

the new department, this piece of legislation of the Department of Industry had to be amended. There was also another piece of legislation called the Industrial Incentives Act, which enabled in the past AIDA to make grants, and which now enables the new department to make grants. This Industrial Incentives Act is still intact.

Senator Carter: Under the Department of Industry?

Mr. Saumier: No, under our department. This is why the Department of Industry Act had to be amended. It was to enable the Industrial Incentives Act to come under our department.

Senator Carter: And the other functions of ADIA have been taken over by your department?

Mr. Saumier: Yes.

Senator Bourget: In that particular instance, are you satisfied with the result obtained so far as to the stimulation of investment in depressed areas? Are the policies already applied adequate, or do you propose some changes?

Mr. Saumier: Well, sir, as our minister has indicated, we propose to make fundamental changes in the industrial incentives legislation. Mr. Marchand has indicated that we hope to have the new legislation available by the end of the spring, or the early summer. There will be some fundamental changes in the legislation.

Senator Bourget: I have here a publication by the Area Industrial Development Agency which shows that the number of jobs created per 1,000 of population has been more in provinces like Ontario and Alberta than in other provinces.

Mr. Saumier: That is correct, sir. This is a common problem in respect of legislation of this type. It is always the richest and best organized provinces that are the first to take advantage of it, while those provinces which are poor, and consequently less well organized, experience considerable difficulty in being able to take advantage of the legislation. This process is reinforcing itself. We begin to understand why rich provinces become more rich, and why poor provinces stay poor.

Senator Carter: In all of this land inventory data that you showed us on the map, are you accumulating geological data of the mineralization of the land as well, or is that being done by some other department?

Mr. Saumier: The C.L.I. itself is not accumulating mineralogical data. However, the geological information system of the Department of Energy, Mines and Resources is capable of handling this data.

Senator Carter: But your department is not interested in the mineralogy?

Mr. Saumier: From the point of view of land use admittedly we are interested. We are more interested in it from the point of view of resources that could be developed in these areas. Obviously in a number of areas mineral resources are paramount.

Senator Grosart: When you referred to ADA a moment ago, were you referring to the Area Development Agency or the incentives act, to ADA or ADIA?

Mr. Saumier: ADA, the Area Development Agency, which does not exist any more as an agency because that part of the Department of Industrys' act which created the Area Development Agency has been repealed.

Senator Grosart: It is ADIA.

Mr. Saumier: No. it is ADA.

Senator Carter: There never was an ADIA.

Senator Grosart: Oh yes.

The Chairman: The legislation authorizing the federal Government to provide financial incentives for designated areas is still operating.

Senator Grosari: But there is an act on the statute book called the Area Development—

Mr. Saumier: Agency.

Senator Grosart: No, the Area Development Incentives Act.

Mr. Saumier: That act is still operative.

Senator Grosart: You were referring to the agency?

Mr. Saumier: The agency itself no longer exists, but the act is still operative.

The Chairman: But the department with its new integration can spend money for this purpose because that act has not been repealed.

Senator Grosart: Does ADIA come under your department?

Mr. Saumier: Yes.

Senator Bourget: ADA and ADIA do not apply to the northern part of Canada?

Mr. Saumier: The Northwest Territories, no.

Senator Bourget: Do you intend to take some interest there?

Mr. Saumier: The legislation makes it clear that we have no mandate in the Northwest Territories. The whole mandate in the Northwest Territories is in the hands of the Department of Northern Affairs and Indian Development.

Senator Bourget: Due to the fact that you now have this experience and a good organization I think it would be a good idea for your department to take some interest in the north, where the people also need some help.

The Chairman: They want to remain small.

Senator Bourget: I did not say that.

The Chairman: Thank you very much, Mr. Saumier and your colleagues. We have been very interested this morning in finding out that at least in one field Canada has been successful due to your work to innovate. It is very refreshing indeed.

Merci beaucoup.

Mr. Saumier: Merci bien, monsieur.

The committee adjourned.

APPENDIX 44

SPECIAL SENATE COMMITTEE ON SCIENCE POLICY

BY THE

DEPARTMENT OF FORESTRY AND RURAL DEVELOPMENT

MARCH 1969

CONTENTS

Page
ural and Rural Development Act (ARDA) 4863 Rural Economic Development (FRED)
and Inventory 4889
Information System 4903
elopment Agency 4924
Program 4939
Development Board 4970
Farm Rehabilitation Act 5009
Program 49. Development Board 49.

Report to

Senate Committee on Scientific Policy

Agricultural and Rural Development Act
Fund for Rural Economic Development

Prepared by

Rural Development Branch
Department of Forestry and Rural Development

March 1969

A

(a) Research Contribution to the ARDA and Fred Programmes

The Acts administered by this group are:

- The Agricultural Rehabilitation and Development Act (ARDA) amended in 1967 as the Agricultural and Rural Development Act.
- The Fund for Rural Economic Development Act (FRED)

The main purpose of ARDA may be seen in the preamble to the Federal-Provincial Rural Development Agreement, April 1, 1965 to March 31, 1970, which states:

"WHEREAS rural areas and rural people are subject to widespread social, technological and economic changes that necessitate adjustments on the part of many rural areas and many rural people;

AND WHEREAS the income level and standards of living of many people in rural areas are unreasonably low;

AND WHEREAS there is a need in Canada for a more effective use of some lands; soil conservation and improvement; and the management, conservation and development of water resources;

....the purpose of the Agricultural Rehabilitation and Development Act is to undertake investigation and research on these needs and to undertake with the Provinces programs and projects for the more effective use of lands; for the conservation and development of soil and water resources in rural areas; and for the development of new opportunities for increased income and employment, and for improving standards of living for rural people;

The purpose of the FRED Act is stated in Section 4(1) of the Act, under the heading, "Comprehensive Rural Development Programs":

- "4. (1) The Minister may, on the recommendation of the Advisory Board and with the approval of the Governor in Council, enter into an agreement with any province providing for
 - (a) the undertaking jointly with the province or any agency thereof of a comprehensive rural development program in a special rural development area; or
 - (b) the payment to the province of contributions in respect of the cost of a comprehensive rural development program in a special rural development area undertaken by the government of the province or any agency thereof."

(b) Importance and Relevance of Research

One of the functions of ARDA is the undertaking of research projects on the particular problems of rural areas. The research functions can be considered in three parts:

- 1. General research. This would include such projects as the map series on economic and social disadvantage in Canada. These projects are not directly related to specific future development projects, but provide necessary general information on particular aspects of the problem of rural development.
 - 2. Research preparation for ARDA projects. This research determines the nature and magnitude of particular problems and assists in finding solutions.
 - 3. Research as part of the planning process under FRED.

 This provides the necessary data for professional
 analysis of the problems in a given area, and allows
 an assessment to be made of the priorities to be
 accorded to action in the different sectors.

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(c) Objectives and General Nature of Research

Research that is directed towards future ARDA and FRED projects has as its objective the definition of the problems involved and the provision of sufficient data to enable professional analysis of the problems to be undertaken.

General research is aimed at the clarification of some problem of national or regional significance such as "The Dairy Industry." Research may be directed towards virtually any social or economic problem that may arise in rural areas.

The objectives of ARDA research are best summed up by quoting from Part I - Research of the ARDA Agreement:

- " 12. The objective of this Part is to enable Canada and the Province to undertake jointly, physical, social and economic <u>research</u> concerning any of the projects or programs under this Agreement. Basic physical and biological research is not considered pertinent to the intent of the Act.
 - 13. Approved projects or programs under this fart shall be selected from any or all of the following categories:
 - (1) surveys, studies and investigations aimed at establishing criteria and priorities for action under ARDA and assisting in the solution of rural problems and to develop programs and projects that qualify for cost-sharing under this Agreement;
 - (2) the formulation of Comprehensive Rural Development Plans;
- (3) pilot action research specifically designed to test new program approaches to the solution of rural problems and the improvement of rural standards of living not allowed for in other sections of this Agreement. Such projects will terminate at an agreed time and participation in them shall not obligate Canada to participate in an extension of the projects thereafter, nor in any additional projects of this type;
 - (4) studies aimed at determining the feasibility of any project aimed at improving the income level or employment opportunities of rural people."

Pre-FRED research is undertaken under Part VI of the ARDA Act and forms a major basis for a FRED plan. viz:

"SPECIAL RURAL DEVELOPMENT AREAS

- 31. The objective of this Part is to carry out a comprehensive rural development program in specially selected rural development areas.
- 32. These areas will be defined by the Provincial Minister and may be agreed to by the Federal Minister, subject to approval by the Governor-in-Council and the Lieutenant Governor-in-Council, as "Special Rural Development Areas".

Such areas warrant a comprehensive co-ordinated approach to economic and social development because they are subject to widespread low income; have major adjustment problems; and have recognized developmental potentials.

- 33. A comprehensive rural development programs involves the following:
- (1) physical, economic, and social studies and investigations necessary to the determination of the development problems and potentials of the area;
- (2) the involvement of local people through the establishment of rural development committees or similar bodies;
- (3) the preparation of comprehensive rural development plans;
- (4) the undertaking of a broad range of projects for the development of the rural development area in conformity with the development plans, to increase income and employment opportunities and raise standards of living as provided below."

Research Methods Employed

Commensurate with the varied nature of the research undertaken by ARDA-FRED, the methods employed have been varied. Methods have included:

social, survey field interviews key informant interviews secondary data analysis

case studies

library research

economic surveys - fields interviews non participant and participant observation

cost benefit analysis

pilot action projects

This is not an exhaustive list but covers the general headings. In some instances specific techniques have been designed to meet the requirements of the task.

In the case of ARDA-FRED it is not possible to define the internal structure of the unit directing research as the research is carried out by a wide range of people and is not the responsibility of any particular unit. In the case of FRED planning it is primarily a provincial responsibility, and general research is usually undertaken on a contractual basis. All cost-shared research is initiated and implemented by provincial ARDAs.

(d) Detailed account of Research Expenditures Expenditures for ARDA-FRED research are shown in Tables 1,2 and 3.

Table 1

Research Expenditures under ARDA to March 31, 1968

	No	of Projec	ets Fed. Expenditures
	110.	01 110,160	red. Expenditures
A. 100% Federal Expenditure			
1. First Agreement:			
a) Specific		95	1,883,180
NOTED COME NOW DESIGNATION			34,552
b) General		46	889,634
		141	2,772,814
2. Second Agreement:			
a) Specific		62	2,347,004
b) General		60	1,092,224
		122	3,439,228
			225,734
Total 100% Federal		263	6,212,042
B. Shared Cost Programs			
B. Shared Cost Flograms			
1. First Agreement:		125	3,260,148
2. Second Agreement		180	7,732,059
Total 50% Federal		305	10,992,207

<u>Includes</u>: Research for the purposes of FRED Planning is included in the above breakdown. A more detailed breakdown of these particular expenditures is shown in Tables 2 and 3 by FRED Agreements signed as of 31 March 1969.

Excludes: Expenditures for research under the Canada Land Inventory.

Table 2

Research Expenditures on FRED Planning, First ANDA Agreement

April 1962 - 31 March 1965

		% Federal	mber of	Federal Expenditures
Prince Edward Island		50	0	0
		100	0	office O
North East New Brunswic	k	50	0	Invested (d
		100	3	117,507
Mactaquac New Brunswick		50	9	91,017
		100	1	21,388
Gaspe Quebec		50	6	1,312,024
		100	1	8,000
Interlake Manitoba		50	3	105,801
		100	13	308,378
TOTAL FIRST AGREEMENT			36	1,964,115

nothing: Herearch for the purroses of FARE Flanning is included to the conditions bove breakdown. A more detailed breakdown of these particular expanditures above in Tables 2 and 3 by FREE Agreements aigned as of 31 March 1969.

Table 3.

Research Expenditures on FRED Planning, Second ARDA Agreement

April 1965 - 31 March 1968

	% Federal	Number of Projects	Federal Expenditures
Prince Edward Island	50	1	11,936
	100	3	701,356
North East New Brunswick	50	3	42,552
	100	3	143,961
Mactaquac	50	2	8,992
	100	0	0
Gaspe Quebec	50	17	1,679,927
	100	1	5,000
Interlake Manitoba	50	6	225,025
	100	6	213,777
TOTAL SECOND AGREEMENT		42	3,032,526

The Branch responsible for ARDA-FRED, inasmuch as it has no formal research unit has no research personnel. None of the Branch staff are assigned full time responsibility for research.

(e) Specific Research

Attached are resumes of two ARDA research projects. Although one might be justified in saying that most ARDA research projects are important within their own contexts, it would be impossible to say that any one research project is characteristic of ARDA research. Given the variety, we have chosen to append two examples which perhaps set outside limits for the work done.

Review of ARDA Research Report 1016

by K. B. Cooke August 10, 1966.

1. Identifying Information

- 1. ARDA Research Project Number 1016
- 2. Title: Cat Harbour: a Newfoundland Fishing Settlement
- 3. Author: James C. Faris
- 4. Contract with the Institute of Social and Economic Research,
 Memorial University of Newfoundland, St. John's, Newfoundland.
 (Newfoundland Social and Economic Study No. 3)
- Location of Study: (a) Newfoundland, (b) Census Division 8,
 (c) Village of Cat Harbour.

Format: Multilithed (pre-publication reproduction for limited circulation. Original Ph.D. thesis on file at Memorial University.)

XI and 249 pages Maps, charts, figures, tables (plates in original) appendices and bibliography.

II. Relation of Report to Research Project Proposal

1. Summary of purpose of research.

"This study is an attempt to describe and explain a rural fishing community on the Northeast coast of Newfoundland..." as pointed out in both the proposal and the report, very little is known of the sociological background of community life in Newfoundland and there is almost no documentation of the outports in terms of historical context, traditions, beliefs and expectations of the inhabitants, ecology and social life. This research is part of several companion studies, which, when taken together will provide such documentation for various types of Newfoundland outports. The Institute of Social and Economic Research at Memorial "has developed as the first stage in its sociological research, a program of basic descriptive studies of different types of Newfoundland communities..." selected on the basis of predominant economic base (e.g. agricultural, logging, or fishing), religious denomination and pupulation size and rate of growth or decline.

In addition to the objectives of providing background materal of a sociological nature, it is intended that these studies will provide valuable information in relation to action programs such as the relocation and centralization of communities in Newfoundland. The proposal notes

Review ARDA 1016

KBC: 10 August 1966 - 2

that the resettlement program at Markham is but one example of such a scheme, prepared and implemented at considerable cost, being entirely frustrated by social factors unrelated to the immediate issues.

- 2. The project proposal as approved by ARDA was adequate with respect to specification of terms of reference, statement of problem and qualifications of personnel. Copy of "outline and purpose of study" is on file.
- 3. The Report clearly states the purpose of the research on which it is based. See point II-1 above.
- 4. The objectives as stated in the proposal are met by the report and the research conducted. The obligations under the contract have been adequately fulfilled.

III. Resume of research as presented in Report

1. Part I - The Setting, deals with the history and the ecology of the Community, pp. 6-62, and describes both the natural and the social setting. Chapter II - History and Settlement, places Cat Harbour and its pattern of settlement in the context of the history of the Newfoundland outports. Cat Harbour was well-established by the mid-1700s. Permanent settlement in Newfoundland was legally prohibited for almost 200 years; up until 1824, and the author sees this as contributing to a settlement pattern that choose rather than avoided, inaccessible spots on the coastline. There is much folklore to the effect that the settlers on the "french-shore" where fugitives from justice and deserters from West Country (England) ships and that settlers deliberately avoided any harbours suitable for vessels bigger than a dory.

Cat Harbour was originally bi-denominational but mass emigration of the Roman Catholic families in the second half of the 19th century left it Protestant. Remanents of Protestant/Catholic - English/Irish antagonisms still persist.

The isolation of settlement has no doubt contributed to 19th century type of living existing in many outports in 1966. The current attitudes of the inhabitants towards strangers are traditional and there is historical president for histility of strangers being the acceptable and "right" outlook,

Chapter III - the Natural Setting, discusses various aspects of the sea, the land, and the elements. Each of these sections looks at these aspects in a functional perspective of their role in the livings of the Cat Harbour inhabitant. The material is well-presented and documented.

KBC: 10 August 1966 - 3

Chapter IV - the social setting is subdivided into three sections:
A-demography, B-activity cycle and C-the outside world. The pupulation of
Cat Harbour was 285 persons (149 males and 136 females) in April 1964.
Although precise pupulation trends are difficult to ascertain, the actual
rate of pupulation increase was likely greatest between 1900 and 1935. The
present birth rate is high but cannot compete with the rate of out-migration.
Cat Harbour today is a dying community. Government centralization policies
as well as expanded educational and training programs for the youth are
hastening the process. Funds are presently availble for relocation of
families to the designated relocation centre of Lumsden South. Details
of the number of families, "gardens" and housing facilities are given.

In duscussing the "activity cycle", the author notes, "one measure of the particular Cat Harbour adjustment of the environment is the tremendous seasonal adjustment of activities." The regular cycle of "the voyage preparation and seal fishery, the voyage, the recupe (sic) and preparation for winter," and winter celebrations are outlined. One point may be noted of importance from the point of view of the sociologist: the lock of a functional differentiation (or specialization) of labour. To a very large extent, occupation, family, residence and social living are geographically coterminous. While there is a distinction between what a man is expected to do and "womens work," each man is almost of a jack-of-all trades. Specialized services aside from those connected with marketing of fish and selling supplies are virtually non-existent.

The line of demarcation between Cat Harbour and the outside world presses in closely around the community. Maps are included showing the "outside" lines for "local" services and for the wider socio-economic area which encompasses the "universe" for Cat Harbour with the exception of the sea and St. John's. This is a very limited world, circumscribed until very recently by lack of transportation facilities, a traditional distrust of "outsiders" and a pattern of intra-community-focused social interaction.

Part II - Territory, Kin and Crew, focuses on the social interaction patterns that have emerged in rolation to the circumstances described in Part I, regarding residential arrangements, kinship concepts and economic units and the fishing crews. Chapter V deals with residence and describes (subsection A - domestic structure; houses and households) the variations in dwelling arrangements. There are three distinguishable types of households: (1) the "elementary" family comprising man, wife and unmarried children (74 per cent of households); (2) type (1) plus one or

Review ARDA 1016

KBC: 10 August 1966 - 4

more kinsmen, e.g. a single surviving parent (21 per cent); and (3) two "elementary" families under one roof but comprising two separate comsumption units (5 per cent).

Houses are inheritable property usually going to the youngest son. Except in exceptional circumstances, women do not inherit property. The land tenure system (discussed in subsection B) is somewhat complicated. Much of the land, except that fronting on the ocean, is not owned by deed but by possession. Fragmentation of holdings permits sons to acquire parts of father's land.

Chapter VI - kinship deals in detail with such arrangements. The focus is on the patrilinial family and to a considerable extent women in general and the wife's family (unless patrilinially related to local family) are regarded as outsiders. The local usage and connotation of the various terms -- "crowd," "clan," "cunny kin," "fork kin," -- are discussed.

Under the heading, sex and age, the report notes the local attitude-set which makes a marked distinction between men and women. Women are on the whole regarded as "strangers" and may be witches. Boats in the outport are referred to as "he" since dependable things are male and those of female gender are undependable. Age does not confer increased prestige. In local parlance, different age groups may be denoted by the term "race," and each age group or "race" has a set of proper-behavious expectations relating to it.

Marriage to local women is to be preferred but a majority of the wives come from outside Cat Harbour. This is partly related to the fact of intra-kin marriages being prohibited and partly to the increasingly great out-migration of young girls to St. John's and elsewhere. Cat Harbour is a "man's world" and opportunity for these girls lies elsewhere. Divorce is essentially unheard of in this outport and "unhappy" marriages are solved by impersonalization of relations between spouses. "pre-marital sexual relations are universal and accepted, in spite (sic) of the recent endeavours by the clergy (page 114."

Chapter VII - The Fishing Crew discusses the "ideal" arrangement and the actualities in practice. This is mainly in terms of who fishes with whom and there is little description of size of boat, how many men are required by such a boat and other "exigencies of the situation".

Part III - Dynamics of Interaction: the Cat Harbour moral community begins in Chapter VII with the following paragraph.

Review ARDA 1016 KBC: 10 August 1966 - 5

Thus far I have discussed the Cat Harbour historical, ecological and social setting; and its implications for discernible patterns of organisation i.e., the way people live together, work together, and view their physical selationships -- the frameworks of interaction. It has been my argument that ecological factors are very important in understanding these patterns. But this is not all, for in the local idioms of interaction, the local patterns of relationships, there are dynamic elements and principles which can be abstracted to illustrate how relationships are made <u>continually</u> operative -- how interaction is <u>maintained</u>.

These dynamics of interaction will constitute the main topic of discussion in Part III.

This review will not attempt to summarize the eighty odd pages comprising Chapters: VIII - The Moral Order, (A) Leadership and Authority, and (B) Sanctions and Conformity; IX - Economics, (A) the Voyage, shares and income returns, (B) Mercantile Capitalism, the traditional outport economics of debt, credit and obligation; X - Religion, (A) The Church and the Kingdon Hall-Outport Christianity and (B) Causality and the Supernatural; XI -The Structure of Verbal Communication; and XII - Occasions, (A) funerals and (B) The "Times (occasions for celebration". A very interesting picture is presented herein and those points considered by the reviewer to be particularly relevant to programs under ARDA will be noted below re assessment of findings and recommendations.

IV. Evaluation of Report and Research

1. Presentation

Presentation of the material in the report is good and the report is well written. Because of technical difficulties in reproduction, one map, the charts, several figures and the plates are not contained herein. They are available in the original thesis (Ph.D. on file Memoral University Library). Since this is regarded as a "pre-publication" edition such a procedure is excusable. Some of the plates obviously would have facilitated individual identification of persons involved in the study and would not be included in the published form in any event.

The report is not concise but I am not at all sure this would be a desirable characteristic. However, if the report is to be published the degree to which the report is cut will depend on the intended audience. For the ethnographer who wishes to read an ethnographic account, it may well be that very little can be omitted. A good deal of the detail that the ethnographer may want, does little to help the reader who wants a

Review ARDA 1016

KBC: 10 August 1966 - 6

description and analysis of a type of community living with which many of us are totally unfamiliar.

Table format could be improved. Some of the tables are difficult to read and tend to merge with the text.

If the report is to be published for a "lay" audience, unfamiliar technical terms should be changed or definitions provided.

2. Methodological considerations.

As noted in the project proposal, the ethnological approach used in this research involved the participant observation by a graduate fellow who lived in the community of Cat Harbour for one year. In addition, various documents were consulted in relation to background, historical context, local ecological factors, and activities of various organizations. Inasmuch as the situation portrayed — that existing in the outport — is a bit "foreign" to most of us as a 20th century way of living, the description of a fishery-oriented outport provided by this approach, is a major contribution. The skilled participant observation of a trained ethnographer is one of the few ways in which an accurate portrait may be obtained. In short, the method used was suitable to research done, documentation is adequate and bibliography may be helpful in other contexts as well as the present one.

3. Assessment of findings and recommendations.

Strictly speaking, there are no recommendations contained in this report. This is in keeping with the objectives of the research. However, in assessing the findings there are several implications that may be viewed in relation to planned or proposed action programs (e.g. relocation and resettlement of Newfoundland outports). This review will not attempt to cover all these but to highlight those that in the reviewer's opinion are most relevant. These are areas to which a good deal more attention should be given than is possible here.

A. The prevailing communication and social process patterns in Cat Harbour may be characterized as "primary" in distinction to secondary patterns occurring in industrialized areas. For example, one speaks ones message when one meets another (or seeks him out) in Cat Harbour — in Toronto, for the same message, one telephones or writes a letter. The inhabitants of this and likely most other outports have not experience with secondary modes of communication and social process. This is a "social fact" that probably should be taken into account in relocating these people. The youth who migrate out of such outports learn the hard way (there is a lovely story about a charming young secretary who followed her native Newfoundland custom in Montreal and said a cheerful hello to all she met as she walked the three blocks each morning to work and when coming home

Review ARDA 1016 KBC: 10 August 1966 - 7

at night. The results were totally incongruent as far as her expectations were concerned), but it may be that the obvious will have to be dealt with more explicitly particularly when relocation of older persons within Newfoundland is involved. The combining of several outports into one community will increase the quantity of interaction and the numbers of people with whom one has to interact to the point where continuation of solely primary modes of communication and social interaction may produce frustration, hostility, etc., rather than the expected results.

- B. A related area of life in Cat Harbour is the general lack of functional differentiation and specialization or division of labour. This is in direct contrast to the increasing trend in industrialized areas towards specialization and division of labour. Again, the residents of such an area are illequippped in terms of past experience, social expectations and established habit patterns. They are, in a sense, living a life no longer characteristic of Canada as a whole.
- C. The prevailing notions and expectations re leadership roles and the accepted patterns of decision-making may hamper the adjustment of these people to modern living. The author notes (pp. 132-3) the reluctance of Cat Harbour residents to accept formal leadership.

Leadership and exercise of authority involve taking decisions which may be binding on other, and in Cat Harbour anything which in this overt way infringes on another is considered aggression and a serious breach (of expected behaviour). . . .

In the hierarchical structure imposed on the community by outside institutions, such as the officers of the Church or the Federation of Fishermen Governing Committee, candidates for positions are never forthcoming and once a man is elected to such a position, his tenure is likely to be for life. Making decisions which may be unpopular is certainly one factor inhibiting office holders, but simply making any decisions affecting others is difficult in the traditions of the Cat Harbour moral community.

This pattern is documented in almost all contexts of Cat Harbour living. If this pattern transfers with relocation, it may raise many barriers to relocation, adjustment, rehabilitation as well as to more specific situations such as establishing ARDA rural development committees. It might be noted that other evidence (observation of reviewer and others) suggests this tendency is not only recognized by provincial government officials and others in positions of authority in St. John's but may even be viewed as the ideal situation.

Review ARDA 1016

KBC: 10 August 1966 - 8

D. The report also notes that change is occuring in many aspects of outport life. For instance, the role of the Church is changing; that of the merchant whose role is being forced to change with the passing of mercantile capitalism in the larger society; the role of women, both in the home and in relation to occupation. The implications here need further analysis and this report will be useful for background.

V. General Comments of Reviewer

1. This report is suitable for publication as an academic paper. I do not recommend that it is one which we should publish primarily because it is a "scientific paper" and should be issued as such for those persons interested. There is little of this kind of material available particularly for Newfoundland and either the Author or the Institute should be encouraged to publish it. One might note in passing that although the editorial and typing services provided at Memorial has improved (over the quality of earlier reports received), there are wonderful idiosyncrasies in spelling, punctuation, etc.

I am sending a copy of this review to Dr. Robert Paine at the Institute of Social and Economic Research unless you have any objections to this procedure.

2. There is no necessity to refer this report to other disciplines for review unless it is desired to have the evaluation of a professional in the field of ethnography or social anthropology. For ARDA's purposes, this would be nice to have in terms of long run perspective re research standards per academic discipline but it does not seem necessary to me at this time.

I do recommend that copies be forwarded or called to the attention (copies may be obtained by writing directly to the Institute) of each Department of Sociology in Canadian Universities, to the federal departments or agencies having direct or indirect interest in this kind of research and to such groups as the Canadian Centre for Community Studies, Canadian Council on Urban and Regional Research, Canadian Welfare Council, Atlantic Provinces Research Board, and so forth. There is no point in our duplicating distribution already made by the Institute at Memorial, I am rather suggesting that we supplement it - particularly with respect to such agencies as the Atlantic Development Board (copy sent to AI Crerar), ADA and Manpower as well as Fisheries.

Science Policy

"Summary Report on Pilot Research Region, Northern New Brunswick" ANDA 4022, 1965.

CONTENTS

INTRODUCTION	Page
INTRODUCTION	rage
The Research Region	2
Organization of the Report	3
	3
Objectives of the Research Program	4
Personnel	7
r ersonner	1
Proxiders for fiverilated that Production	
SECTION ONE	
A DEVELOPMENT PROGRAM FOR THE REGION	
CHAPTER 1	
ANALYSIS OF THE REGIONAL INCOME AND EMPLOYMENT PROBLEM	
Definition of the Problem	11
Origin of the Problem	11
The Impact of Recent Improvements in the Economic and Institutional Environments	12
CHAPTER 2 THE MAIN COMPONENTS OF THE PROPOSED REGIONAL DEVELOPMENT PROGRAM	
Objectives	14
A General Educational and Training Program	14
A Program to Accelerate Labour Force Mobility	14
A Program of Population Agglomeration and Resettlement	15
A Program to Coordinate Regional Development with the Developments at Belledune	15
A Program for Establishing and Expanding Labour - Intensive Rural Enterprises	15
Comments and Recommendations Concerning Institutional Arrangements	16
Opportunities and Prerequisites for Development in the Primary Resource - Based Enterprises	17
An Agricultural Development Program	18
A Development Program for Freehold Forest Resources	20
A Development Program for the Commercial Inshore Fishery	21
A Program to Develop Processing Industries Based on Agricultural Resources	23
Possible Road and Airport Developments	23

Contents

SECTION TWO

	SUMMARY OF THE TECHNICAL VOLUMES	Page
CH.	APTER 1	, eg
FA	RM AND RURAL NON-FARM ENTERPRISES	
	Introduction	2
	Soil Resources and Land Use	2
	Farm and Rural Non-Farm Population	2
	Economic Studies of Commercial Farms	2
	The Rural Non-Farm Enterprises	2
	The Agricultural Situation Summarized	30
	Dairy Farming and the Dairy Industry	3
	Beef Cattle Possibilities	3.
	The Place of Community Pastures in the	19
	Agriculture of Northern New Brunswick	3.
	Prospects for Expanding Hog Production	3.
	Prospects for Expanding Poultry Production	3.
	Small Grains: Production and Prospects	3:
	Expansion of Blueberry Production	3.
	Prospects for Producing and Processing	,
	Small Fruits and Vegetables	33
	Soil and Water Conservation Projects	34
	Marketing Organization	34
	Agricultural Advisory Services	34
	Management Studies and Record Keeping	34
	management staates and Necora Neeping	24
CH	APTER 2	
	REST RESOURCES, FOREST UTILIZATION	
INA	D FOREST DEVELOPMENT	
	Introduction	30
	Growing Stock	30
	Size of Holding	30
	Production and Consumption of Forest Products	30
	Logging Methods, Management and Employment	3
	Pulpwood Supply and Demand	37
	Costs and Returns in Small-Scale Forest Operations	37
	Investment Aspects of Freehold Forest Operations	38
	Assessment of Freehold Timberlands	38
	Administrative and Institutional Arrangements for Forest Development • • •	39
	Crown Forest Development Corporation: A Pilot	grì
	Action Program for Beresford Parish	41
	Forest Inventory and Feasibility Studies	1 43

V

Science Policy

Contents					Page
CHAPTER 3 ECONOMIC ANALYSIS OF THE C	COMMERCIAL INSHORE FISHERY				
Purpose and Scope	the contract of the contract and the contract			e house	44
Marine Resources Available t					44
Lobster Enterprises in the Re	egion				45
Price Elasticity of Demand for	or Lobster				45
Bionomic Equilibrium of the	Fishing Industry		Strate.	TO TO	45
Productivity of Lobster Fisher	ery Resources in the Research Region		-		46
Factors Required in the Prod	luctive Process				46
Conclusions			a line	Sandi I	47
Recommendations	nutralimated frames unineging	H W	STATE OF	agring.	48
CHAPTER 4	WIENER AND THE LABOUR BORDE				
CHARACTERISTICS OF EMPLOY	YMENT AND THE LABOUR FORCE				
Introduction	with the state of	1.1		io:	51
Industry Divisions in the Lab		The little	-100.		51
Participation in the Labour F		ry · (Lis)		10 .0	51
		*(51)		-	52
Labour Force Mobility		d2*10 3	1000	1015-0	53
Unemployment Insurance and		out be	1 30.	ingle :	53
Conclusions and Recommende	ations	olev a	10 20	100 011	54
be directly concerned with formu-					
CHAPTER 5 SOCIAL CHARACTERISTICS OF	THE REGION'S POPULATION				
Introduction	or contained and another the			18112d	56
Language	March (egle) . Iproper in section :				56
Household Size	or introductive opinions in security	, long			56
Age Structure of the Populati	on	100			56
Trends in Population Growth	Note Thempiets and other provinces	. 9		- 100	57
Educational Achievement -	ten gisetan Colego al viana water atte			5605	57
Social Assistance Dependence	cy	Bright.	. 72.	wife ii	58
CHAPTER 6 ADDITIONAL DEVELOPMENT F AND INSTITUTIONAL ARRANG					
Primary Products Marketing a	and Marketina Power	prizve	onn a	ldman	60
Real Estate and Personal Pro	The state of the s	1000	Sign	To the	61
Prospects for Expanding the	of the template and a families the families of the latest and the	SHEET,	1 1		62
The second secon	ies Based on Agricultural Resources	THE REAL PROPERTY.		NE STATE	62
Road Developments in the Re		Charles III	W YV		62
Airport Facilities	Skron.	ALKE		3	63
	tion Oakostumition	100 111	Web!	201	63
Resettlement and Agglomerat	the second state of the se	and the	OIN S	Harris	64
The Economic Impact of the	Developments at Betteaune	TENTO U		THE PARTY	04

INTRODUCTION

This report presents the findings of a research program carried out in northern New Brunswick by Lockwood Survey Corporation Limited (successors to Hunting Survey Corporation Limited) for the Canada Department of Forestry, Agricultural Rehabilitation and Development Administration. The study was authorized in an agreement made on January 8, 1964 by the Minister of Agriculture and the corporation.

THE RESEARCH REGION

The research region comprises Gloucester County, Addington, Dalhousie, Balmoral, Colborne and Durham parishes of Restigouche County, and Alnwick Parish of Northumberland County (see Figure 1). This area had been designated a Rural Development Pilot Research Region and, more recently, has been designated a Rural Development Area for purposes of carrying out action programs.

ORGANIZATION OF THE REPORT

The results of our investigations are presented in seven volumes. The present volume contains a statement of the scope and objectives of the research program and a summary of the program's findings and recommendations; it has been prepared with a fairly wide distribution in mind. The other six volumes constitute the technical report and are intended for more limited distribution, particularly to those persons and agencies that will be directly concerned with formulating action programs for rehabilitation and development in the region. A single volume is devoted to each of the following subjects; agriculture, forest development, the inshore fishery, employment, characteristics of the region's population, and additional development possibilities.

OBJECTIVES OF THE RESEARCH PROGRAM

The research program had one main purpose, namely to provide information that policymakers, planners, and public and private investors require in order to make intelligent decisions
concerning the promotion of balanced and orderly economic growth and social development. More
specifically, the program had several objectives, which may be summarized under the following
headings.

- 1. To assemble and evaluate the existing information on natural resources and human activities and, where necessary, to supplement it by field studies.
- To ascertain, by special field studies, the costs, returns, living levels, and other features of
 (a) enterprises in farming, fishing and forestry and (b) rural non-farm enterprises and households
 not primarily engaged in these three activities.
- 3. To determine the inter-regional competitive position of various types of primary resource-

based enterprises.

- 4. To assess existing policies and institutional arrangements as they affect resource use and and other human activities.
- To identify the opportunities for promoting orderly economic growth and for increasing incomes and employment in the region.
- 6. To specify the investments, incentives, training programs, and new administrative and institutional arrangements that will help to ensure that these growth opportunities are taken up.

If Canada is to achieve its economic growth and regional growth objectives, it must find solutions to the chronic low-income problems of areas such as northern New Brunswick. There is growing recognition that our society is under an obligation to provide at least a minimum income or a minimum level of living for all its members. We recognize too that society has an obligation to provide equality of economic opportunity for its citizens, no matter where they reside. To provide equality of economic opportunity and at least a minimum level of income for each individual and each family would ensure that the misfortunes of the parents are not visited on their children. This would in turn ensure that poverty itself is not self-perpetuating. In our society such a program is not philanthropy; it is the cornerstone of economic and social progress.

SCOPE AND METHODOLOGY

General Considerations

For obvious reasons, our research effort was focussed mainly on conditions and prospects in the rural development pilot research region. However, for certain insights we were obliged to look beyond the region. In making comparative analyses, in assessing the region's competitive advantages and disadvantages in certain primary resource-using enterprises, we have resorted to data pertaining to other parts of New Brunswick and other provinces in Canada. Moreover, it became evident during the early stages of our study that resource use and development prospects in the region have been strongly influenced by existing government policies and institutional arrangements of provincial or national scope. We have examined the role played by those policies and arrangements that have special relevance to the research region, and we make no apology for having done so; in fact we would argue that boldness in creating new administrative and institutional arrangements is a prerequisite for successful rehabilitation and development programs in disadvantaged regions such as that in northern New Brunswick.

A detailed investigation of the probable ramifications of the new industrial developments at Belledune was beyond the scope of the present study. Indeed, the full magnitude of these developments was not apparent at the time we carried out our field survey program. Belledune appears destined to emerge as the major population growth node and industrial centre of the rural development area. The developments there will have a tremendous direct and indirect impact on resource use and people in the area. It is exceedingly important that the Belledune developments be guided and supported in such a way that they make their maximum possible contribution to resolving the problems of the area.

We have one further point to make. The recommendations resulting from our study are concerned with a wide range of development programs, including comprehensive programs for education, training, and labour force mobility, the formulation and application of administrative arrangements, and the undertaking of specific projects. In framing these recommendations, we have deliberately chosen not to specify the agency or agencies that should be responsible for implementation. We believe that the institutional arrangements and policies that have been created or appear likely to be created are sufficiently comprehensive in scope and range to accommodate all of our recommendations.

Physical Resource Studies

The mapping of physical resources and existing resource uses did not constitute a major part of the research program. Most of this information already existed in published or manuscript form and was made available for our use. Geological maps and reports were obtained from the Geological Survey of Canada and the New Brunswick Department of Lands and Mines. The latter department also supplies detailed maps showing the distribution of freehold and provincial Crown lands. The mapping of soils and soil capability was carried out during 1963-1964 as a joint program by officers of the Canada Department of Agriculture and the New Brunswick Department of Agriculture. The Geographical Branch, Department of Mines and Technical Surveys, made available manuscript land use mapping on a photo-mosaic base. The provincial forest inventory provided many useful data for our forestry studies. However, its results are presented in statistical rather than map form and, accordingly, we considered it necessary to carry out a modest forest cover mapping program of our own.

Agricultural Studies

The main objectives of our agricultural studies were 1) to define the potentialities for growth in the commercial farming sector, 2) to identify the opportunities for introducing labour-intensive agricultural activities that could provide employment for rural non-farm people, and 3) to suggest institutional arrangements appropriate for promoting these types of development.

In order to achieve these research objectives we carried out a number of non-economic and economic studies. The two main non-economic studies were concerned with describing the physical resource base and its existing use and with defining the importance of farming in human terms. Our economic studies were concerned with determining the resources available to farmers, defining the living levels and incomes of farmers, comparing the inputs, outputs, costs and returns of farm enterprises elsewhere, and determining the effects of existing institutional arrangements on agricultural resource use.

Forestry Studies

The main objectives of our forestry studies were 1) to provide the information that policy-makers, planners, and investors require in order to make intelligent decisions concerning orderly development in the forest resource sector of the economy, and 2) to evaluate the various kinds of new institutional arrangements that would facilitate such development.

The major emphasis in the study was placed on determining the prospects for development

of the freehold forests of the region and for increasing the incomes of freehold forest users. Company operations on Crown lands were not examined in detail; indeed, we have assumed that rationalization of these operations and adjustments in the labour force that they employ will continue to take place mainly as policy considerations and economic forces dictate.

In achieving our study objectives in so far as freehold forest operations are concerned, we carried out studies of growing stock, holding size, logging methods, forest management, employment, pulpwood supply and demand, costs and returns involved in small-scale forest operations, investment prospects, assessment, and institutional arrangements.

Studies of the Commercial Inshore Fishery

The objective of the fisheries study was to examine the utilization of the fishery resources in order to evaluate the means by which the incomes of fishermen can be raised. For reasons explained in the text, attention was focussed almost exclusively on the inshore fishery. In achieving our stated objective, we defined the marine resource, conducted a field survey to determine the incomes, costs and returns, and other features of inshore fishery enterprises, carried out a production function study to determine the relationship between the inputs of the various factors of production and the resulting output of products, and evaluated existing regulations governing the inshore fishery.

Study of the Rural Non-Farm Group

Since rural non-farm people greatly outnumber the commercial farm population in the research region, great concern must rest on the prospects that these people have for playing a productive role in regional economic life. A field survey involving questionnaire procedures was carried out in order to determine the economic status and social attributes of this group.

Labour Force and Human Resource Studies

Our labour force and human resource studies have lead us to make major recommendations concerning investments in education, training, and mobility. In developing these recommendations we relied heavily on unpublished data supplied by the Dominion Bureau of Statistics and the Canada Department of Labour. We also made extensive use of case records kept at National Employment Service offices and the headquarters office of the New Brunswick Department of Youth and Welfare, Social Assistance Division.

Economic Studies

Our major research effort was applied to investigating the economic aspects of the various types and scales of enterprises in the region. The objectives of these studies are summarized earlier in this introduction and need not be re-stated here. Our approach to resolving the data problems of the economic studies included the use of such methods as formal sampling, field surveys, case studies and interviews, as well as study of every relevant secondary source of data. The formal data assembled in the field were subjected to analysis using computer programming

techniques, as described in Parts I and III of our technical report.

In our economic studies, we may appear to be concentrating on improvements in resource use, placing special emphasis on agriculture, forestry and inshore fishing. However, we would point out that we are primarily interested in developing a plan for using resources in such a manner that the people of the region obtain increased income, that they share in a more equitable fashion the income available, and that they are given an opportunity to achieve the highest income possible commensumte with their ability.

Traditionally, in their analysis of natural resource industries, economists have tended to emphasize resource efficiency criteria; to a certain extent they have ignored income distributional criteria and effects. If they discussed income distribution at all, this was done in order to indicate how improved resource allocation affected income distribution.

In most studies, the resource efficiency approach was warranted. However, we did not feel that it was the most appropriate approach for this particular study. Economists are now increasingly addressing themselves to low-income problems generally and to the problems of chronically depressed areas in particular; in our own study, we have taken into account not only efficiency criteria but also income distribution criteria.

PERSONNEL

Four staff members of Lockwood Survey Corporation Limited took part in the survey: I.S. Fraser (Project Manager, report editor, labour force and human resource studies), D. H. Recter (studies in agricultural economics), J. R. T. Andrews (forestry studies), and G. S. Groves (study of the commercial inshore fishery). Professor C. B. Haver, Department of Economics, Macdonald College, McGill University, was retained as consultant in resource economics for the duration of the project. D. Lingeman, K.J. Joseph and J.W.B. Urquhart carried out short-term data compilation assignments.

REPORT ON SCIENTIFIC ACTIVITIES

Prepared by

CANADA LAND INVENTORY

DEPARTMENT OF FORESTRY AND RURAL DEVELOPMENT

August 20, 1938, recommender of for the property of the state of the s

THE SENATE COMMITTEE ON SCIENTIFIC POLICY

March 1969

SCIENTIFIC RESEARCH ACTIVITIES as carried out by the CANADA LAND INVENTORY

Authority of Mandate:

The Canada Land Inventory was established under the Agricultural Rehabilitation and Development Act assented to June 22, 1961, and amended to Agricultural and Rural Development Act and assented to May 12, 1966.

Under Part 2, Section (2), of the revised Act the authority is stated as follows:

2.(2) The Minister may cause to be prepared and undertaken, directly or in co-operation with the government of any province or any agency thereof, programmes of research and investigation respecting the more effective use and economic development of rural lands in that province.

Historical Background:

1. The Special Committee of the Senate on Land Use in Canada, No. 4,
August 20, 1958, recommended as follows:

That it be called to the attention of the proper authorities the need of a systematic land use survey based upon appropriate factors to provide for an economic classification of the land according to its suitability.

This recommendation was restated in Proceeding No. 12, July 8, 1959.

2. The Resources for Tomorrow Conference, Montreal, 1961. Each of the Agriculture, Forestry, Wildlife and Recreation Workships recommended Land capability studies which resulted in a joint statement by research coordinators as follows:

The Conference affirmed the following needs:

- To complete a country-wide assessment of resourceo
 supplies which may be set against long-term assessment
 of resource needs.
 - 2. To make possible systematic studies of:
 - (a) Problems of resource management and development in all fields; and
- (b) Economic potentials and social needs in all regions.

Formal federal-provincial consideration of the Canada Land Inventory took place in November 1963 when a Memorandum on the subject was presented to the Canadian Council of Resource Ministers. This Memorandum put forward by the ARDA Administration stated the need for the Inventory, outlined its proposed scope and presented recommendations for a division of responsibilities. The Canadian Council of Resource Ministers approved the proposal in principle and recommended that the Inventory proceed on the basis of working agreements between individual provinces and the ARDA Administration.

On October 3, 1963, the Government of Canada approved the undertaking, under ARDA, of this comprehensive land resource inventory.

Relevance and Importance of Research Activities to the Program:

Very early in the ARDA program it became obvious that rural development could only be achieved if land use rationalization were achieved. This would involve consolidation of farms located on high capability soils into viable units, but equally important the conversion of submarginal agricultural lands to alternative uses for which they are physically suited and from which positive economic returns could reasonably be expected. In the absence of objective information with which to

classify soils as to their capability for agriculture it was decided, in association with provinces, to map the soil capability for agriculture of the settled areas of Canada, approximately one million square miles. In order to provide objective information on the best alternative uses it became necessary to map the same areas for their capability for forestry, for recreation and for wildlife (ungulates and waterfowl). To relate use to capability for planning purposes the mapping of present land use became necessary.

In view of the absence of definite development regions at that time and because of the value attached to the data by the provinces, mapping of the settled area of Canada was undertaken. (See attached map.)

From a number of alternatives it was decided, if possible, to have the provinces accept responsibility for the program and ARDA would finance the additional costs of each province. Co-ordination of each program was arranged with the responsible federal departments or agencies and the necessary positions, as well as additional costs, were guaranteed. In addition, each federal department involved in the program seconded senior co-ordinators to ARDA for the duration of the Inventory.

National classification systems for each sector were drawn up,
discussed with and agreed to by all provinces and pilot scale projects
were carried out to ensure feasibility of the systems.

As a compromise with the provinces two scales of maps are prepared - one, in fact, being a generalization of the other. The scale for planning is 1:50,000 and these maps are generalized to the 1:250,000 for publication. Examples of the published maps are included as part of the submission.

The program will result in about 20,000 maps at the larger scale and 1,000 at the smaller scale. In order to make this mass of data readily available and manageable for multiple comparisons, it became necessary to design a computerized systems to convert mapped date into digitized information on tape, store the information, carry out multiple comparisons, and output information in form and for regions required. The Geo-Information System, unique in the world, was developed for this purpose. The Geo-Information System will be the subject of a separate submission and, thus, the only purpose here is to place it in context with the Canada Land Inventory program.

As the date became available it was obvious that it would have to be tested in land use planning projects in order to assess its adequacy for the purpose for which it was designed. Thus land use planning pilot projects have been financed in each province that wished to carry one out. To date British Columbia, Nova Scotia and Prince Edward Island have initiated projects and in 1969 projects are expected in New Brunswick, Quebec, Manitoba and Alberta.

In summary the program consists of:

- 1. Land Capability for Agriculture
- 2. Land Capability for Forestry
- 3. Land Capability for Recreation
- 4. Land Capability for Wildlife (Ungulates and Waterfowl)
- 5. Present Land Use
- 6. Geo-Information System
- 7. Land Use Planning
- 8. Economic Studies to relate feasibility to capability.

Objectives and General Orientation of Research Activities

The objectives are to:

 Provide an objective base for program formulation and evaluation.

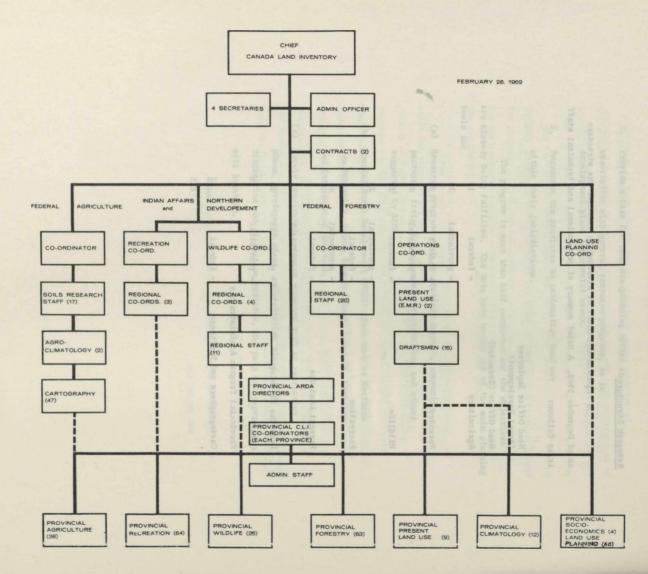
- 2. Provide a base for land use planning either in
 association with general resource programs, or in
 development plans for special areas.
 - 3. Encourage the provinces to rationalize land use within their jurisdictions.

The program is more than half completed and the objectives are already being fulfilled. The data have become one of the main planning tools in:

- (a) Resource programs such as drainage support, community pastures, irrigation schemes, reforestation, and others supported by ARDA.
- (b) Special Rural Development (FRED) plans such as Northern

 New Brunswick, Prince Edward Island, Lower St. Lawrence,
 and Interlake of Manitoba.
 - (c) Purely provincial resource programs such as recreation plans, development plans, reforestation plans, land disposition and alienation policies, and pulp and paper mill location.

is	as follows:		
	Head Office Employees (Rural Development)		4
	Head Office (Seconded)		4
	Agriculture	- federal	19
		- provincial	38
	Forestry	- federal	20
		- provincial	63
	Wildlife	- federal	15
		- provincial	25
	Recreation	- federal	3
		- provincial	64
	Present Land Use	- federal	2
		- provincial	9
	Land Use Planning	- provincial	60
Land	Others	- provincial	16
	Provincial Program Administrators Cartographers and Draftsmen	- federal	9
		- rederar	<u>62</u> 413



Internal:

As of February 1969 the staff details are as follows:

(a) Rural Development Staff

Birthplace	Last University Degree Obtained		No. of Years with Agency	Years on Labour Market
Canada	M.Sc.	- U.S.A.	5	17
Canada	M.A.	- Canada	3	5
Canada	M.A.	- Canada	1 1	3

(b) Seconded Staff

Birthplace	Last University Degree Obtained	No. of Years with Agency	Years on Labour Market	
Canada	M.Sc U.S.A.	5	10	
Canada	Ph.D U.S.A.	1	10	
Canada	Ph.D U.S.A.	2	20	
Canada	M. S.A Canada	0 mg = 0.5 of no.22	25	

Of the seven co-ordination staff all have ability to work in English, three are fluently bilingual and two additional are adequate in French.

The staff employed by other government departments and by the provinces who are engaged in the Inventory program will be reported by their parent agencies.

Budget:

Expenditures to March 14, 1969, from the beginning of the Program are as follows:

	1963-63	\$ 4,000	
	1963-64	159,855	
	1964-65	486,785	
	1965-66	862,518	
	1966-67	3,210,858	
	1967-68	6,179,202	
(to	1968-69 March 14)	2,957,557	
		\$13,860,775	

Summary of Selected Projects, 1963 to 1968:

In addition to the program outlined earlier, a few examples of projects are listed to indicate the type of parallel research being supported.

- Economics of Plantation Forestry in Southern Ontario, by D.V. Love (University of Toronto) and J. R. M. Williams (Ontario Department of Lands and Forests).
 - benefit/cost analysis of planting white spruce and red pine on submarginal agricultural lands in Southern Ontario.
 - final report in the process of printing.

- An Analysis of Shoreland Use and Capability for Cottaging in the Georgia Lowland of British Columbia in Relation to Canada Land Inventory, By Colin K. Campbell.
 - to test the assumptions made in the recreation capability classification system respecting relative capability of natural shoreland types to engender and sustain recreational uses.
 - report published September 1967.
- Climates of Canada, by L. J. Chapman and D. M. Brown, Ontario Research Foundation.
 - to analyse pertinent meteorological data and prepare maps and a report dividing Canada into homogeneous climatic zones for agriculture.
 - Canada Land Inventory Report No. 3, 1966.
- 4. Socio-Economic Studies British Columbia, by C. Verner, University of British Columbia.
 - to conduct socio-economic studies in selected regions of British Columbia to relate socio-logical and economic factors to physical capability properties of land.
- Economics of Agriculture on Various Soil Capability for Agriculture Classes in Southern Ontario, by D. W. Hoffman, University of Guelph.
 - to assess economics of various types of agriculture on the various national capability classes for agriculture,
 - project now ongoing.

Publications:

- The Canada Land Inventory Objectives, Scope and Organization CLI Report No. 1, 1965.
- 2. Soil Capability Classification for Agriculture
 CLI Report No. 2, 1965.
- 3. The Climates of Canada for Agriculture
 CLI Report No. 3, 1966.
- 4. Land Capability Classification for Forestry
 CLI Report No. 4, 1967.
- 5. Land Capability for Forestry Guidelines for Mapping, 1968.
- 6. Land Capability for Recreation
 Preliminary Report, 1965
 Final Report in process of publication.
- 7. Land Capability Classification for Wildlife
 Preliminary Report, 1966
 Final Report in process of publication.
- An Introduction to the Geo-Information System of the Canada Land Inventory, 1967.
 - Forty-five (45) maps at 1:250,000 scale for various parts of Canada.
 - Land Use in Canada The Canada Land Inventory Canadian Geographical Journal, 1968.

A GEOGRAPHIC INFORMATION SYSTEM FOR REGIONAL PLANNING

Canada, like many countries, faces an immense problem in both understanding and guiding the development of its land, water, and human resources. One of the major agencies created specifically to implement policy to attack this problem is the Rural Development Branch of the Department of Forestry and Rural Development. A primary task facing this agency is to assemble social (demographic), economic, and land data for an integrated analysis to enable problems of rural development to be specified, development programs to be implemented, and their effectiveness evaluated.

Parallel with the gathering of data has been the development, by the Regional Planning Information Systems Division of the Branch, of interrelated computer-based information systems to handle and analyse the data. The Geographic Information System, for the storage and manipulation of land data, is the most developed of these systems. Its design and development started in 1963, implementation began in 1965, and is now in its final stages; routine use is scheduled for September 1968. It is perhaps worthwhile to recount our progress with this system at this time.

Early in the life of the Branch (1962) a start was made with the gathering of some kinds of land data by the Canada Land Inventory. The data they collect is restricted to five types: the present use of the land, the capability of the land for agriculture, the capability of the land for forestry, the capability for recreation, and the capability for supporting wildlife. These data alone, if gathered in sufficient quantities for the summaries to be directly applicable to provincial and federal resource policy and regional planning, will generate an estimated 30,000 map sheets, at various scales. The Inventory has currently produced 7000 map sheets, of which 3000 have been prepared for computer input. The maps contain an average of 800 distinct areas on each sheet, and have been found to contain as many as 4000. Additionally, other types of maps covering watersheds, climate, geology, administrative boundaries, and land titles are generated by other agencies.

The need for a computer-based system, whereby map and related data can be stored in a form suitable for rapid measurement and comparison, is apparent as soon as the magnitude of the problem of handling large numbers of maps is appreciated. Lack of trained personnel makes it impossible to examine such large amounts of data manually in any sensible time, much less to provide a meaningful analysis of the content. A situation can be reached where the amount of data precludes its use. The end product of countless hours of survey can remain unused, with the result that administrators do not receive information necessary for a sound basis to decision making.

From the first, it was the intention to produce the maps generated for the Canada Land Inventory in such a way that their data could be related on a nation-wide basis by the geographic information system. This made it necessary to establish a common basis of data description. Classification systems were evolved for each type of data by discussions with the federal and provincial agencies concerned in the original survey, under the guidance of a federal co-ordinator. In each case, the classification systems were subject to trial in pilot areas in various regions of the country. Regional variations are incorporated into the classification system by development of ratings which recognize equivalent values. The classification systems vary from a relatively simple, one-letter code for present land use to a complex, multi-level description used for forestry.

The maps, essentially interpretations of existing data in terms of the classification system, are usually produced by the federal and provincial agencies most closely related to the collection of the original data (over 100 agencies are involved). The manuscript maps are sent to Ottawa to be edited and prepared for computer input.

The basic capability of the geographic information system is that it accepts and stores all types of location-specific

information, that is, any information which can be related to an area, line, or point on a map. Information relating to land resources is most frequently location-specific in character. For example, census data (perhaps not usually thought of as location-specific) are collected from specific areas of land called enumeration areas, which are recorded on maps; a highway is a location-specific line; a campsite can be thought of as a location-specific point on a map.

The system can best be described as comprising two parts: the data bank and the set of procedures and methods for moving data into the bank, and for carrying out the manipulations, measurements, and comparisons of the data, once there. These two parts will be referred to as the 'data bank' and the 'information system', respectively. It is quite possible to have the entire geographic information system with full operating capability and have no data in the data bank. The amount of data which can be put into the data bank is infinite, as any number of magnetic tapes can be generated and stored. Additional data related to any area can be inserted at any time.

The system has the following capabilities:

It will accept maps containing data represented as areas or lines or points. The maps can be of any scale and on any map projection, and they can contain linear distortions. All of these characteristics will be adjusted to a standard format (normalized) when they are put in. Data relating to points only can be put in independently of maps. They are simply related to their latitude and longitude points.

The system compacts and stores information. The compaction is most efficient. For maps at a scale of 1:50,000 with an average density of information it is expected that a complete coverage of the farmed area of Canada (approximately 600 map sheets) can be recorded on two reels of magnetic tape.

The system can measure any data in the data bank. If the data have been inserted in the form of areas, then each area can be measured. For example, a soil map might be represented by different areas of different soils. The area of each patch of soil or the total area of any one type of soil can be calculated.

Similarly, the lengths of lines can be measured and the occurrences of points counted.

The region from which area, line, or point measurements are required can be limited in a variety of ways. Data can be retrieved within any boundary already described to the system. If, for example, a map of administrative region boundaries has been put into the data bank, measurements can be carried out within a specific administrative region. If a desired boundary has not already been described to the system it can, of course, be drawn on a clean sheet and inserted in the normal way, or if it is simple enough in shape to be described by a straight line joining points, then it is only necessary to put in the co-ordinate values of the points.

It will also be possible to limit retrieval by reference to any line or point already described to this system. The system can be asked, for example, to measure the area of patches of land crossed by the line of a highway or within a band of specified width along the highway, or to determine the areas suitable for sub-divisions within 20 miles of the centre of a city.

A major system capability is comparison of two types of mapped data relating to the same area. Just as two maps can be manually overlaid to allow the relationships between the data to be examined, the system can overlay any two or more types of data to measure the exact amounts of each type of land in juxtaposition to the map or maps below.

This can be applied as a search capability, whereby a comparison of various types of information is made to find out where a selected set of characteristics occur together. For example, a request to find suitable landing sites for a helicopter would require an examination of the vegetation map to determine treeless areas, the topographic map to make sure that the area was flat, and the present land use map to make sure that the area was not populated. These three coverages would be compared to identify and describe all points having the desired characteristics.

A further extension of the search capability could result in a 'search in context'. A potential helicopter landing-site, for example, would be of limited value if, while being perfectly treeless, flat, and uninhabited, it occurred as an island in the middle of a swamp. The search routine can be instructed to ignore otherwise desirable sites if they do not occur in a desirable context.

Another search capability that can be implemented is referred to as the 'nearest neighbour search'. This would be employed when the limit of the search is not definite enough to be specified. The search command would simply request the nearest examples of the desired character to be located. A composite example of some of these capabilities might be an instruction to locate the nearest potash mine which is served by a main highway, north and south railroad connections, and is surrounded by a minimum of 10,000 sq. miles of good farmland.

The system can produce information in two different forms. The commonest form is perhaps the normal printed alphabetical and numerical data produced on the regular computer printer. In addition to the printer will be a graphic plotter which, under the control of the system, produces a map showing the location of the desired areas, lines, or points which satisfy the request.

An inherent danger of information systems is that the data entered into the system may vary widely in reliability, but

may be assumed to be equally reliable in subsequent multifactor assessments. The system can accept a reliability identifier with any type of information and can keep track of reliability tags so that degrees of reliability are printed out beside the answer to a request.

The advantages of information which is kept up to date, compared with data which have to accumulate for several years before it is economically desirable to reprint a map, are well known to users of map information. Data can easily be added to the system without waiting for large amounts of new data to accrue. Old coverage can be erased and replaced on the magnetic tapes or, if desired, both the old and the new coverage can be retained. New survey data at a more detailed scale can be incorporated with previous data at smaller scales, provided, of course, that the classification systems are compatible.

For many of the day-to-day information needs of administrators of land resource policy, simple forms exist to allow the administrator to initiate the request without the assistance of a computer programmer. Although more detailed assessments requiring the full flexibility and capability of the system would best be handled by someone acquainted with the data formats, a considerable amount of programming effort has been eliminated even at this level by use of programs already written and incorporated into the system. It is estimated that, with no previous computer knowledge, an administrator could be taught to complete normal form-originated requests in one week. Three weeks training and practice thereafter are expected to be necessary for the same administrator to handle more detailed requests. The unusual or very complex requests will need a programmer working in conjunction with the system librarian.

In many ways the system is self-monitoring. On accepting a request for information, the first response of the librarian will

be to use the system's KWIC* index to check whether that particular request has been made before and, if so, to indicate where the answer is stored in the filing cabinet. If the request has already been partially answered, this also is determined. If the request requires new manipulation of data, the system indicates which tapes have the requisite data stored on them.

The tapes then are selected from the library, put on to the computer and the assessment is executed. An extension of this capability is to provide a cost estimate of the work, prior to processing, based on a preliminary analysis of the amount of data on the requested tapes. Such estimates will be necessary in more complex applications.

The system is independent of peripheral devices such as input scanners or output plotters. While the IBM cartographic scanner is now in use, in conjunction with a D-Mac X-Y digitizer, to convert graphic data to digital form, instrumentation is likely to be developed in the next two or three years to combine these functions.

The normalization step, which converts digitized graphic information to the format required by the data bank, is independent of the main system functions and can be changed accordingly.

The system is designed for use on the IBM System 360 Model 50, with 512 thousand bytes** of storage, 6 magnetic tape drives, and 3 magnetic disc drives under the control of the standard operating system. Greater operating efficiency is achieved if the System 360 Model 65 is used. The practical application of the data bank concept and the entire system capability is available by use of this general-purpose computer.

^{*}KWIC - Key Word In Context document indexing and cross-referencing system based on computer sorting of key words in the title. Ref. IBM Publ. E20-8091.

^{**} Byte - a unit of computer storage space made up of eight digits, or bits, in the binary system (using only 0 or 1). Each byte is capable of storing one letter, two decimal digits, or a binary value.

SYSTEM DESCRIPTION

Boundary data to be put into the data bank are traced (scribed) on to a clean sheet from the source map (Fig. 1). The unique areas or 'map elements' are numbered on a transparent overlay and the corresponding classification is transcribed to a data sheet for punching into cards to be read by the computer.

The traced boundary sheet is placed on the drum scanner, and the scanning operation produces a digitized map of the boundaries on magnetic tape. The drum scanner was developed to meet Rural Development Branch requirements by the International Business Machines Company. The possible use of the drum scanning approach was first considered in 1963. The preliminary design criteria were established by the Rural Development Branch in 1964 and development work was contracted to the International Business Machines Company in 1965. The scanner consists of a cylindrical drum on which a map or chart can be mounted, and a movable carriage which slowly moves the scanning head across the front of the revolving drum. The scanning system consists of the scanning head proper, its associated electronics, and controls leading to a standard IBM magnetic tape drive.

The technique employed is to detect the changes in intensity of light reflected from black or white areas on the map or chart surface and to record this information as a series of binary bits written on magnetic tape. The scan head is a device utilizing fibre optics and is capable of scanning eight scan lines simultaneously. The drum scanner can accept a map up to 48 in. x 48 in. in size. A fill-size map takes approximately 15 minutes to scan, including the time for mounting and dismounting it. Smaller sheets take a correspondingly shorter time.

It is not within the scope of this paper to give a detailed description of the drum scanner, though it is hoped that the engineering aspects will be covered in detail in a future paper. The format of the map-image data on tape is, however, pertinent to

the discussion. One map-image record is produced for each 0.032 in. along the X-axis of a map sheet, and the height of each record area is 0.004 in. along the Y-axis. The 0.032 in. record, comprising one byte of computer storage, is divided into eight bits. Each bit thus represents an area or spot 0.004 in. wide. Lines drawn on the map are usually 0.008 in. wide. If the scan heads on the scanner identify 50% or more of a spot as part of a line, then a 'l' bit is generated; otherwise a '0' bit is generated. A line in this manner is represented as a collection of bits which are usually either one, two, or three spots in width.

The traced boundary sheet with the transparent numbered overlay is placed on a D-Mac cartographic X-Y digitizer where the four reference corner points and the co-ordinates of one reference point per 'map face' are coded in digits. A map face is any one of the distinct areas that together make up the surface of the map. As noted before, information related to a face is considered to be homogeneously distributed within that face. The output from the X-Y digitizer is produced on magnetic tape by means of an NCR encoder; this will revert to punched cards if it is found that the error-edit capability of cards is needed. The classification data sheet is now also directly transcribed on to magnetic tape, though this may be taken back to punched card output. Classification data and the digitized reference points are combined on the basis of map face number to result in a classification tape.

Entering Data into the System

The basic approach to feeding map data into the system is to reconstruct a line segment, or the part of a line that lies between adjacent vertices, from the points comprising the scanned map image. These segments are then combined with the classification information to produce map faces which are a basic unit of storage.

The following are some of the steps in this input procedure: As a preliminary, the identification of the scanner and classification tapes, coverage and map identification, and similar

data are put into the procedure which controls the flow in the subsequent update* operation. The classification tape is edited for data consistency and is changed into system format during this stage (Fig. 2).

The map-image tape then enters the main map-data reduction procedure. Since a 30-in. by 30-in. map generates over 56 million bits, occupying over 7 million bytes of computer storage on an IBM System/360, the data reduction of the map image is performed sequentially on smaller units known as 'sections' The use of a square (or nearly square) section results in considerably longer lines being available from the map for processing at one time than would be the case if a long, thin rectangle were used. A computer with 512 thousand bytes of core storage can handle a section in the order of $1\frac{1}{2}$ in. x $2\frac{1}{4}$ in.

Each spot in the cloud of spots which make up the lines is assigned a 'V' value. This is a measure of the number of information-carrying spots surrounding it. This minimizes the effect of irrelevant bits and tends to pick out the center points along the line. The search follows the highest V values; it eliminates the redundant spots in the cloud.

The center points are coded to identify line intersections (or vertices) and the sense of direction of the line. Having thus located the points which comprise boundary lines, it is a simple task to record the X and Y co-ordinates of each point along a segment.

The system requires descriptive information to be related to map elements. One method of accomplishing this is to apply an identifying tag to both sides of the line. This tag also indicates

^{*} Update - A computer procedure to combine new data being entered into the system with data already existing in the system. This may take the form of correcting, replacing, or deleting existing data, or inserting or adding new data.

in which direction the line was first followed, this being necessary if the sides of the line are to have a constant meaning. The identifying tags are called 'system colors'.

They are analogous to the colors in a political map. A sortand-search of these colors enables the segments to be connected with each other, and hence faces to be assembled.

Using the reference points in latitude and longitude taken from the four corner points of the map, a transformation is carried out which locates the X-Y digitizer map-element reference points within the scanner. Map projections, which can vary from one map to another, are normalized. Calculations are made to correct for linear distortion and skewed orientation of the map on the scanner or digitizer. The transformed 'map-image data set' and the classification (or 'descriptor-data set') then are matched and compacted. During this match-and-compact operation, the map-image co-ordinates are recorded in terms of a standardized geodetic co-ordinate system. This allows a uniform base for storage and the subsequent measurement and overlay procedures.

The choice of a standard co-ordinate system was a major consideration. The eventual measurement needs (i.e. area, length, and centroid) required the chosen system to be locally cartesian. However, a co-ordinate system based on a projection can result in a system of regions, each with its own co-ordinate system. This problem is particularly pertinent when one considers an area as extensive as Canada.

Careful investigation indicated that a system comprised of the geodetic latitude and longitude had many advantages. The smallest division in the geodetic co-ordinate system used in the data bank is called a unit grid. It represents an angular displacement of 1/2²⁴ degrees. This was derived quite empirically. Using a 4-byte unit, 1 byte allows a span of 128 degrees which is sufficient to encompass Canada. The remaining 3 bytes represent the possible subdivision of any one degree.

The theoretical resolution of the system is determined by the actual distance on the ground covered by this unit grid, which at 45 degrees latitude is just over 1/4 in. in the latitudinal (or X) direction. This is considered adequate for the data being put into the system.

Scale within the system is in terms of the unit grid distance. Factors from 20 to 231 have been devised to provide coarser resolution.

To handle map information within the system it is convenient to subdivide the co-ordinate system into regions called 'frames'. A frame has an equal angular displacement in the X and Y directions, hence is a square in the geodetic co-ordinate system.

A relatively simple calculation reveals that a map of average density (30 in. by 30 in., with 800 in. of boundary lines), will occupy 200,000 bytes of storage if no scale change or transformation is performed. With up to 30,000 maps envisaged as the primary content of the data bank, a compact notation for storage of co-ordinates was essential.

With a code based on direction change between co-ordinates and distance between co-ordinates, a sequence of simple codes can be used to describe co-ordinates. A sample line, requiring 864 bits for normal X-Y recording, occupies 76 bits in compact notation. If required, lines with regular patterns can be further compacted by storing the pattern with an indication of how many times the pattern is repeated.

In the match-and-compact phase, routines are carried out to calculate the area of each face, the centroid of face elements, and the length of line elements. In the same phase, an extensive error analysis is performed to ensure that the map is topologically correct. Errors found at this stage are documented by a series of error messages on the computer printer.

The match-and-compact operation produces two index files.

The first of these is a face file with classification and frame number which, when sorted, is used in updating the descriptordata set. The second is a face file with segment identifiers which is used to update the image-data set. Incorporated in the second file is the basic compact notation of co-ordinate data by frame number. The routine for updating the image data set provides the geodetic properties (area, centroid, and length) as required to update the descriptor-data set. Both of these update routines can produce error listings as new data are matched with data already in the data bank. Again, error correcting is carried out as an update to the primary map-data reduction phase.

The best approach to take with regard to error correction will only be found by trial with a working system. Given a high percentage of errors requiring reference back to source documents or even to field survey, the relatively expensive method using cathode-ray tube displays would add little, if anything, to the efficiency of the error-correction procedure. On the other hand, given a high percentage of errors of a strictly cartographic nature and not requiring reference to source documents, the cathode-ray tube approach, by which images displayed on the tube can be corrected by 'drawing' on it with a beam of light, would have considerable merit. Both approaches will be investigated during the system trials.

Data Bank Organization

The data bank is divided into classification data contained within the descriptor-data set and boundary data contained within the image-data set. Three levels of file organization are envisaged. These are: (1) consecutive, (2) regional, and (3) indexed. These file organizations, together with an unstructured or structured version of the classification data within the descriptor-data set, have been combined into six levels. Five of these will be possible within the present scope of the data bank.

Using the descriptor-data set as an example, the relationship between the various levels can be thought of as follows: Level 1 represents the basic descriptor-data set arranged by consecutive face number; Level 2 represents a sorted Level 1, grouped according to some selected characteristic or set of characteristics; Level 3 is the equivalent to Level 1 for a specific region or group of regions; Level 4 can be thought of as a Level 3 which has been structured by grouping the faces relating to a certain characteristic or set of characteristics; Level 6 is a Level 2 or 4 which is not only structured but has an index of its contents available to facilitate further search. Level 5 is not implemented as an indexed consecutive file is not an advantage.

In the descriptor-data set for each map element, there is a list of pointers to the frames containing relevant parts of the boundary information for that map element. The format of this key varies with the level of file organization, but in all cases, it serves to relate the image-data set to the descriptor-data set. The record formats of the various levels of descriptor-data set are illustrated below.

nolter	Cover-	ntant vitil	divale pide	ald teal	Language of	Level
Record	age	Map	Geodetic	Factor	Frame	Region
Туре	Number	Element	Data	Data	List	List

Level 2, 4, 6

Record Type	DDS Key Classification Data	Geodetic Data	Non-Key Factor Data	Frame List	Region No. List
			-2.1	AND DOLL	SUPI BUBD

Data Retrieval

As the boundary information is kept separate from the description information it is only necessary to use the boundary information if actual boundaries have to be compared or output. Otherwise, all retrieval can be done from the description information files. This leads to extremely efficient use of the data bank, as most requests will not require use of the boundaries.

A computer needs a detailed description of the location and organization of data within itself before it can bring it out or manipulate it. These detailed descriptions are themselves kept in computer storage and are indexed by key words. These key words have been made to be the normal words that would ordinarily describe the maps such as PRESENT LAND USE or AGRICULTURAL CAPABILITY. The use of such key words automatically generates computer programs that both describe the data and actually bring it out of the computer.

In the same way key words are used to describe the types of manipulation that can be carried out by the system. When data is to be retrieved the request is written by combining the key names of the data and the key words of the desired analysis. This results in a very powerful set of instructions being available that are also very flexible. This flexibility in data specification statements is made possible by use of the PL/1 language. Uncomplicated requests will be extremely simple to address to the computer. The more complex requests will necessitate a small program being written, but even this will be facilitated by the use of these key words which represent already written small programs.

Overlay Procedure

The overlay procedure of the system is the well-known function of putting one map over another and examining the resulting data relationships.

Firstly, the two maps in the data bank are brought to the

same scale. Then a section of one map of a size that can be handled by the computer is brought into core and the corresponding section of the map being overlaid is similarly brought into core and superimposed on the first. This, in effect, creates a new map with new faces. The new faces are 're-coloured' and identified as new homogeneous areas. The first description data set is then brought in and the proper description is applied to each of the new faces. The description data set from the overlay map is similarly brought in and applied to the new map faces. Each of the new faces has now got a double name, one from each of the original two maps. The process is thus one of creating one 'new' map from the two original maps being overlaid. The new map can then have its areas measured and summarized in the same way as any other map in the system. It is stored and kept in the system as if it were an original map coverage. Up to eight maps can be overlaid in the same operation but obviously this is not a limitation, as the results of two overlays can subsequently be themselves overlaid.

Data Control

Data control within the system is achieved by the system monitor. The system monitor accepts pertinent data on the history of map-data manipulation within the system at all times. Many of the responsibilities for system control in such an open-ended system must rest with the system librarian.

The librarian's responsibilities include deciding whether coverages are permanent or temporary, selecting the resolution at which boundary lines for various coverages need to be stored, and deciding the way in which the descriptor-data sets are filed for ease of retrieval and comparison. He is also responsible for providing the procedures which edit the classification data in the preliminary phase of the map-data reduction sub-system. He must tailor the key words that describe the different types of map and different types of manipulation to efficient, specifically applicable retrieval requirements. He is in control of the flow of

individual maps within the system and, similarly he must evaluate the practicability of assessment requests, including the avoidance of duplicate assessments.

CONCLUSION

The Geographic Information System of the Rural Development Branch is still in an early stage of its development. Not all the procedures described have yet been fully implemented and at present rates of progress it will be several years before the data bank contains maps for any one type of information that cover the whole of the settled portion of Canada. The effectiveness of the system will of course depend as much on the quality of the data entered into the bank as on the capabilities for handling data. Nevertheless, the system is further advanced than any other major land data bank and contains several new concepts and techniques, especially those relating to the compact storage of boundary data and the rapid comparison of one map with another. Such a system is essential to effective rural planning in any country and offers for the first time the possibility of rapid and efficient geographical analysis which has application in any nation where the developing economy is concerned with the natural resources.

LEGENDS TO FIGURES

Fig. 1. Diagram showing flow of data preparation procedures.

Fig. 2. Diagram showing sequence of file update operations.

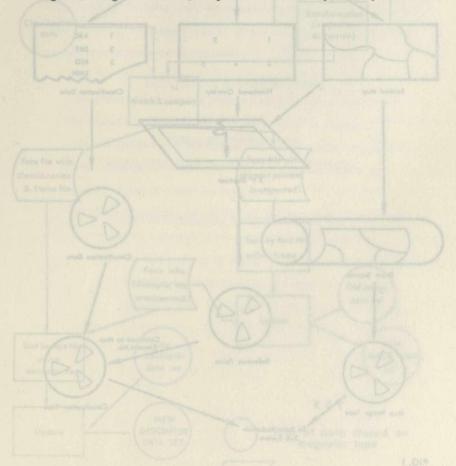


DIAGRAM SHOWING FLOW OF DATA PREPARATION PROCEDURES

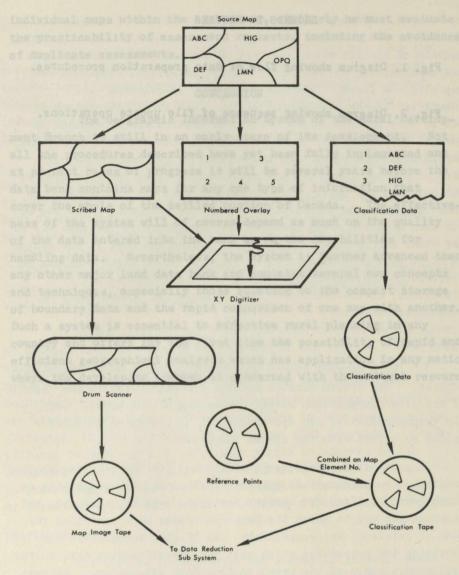
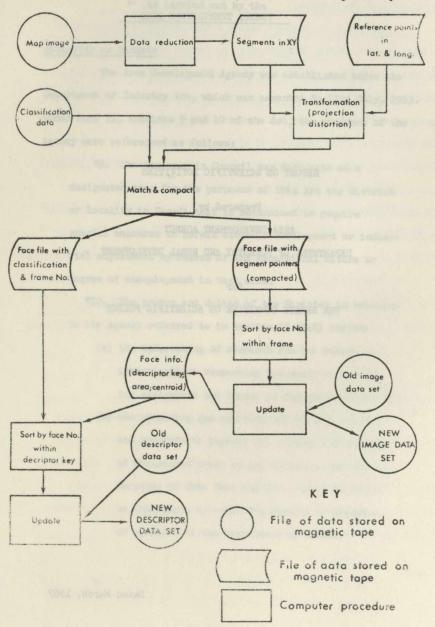


FIG. 1
DIAGRAM SHOWING FLOW OF DATA PREPARATION PROCEDURES

Fig. 2 Diagram showing sequence of file update operations.



REPORT ON SCIENTIFIC ACTIVITIES

Prepared by

AREA DEVELOPMENT AGENCY

DEPARTMENT OF FORESTRY AND RURAL DEVELOPMENT

for

THE SENATE COMMITTEE ON SCIENTIFIC POLICY

Dated March, 1969

SCIENTIFIC RESEARCH ACTIVITIES as carried out by the AREA DEVELOPMENT AGENCY

Authority or Mandate

The Area Development Agency was established under the Department of Industry Act, which was assented to 22nd July, 1963.

Under Part II, sections 9 and 10 of the Act, the purposes of the Agency were referenced as follows:

- designated area for the purposes of this Act any district or locality in Canada that is determined to require special measures to permit economic development or industrial adjustment by reason of the exceptional nature or degree of unemployment in that area.
- "10. The powers and duties of the Minister in relation
 to the Agency referred to in section 12 shall include
 - (a) the undertaking of research and the making of investigations respecting the means of increasing employment and income in designated areas; and
 - (b) the preparing and carrying out of such programs
 and projects to improve the economic development
 of designated areas as may be appropriate to the
 purposes of this Part and that cannot suitably
 be undertaken by other departments or branches
 or agencies of the Government of Canada."

Relevance and Importance of Research Activities to the Program

The Area Development Agency establishment is comprised of a Commissioner, Deputy Commissioner, an Incentives Division, a Regional Development Division, and Specialist staff. The Specialist staff perform the functions of program co-ordination and assume the responsibility of carrying out research activities for the Agency. The Specialist staff consists of eight positions out of a total of 60 positions (officer and support staff). This approximates 12% of the staff resources that are directly or indirectly concerned with research activities. Approximately 60% of the time of the Specialist staff is directly concerned with research activities, the remaining portion of time is directed towards service and administrative functions.

Functionally, the research activities provide the analytical basis for the identification of "designated areas" and thereby establishes the geographic parameters in which the industrial incentives and regional development programs are administered.

Objectives and General Orientation of Research Activities

The objectives of research activities are closely related to the objectives of the overall program and are concerned with the assessment of economic conditions on an area and regional basis, the means of improving these conditions and research directed towards evaluating the industrial incentive program. The principal sectors of research are as follows:

 The analysis of economic conditions on an area and regional basis, the study of community problems and research concerning delimitation of development regions.

- 2) Research to appraise the types of industrial incentives and other types of incentives for development purposes.
- 3) Applied research relating to the feasibility of locating specific enterprises in given localities.
 - 4) Research evaluating the ADA program with reference to its impact on the economic and employment growth in designated areas.

Internal Structure

As of February 1969 the number of research personnel consisted of four officers and four support staff. The academic training and labour market experience of the officers are summarized as follows:

Birthplace of Officer	Last University Degree Obtained	Number of Years with Agency	Number of Years on Labour Marked (ex- cluding University Enrollment)
Canada	M.A Canada	3	15
Canada	M.A Canada	1	9
Canada	M.B.A Canada	Tourist Industry	1964.4
England	Ph.D England	Less than 1	17

The average age of the above officers is 36. All members have ability to work in English and one member has ability to work in French. The support staff consists of two stenographers and two clerks.

Research within the Agency (inhouse research) has been restricted in the main to the analysis of data internal to the Agency and to data received on a confidential basis from other departments. Because of the relatively small staff associated

with research activities, considerable reliance has been placed upon satisfying the Agency's research requirements through the use of contracts let with universities and private consultants.

Summary of Projects 1963-1968

Inhouse Research

Since the commencement of the ADA program in July 1963
no published research projects have been produced within the Agency.
Mumerous projects have been undertaken and completed for purposes
of program support and that have served to complement studies
contracted by the Agency to universities or private consultants.

Examples of research carried out inhouse are as follows:

- labour force projections and the analysis of labour force and job vacancy ratios in Cape Breton Island.
- Analysis of factors, including industrial incentives, underlying the decision making processes of entrepreneurs in their selection of new manufacturing plant sites.
 - Analysis of the efficiency of different types of industrial incentives for purposes of area development.
 - Analysis of levels of income and income distribution in designated areas.
 - Analysis of industrial patterns emerging under the Program's incentive scheme.

The staff salareies allocated on the basis of association with direct research activities approximate \$35,000 per annum. It is estimated that of this sum \$20,000 is apportioned to inhouse research and \$15,000 relates to activities concerned with research let out under contract.

Contract Research and again alasted to mandon'd and to whole At

As of February 1967 ten research projects have been completed and reports have been presented to the Agency. These reports have been made available to the public. In addition to the above, three studies are scheduled for completion by April 1969. The cost of the total complement of studies is \$224,950. Some of the studies have been contracted for periods greater than one year. The amount of funds spent on contracted research allocated on an annual basis has been approximated as follows:

1964-65	\$	2,000
1965-66		21,000
1966-67		55,950
1967-68		73,000
1968-69	m	73,000
	\$	224,950

The following studies have been completed with reports presented to the Agency:

"The Cape Breton Island Tourist Industry, 1964", by
C.W. Raymond, Memorial University, St. John's, Newfoundland.

- The study analyzes the growth of Cape Breton Island's tourist industry since 1959, taking into account the reconstruction of the Fortress of Louisbourg, and making observations with respect to the current and future tourist development of the area. Completed in 1965. Cost - \$2,000.

- "A Study of the Problems of Certain Cape Breton Communities", by K. Scott Wood and H.F. Varge, Institute of Public Affairs, Dalhousie University.
- The study evaluates problems of adjustment being faced by communities in Cape Breton which are dependent on a narrow and declining economic base. Completed 1966. Cost \$10,000.
- "Physical Location of Industry in Canada", by G.M. Davidson, Consultant in Town Planning.
- A study analyzing the physical facilities of area environment on industrial location. Completed 1966. Cost \$9,500.
- "Area Development Policy in the United States 1955-1965", by M.J. Boote, Professor of Economics, Trent University.
- The study examines American experience in the development of economic policy in relation to depressed areas during the ten-year period 1955 to 1965. Completed in 1966.

 Agency contribution \$1,500.
- "Industrial Land Study, Corner Brook, Newfoundland", by Project Planning Associates, Toronto. The study assesses the physical environs of Corner Brook for industrial development, including availability of land, land prices, and proposes a physical development plan. Completed 1967. Cost \$15,500.
- "The Post War Development of Nova Scotia Manufacturing Industry", by R.E. George, Professor of Economics, Dalhousie University.
- The study examines the costs involved in alternative manufacturing locations between Nova Scotia and Central Canada.

 Completed 1967. Cost \$2,850.

- "Research Needs in New Brunswick". A study undertaken by
 New Brunswick Research and Productivity Council.
- The study evaluates present and future research requirements in New Brunswick within the categories of economic research and technical research relative to the New Brunswick economy. Completed 1967. Cost \$20,000.
- "Delimitation of Development Regions in Canada" by R.S. Thoman and M.H. Yeates, Department of Geography, Queen's University.
- The study formulates criteria and principles generally applicable to the delimitation of development regions in Canada, and sets forth a delimitation of a development region in the Georgian Bay area of Ontario. Completed 1967. Cost \$17,600.
- "A Study of the Impact of the Area Development Program on the Southern Georgian Bay Area, Ontario", by M.H. Yeates and P.E. Lloyd, Department of Geography, Queen's University.
 - The study assesses primary and secondary economic impacts of the ADA program to the focal point of designated areas and sets out local, regional and national employment multipliers in regard to the ADA induced industries. The implications for sustained industrial development in the area are examined as well as the economic strains put upon communities resulting from a rapid influx of industrial capital. Completed 1968. Cost \$41,000.

- "Industrial Development Assessment of the Moncton Area,
 New Brunswick", R.B. Truemner, Regional Planning Consultant.
- The study examines factors limiting industrial development within the community and assesses the potential for future industrial development, including location site factors, state of commercial development, transportation and distribution facilities, and the state of community awareness and preference for industrial development. Completed 1969. Cost \$15,000.

Studies in Process

"Impact of the ADA Program on Newfoundland" under direction of N. Hurwitz and Y. Cho, Department of Economics, Memorial University. Estimated Cost - \$30,000.

"Impact of the ADA Program in Nova Scotia", under direction of R. Comeau, Department of Economics, Dalhousie University, estimated cost - \$30,000.

"Impact of the ADA Program in New Brunswick", under direction of H. Larsen, Department of Economics, University of New Brunswick, estimated cost - \$30,000.

The above are projects undertaken in 1967 and scheduled for completion during the fiscal year 1968-69. The studies will complement one another and supplement information obtained in the earlier study of the Georgian Bay.

PUBLICATIONS AND THESIS TITLES

by

RESEARCH STAFF

- A) G. Ala
 - B) P. Bowden
 - C) E. King
 - D) J. Martin

L. G. Ala

Thesis Titles

1) Ladner, British Columbia: A Case Study in Planning
for the Revitalization of the Commercial District
in an Established Hitherto Rural Community Subjected
to Expanding Metropolitan Growth,
(Master's Thesis in Community and Regional Planning,
Department of Community and Regional Planning,
University of British Columbia, 1961).

Significant Publications

- 1) Urban Renewal: Ottawa, Canada,
 Corporation of the City of Ottawa, March 1969.
- 2) <u>Industrial Land Study</u>, City of Ottawa, 1967.
- Lower Town East Neighbourhood Study,
 City of Ottawa, 1966.
- 4) Preston Street Neighbourhood Study,Oity of Ottawa, 1965.
- A Development Plan for Shellbrook, Saskatchewan,
 Department of Municipal Affairs, Regina, Sask., 1963.
- 6) A Development Plan for Outlook, Saskatchewan,
 Department of Municipal Affairs, Regina, Sask., 1963
- 7) A Development Plan for Humboldt, Saskatchewan,
 Department of Municipal Affairs, Regina, Sask., 1962.

P. Bowden - Addon Main Askroy Viges A - apairl look of atheravolt (11

Thesis Titles

- 1) The Effects of the Trade Cycle on Human Fertility.

 (B.A. dissertation), 1949.
- 2) The Internal Wood Trade in England (Ph.D. Thesis) 1952

Significant Publications

- The Capital Requirements of New Industrial Establishments
 in the North-East of England.
- 2) An Economic and Sociological Study of the New Town of
 Newton Aycliffe, Co. Durham.
- 3) Economic Growth in the North-East of England
- 4) Industrial Retraining in the North-East of England
- 5) 'Movements in Wool Prices, 1490-1610', Yorkshire Bulletin of Economic and Social Research, 1952.
- 6) Northern Region: Review of Industry and Employment in the

 North-East of England (North East Industrial & Development

 Association), 1954.
- 7) Northern Region: Review of Industry and Employment in the

 North-East of England (N.E.I.D.A.) 1956: in association

 with A. J. Odber.
- 8) 'Wool Supply and the Wool Textile Industry', <u>Economic History</u> Review, 1956.
- 9) 'The Home Market in Wool, 1500-1700' Yorkshire Bulletin of Economic and Social Research, 1956.
- 10) Development Area Policy in the North East of England, (N.E.I.D.A.),
 1957: in association with E. Allen and A. J. Odber.

- 11) 'Movements in Wool Prices A Reply' Yorks. Bull. Econ.

 8 Soc. Res., 1957.
- 12) 'Rent Subsidies in Development Areas' <u>Journal of Industrial</u>

 <u>Economics</u>, 1958: in association with A. J. Odber.
- 13) 'The Regulation of the Internal Wool Trade, 1552-1624',
 Wool Knowledge, 1957-58.
- 14) The Wool Trade in Tudor and Stuart England (Macmillan) 1962.
 Republished 1968.
- 16) 'Regional Problems and Policies in the North-East of England', Papers on Regional Development, ed. Thomas Wilson, 1965.
- 17) 'Sheep Breeds', Agricultural History Review, 1965.
- 18) 'Attracting the Executive', <u>Financial Times</u>, <u>London</u>, 9th May,
- 19) 'Agricultural Prices, Farm Profits and Rents', a 16C page contribution to <u>The Agrarian History of England and Wales</u>, Vol. IV. (Cambridge University Press), 1967.

E.E.R. King

Thesis Titles

- 1) Changes in Farm Occupancy,
 (B.S.A. University of Saskatchewan)
- 2) Interregional Competition in the Western

 Canadian Market for Eight Fresh Vegetables,

 (M.A. Economics, University of Alberta)

Publications

- The Market for Eight Fresh Vegetables in Western Canada, Ottawa, June, 1962.
- 2) "The Potato Industry in Alberta", Economic Analyst, Ottawa, 1963.
- 3) "Capital Investment, Production Costs and Yields of Commercial Potato Production", Economic Analyst, Ottawa, 1964.
- 4) "Decreasing Farm Numbers and Incomes", Canadian Farm Economics, Ottawa, April, 1966.

J. Martin ents in door brices - a Beely Yorks, Bulbarktus, 3.

Thesis Titles

Le concept de pôle de croissance, appliqué

à la ville de Sherbrooke

(L. Sc. Com., Université de Montréal)

REPORT TO

SENATE SPECIAL COMMITTEE ON SCIENCE POLICY

ON THE

CANADA NEWSTART PROGRAM

in connection with the utilization of manpower resources in Canada,

MARCH 1969



PRIVY COUNCIL

P.C. 1966-16/2057

(T.B. REC. 660891

AT THE GOVERNMENT HOUSE AT OTTAWA
THURSDAY, the 3rd day of NOVEMBER, 1966
PRESENT:

HIS EXCELLENCY

THE GOVERNOR GENERAL IN COUNCIL.

His Excellency the Governor General in Council, upon the recommendation of the Minister of Manpower and Immigration and the Treasury Board, pursuant to section 2(f) of the Appropriation Act No. 7, 1936, and Vote 15(a) of The Supplementary Estimates "A" for the fiscal year ending the 31st day of March 1967, is pleased hereby to approve agreements substantially in the form attached hereto with the Provinces of Alberta and Prince Edward Island which the Minister of Manpower and Immigration will enter into on behalf of Canada for the establishment of Pilot Training Projects in connection with the utilization of manpower resources in Canada, including the development of experimental training methods and techniques, the payment of training allowances and related activities.

CERTIFIED TO BE A TRUE COPY - COPIE CERTIFIEE CONFORME

CLERK OF THE PRIVY COUNCIL - LE GREFFIER DU CONSEIL PRIVÉ

TABLE OF CONTENTS

Mandate 19 bas notificition ods essential	The second secon
Purpose and Importance Objective	
mations will be established by agreement	
Terms of Reference and Main Areas of Research	
General Methodology	
experimental projects are so conducted the	
Research Budget	
Research Personnel Detailed Description of a Project	
Detailed Description of a Project	

PURPOSE AND IMPORTANCE

The NewStart Program is intended for areas of Canada having an unusually high proportion of people inexperienced in work that will yield anything close to the average Canadian standard of living.

The purpose of the program is to help the disadvantaged to acquire the motivation and preparation necessary for stable and rewarding employment.

The program will operate only in selected small areas, up to a maximum of ten. In these selected areas, NewStart corporations will be established by agreement with the provinces. The corporations are responsible for conducting experimental projects designed to help disadvantaged adults to acquire the motivation and preparation necessary for employment.

The experimental projects are so conducted that the provinces and the federal government can take advantage of their findings in structuring development measures for other areas.

The corporations in the field and the headquarters staff at Ottawa work closely with federal departments and provincial governments. They pass to the appropriate departments of government all findings that may be significant for policy and programs.

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OBJECTIVE TO THE TENED OF THE STATE OF THE S

The Canada NewStart Program is one experimental approach to solving the development problems of particularly disadvantaged areas. Its objective is to develop, through action research, methods and programs which will prove their effectiveness in helping to motivate and prepare unemployed and underemployed adults to take advantage of opportunities for stable and rewarding employment.

The program operates in selected small areas.

It is hoped by this means to find techniques which are applicable to development programs in other areas.

The program is conducted by NewStart corporations.

They involve numerous individuals, agencies and other resources in all phases of the experimental human and social development program.

A NewStart project is an experimental and demonstration activity which is undertaken to:

- Develop sufficient acquaintance with a problem area to permit the formulation of hypotheses for testing by experimentation.
- 2. Pioneer program innovations.
- 3. Display and demonstrate the feasibility of using new ideas, techniques and programs which are not yet in general use, with the

intent of stimulating and assisting in the widespread adoption of those that are considered successful.

4. Develop new knowledge or use existing knowledge in new applications to activities which are or may be organized to meet problems of motivating and preparing disadvantaged adults for stable and rewarding employment.

These projects study, in a real life context, ways and means of alleviating problems through systematic experimentation with new or modified techniques and institutional arrangements.

TERMS OF REFERENCE

The terms of reference agreed upon by the federal and provincial governments give the NewStart corporations the powers to:

- Develop methods of qualifying persons who are disadvantaged, for rewarding and stable employment.
- 2. Execute on an experimental basis approaches to the solutions of employment problems by recruitment, motivation, counselling, basic education, training, placement, welfare and related matters; on the basis of the employment and other prospects for persons with various levels and types of education and skills.
- 3. Carry on the activities of a research centre,
 pay and provide such other services and benefits
 as are deemed necessary, to or on behalf of
 trainees.
- 4. Maintain liaison with local and regional human and social development agencies and with provincial and federal governments and agencies.

- 5. Develop methods of evaluating the procedures and methods used, prepare reports and publish and disseminate information relating to research and related programs.
- 6. Enter into any arrangements with any authorities, public, academic, private or otherwise that may seem conducive to the Corporation's objects or any of them, and to obtain from any such authority any rights, privileges and concessions which the Corporation may think it desirable to obtain, and to carry out, exercise and comply with any such arrangements, rights, privileges and concessions.

The needs of a designated area include not only preparation for unfilled jobs, but also the creation of a milieu which encourages, provides for and assists with the total preparation of the labour force potential in an area. A designated area presents particular challenges in this regard, because of its characteristic low level of education, aspiration and opportunity. Therefore, the Canada NewStart Program must address the total situation of the community regarding employment preparation and work. This requires a broad range of programs and methods. A comprehensive approach to an area's human and social

problems will reveal more clearly the gaps and overlaps in programs. The areas will be used as laboratories to validate a wide range of possible techniques and programs for human resource and social development.

MAIN AREAS OF RESEARCH

(See Terms of Reference)

GENERAL METHODOLOGY

Design of the Action Research System

A. Criteria

The Canada NewStart Program is experimental in nature, and the evaluation and the cost/benefit analysis of each phase is critical to the whole operation. On the basis of such assessments it will be possible to determine the value of the methods and techniques developed, and most importantly assess the extent to which they can be replicated economically on a wider basis.

An experimental project must have measurable criteria to assess the extent to which its objectives are achieved. In educational, social and economic experimental programs there is a requirement for both intermediate and ultimate criteria. The ultimate criteria are related to the social and economic intent of the program.

Regular evaluation of the program is essential to learn how the various segments of the program are meeting the goals set for them, to identify new and changing problems which may require program adjustment, and to ensure that the policy and operation of the program are responsive to overall needs.

B. The Integrated Elements of the Action Research System

The application of modern system theory to the Canada NewStart Program takes advantage of research, application studies, feasibility studies, job analysis, task analysis, behavioural analysis, and many other techniques. It relies upon analytical methods for establishing objectives, and calls for combinations of instructional media to meet the stated objectives.

1. Design of Action Research Systems

Heretofore, action research has had a minimal impact on social policy and programs because adequately conceived efforts have rarely been undertaken and completed.

The complexity of the problems confronting the Canada NewStart Program requires the development of new action research designs so that any impact of changes of program variables on employability or on employment may be detected, identified and measured. This phase will also involve the development of a theory which logically interrelates a set of principles and procedures with the project objectives.

2. Development of Experimental Methods

The processes which will be experimented with to produce changes in employability and employment behaviour which might be fostered may also require changes in income maintenance, health service, business organization and practice, and social organization to support and

maintain these changes. Recognizing that community involvement is an integral part of development programs, individual community leaders and community agencies will be involved throughout the program and a measure of their effect will be attempted. Each program component must be well defined and described so that it may be used elsewhere if found effective.

3. Development of Evaluation Methods

Methods of evaluation are required to assess each component not only "before and after", but also during the experiment to suggest possible changes or improvements.

They are required to identify inputs from several sources in the program or in the community, and to recognize which should be applied in other programs.

4. Development of Administrative Support

The establishment of NewStart corporations requires that these new, relatively autonomous organizations develop their own administrative services, including finance and accounting, personnel, purchasing, accommodation and equipment. Some of these, such as personnel (use of indigenous leaders, staff qualifications, staff-trainee ratios, etc.) and accommodation (location, type, etc.) may well also serve as experimental variables. Others of the cost/benefit analysis.

5. Planning, Conduct and Evaluation of Experimentation

The effectiveness of the projects will depend upon how well their objectives are defined and how program activities are planned and conducted. Methods of program planning, implementation and evaluation by a NewStart corporation will be based upon an analysis of the people and the community. Its problems and opportunities will suggest methods and a sequence of program activities. In experimental or intervention research this phase is critical because of the impossibility of reproducing any one experiment.

6. Applications for Implementation on a Widespread Basis

The purpose of the Canada NewStart Program is to develop methods which may be implemented on a widespread basis. This involves adapting and utilizing the results of experiments to prepare and demonstrate practical methods which are capable of general application.

The End-Product of the Program

The concept of objectives or end-product should be the focus of the values and goals of the program.

This implies that something specific is to be delivered, and is to be applicable on a widespread basis following a sequence of experimental activities. This end-product will be tested and validated knowledge, usually in the form of reports which will provide the bases for widespread application of this knowledge.

The reports of NewStart corporations will focus on the following five major areas:

- 1. Report of the project dynamics and its history, as well as significant insights, audits of the services rendered, and case histories.
- 2. The model and specifications for dealing with a given type of problem, making explicit all the essential services and procedures. This should be technical, to enable a new technology of human resource development for disadvantaged and inexperienced people to be replicated and applied successfully by others to the solution of the type of problem for which it was found to be valid.
- and a sexperimental analysis which uses
 experimental methodology (design, mensuration,
 etc.) to establish credibility in the
 judgements of effectiveness and in the
 empirically tested hypotheses pertinent to
 the acceptance of a scientifically
 developed artifact and/or behaviour system.
- 4. Ancillary studies and the data bank
 functions as a class of end-products should

be given prime attention. The NewStart
corporations are sites for the analysis and
study of human adjustment, social dynamics
and behaviour systems basic to the
development of slow-growth areas. Undoubtedly
an analyst will find each project so complex
that it provides more studies than he can
conceivably handle. There are special
problems in this area, but the potential
return in terms of applied and basic
knowledge is well worth the cost and effort.

5. Cost/benefit analyses in varied forms should, when possible, be a part of the project yield.

The transmission of the results of the program will undoubtedly commence before the termination of the program, and it is envisaged that the publication of reports and the conduct of symposia, demonstrations and conferences on new methods will be held as these new methods are developed and validated. In this way, the results of the program will be provided to the authorities concerned, so that they may consider and apply the new methodologies in a progressive manner.

STRUCTURE

Organization and Financing of NewStart Corporations

The unique organizational model developed for the Canada NewStart Program represents an exciting experiment itself.

Each NewStart corporation has considerable administrative authority and autonomy to ensure that:

- Operating decisions may be made and implemented quickly.
- 2. Staffing problems may be handled promptly.
- 3. Freedom to hire and evaluate staff.
- 4. Flexibility be exercised, with freedom from rigid commitment to established methods and procedures of counselling, training etc.

The organizational structure considered best able to provide these operating conditions and to provide for financial accountability to the federal and provincial governments is that of a company or society formed in a province under provincial legislation. The federal and provincial governments hold equal shares in it. The board of directors of each corporation so formed consists of five members including the full-time executive director, and are appointed after consultation and agreement between

the federal and provincial ministers concerned. It is responsible for the operation of the corporation. The executive director is the chief executive officer. The records of the corporation are subject to audit by the government of Canada. The federal government finances up to 100% of the corporation's operation, and its assets will be turned over to the government of Canada at the termination of the project.

Each province which desires to participate will recommend the areas for one NewStart program and will state the particular problems or that part of the province.

The provincial minister concerned and federal minister responsible for regional development enter into formal agreement to incorporate the project, following joint agreement to the proposal. The agreement stipulates the terms of reference for the NewStart corporation, the personnel of the initial board of directors, including the executive director, responsibility for the costs of incorporation, the distribution of shares, and the conditions governing the winding up of the company.

On the basis of the agreement, an application is made to the provincial authorities for a company charter under provincial legislation.

After the granting of a provincial charter to the NewStart corporation, and appointment of the board of directors, the federal government will make an advance payment of up to \$150,000, under a contract with the

corporation, to enable it to prepare a plan of operations for consideration by the federal and provincial ministers.

The plan will indicate the population of the area to be served, the nature of the tasks of employment preparation that are to be studied, the experimental methods proposed, and the liaison with provincial and federal government departments and agencies. The plan will include a budget and staff establishment.

Upon agreement between the ministers and the corporation to the plan, the federal Minister responsible for regional development will provide the required funds to the corporation. Subsequently, annual plans and budgets will be submitted to the provincial and federal governments. Each NewStart corporation will plan, organize, conduct and evaluate methods and programs required to meet the objectives in an area. It will co-operate with and utilize existing personnel and institutional resources.

The preparation and testing of new methods in new settings requires close and continuing collaboration between the individual NewStart corporations and the federal Department. This relationship must be free from administrative constraints, traditional methodologies and professional vested interests to ensure the interchange of critical ideas and findings, and the constant evaluation of the program.

payment of up to \$150,000, upder a contract with the

human and social development needs of an area, and is responsible for organizing and carrying out all aspects of the program. The staff for each corporation should be recruited to the extent possible from the area, because a significant dimension of the experimental project is to test the feasibility of this strategy.

A core staff is employed by each corporation to plan, promote, organize, supervise and evaluate the program in the area. The existence of such qualified staffs makes possible the necessary degree of autonomy and the ability to develop the program.

Selection of Areas for NewStart Projects

The locations for the NewStart projects are selected on the basis of discussion between federal and provincial authorities and must be in an area designated for development purposes.

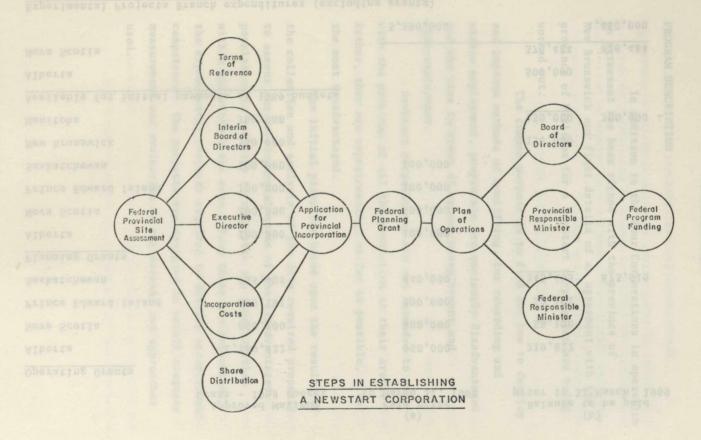
The areas selected reflect a variety of situations including industrial growth or decline, sizeable native populations, various "mixes" of farm and non-farm populations etc.

These human and social development projects are established to develop the best methods of meeting the needs of disadvantaged, unemployed and underemployed adults.

Priority must therefore be given to those areas which have a maximum potential for intensive study of these problems. The NewStart corporation does not replace existing operational programs for training unemployed or underemployed groups in the area.

The areas are of such size as to provide scope for a full range of research and development activities, but not so large as to be unmanageable in terms of the development of experimental programs. A total population from 10,000 to 25,000 appears to be practical for this purpose.





Operating Grants	Approved Maximum Grant - 1968 Budget	(a) Paid prior to March 31, 1968	Balance t	b) o be paid March, 1969
Alberta	1,169,822	950,000	219,822	
Nova Scotia	858,100	800,000	58,100	
Prince Edward Island	850,191	800,000	50,191	
Saskatchewan	785,403	440,000	345,403	673,516
Planning Grants				
Alberta	100,000	100,000		
Nova Scotia	100,000	100,000		
Prince Edward Island	100,000	100,000		
Saskatchewan	100,000	100,000		
New Brunswick	150,000		150,000	
Manitoba	150,000		150,000	300,000
Available for initial p	ayments on 1969 budgets			
Alberta			500,000	
Nova Scotia		1 3 5 7 5 5	376,484	876,484
		3,390,000		1,850,000

Experimental Projects Branch expenditures (excluding grants)

Fiscal year ending 31 March, 1968 \$327,811.00 From 1 April, 1968 to 31 December, 1969 277,007.00

PROGRAM DESCRIPTION

In addition to the four Corporations in operation an agreement has been signed with the province of New Brunswick and final details of an agreement with the province of Manitoba for a NewStart corporation are being worked out.

The common purpose is to find out how to develop and improve methods of qualifying, for rewarding and stable employment, people who are seriously disadvantaged and who live in areas of severe unemployment and underemployment.

NewStart corporations are not intended to cope with the problems of all the population in their areas.

Rather, they are experimenting, as far as possible, with the most disadvantaged.

The initial plans are based upon the results of the collection and analysis of the data required properly to assess the developmental needs of the disadvantaged population in relation to realistic job opportunities within and without the area. From these are determined the experimental projects required to develop occupational competence. The projects are designed to permit adequate measurement and evaluation of the methods and approaches used.

The accompanying descriptions reflect the differences of the problems which confront the disadvantaged population, the different stages of development of the individual corporations, and the wide variety of experimental methods being applied.

Nova Scotia NewStart Inc. Plan of Operations, 1968

Nova Scotia NewStart's plan of action research is designed to help people with identified needs to progress through a series of programs to attain specific bas objectives.

Projects contain interrelated components

consisting of counselling, academic upgrading, life skills

development and combined work and occupational skills

training.

courses are offered in a range of career opportunities, including hospital aides, counsellor aides, teacher aides and family service aides. This consists largely of on-the-job placements. It permits the validation of the hypothesis that the preparation and employment of local people as para-professional staff can be accomplished within practical limits of time and cost.

The adult basic skills project tests techniques for developing communication and methematical skills as a prerequisite for further instruction or employment.

Additional projects are being developed to provide supplementary income for elderly or partially disabled persons, while other projects help inshore fishermen and their wives to acquire better fishing techniques and management practices.

Prince Edward Island NewStart Inc.

Plan of Operations 1968-69

The plan includes a number of experimental components, the principal ones being, the evaluation of the employment adjustment problems of disadvantaged adults and development of achievement motivation; basic education and office skills; work orientation for female heads of households; basic farm operation and preparation for agricultural occupations; and preparation for fishing occupations and industrial skills.

Three basic education and office skills projects are being conducted to provide mathematical and communication skills. Each course accommodates twenty-four people; one group for non-farm males aged 20-35, one for male farmers and one group for females. Commercially produced programs that permit participants to advance at their own rate are being experimented with and experience gained in these three projects will determine future development.

Several short term agricultural courses have
been held for farmers operating inefficient sub-marginal
enterprises. Subjects included basic farm management,
cole crop and potato production, basic education and
vocational counselling. The cole crop and potato course
are prototypes for a larger experimental program planned
for late 1969.

Saskatchewan NewStart Inc.

Plan of Operations 1968

The presence of 2,000 to 2,500 Indian and Metis
people with the attendant problems of their integration
and adjustment to urban life add a special dimension to
the challenge of the experimental program.

The Corporation's strategy is to identify clearly human resource development problems of the target population through surveys and to design experimental projects which are addressed to solutions to the problems for the disadvantaged. It has conducted employment opportunity surveys to search out the growth occupations and to implement programs which bring together the unemployed and needs of the employment market.

Male and female trainees have been involved in a new careers program, and the initial success of this project has led to further expansion of teacher aides courses and the introduction of a social work aide

course. This project is a result of the growth in acceptance and demand for para-professional staff.

In co-operation with the business community in Prince Albert, innovative approaches have been taken to preparing and upgrading people who seek a career in sales.

Depending on the needs of the participants and the type of sales occupation a multi-track program has been developed. One concept that the corporation is working out involves using space in a shopping plaza as a teaching centre. Another is on-the-job training in co-operation with various businesses.

Alberta NewStart Inc. Plan of Operations 1968

The corporation has designed a system for the acculturation and social and vocational development of the target population, most of whom are Indians and Metis.

The design consists of three major program components that are inter-dependent and form the basis for the conduct of a broad range of experimental human resources development activities. These three components are:

- (a) basic development in the home community, through mobile centres at Fort Chipewyan, Janvier and Kikino-Casland;
- (b) a residential course in Lac la Biche;
- (c) an accelerated vocational training centre at Fort McMurray.

The above program is being based upon appropriate surveys of human resources and of job opportunities.

At the mobile centres, the program will provide academic upgrading, basic life skills training for all adults; vocational orientation, driver training and personal grooming for men; home economics, child care and personal grooming for women; and a day-care centre for all pre-school children belonging to the participants. By bringing the training to the community, environmental changes are minimized. Experimentation will be possible in the development of alternate methods of instruction, guidance, curriculum development, attitudinal changes and social development. Communities of similar structure but without mobile centres will be used as control units to test the changes. Operation is just beginning, with length of training varying from 3 to 9 months.

The residential program is to be provided in Lac la Biche. It is designed for the young men and women from the reserves and Metis colonies who often migrate to industrial centres without adequate preparation to adapt to modern living. All participants will be provided with academic upgrading, basic life skills training, personal grooming, hygiene, social behaviour and human relation skills necessary in the world of work. In addition, programs will be offered in driver training, basic trades training in automotive, welding, building construction, electrical and pipefitting trades for the men.

RESEARCH PERSONNEL

Research Personnel as of February, 1969 - N-60

Country of Birth	Bachelor	Master	Doctorate
Canada Canada	29	14	entres En three
United States	3	5	
England	1	-	
India		1	
China	olgae 1st an	antaghd perso	
Tanzania	and rotations	life skills a	L. Basic
Total add ad	bessel 35	22	olevelo
Name of country where last degree attained	troductory to	ment familia ministration d ni giderate d nor conjection	entives g, recreation, red bus
Canada	26	13	na eat 1
United States			rigosat 1
England	pleted befor	1	
Italy			1
Total	35	22	3
Average years of experience	20	16	14
Average years with project	to particles to the less to th	ada no 1½ ngoo	er ed 1½
Average age	35	40	40
Capability in both French and English	alook wasse:	itions of nections skills.	

DETAILED DESCRIPTION OF A PROJECT

Mobile Training Centre, Alberta NewStart

Alberta NewStart has established Mobile Training

Centres in three isolated Northern Alberta communities;

Janvier, Fort Chipewan and Kikino. This action-research

project will test the value of the following methods in

preparing disadvantaged persons for employment:

- Basic life skills and vocational skills development should be initiated in the environment familiar to each individual and preferably in his own community;
- The family should be considered as the integral part and focus for development plans;
- The training environment should embody
 the conditions found in industry with
 regard to employer and employee
 expectations;
- 4. The recognition that learning and change is a gradual process requiring a sequence of training experiences leading to acquisitions of necessary social and occuptional skills.

Therefore Alberta NewStart has embarked on adult training programs aimed at the whole family, in their own communities, in a work-oriented environment and with a substantial emphasis on personal, social and community skills development as well as development of employment skills.

During 1968 the physical facilities for the Training Centres were established and the three commenced operation early in 1969. These centres provide facilities for basic education, community and family counselling, home economics, introductory trades training, recreation, child day care and a kitchen-diner complex.

A planned program of community education and involvement was completed before any of the physical aspects of the centres were moved in. Community comment and recommendations assisted in the design of the projects to meet their needs. Criteria for the selection of families for participation was clearly spelled out and candidates invited to participate.

SUBMISSION BY THE ATLANTIC DEVELOPMENT BOARD

to the community and the state of the community and the state of the s

SPECIAL COMMITTEE ON SCIENCE POLICY

of the

SENATE OF CANADA

Ottawa

December 1968

Submission by the Atlantic Development Board

to the

Special Committee on Science Policy

of the

Senate of Canada

Table of Contents

Section	Pages
 Background, Objectives, and Functions of the Atlantic Development Board. 	4973
1.1. Background of the Economic Problem of the Atlantic Region	4973
1.2. Objectives of the Atlantic Development Board	4974
1.3. Organization of the Board	4975
2. Personnel	4977
2.1. Board Staff	4977
2.2. Outside Consultants	4981
3. Activities and Research Projects	4981
4. Socio-Economic Studies in Support of Planning	4982
4.1. Research Studies	4982
4.2. Research Output	4983
5. Research in Support of Development Projects	4987
5.1. Transportation	4987
5.2. Industrial Parks	4988
5.3. Water Resources	4988
5.4. Other Studies	4988
6. Assistance to Scientific Research and Development	4989

APPENDIXES

- 1. Organization Chart of the Atlantic Development Board.
- Office of the Executive Director and Organization of the Program Division.
 - Office of the Executive Director and Organization of the Planning Division.

APPENDIXES (Cont'd)

- 4. The Atlantic Development Board Act, 1962, as amended.
- Research Studies Prepared for the Board as Part of its 'Overall Economic Planning' Activities.
- 6. Research Studies Prepared for the Board as Part of its 'Assistance to Development Projects' Activity.

December 9, 1968.

SUBMISSION BY THE ATLANTIC DEVELOPMENT BOARD

TO THE

SPECIAL COMMITTEE ON SCIENCE POLICY

OF THE

SENATE OF CANADA

1. Background, Objectives, and Functions of the Atlantic Development Board

1.1. Background of the Economic Problem in the Atlantic Region

For most of a century, the performance of the Atlantic regional economy has compared unfavorably with that of the rest of Canada. With the exception of the two wartime periods, the region has experienced slower economic growth, endured higher unemployment, and has seen a steady loss of much of its natural increase in population to other regions. Although a complete and definitive explanation of this phenomenon still appears somewhat elusive, certain causes can be identified. Some of the more important ones are: the location of the region which, in many respects, is peripheral to the Canadian economic heartland; the small size and the widely dispersed settlement pattern of its population; inadequate labor force skills, both in management and in production; lower proportion of the population in the active work force; higher unemployment with greater seasonal employment swings; lower productivity due to deficiencies in education, natural resources, and public services; migration; insufficient capital, either for infrastructure or for directly productive enterprises; and effect on the region of national economic and trade policies. In the past decade (1958-67), for example, the region averaged 10.2 per cent of the national population and 8.6 per cent of the national labor force. Unemployment in the region averaged 9.3 per cent of the regional labor force, as compared to the corresponding national figure of 5.4 per cent. Income-per-person in the region averaged 68.8 per cent of that in the country as a whole.

The above indicate some aspects of the region's economic problem. However, regardless of the relative importance of specific causes of the region's state of economic underdevelopment and inadequate income opportunities for its population, two important facts stand out: (a) the economic malaise is evident in the region as a whole and, to some degree, in virtually

every economic sector; and (b) despite all the efforts to deal with the problem to date, there is as yet no significant and convincing evidence of a breakthrough. These two facts strongly convey the conviction that what is at work in the region is a veritable system of economic retardation in which all of the elements of cause and effect interact in mutual reinforcement. This renders partial and piecemeal remedial measures largely ineffective and useless.

1.2 Objectives of the Atlantic Development Board

Although certain special agencies (concerned with different aspects of economic growth and development problems) of the federal Government have been created in recent years, they were either charged with specific functions, or were directed to tackle specific problems and/or problem areas. None of them was given the responsibility for tackling the problems of the Atlantic region in its geographic and economic totality. It was for this reason that the Atlantic Development Board was created by an Act of Parliament in 1962.

In its planning and programming activities the Board has attempted to achieve three essential principles in regional economic development: joint and closely co-ordinated development of programs with the governments of the Atlantic provinces; a concern with the overall basic structure of the regional economy and with the causes of the current problems rather than their symptoms; and federal financial assistance for essential development projects for which satisfactory financial arrangements are not otherwise available. These principles are reflected in both the structure and terms of reference of the Board.

The objectives of the Board are contained in the Atlantic Development
Board Act as amended in the following terms:

- "9. (1) The objects of the Board are to inquire into and report to the Minister upon programs and projects for fostering the economic growth and development of the Atlantic region of Canada, and to consider, report and make recommendations to the Minister concerning programs and projects not involving the use of the Fund and programs and projects involving the use of the Fund; and without limiting the generality of the foregoing, the Board may, in furtherance of its objects.
 - (a) prepare, in consultation with the Economic Council of Canada, an overall co-ordinated plan for the promotion of the economic growth of the Atlantic region;
 - (b) keep under constant review appropriate methods of furthering the sound economic development of the Atlantic region, whether such methods involve new programs and projects or the removal

or mitigation of existing factors that may be considered to inhibit such development;

- (c) with respect to particular programs or projects that may be referred to it by the Minister or that the Board may on its own initiative investigate, inquire into, assess and report to the Minister upon the feasibility of such programs or projects and the effect thereof in relation to the economy of the Atlantic region, and make recommendations to the Minister with respect to any such programs or projects that, in the opinion of the Board, will contribute to the growth and development of the economy of the Atlantic region; and
- (d) with the approval of the Governor in Council, enter into agreements with
 - (i) the government of any province comprised in the Atlantic region or the appropriate agency thereof, or
- (ii) any other person,

respecting the use of the Fund in financing and assisting in financing the undertaking and carrying out of particular programs or projects described in subsection (1) of Section 16.

(2) The Board shall, to the greatest possible extent consistent with the performance of its duties under this Act, consult and co-operate with the Economic Council of Canada and all departments and other agencies of the Government of Canada having duties related to, or having aims or objects related to those of the Board."

"ATLANTIC DEVELOPMENT FUND

16. (1) Subject to subsection 4, the Minister of Finance may, on the recommendation of the Minister, pay to the Board out of the Consolidated Revenue Fund such amounts as are from time to time required by the Board for the purpose of financing or assisting in financing the undertaking and the carrying out of programs and projects that, in the opinion of the Board, will contribute to the growth and development of the economy of the Atlantic region and for which satisfactory financing arrangements are not otherwise available."

1.3. Organization of the Board

The Board consists of eleven members one of whom is its Chairman.

These members are private citizens representing the four provinces which comprise the Atlantic region. They are appointed, for fixed periods, by the Governor in Council. The Board's organization chart, showing its parliamentary reporting channel and its main divisions, is given in Appendix 1.

The Board has no unit which is exclusively responsible for "scientific activities" associated with its functions. All such activities which the Board is engaged in take place in two major divisions, viz., the Program Division and the Planning Division. The major function of the former is concerned with the disbursement of assistance to development projects in the region from the Atlantic Development Fund which was also established by

the Atlantic Development Board Act (1962, as amended, 1963 and 1966); that of the latter is the preparation of an overall co-ordinated plan for the promotion of the economic growth of the Atlantic region. The organization charts of these two divisions are shown in Appendices 2 and 3 respectively.

The Board has no offices outside Canada, and it has no formal agreements regarding scientific activities with organizations outside Canada.

The legislation governing the Board, the Atlantic Development Board Act, as amended, is reproduced in Appendix 4.

In carrying out its responsibilities and functions, the Board has a direct working relationship with the Economic Council of Canada in so far as it has been directed to prepare an overall co-ordinated plan for the promotion of the economic growth of the Atlantic region in consultation with the Council. The Board's functions in relation to other federal Government agencies and departments are related to the conduct of its work. The working relationships which have evolved since the Board's inception include interdepartmental committees, joint sponsorship of research, etc. With respect to private industry and educational institutions, the Board's relationships respecting its scientific activities have been largely in the form of contractual arrangements for research studies relating both to the preparation of the development plan for the region and to the disbursement of assistance from the Atlantic Development Fund for specific projects. Studies of the former kind relate to different aspects of all sectors of the regional economy; those of the latter kind include such investigations as project feasibility studies, assistance to specific research facilities in universities, etc. In the international sphere, the Board's activities have been, for the most part, confined to the occasional participation in the review-discussions of regional development problems, policies and programs of the member countries at the O.E.C.D. (Organization for Economic Co-operation and Development) level. However, in spite of the above kinds of working relationships with other agencies and organizations, since the Board has no specific statutory functions or powers regarding "scientific activities" other than those described above, no "science policy" as such has evolved so far.

2. Personnel seems seems withdraw of northerests using a

2.1. Board Staff

The Board has recruited its staff largely through advertisements in the press, contacts with universities, and expert staff-on-loan arrangements with other government agencies.

The personnel establishment of the Board, as at June 1968, by job-category, is given in Table A below.

Table A

Personnel Establishment of the Board by Job-Category, as at June 1968

Job-Category	Number
Executive	4
Scientific and Professional	29
Administrative and Foreign Service	4
Technical	4
Administrative Support Total	<u>35</u> 76

Of the above establishment, none of the "Scientific Professional" staff devotes most of his time to administrative duties.

Of the twenty-nine persons in the "Scientific and Professional" category, sixteen are or have been associated with "Scientific activities" at the Board. A distribution of these persons, by country of birth, indicating the highest university degree obtained, is shown in <u>Table B</u> below.

Table B

Distribution of the Board's Professional Staff Associated with Scientific Activities, by Country-of-Birth

Country of Birth	B.A.				Total
Austria waving .2.U a ne drapor		1			1
Canada	2	1	1	2	6
Great Britain	1	1	100	the some	2
Guyana	10.3 00	1950 14	1	of Sin State	1
India	-	2	-	1	3
Jamaica 30 2mm	-	1	-	T wasted	1
Poland	-	-	-	1	1
Trinidad	1 4	- 6	- 2	Ta Viewes	1 16

A similar distribution, by country where secondary education was obtained, is shown in Table C. below.

Table C

Distribution of the Board's Professional Staff Associated with Scientific Activities, by Country-of-Secondary Education

Country of	High	est Univ	versity D	egree Obt	ained
Secondary Education	В.А.	<u>M.A.</u>	M.S.	Ph.D.	Total
Canada	2	1	1	3	7
Great Britain	1	2	100	Ad - che	3
Guyana	with the s	condition	1	L. ELE	1
India	spare an ev	2	-crdinat	1	3
Jamaica	1 4	1 6	- 2	-4	2 16

Table D

Distribution of the Board's Professional Staff Associated with Scientific Activities by Country-of-University Education

	Highest University Degree Obtained *					
Country of University Education	B.A.	M.A.	M.S.	Ph.D.	Total	
Canada	4	2	1	1	8	
Great Britain	A bankard	2	orthogor.	2	4	
India	Sel BA-XII	2	giarna,	MATERIAL A	2	
U.S.A.	-4	-6	1 2	1 4	2 16	

Four of the stateen persons, three M.A.'s and one M.S., are at present in the process of completing their Ph.D. degree program, the first three in a Canadian university and the fourth in a U.S. university.

The professional staff members' number of years of work since their graduation from university, and the number of years they have been employed on the Board's staff, are shown in Table E below. The average age of these persons is forty years. About fifty per cent of them are now proficient or are in the process of developing the proficiency to operate effectively in Canada's two official languages.

Table E

Number of Working Years since Graduation and Number of Years of Employment at the Board of Professional Staff Associated with Scientific Activities

Number of Working Years since Graduation

Prior to Employment at the Board			Employment at the Board			
Range (years)		No. of Pe	rsons	Range (years)	No. of Po	ersons
Less than 5		-1		Less than 1	1	
5 - 9		-3		1 - 2	8	
10 - 14		- 5		2 - 3	3	
15 - 20		6		3 - 4	3	
		16		4 - 5	16	

The number of people on the Board's professional staff, in each degree category and for each of the years 1963 to 1968 is shown in $\underline{\text{Table } F}$ below.

Table F

Number of Persons on	the Board's Profe	ccional Staff	Accordated	with
Scientific	Activities, by De	gree Category	. 1963-1968	

	Highest University Degree Obtained					
Year Year	B.A.	M.A.	M.S.	Ph.D.	Total	
1963	1	1	-	-	2	
1964	1	1	-	1	3	
1965	3	4	-	3	10	
1966	3	3	2	2	10	
1967	4	6	2	3	15	
1968	4	6	2	4	16	

The turnover (number) of professional staff in the above degree categories for each of the years 1963 to 1968 is indicated in <u>Table G</u> below.

Table G

Turnover of Professional Staff Associated with Scientific Activities, by Degree Category, 1963 - 1968

, men	High	est Univ	versity D	egree Obt	ained
Year	<u>B.A.</u>	<u>M.A.</u>	M.S.	Ph.D.	Total
1062	Senano Dael	a Basessa	HY SHAP	Albiel and	Prior
1963	all the same of th	O TRIVE	WILLIAM		
1964	(annow) ephote	THE PARTY	STATE OF	Die Property	(1000-1) 01
1965	Legs than I	1	1-	3-	d Ande e
1966	\$ - 1 2		6-		2
1967	6-5-	1 .	1-	1	2 -
1968	A-E -	1	0-		10 - 6

The number of persons on the Board's current professional staff associated with Scientific activities who have, since graduation, been employed on a <u>full-time</u> basis, by private industry, universities, provincial government departments or agencies, other federal Government departments or agencies, or other organizations is shown in <u>Table H</u> below.

Table H

Previous Employment Record of the Board's Professional Staff Associated with Scientific Activities

Source of Employment	Range (Years) *					
	Less than 5	5-9	10-14	15-20	Total	
Private Industry	1	1	- /		2	
Staff of University	5	2	1	_10	7	
Prov. Govt. Depts/Agencies	3	2	1	2	8	
Other Federal Depts/Agencies	5	2	3	1	11	
Other Organizations	5	2	2	universit	9	

The total adds to more than sixteen persons as almost everyone has had work experience in more than one of the following sources of employment.

The number of university graduates given summer employment at the Board in work related to scientific and research activities in the years 1963 to 1967 is shown in <u>Table I</u> below.

Table I

Summer Employment of University Graduates at the Board, 1963-1967 (Associated with Scientific Activities)

Year description and the second secon	Number
1963 the state defents (a)(f) and have despetute of tending the sending to	
1964 Continue of transer by 52% trades un constitute Intelle	
1965 and the section of the section	
1966 of the all males of all houldest as affined described all allow	2
1967	1 3

2.2. Outside Consultants

The amount of research work the Board found it required and the variety of skills needed to permit it to effectively carry out its responsibilities were far greater than could be provided by the Board's staff itself. It was necessary, therefore, for the Board to have recourse in the use of outside consultants, both commercially operated consulting firms and the academic staff of universities. The experience of the Board with these arrangements was that the quality of the work done was very uneven, and the Board was led to the belief that agencies like itself, responsible for dealing with broad social and economic questions, would be well serviced if there were in existence centres engaged in research in the social sciences staffed by competent, interdisciplinary teams of researchers to work on many of the social and economic problems governments face.

3. Activities and Research Projects

The Board is engaged in two types of activities -- those involving the use of the Atlantic Development Fund, and those not requiring monies from the Fund. The former relate to the development projects assisted by the Board and the latter to the research projects and surveys it has carried out.

The Board's scientific and research activities fall into three broad categories:

- Socio-economic studies designed to support the planning activities defined in sub-Sections 9(1)(a) and (b) of the Act;
- ii. Studies in support of current or contemplated development projects as defined in sub-Section 9(1)(c) of the Act; and
- iii. Financial assistance to scientific and research organizations in the Atlantic region (including expenditures from the Atlantic Development Fund), as defined in Section 16 of the Act.

4. Socio-Economic Studies in Support of Planning

The Board's overall economic planning activity commenced only in mid-1965. The research studies undertaken since that time relate to the major sectors of the region's economy, and to the inter-relationships between them. Specifically, they estimate the potential that the region's resources have for supporting employment and income, the obstacles which inhibit the attainment of this potential, the policies that might eliminate these obstacles, and the impact that potential could have on the level of income and employment in the region.

Priorities among such research projects have been determined according to the importance of the problem or subject of investigation to the economic development of the region. However, in several instances, the system of priorities determined in this way has had to be modified in accordance with the availability of research personnel to work on these problems. Consequently, some important work has suffered due to shortages of expert personnel.

4.1. Research Studies

Some of the major investigations and research studies the Board has undertaken as part of its overall planning activity, intramurally or extramurally, during the period 1965-66 to 1967-68 relate to more than one province in the Atlantic region. It is therefore, difficult to provide a precise provincial distribution of the expenditures the Board has incurred in the above period on account of research studies relating to its planning activity. A complete list of these studies is, however, given in Appendix 5,

along with their respective cost to March 31, 1968. The total expenditure on extramural studies in support of the Board's intramural research and planning activities to March 31, 1968 has been \$1.8 million.

Since the bulk of the Board's research activity associated with its planning function has been of a 'diagnostic' kind whose objective is to provide a basis for determining specific priorities and policy recommendations in the development plan for promoting economic growth in the Atlantic region, no cost-effectiveness analyses have as yet been carried out on the research projects themselves. As indicated below (Section 4.2), since the Board's development plan for the region and its recommendations regarding the probable policy-mix required to effectively implement the plan are still in the process of evolution, it is premature now to comment on the necessary conditions for the most desirable future pattern of distribution of the Board's scientific activities which would contribute most to regional development.

4.2. Research Output

Besides the Board's Annual Reports, a number of research studies undertaken intramurally or commissioned by the Board from outside consultants (in support of its intramural research and overall planning activities), and relating to various economic sectors, have been completed (Appendix 5). Although varying degrees of confidentiality are still attached to the material in these studies, the reports are now being edited in preparation for general release. None of these studies has, therefore, been issued to the general public so far. The actual or expected date of completion of the studies which commenced in the 1965-68 period is shown in parenthesis at the end of each title in Appendix 5.

make significant contributions in at least three areas:

First, the Board is developing a methodology for economic planning that has never before been tried in Canada. The approach is composed of two major elements: (1) a series of sector studies concerned with the problems, prospects, and policies germane to individual sectors and industries, and (2) an integrative framework enabling them to be analyzed in terms of their inter-relationships within an organic entity. A fuller account of the

second element, which represents the innovation in the methodology of public policy formulation, is warranted at this point.

The principal tool which the Board has chosen to adopt for integrating sector studies is a set of Atlantic province input-output tables.

Some five years in the making, these recently completed tables are a systematic accounting of transactions generated by the production of commodities and services in approximately fifty major categories of industrial activity. Industry by industry, they identify the disposition of output to other producers, to households or consumers, to capital formation, to government use, and to exports. Simultaneously the inputs into each industry are identified as coming from other producing sectors, from government services, from imports, and from wage-earners and other factors of production. For our immediate purposes, the principal feature of this accounting matrix is that it permits us to determine, starting with an initial change in one or more sectors, the ultimate direct and indirect effects on the economy as a whole. These are revealed both in terms of the incidence of the impact and the mechanism by which it is transmitted.

Our use of the input-output model involves seven steps, which are described below in a somewhat simplified form:

- (i) Certain activities, namely, major exporting industries and some kinds of government expenditure, can effectively be forecast without reference to how the rest of the regional economy is faring. Their prospects are determined, in other words, by external circumstance or by fiat. These forecasts have, with some exceptions, now been prepared.
- (ii) Associated with the expected levels of output will be the additions to capital stock that are required to increase productive capacity. The resulting investment must be estimated with respect to its volume and composition and distributed chronologically so as to reflect realistic lead times. Preliminary work has been completed in estimating capital-output ratios, and these will be supplemented, where possible, with specific information on capital requirements.
- (iii) The next step is to calculate the direct and indirect output

requirements from all sectors that are consistent with the forecast, including such requirements as are generated by the spending for consumption purposes of income received in the course of production. If the sectors for which independent forecasts can be made are designated as autonomous, the calculated output in all other sectors can be said to be dependent or induced. It is also incremental, in the sense that it represents additions to the levels of output in these sectors which prevailed in the base year. The results to this point are a first approximation of aggregate output.

- (iv) The second approximation will consist of an estimate of government expenditure that is population-linked: principally on health, some part of education, welfare, and other administrative functions. At the same time, investment requirements in the dependent sectors will be estimated, again using the appropriate capital-output ratios applied to the new derived levels of output. A particularly important category of investment will be that of housing, in respect of which both size of population, the present housing stock, the geographic shift of population and government policy will be governing factors. As before, direct and indirect output will be calculated.
- (v) As a third approximation to aggregate output, the impact of the preceding stages on imports into the region will be assembled and subjected to the conventional methods of analysis employed in identifying import substitution possibilities. The results of this analysis will be treated conditionally as potential output based on developmental possibilities rather than as a necessary outcome to the model's structural interdependence.
- (vi) The penultimate step will be the conversion of sectoral output values into sectoral employment and income through the application to the former of man-output ratios. These will be adjusted up to the year of the forecast for expected productivity increases partly on the basis of historical trends and partly on the basis of independent estimates. Work on this trend analysis

is now proceeding and is partly completed. Incomes, labor

force, dependency ratios and assumed unemployment rates can then
be combined to yield estimates of per capita income. At this

point one can consider trade-offs between various rates of in
come, unemployment, and migration.

(vii) The final step (in the use of the model) will be to check for internal consistency between population, government expenditure levels, and residual investment requirements, and to investigate the implications with respect to the demand for funds arising both from government expenditure and private capital formation.

The Board's second contribution relates to an investigation of the water resources of the Atlantic provinces. The work the Board has undertaken represents the most comprehensive analysis both with respect to the area it covers and the different aspects of resource development that has ever been undertaken in Canada. It will provide a detailed account of the sources of supply, the quantity and quality of the supply, present and anticipated demand, the legal context within which water development policy must be formulated, and the administrative implications all these aspects have for sound water management policy. The study is being carried out under the supervision of a committee of federal and provincial officials responsible for water resources in their respective jurisdictions. The extent and depth of the collaboration we have achieved represents, we believe, an important contribution to the development of joint federal-provincial participation in resource planning.

A third contribution of the Board relates to another major economic sector, that of tourism and recreation. Here too the Board has undertaken the most comprehensive survey of the character and potential of tourist and recreation activity in a large geographical area. Our study deals with the region's natural attractions, its man-made attractions, commercial activities and the conditions for their viability, the nature of the demand for these tourist and recreation facilities, and will result in the preparation of a policy framework for developing the tourist and recreation industry in the region.

In addition to these major innovations, we believe the Board has also made a significant contribution with respect to other sectors as well, to the extent that it has created a planning perspective in which to view the activities of all the important economic activities in the region, and to the extent that it has focussed attention on the future conditions that should be achieved in the sectors to permit them to make their maximum contribution to a comprehensive development plan for the region.

5. Research in Support of Development Projects

It became apparent almost right from the inception of the Board that certain major sectors of the region's economy were characterized by relatively more pressing problems and, therefore, certain development projects would have to be undertaken immediately, even before the formulation of an overall development strategy for the Atlantic region based on the Board's economic planning activity. Such projects generally involve expenditures from the Atlantic Development Fund. Considerable research had to be undertaken with regard to some of these projects to determine their economic and technical feasibility. Many of the requisite studies were beyond the ability of the relatively small staff of the Board to perform within the time available and, therefore, consultants had to be commissioned to prepare them. Appendix 6 contains a list of these studies, undertaken in the 1963-68 period, with their respective cost, to March 31, 1968. The actual or expected date of completion of these studies is indicated in parenthesis at the end of each title.

Broadly, these studies fall into four main groups: transportation, industrial parks, water supply and pollution control, and urgent social problems.

5.1. <u>Transportation</u>

Since the Atlantic region is relatively remote from the industrial heart of Canada, transportation has always played a major rôle in economic development. Marine transport in particular is at present on the threshold of major technological change which will have profound effects on existing ports and the development of new ones, as well as on all other parts of the transportation industry. Due to these new developments, the industrial

profile of the region may undergo significant restructuring in the years ahead. Studies were, therefore, commissioned to determine the total impact these changes may have and the adjustments they may require of the region's economy.

5.2. <u>Industrial Parks</u>

The availability of suitable serviced industrial land is a basic prerequisite for industrial development, particularly for the development of secondary manufacturing industries. Very few suitable sites of this kind were available in the Atlantic region. The Board, therefore, decided to assist financially in the development of industrial parks in selected centers. Studies were needed to determine suitable locations for the industrial parks and the quantity of land that might be required there. Most of these studies were prepared by consultants, and their recommendations have resulted in the establishment of a number of successful industrial parks.

5.3. Water Resources

In 1965, new regulations under the Fisher Inspection Act required higher standards of purity of water used in fish processing. As a result, many existing processing plants would have been forced to close, with the consequent serious dislocation of an important industry in the region.

A number of investigations were, therefore, commissioned to determine how the problems of existing and new plants could be best met.

Akin to the problem of water have been studies to control pollution so as to maintain and restore one of the region's great natural assets - clear water for industrial and recreational purposes.

5.4. Other Studies

From time to time, the Board has been called upon to recommend measures designed to alleviate unusual and unforeseen hardships due to economic dislocation, e.g., the closing of the mines on Bell Island. Studies were, therefore, required to determine the extent of the economic distress, and to explore alternative uses of the human and physical resources.

The discovery of mineral wealth is one important spurr for economic development and the Board has, therefore, participated financially, together with the province of Nova Scotia, in exploratory drilling for potash. This

has resulted in certain new information concerning the geological structure of the area. The Board, in conjunction with the province, is now prepared to underwrite some of the risks involved if private companies would be willing to continue the exploration program.

6. Assistance to Scientific Research and Development

While the Board is itself not engaged in 'basic' scientific research, it is, nevertheless, convinced that economic growth and industrial development in the Atlantic region would be greatly assisted if suitable research facilities and graduate schools were to exist there.

Provincial industrial research organizations have been operating on a limited scale in Nova Scotia and New Brunswick for some time now, but neither of these provinces had laboratory facilities adequate to service the technological requirements of modern industry. Since it was clear that such laboratories would be needed and that suitable staff would be available, the Board recommended grants of \$1,887,179 to the New Brunswick Research Council and \$2,350,000 to the Nova Scotia Research Foundation and Technical College for the purpose of constructing laboratory buildings and to assist in the purchase of suitable equipment. The buildings in New Brunswick have been completed and are in full operation; those in Nova Scotia will be completed shortly. Further grants for the purchase of scientific equipment for both institutions are now under consideration.

The Board is also of the opinion that financial assistance to provide additional facilities for research and graduate training at major universities in the region will have beneficial effects there. A grant of \$2,556,000 has, therefore, been approved for the University of New Brunswick to assist in the construction of new buildings for the Social Sciences, Engineering, Computer Research, Chemistry, Biology, and Geology. The first three of these have been completed, the Chemistry building is now under construction, and it is anticipated that work on the Biology and Geology buildings will be started soon. A grant of \$2,000,000 has been approved for Dalhousie University to assist in the construction of oceanographic research facilities, and an increase in this grant is now under consideration.

The Board is also to furnish a grant of \$3,000,000 to Memorial
University of Newfoundland. This sum is to assist in the construction of
an Engineering building and to finance the purchase of requisite equipment
and books. This is the only grant the Board has ever made in support of
undergraduate education, but it was considered that, in the case of Newfoundland, where no technological research facilities now exist, financial
assistance for the construction of an Engineering building at the University
would be an appropriate step to further economic development.

Grants of \$50,000 each were made for the purchase of equipment for a geochemical laboratory in New Brunswick and an ore dressing laboratory in Nova Scotia. It is anticipated that these new facilities will assist materially in developing new mining ventures in the region.

Actual expenditures in respect of these programs for the years
1963-64 to 1967-68 are given in Table J below.

Table J

Operating and Capital Funds Expended by the Board on Scientific Activities, 1963-64 to 1967-68

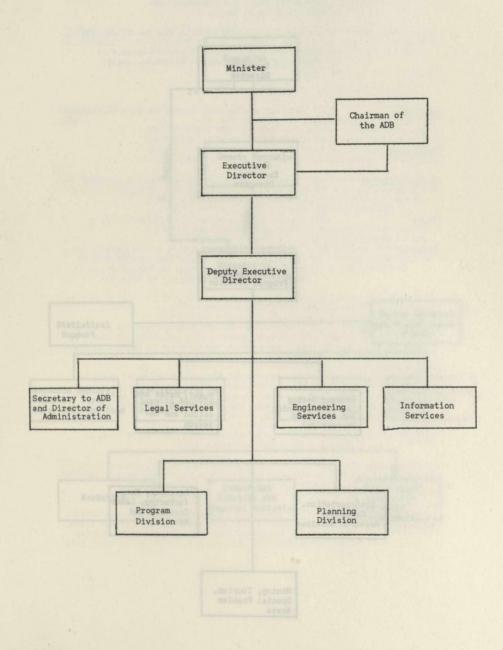
Year	Nature of Operating	Capital	re (\$) Total
1963-64	shorteneds, it	minoritary airs b	the positionary of
1964-65	ers out about	he shorted to	Antonomic substi
1965-66	The contributed	132,589	132,589
1966-67	ested tueson aluteror	481,618	481,618
1967-68	or alessanders	1,718,662	1,718,662
<u>Total</u>	-	2,332,869	2,332,869

All the above expenditures have been on account of capital grants for the construction of buildings or for the purchase of major items of equipment.

The Board does not support the operating expenses or the minor routine laboratory equipment expenses of such research facilities.

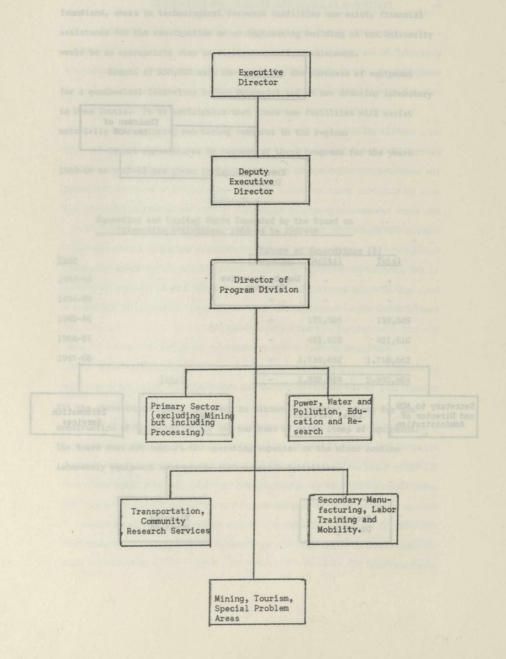
APPENDIX 1

Organization Chart of the Atlantic Development Board



APPENDIX 2

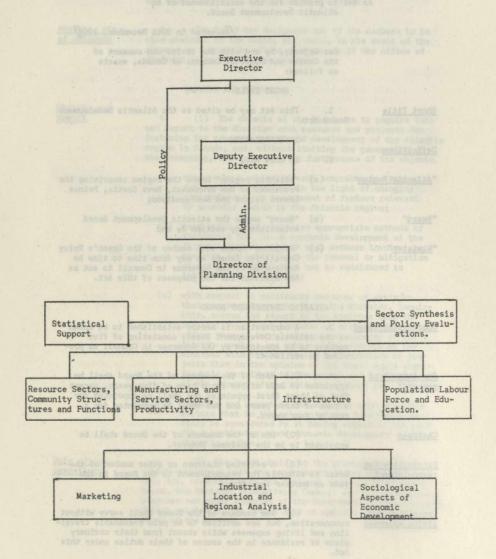
Office of the Executive Director and Organization of the Program Division



APPENDIX 3

Office of the Executive Director

and Organization of the Planning Division



APPENDIX 4

The Atlantic Development Board Act, 1962

11 ELIZABETH II

Chap. 10

An Act to provide for the establishment of an Atlantic Development Board.

Assented to 20th December, 19627

Her Majesty, by and with the advice and consent of the Senate and House of Commons of Canada, enacts as follows:

SHORT TITLE

Short Title

1. This Act may be cited as the Atlantic Development Board Act.

INTERPRETATION

2.

2. In this Act,

"Atlantic Region" (a) "Atlantic region" means the region comprising the Provinces of New Brunswick, Nova Scotia, Prince

Edward Island and Newfoundland;
(b) "Board" means the Atlantic Development Board

established by section 3; and

"Minister"

"Board"

Definitions

(c) "Minister" means such member of the Queen's Privy Council for Canada as may from time to time be designated by the Governor in Council to act as the Minister for the purposes of this Act.

ATLANTIC DEVELOPMENT BOARD

Board established

d 3. A corporation is hereby established to be known as the Atlantic Development Board, consisting of five members to be appointed by the Governor in Council as provided in section 4.

Appointment of members

4. (1) Each of the members of the Board shall be appointed to hold office for a term of five years, except that of those first appointed one shall be appointed for a term of three years and two shall be appointed for a term of four years.

Chairman

(2) One of the members of the Board shall be appointed to be the chairman thereof.

Eligibility for reappointment

(3) A retiring chairman or other member of the Board is eligible for reappointment to the Board in the same or another capacity.

Travelling and living expenses

5. (1) The members of the Board shall serve without remuneration, but are entitled to be paid reasonable travelling and living expenses while absent from their ordinary place of residence in the course of their duties under this Act.

Honorarium to Chairman

Notwithstanding subsection (1), the chairman of the Board may be paid such amount per annum as an honorarium as may be approved by the Governor in Council.

Quorum

6. Three members constitute a quorum of the Board.

Vacancy

7. A vacancy in the membership of the Board does not impair the right of the remainder to act.

Absence, etc. 8. The Board may designate one of its members to be of chairman vice-chairman of the Board, who shall, in the event of the absence or incapacity of the chairman or if the office of chairman is vacant, act as chairman.

OBJECTS AND POWERS

Objects and powers

- (1) The objects of the Board are to inquire into and report to the Minister upon measures and projects for fostering the economic growth and development of the Atlantic region in Canada, and, without limiting the generality of the foregoing, the Board may, in furtherance of its objects.
 - (a) prepare on a systematic and comprehensive basis, and revise as required in the light of changing circumstances, an assessment of factors relevant to economic growth in the Atlantic region;
 - (b) keep under constant review appropriate methods of furthering the sound economic development of the Atlantic region, whether such methods involve new measures and projects or the removal or mitigation of existing factors that may be considered to inhibit such development;
 - (c) with respect to particular measures or projects that may be referred to it by the Minister, inquire into, assess and report to the Minister upon the feasibility of such measures or projects and the effect thereof in relation to the economy of the Atlantic region, and make recommendations to the Minister with respect to any such measures or pro-jects that in the opinion of the Board would signiof the economy of the Atlantic region; and ficantly contribute to the growth and development
 - (d) consider and report to the Minister upon any other matters that in the opinion of the Board may use-fully be considered by it having regard to the need for a continuing sound economic development of the Atlantic region.

Duty of cooperation

(2) The Board shall, to the greatest possible extent consistent with the performance of its duties under this Act, cooperate with the National Economic Development Board, the National Productivity Council and all departments, branches and other agencies of the Government of Canada having duties related to, or having aims or objects related to those of the Board.

ORGANIZATION

Meetings

10. The Board shall meet at such times and places as it deems necessary but shall meet at least once a year in the City of Ottawa.

Executive Director

(1) The Governor in Council may appoint an Executive Director of the Board, who shall hold office during pleasure and shall be paid such salary and expenses as are fixed by the Governor in Council.

Direction of

(2) The Executive Director is the chief work and staff executive officer of the Board and has supervision over and direction of the work and staff of the Board.

By-laws

(1) The Board may, subject to the approval of the Governor in Council, make by-laws for the regulation of its proceedings and generally for the conduct of its activities, including the establishment of advisory and other committees of the Board.

Advisorv

(2) Any by-law made pursuant to subsection (1) establishing an advisory committee of the Board may provide for the membership thereon of persons other than members of the Board, in addition to members of the Board.

Appointment of Staff

- 13. (1) The Board may
 - (a) appoint such officers and employees as are necessary for the proper conduct of the work of the Board; and
- (b) prescribe the duties of such officers and employees and, subject to the approval of the Treasury Board, prescribe the conditions of their employment.

Salaries and expenses of staff

(2) The officers and employees of the Board appointed as provided in subsection (1) shall be paid such salaries and expenses as are fixed by the Board with the approval of the Treasury Board.

Technical and

The Board may engage on a temporary basis or special advisors for any period of not more than two years the services of persons having technical or specialized knowledge of any matter relating to the work of the Board, to advise and assist the Board in the performance of its duties under this Act, and with the approval of the Treasury Board may fix and pay the remuneration of such persons.

Superannuation

(1) The Executive Director and the officers and employees of the Board appointed as provided by subsection (1) of section 13 shall be deemed to be employed in the Public Service for the purposes of the Public Service Superannuation Act, and the Board shall be deemed to be a Public Service corporation for the purposes of section 23 of that Act.

Application of Government Employees Compensation Act

(2) The Government Employees Compensation Act applies to the Executive Director and the officers and employees of the Board appointed as provided in subsection (1) of section 13 and, for the purposes of that Act, such persons shall be deemed to be employees in the service of Her Majesty.

Not agent of 16. The Board is not an agent of Her Majesty and, except as provided in Section 15, the members, Executive Director and staff of the Board are not part of the public service.

FINANCIAL

17. All amounts required for the payment of salaries and other expenses under this Act including expenses of administration shall be paid out of moneys appropriated by Parliament for the purpose.

AUDIT

Audit

18. The accounts and financial transactions of the Board shall be audited annually by the Auditor General, and a report of the audit shall be made to the Board and the Minister.

REPORT TO PARLIAMENT

Annual report to be made

The chairman of the Board shall, within three 19. months after the termination of each fiscal year, transmit to the Minister a statement relating to the activities of the Board for that fiscal year, including the financial statements of the Board and the Auditor General's report thereon, and the Minister shall cause such statement to be laid before Parliament within fifteen days after the receipt thereof or, if Parliament is not then sitting, on any of the first fifteen days next thereafter that Parliament is sitting.

APPENDIX 4 (Cont'd)

12 ELIZABETH II

Chap. 5

An Act to amend the Atlantic Development Board Act

Assented to 31st July, 19637

- 1962-63, c. 10 Her Majesty, by and with the advice and consent of the Senate and House of Commons of Canada, enacts as follows:
 - 1. Section 2 of the Atlantic Development Board Act is amended by striking out the word "and" at the end of paragraph (b) thereof and by adding thereto, immediately after paragraph (b) thereof, the following paragraph:

"Fund"

- "ba) "Fund" means the Atlantic Development Fund established by section 16; and"
 - 2. (1) Sections 3 and 4 of the said Act are repealed and the following substituted therefor:

Board established

ed "3. (1) A corporation is hereby established to
be known as the Atlantic Development Board, consisting
of eleven members to be appointed by the Governor in
Council as provided in section 4.

Constitution of membership

n of (2) The membership of the Board shall be constituted in such a manner as to reflect the economic structure of the Atlantic region.

Appointment of members

4. (1) Each of the members of the Board shall be appointed to hold office for a term of three years, except that of those first appointed four shall be appointed for a term of one year and four shall be appointed for a term of two years.

Chairman

(2) The Governor in Council shall designate one of the members to serve as chairman of the Board during pleasure.

Eligibility for reappointment

- (3) A person who has served two consecutive terms as a member of the Board is not, during the twelve month period following the completion of his second term, eligible for reappointment."
- (4) A person who, at the coming into force of this Act, held office under the Atlantic Development Board Act as a member of the Atlantic Development Board shall be deemed to have been appointed as a member of the Board under this Act
 - (a) in the case of the person who at the coming into force of this Act held the office of chairman of the Board, for a term of two years, and
 - (b) in any other case, for a term of one year.
- (5) The term of each of the persons first appointment to the Atlantic Development Board after the coming into force of this Act and the term of each of the persons referred to in subsection (2) shall be calculated as if such term had commenced on the 24th day of January, 1963.

3. Section 6 of the said Act is repealed and the following substituted therefor:

Quorum

- "6. A majority of the members consitutes a quorum of the Board."
 - The said Act is further amended by adding thereto, immediately after section 8 thereof, the following section:

Her Majesty

Board agent of "8A. (1) The Board, is for all purposes of this Act. an agent of Her Majesty, and its powers under this Act may be exercised only as an agent of Her Majesty.

Contracts

(2) Subject to the approval of the Governor in Council, the Board may, on behalf of Her Majesty, enter into contracts in the name of Her Majesty or in the name' of the Board.

(3) Property acquired by the Board is the property of Her Majesty and title thereto may be vested in the name of Her Majesty or in the name of the Board.

Proceedings

- (4) Actions, suits or other legal proceedings in respect of any right or obligation acquired or incurred by the Board on behalf of Her Majesty, whether in its name or in the name of Her Majesty, may be brought or taken by or against the Board in the name of the Board in any court that would have jurisdiction if the Board were not an agent of Her Majesty."
- 5. Section 9 of the said Act is repealed and the following substituted therefor:

Objects and

- "9. (1) The objects of the Board are to inquire into powers and report to the Minister upon programs and projects for fostering the economic growth and development of the Atlantic region of Canada, and to consider, report and make recommendations to the Minister concerning programs and projects not involving the use of the Fund and programs and projects involving the use of the Fund; and without limiting the generality of the foregoing, the Board may, in furtherance of its objects,
 - (a) prepare, in consultation with the Economic
 Council of Canada, an overall co-ordinated
 plan for the promotion of the economic growth of the Atlantic region;
 - (b) keep under constant review appropriate methods of furthering the sound economic development or the Atlantic region, whether such methods involve new programs and prodevelopment of the Atlantic region, whether jects or the removal or mitigation of existing factors that may be considered to inhibit such development;
 - (c) with respect to particular programs or projects that may be referred to it by the Minister or that the Board may on its own initiative investigate, inquire into, assess and report to the Minister upon the feasibility of such programs or projects and the effect thereof in relation to the economy of the Atlantic region, and make recommendations to the Minister with respect to any such programs or projects that, in the opinion of the Board, will contribute to the growth
 and development of the economy of the Atlantic
 region; and

- (d) with the approval of the Governor in Council, enter into agreements with
- (i) the government of any province comprised in the Atlantic region or the appropriate agency thereof, or
- (ii) any other person,

respecting the use of the Fund in finan-cing or assisting in financing the undertaking and the carrying out of particular programs or projects described in subsection (1) of section 16.

Duty of co-

- (2) The Board shall, to the greatest possible operation extent consistent with the performance this Act, consult and co-operate with the Economic Council extent consistent with the performance of its duties under of Canada and all departments, branches and other agencies of the Government of Canada having duties related to, or having aims or objects related to those of the Board."
 - 6. Section 16 of the said Act is repealed and the following heading and section substituted therefor:

"ATLANTIC DEVELOPMENT FUND

Consolidated Revenue Fund

Payments out of 16. (1) Subject to subsection 4, the Minister of Finance may, on the recommendation of the Minister, pay to the Board out of the Consolidated Revenue Fund such amounts as are from time to time required by the Board for the purpose of financing or assisting in financing the undertaking and the carrying out of programs and projects that, in the opinion of the Board, will contribute to the growth and development of the economy of the Atlantic region and for which satisfactory financing arrangements are not otherwise available.

Atlantic Development

(2) There shall be a special account in the Consolidated Revenue Fund to be known as the Atlantic Fund established Development Fund, to which shall be credited all amounts paid by the Minister of Finance to the Board under subsection (1) and to which shall be charged all payments in respect of programs or projects described in that subsection.

Approval of programs or projects

(3) No payments may be made by the Minister of Finance to the Board under sub-section (1) except in respect of a program or project described in that subsection that has been approved by the Governor in Council.

Total of amounts that may be paid

- (4) The total of all amounts that may be paid by the Minister of Finance to the Board under subsection (1) and credited to the Atlantic Development Fund is one hundred million dollars."
- 7. Section 17 of the said Act is repealed and the following substituted therefor:

Appropriations

"17. All expenditures under this Act including amounts required for the payment of salaries, technical and economic surveys and other expenses including expenses of administration, except any amount described in sub-section (1) of section 16, shall be paid out of moneys appropriated by Parliament therefor."

Coming into force

This Act shall come into force on a day to be fixed by proclamation of the Governor in Council.

14-15 ELIZABETH II

Chap. 31

An Act to amend the Atlantic Development Board Act.

Assented to 11 July, 19667

1962-63, c. 10; Her Majesty, by and with the advice and consent of the 1963, c.5 Senate and House of Commons of Canada, enacts as follows:

1963, c.5,

l. Subsection (2) of section 8A of the Atlantic

s.4

Development Board Act is repealed and the following
substituted therefor:

Contracts

"(2) The Board may, on behalf of Her Majesty,
enter into contracts in the name of Her Majesty or in
the name of the Board."

1963, c.5,
2. Paragraph (d) of subsection (1) of section
5. 5
9 of the said Act is repealed and the following substituted therefor:

- "(d) enter into agreements with the government of any province comprised in the Atlantic region or the appropriate agency thereof, subject to approval thereof by the Governor in Council, or enter into agreements with any other person, providing for
- (i) the undertaking by the Board of any programs or projects that, in the opinion of the Board, will contribute to the growth and development of the economy of the Atlantic region and for which satisfactory financing arrangements are not otherwise available,
 - (ii) the joint undertaking by the Board and the province or agency thereof or person of programs or projects described in subparagraph (i), or
 - (iii) the payment by the Board to the province or agency thereof or person of contributions in respect of the cost of programs or projects described in subparagraph (i)."
 - 3. The said Act is further amended by adding thereto, immediately after section 9 thereof, the following section:

Provision to be included in agree—(d) of subsection (1) of section 9 shall, where appropriate, specify the respective proportions of the revenues from any program or project to which the agreement relates that are to be paid to the Board and the province or agency thereof or person."

1963, c. 5, s. 6 (1) Section 16 of the said Act is repealed and the following substituted therefor:

Atlantic Development Fund
established

"16. (1) There shall be a special account in the
Consolidated Revenue Fund to be known as the Atlantic
Development Fund.

Credits and charges to Fund

(2) There shall be credited to the Fund. in addition to the amounts credited thereto pursuant to subsection (1) of section 16A, all revenues of the Board under agreements entered into pursuant to paragraph (d) of subsection (1) of section 9 and there shall be paid out of the Consolidated Revenue Fund and charged to the Fund all expenditures under agreements entered into pursuant to paragraph (d) of subsection (1) of section 9.

Limitation.

(3) No payment shall be made out of the Consolidated Revenue Fund under this section in excess of the amount of the balance to the credit of the Fund.

Payment out of Consolidated Revenue Fund

- 16A. (1) Subject to subsection (2), the Minister of Finance may, on the recommendation of the Minister, credit to the Fund out of the Consolidated Revenue Fund such amounts not exceeding in the aggregate one hundred and fifty million dollars as are from time to time required by the Board under agreements entered into pursuant to paragraph (d) of subsection (1) of section 9.
- (2) No amount may be credited by the Minister of Finance to the Fund under subsection (1) in respect of programs or projects described in an agreement entered into under paragraph (d) of subsection (1) of section 9 with a province or agency thereof, unless the agreement has been approved by the Governor in Council."

Approval of

(3) For the purpose of section 16A of the agreements said Act as enacted by this section, all amounts credited or charged to the Atlantic Development Fund pursuant to section 16 of the said Act before the coming into force of this Act shall be deemed to have been credited or charged, as the case may be, to the Atlantic Development
Fund pursuant to sections 16 and 16A of the said Act as enacted by this section.

APPENDIX 5

Research Studies Prepared for the Board as Part of its "Overall Economic Planning' Activity

Sector	Project-Title	Cost (\$)*
A. AGRICULTURE	1. The Competitive Position of Agricultural Enterprises in Nova Scotia, New Brunswick and Prince Edward Island. (1968).	58,200
	 Past Trends and Prospects for Agri- culture in the Atlantic Provinces. (1967). 	16,461
B. <u>FISHERY</u>	1. Fishery in the Atlantic Provinces. (1968).	ж
C. PORESTRY	1. Demand for and Supply of Hardwood in the Atlantic Provinces. (1966).	50,000
	2. Forestry in the Atlantic Provinces. (1968).	46,303
D. HUMAN RESOURCES	1. Barriers to Manpower Mobility in Economically Lagging Areas of New- foundland and Labrador, Nova Scotia, New Brunswick and Quebec. (1968).	35,000
	Education as a Factor in the Growth of the Atlantic Provinces. (1968).	24,840
	3. Past and Future Trends in the Labor Force of the Atlantic Provinces. (1966).	××
	4. Recent Trends in the Determinants of Population Growth in the Atlantic Provinces and Provincial Projections by Age and Sex for the Period 1966-1991. (1966).	**
	5. Training and Other Sources of Supply of Skilled and Technical Manpower in the Atlantic Provinces: Part 1 - Past Developments and Continuing Problems. (1968).	ж
E. <u>INPUT-OUTPUT</u> ANALYSIS	1. Derivation of Capital Stock and Capital-Output Ratios for Industries	
00026 . (198)	in the Atlantic Provinces. (1968). 2. Inter-Industry Flow of Goods and	××
	Services in the Atlantic Provinces. (1968; 1969).	126,403
	3. Projection of Consumption Demand in the Atlantic Provinces. (1968).	××
F. MANUFACTURING INDUSTRY	1. The Manufacturing Sector of the Atlantic Region. (1968).	××
	 New Manufacturing Establishments and Expansions in Canada and in the Atlantic Region, 1956-1965. (1967). 	××

Sec	tor		Project-Title Co	ost (\$)x
F.	MANUFACTURING INDUSTRY (Cont'd)	3.	Manufacturing Opportunity Studies (covering the following industry groups):	
			a. Asbestos Products. (1969).	# 20
			b. Canvas Products. (1969).	#
			c. Furniture and Fixtures. (1969).	#
			d. Fruits and Vegetables. (1969).	#
			e. Metal Fabricating. (1969).	#
			f. Paper Products. (1969).	#
			g. Plastics. (1969).	#
G.	MARKETING	1.	Groundfish Trade between the Atlant Coast (including Quebec) and the	
	000,08		United States. (1969).	5,000##
н.	MINING	1.	The Mineral Resources of the Atlantic Provinces. (1966-68).	*
I.	SOCIOLOGICAL FACTORS	1.	Sociological Factors in the Economic Development of the Atlantic Pro- vinces. (1967).	10,000
J.	TOURISM AND RECREATION	1.	The Tourist Industry in Newfoundland, New Brunswick and Nova Scotia. (1968).	366,707
к.	TRADE	1.	The Export Trade of the Atlantic Provinces. (1967).	3,000
L.	TRANSPORTATION	1.	The Deep Water Harbors of the Atlantic Provinces. (1968).	8,469
		2.	Transportation Network and Urban Systems of the Provinces of Nova Scotia and New Brunswick. (1966).	3,500
М.	URBAN CENTERS	1.	The Structure and Functions of Urbar Centers in the Atlantic Provinces. (1968).	148,929
N.	WATER RESOURCES	1.	The Water Resources of the Atlantic Region. (1966-69).	902,322
0.	OTHER STUDIES	1.	Analysis of Federal Expenditures in the Atlantic Provinces. (1967).	4,500
		2.	Development of the Newfoundland Economy since Confederation. (1965).	7,000
		3.	Industrial Location, with Special Reference to the Atlantic Provinces. (1965).	5,841
		4.	Major Economic Indicators - Atlantic Region. (1967).	MK MK

LATOT Separations in Canada and in the Melanaic Region, 1956-1965. (1967).

1,822,475

Notes

- All 'cost' figures are cumulative to March 31, 1968.
- These studies have been undertaken intramurally, whereas the others have been commissioned by the Board from outside consultants. Some of these studies, as indicated, are currently under way, and are scheduled for completion in early 1969.
- # All these studies are now under way, and will be completed by early 1969. However, no expenditure had been incurred on account of any of these studies prior to March 31, 1968.
- ## This is on account of only one section of this study that is being prepared extramurally; the rest of the study is being carried out intramurally.

APPENDIX 6

Research Studies Prepared for the Board as Part of its "Assistance to Development Projects' Activity

			be being and buy one year some visiters	100
Sec	tor		Project-Title	Cost (\$)x
Α.	AGRICULTURE	1.	Agricultural Land Mapping. (1968).	5,000
В.	HUMAN RESOURCES	1.	Minto-Chipman, N.B., Labor Force. (1965).	3,700
C.	INDUSTRIAL PARKS	1.	Layout and Design of Proposed Water Front Industrial Park at Site of former Point Edward Naval Base, Cape Breton, N.S. (1968).	36,989
		2.	Industrial Park Needs at various centers in New Brunswick and Nova Scotia. (1966).	70,000
		3.	Industrial Park Needs in Charlotte- town, P.E.I. (1967).	10,000
		4.	Industrial Park Needs in the Metro- politan Area of St. John's, Nfld. (1967).	25,000
		5.	Survey and Pre-Design of a Sewer System for the Industrial Park in Stellarton, N.S. (1967).	3,150
D.	MARKETING	1.	Marketing Possibilities for Sydney Steel. (1968).	5,000
		2.	Marketing Study of Selected Steel Products of Sydney, N.S. (1967).	12,776
E.	MINING	1.	Beneficiation Research Program on Silica Sand. (1966).	3,000
		2.	Beneficiation Research Program on Wabana Iron Ore, Bell Island, Nfld. (1965).	300,000
		3.	Potash Exploration in Nova Scotia. (1967).	265,801
F.	POWER	1.	Foundation Investigation for Tidal Power Development in Upper Bay of Fundy, New Brunswick. (1965).	100,000
		2.	Investigation for a Possible Power Site at Minas Basin, Bay of Fundy, N.B. (1967).	70,000
G.	TRADE	1.	Economic Study of Grain Trade via Atlantic Ports. (1965).	25,000
н.	TRANSPORTATION AND COMMUNICATION	1.	Engineering and Economic Feasibility Studies re Submarine Cable between Prince Edward Island and the Main- land. (1964).	10,000
		2.	Engineering Investigations for Deep Water Harbor, Ore Dock, and Ancillary Facilities at Belledune Point, N.B. (1965).	86,253

Sec	tor		Project-Title	Cost (\$)*
н.	(Cont'd)	3.	Preliminary Study of Economic Aspects of Effects on the Atlantic Ports of Winter Navigation in the St. Law- rence River and Gulf of St. Law- rence. (1964).	10,000
		4.	St. John Harbor Bridge Throughway Complex. (1968).	8,014
		5.	Stream Gauging Survey of North West Brook near Trepassy, Nfld. (1967).	2,232
		6.	Study of the Effects of the North- umberland Strait Causeway upon Prince Edward Island. (1968).	34,178
		7.	Study of Gander Airport as a Major Air Cargo Staging Point and Industrial Center. (1967).	3,449
		8.	Technical Aspects of Winter Navigation in the St. Lawrence River and the Gulf (1964).	
		9.	Trans-Atlantic Container Shipping Operations from the Ports of Halifax, N.S. and St. John, N.B. (1966).	23,976
I.	WATER RESOURCES	1.	Engineering Investigation of a Suitable Water Supply System for Fish Plant at Shippegan, N.B. (1965).	11,310
		2.	Investigation of Water Supplies to Fish Processing Plants and Water Re- sources Survey at Trepassy, Nfld. (1968).	118,870
		3.	Investigation of Water Supply in Bay St. George, Stephenville, Nfld. (1968)	. 40,000
		4.	Study and Investigation of Purification of Salt Water for use in Fish Processing Plants. (1967).	19,947
		5.	Study of Ground Water Resources in Nova Scotia. (1968).	26,500
		6.	Survey of Water Resources in North Rustico, P.E.I. (1968).	22,830
		7.	Survey of Water Supplies in Witless Bankfld. (1968).	y, 6,211
		8.	Water Supplies and Needs in Placentia, Nfld. (1967).	19,501
		9.	Water Supplies and Needs in St. Mary's Bay Area, Nfld. (1968).	17,988
		10.	Water Supplies in Alder Point, Isle Madame-St. Peters, Cape Sable Island and Digby Neck, N.S. (1968)	112,657
		11.	Water Supplies in Bay Bulls area of Newfoundland. (1967).	2,913

Sec	tor		Project-Title	Cost (\$)*
I,	WATER RESOURCES (Cont'd)	12.	Water Supplies in Charlotte County and Caraquet Areas of New Brunswick. (1968).	119,569
		13.	Water Supply at Come-by-Chance, Nfld. (1966).	12,800
J.	OTHER STUDIES	1.	Development Plan for Ernest Harmon Air Base, Stephenville, Nfld. (1968).	40,000
		2.	Economic Survey of Bell Island, Nfld. (1967)	26,661
		3.	Industrial Opportunities in Cape Breton, N.S. (1966).	32,000
			Potential Industrial Sites in the Halifax Area. (1968).	20,000
		5.	Study of Waste Products of Foods and Beverages Industries in the Atlantic	
			Provinces. (1966).	9,600
			TOTAL 1,	777,415
	Note:	1)	Unit manapagatak Internativa Park In	3,150

All 'cost' figures are cumulative to March 31, 1968.

Sanate Committee on Science Poli

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the Government of Canada, April 17, 1915; smendments to the

Report to

Senate Committee on Science Policy

Prairie Farm Rehabilitation Act

Department of Forestry and Rural Development

March 1969

Information on P.F.R.A. with reference to Senate Committee on Science Policy

Mandate

- 1. The Prairie Farm Rehabilitation Act, assented to by the Government of Canada, April 17, 1935; amendments to the Act assented to March 31, 1937, April 5, 1939, June 14, 1941, May 14, 1948, June 30, 1951 and June 28, 1955.
- 2. The purpose and objective of the P.F.R.A. program are summarized in Section 4 of the Act:

"....to secure the rehabilitation of the drought and soil drifting areas in the Provinces of Manitoba, Saskatchewan and Alberta, and to develop and promote within these areas systems of farm practice, tree culture, water supply, land utilization and land settlement that will afford greater economic security...."

Importance and pertinence of research in the P.F.R.A. program

- 3. In certain areas, such as systems of farm and ranch practice, tree culture and land utilization, results of research carried out by other agencies have been applied, -- particularly research done by the Research Branch of the Department of Agriculture. In applying research results, some investigations, tests and studies are carried on to improve mechanical and cultural techniques.
- 4. In the field of water supply, conservation and use, considerable research has been conducted with reference to the problems encountered in the investigation, design and construction of complex works for water conservation projects.

 Research is carried out as required for project planning and construction, on a continuing basis, as part of the regular work of Engineering Divisions. Personnel and funds are generally not specifically designated for research.
- 5. Particulars concerning the above activity are as follows:

6. Category - Engineering Works - Specifications and Design

Soil Mechanics Division:

- 6.(a) Research on shear strength and stability of highly plastic clays and clay shales in foundations and natural slopes. Using observational approach in the field and residual strength in laboratory. Commenced in 1950.

 Staff Masters 0.1, Bachelors 0.1, technicians 2.0 manyears. Average annual cost \$20,000.
- 6.(b) Research on design, construction methods and observational apparatus for earth dams and related structures. Evaluating designs on the basis of performance to develop safer and more economical dams. Commenced in 1941. Staff Bachelors 0.5, technicians 2.0 man-years. Average annual cost \$25,000.
- 6.(c) Research on heave and rebound of concrete water development structures resulting from frost action and soil swelling. Observation of existing structures and theoretical studies. Commenced in 1957. Staff Masters 0.2, technicians 1.5 man-years. Average annual cost \$13,000.
- 6.(d) Research on canal and dugout linings. Determining effectiveness of various types of materials and methods used to line and waterproof canals and dugouts. Commenced in 1950. Staff Bachelors 0.1, technicians 0.2 man-years. Average annual cost \$3,000.
- 6.(e) Research on embankment slope protection. Observing performance of existing slope protection. Commenced in 1960. Staff Bachelors 0.7, technicians 1.5 man-years. Average annual cost \$18,000.
- 6.(f) Research on improvement of field exploration and sampling methods. Developing and comparing different techniques in foundation and site exploration. Commenced in 1941. Staff Bachelors 0.1, technicians 0.2 man-years. Average annual cost \$3,500.

Design Division:

- 6. (g) Hydraulic model tests three to six projects annually. Typical projects undertaken hydraulic model study of spillway approach channel to Shellmouth Dam; hydraulic model study of gating arrangement in Qu'Appelle Dam conduit; hydraulic model study of side-channel spillway for Penticton Creek diversion dam; feasibility of using asphalt waterstops in South Saskatchewan River Dam. Other modelling projects for specific purposes will be undertaken as required on a continuing basis. The results of these applied research studies are applicable, to some degree, in other areas.

 Staff Masters 1.0, technicians 2.0 man-years. Average annual cost \$20,000
- 7. Category Engineering Materials Soil Mechanics Division:
- 7. (a) Applied research on up-grading of natural aggregates for concrete construction. Study of deleterious materials occurring in aggregates and methods of removal, evaluation of beneficial aggregates in concrete mixes in field and laboratory. Commenced in 1950. Staff Bachelors 0.1, technicians 0.3 man-years. Average annual cost \$4,500.

 7. (b) Applied research in concrete technology, including restoration and repair, with respect to Western Canadian conditions and sulphate environment. Appraisal of techniques in field and laboratory. Commenced in 1950. Staff Bachelors 0.1, technicians 0.2 man-years. Average annual
- 7.(c) Study of cementitious materials and admixtures for concrete structures. Long term observations of laboratory and field specimens. Commenced in 1955. Staff Bachelors 0.1, technicians 1.0 man-years. Average annual cost \$9,000.

Regional Engineering Division:

cost - \$4,000.

7.(d) Evaluation of sealing compounds in construction of articulated joints in concrete water control structures.

To evaluate the effectiveness of various sealers (polymers, expoy resins, bitumens) in regard to water tightness, bonding qualities and permanence. To determine field application requirements and cost. Commenced 1960. Staff - Bachelors 0.2, technicians 0.1 man-years. Average annual cost - \$3,000.

8. Category - Economic, Social and Institutional
Aspects of Water Resources Research

Determination of Annual Cost of Irrigation Districts in Alberta. To determine the true annual cost of operating, maintaining and periodic replacement of capital works and to compile an inventory of works and their life expectancy.

Commenced 1964, completed 1968. Staff - Bachelors 1.4, technicians 2.0 man-years. Average annual cost \$33,000.

- Category Water Cycle
 Regional Engineering Division:
- 9.(a) Wilson Creek Experimental Watershed. To study in broad terms the interrelation of climate, hydrology, land forms, vegetive cover, and their effect on runoff, erosion and sedimentation in the Manitoba Escarpment watersheds.

 Commenced in 1957, expect to complete in 1972. Staff Bachelors 2.0, Under-graduate assistants 0.5, technicians 2.5 man-years. Average annual cost \$34,000.

Hydrology Division:

- 9.(b) Evaporation from lakes and reservoirs on the Canadian prairies. Using new data and new techniques, to update a report on this subject published in 1952. Commenced in 1965, expect to complete in 1970. Staff Bachelors 0.1, technicians 0.2. Average annual cost \$1,000.
- 9.(c) Thermo-structure of prairie reservoirs. To obtain information on the thermo-structure of selected small lakes and reservoirs on the prairies. Commenced in 1963, expect to complete in 1970. Staff Bachelors 0.1, technicians 0.1 man-years. Average annual cost \$750.

9. (d) Regional Characteristics of Recession Curves. To analyze on a regional basis, from recorded hydrographs, research curve characteristics for prairie streams. Commenced in 1966, expect to complete in 1969. Staff -Bachelors 0.2, technicians 0.3 man-years. Average annual cost - \$2,000.

10. Publications in connection with the above research					
Author	Published				
R. Peterson	The Engineering Jour- nal, May 1945				
J.L. Jaspar & A.S. Ringheim, Soil Mechanics Engineers	The Proceedings of the Third International Conference on Soil Mechanics & Foundation Engineering, Switzer- land 16th to 27th Aug. 1953, Vol. II, Session 8.				
R. Peterson & N.L. Iverson, Soil Mechanics Engineers	eleterica miterials mire MX XM-D Ordilw (s). Fremoval, evaluation Listerial odr emma because Listerial odr emma because				
R. Peterson	The Engineering Jour- nal, February 1957				
N. Peters	The Twelfth Canadian Soil Mechanics Conference, Saskatoon, Sask., Dec. 8 & 9, 1958				
R. Peterson	1967 Congress of Canadian Engineers, Montreal, Que., May 29 - June 2, 1967, Series "D" preprints				
R. Peterson	Proceedings of the American Society of Civil Engineers, August 1954, Vol. 80, Sup. No. 476				
R. Peterson, N.L. Iverson & P.J. Rivard, Soil Mechanics Engineers	Proceedings of the Fourth International Conference on Soil Mechanics and Foundation Engineering, London, August 1957				
R. Peterson	Bulletin of the Geologi- cal Society of America, September 1958, Vol. 69, pp. 1113-1124				
	Author R. Peterson J.L. Jaspar & A.S. Ringheim, Soil Mechanics Engineers R. Peterson, Soil Mechanics Engineers R. Peterson N. Peters R. Peterson R. Peterson				

Title on passing to	Author	Published
Limitations of Laboratory Shear Strength in Evalu- ating Stability of Highly Plastic Clays	R. Peterson, P.J. Rivard, J.L. Jaspar & N.L. Iverson	Proceedings of A.S.C.E. Research Conference on Shear Strength of Co- hesive soils (1960)
The Effect of Test Techniques on the Shear Strength of Western Canadian Clays	L.G. Chan & P.J. Rivard, Soil Mechanics Engineers	Laboratory Shear Test- ing of Soils, 1963, Special Technical Pub- lication No. 361, A.S.T.M.
Shellmouth Dam Test Fill	P.J. Rivard & A. Kohuska	Canadian Geotechnical Journal Vol. II, No. 3, August 1965
Heave of Spillway Structures on Clay Shales	R. Peterson & N. Peters, Soil Mechanics Engineers	Canadian Geotechnical Journal, Vol. I, No. 1
Frost Action in Hydraulic Structures and Roads on the Canadian Prairies	C.A. L'Ami	M.Sc. Thesis, Dept. Civil Engineering, Uni- versity of Saskatchewan, October, 1959. Unpublished.
Third Progress Report on Experi- mental Canal and Dugout Lining Pro- gram	T.G. Goodwin & R. Peterson	PFRA Soil Mechanics and Materials Division; un- published. (March 1947)
Evaluation of Selection of Aggregates for Concrete Construc- tion	G.C. Price, Concrete Engineer	Thirty-ninth Annual Convention of the Canadian Good Roads Association, Montreal, Sept. 30 - Oct. 3, 1958
Experience with Concrete in Sulphate Environments in Western Canada		Thorvaldson Symposium, ACI Convention, Toronto, April 7, 1967. To be published in Thorvaldson Memorial Volume
Investigation of Concrete Materials for the South Saskatchewan River Dam	Concrete	Proceedings of the American Society for Testing and Materials, Philadelphia, Pa. Vol. 61, 1961
Wilson Cr	eek Experimental	Watershed

Wilson Creek Experimental Watershed

Report on Background Information - Wilson Creek Watershed - by C. R. Stanton, P.F.R.A. Winnipeg, Man. June 12, 1958.

Report to Headwater Flood and Erosion Control Committee on Activities in Wilson Creek Watershed, November 1, 1957 to December 31, 1958 - by C. R. Stanton, P.F.R.A. Winnipeg. January 2, 1959.

Appendix B - Scott and McKinnon Creeks - Committee on Headwater Flood and Erosion Control - by G. H. MacKay, P.F.R.A. Winnipeg. February 1959.

Progress Report - Northwest Escarpment and Interlake Region Agreement - by C. R. Stanton, P.F.R.A. Winnipeg. September 1959.

Report of Headwater Flood and Erosion Control Committee on "Headwater Storage Proposals - Wilson Creek Watershed" by G. H. MacKay & G. T. Forsyth, P.F.R.A. Winnipeg. February 1960.

Report on Activities in Wilson Creek Watershed, January 1, 1959 to March 31, 1960 - by C. R. Stanton, P.F.R.A. Brandon. April 1960.

Report on Activities in Wilson Creek Watershed, April 1, 1960 to March 31, 1961 - by C. R. Stanton, P.F.R.A. Brandon.
March 1961.

Report on Activities in Wilson Creek Watershed - April 1, 1961 to March 31, 1962 - by C. R. Stanton, P.F.R.A. Brandon. March 1962.

Report on Activities in Wilson Creek Watershed - April 1, 1962 to March 31, 1963 - by C. R. Stanton, P.F.R.A. Brandon. March 1963.

Report on Activities in Wilson Creek Watershed - April 1, 1963 to March 31, 1964 - by Manitoba Regional Office, P.F.R.A. June 1964.

Report on Activities in Wilson Creek Watershed - April 1, 1964 to March 31, 1965 - by J. E. Thomlinson, P.F.R.A. June 1965.

Report on Activities in Wilson Creek Watershed - April 1, 1965 to March 31, 1966 - by J. E. Thomlinson, P.F.R.A. April 1966.

Report on Activities in Wilson Creek Watershed - April 1, 1966 to March 31, 1967 - by J. E. Thomlinson, P.F.R.A. April 1967.

Hydrometeorological Compilations and Analyses - Wilson Creek Watershed - Volume 1 - 1959 to 1963 - by G. A. McKay, P.F.R.A. Regina. July 1964.

Hydrometeorological Compilations and Analyses - Wilson Creek Watershed - Volume 2 - 1964 - by G. A. McKay, P.F.R.A. Regina. 1965.

The Vegetation of the Wilson Creek Watershed, Riding Mountain
National Park, Manitoba - by J.C. Ritchie, Department of
Northern Affairs and National Resources, Forestry Branch,
Winnipeg, Manitoba. December 1958.

Report of Detailed Reconnaissance Soil Survey of Wilson Creek
Watershed - by L.E. Pratt and E.A. Poyser, Soils & Crops
Branch, Manitoba Department of Agriculture. February 1959.

Field Trip Report on Visit to Wilson Creek Watershed and Adjoining Areas - Riding Mountain National Park, Manitoba - August 28 - 31, 1961 - by Carl R. Miller, U.S.A. Soils Consultant.

Geological and Hydrogeological Reconnaissance of the Wilson Creek Basin, Manitoba - by P. A. Carr, Geological Survey of Canada, Department of Mines & Technical Surveys. Ottawa 1965, Topical Report, No. 106.

Wilson Creek Study, Erosion and Sedimentation Control - by G. H. MacKay, Water Control & Conservation Branch & C.R. Stanton, P.F.R.A. February 1964.

Wilson Creek Experimental Watershed by G. H. MacKay - presented at 1966 Annual General Meeting, E.I.C., 25 - 27 May 1966.

APPENDIX 45

CUSTOMS AND EXCISE

CONNAUGHT BUILDING

OTTAWA, CANADA

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A BRIEF FOR THE SPECIAL COMMITTEE ON SCIENCE POLICY

SENATE OF CANADA

OCTOBER 1968

Special Committee

TABLE OF CONTENTS

	Page
Preface	5019
Chart - Organization of Department	5021
PART A	
CUSTOMS AND EXCISE LABORATORY	
Introduction	5022
Historical Development	5022
Organization	5022
Organizational Functions	5024
Operational Effectiveness	5025
Personnel Policies	5026
Personnel Associated with Scientific Activities	5027
Expenditures Associated with Scientific Activities	5029
Intramural Research Activities	5030
Research Output	5030
Projects	5031
Case Histories of Significant Projects	5033
Applied Research	5033
Development	5035
The Age-tra he of the Wilson Creek Watershed, Alding Mountain	
PART B	
POSSIBLE IMPROVEMENTS DUE TO TECHNICAL DEVELOPMENTS AND THE TYPES OF TECHNICAL ADVICE SOUGHT IN THE PAST	
Electronic Data Processing	5042
Types and Sources of Advice Sought	5043
Types and Sources of Advice Sought	7047
PART C	
RESEARCH IN THE EXCISE TAX BRANCH	
General Comment	5045
Organization	5045
Organizational Functions	5046
Personnel Policies	5046
Research Output	5047

PREFACE

The Department of National Revenue, Customs and Excise, has as its primary responsibility the collection of revenue. The administration and enforcement of the Customs and Excise laws, and the regulations established thereunder, involve the assessment and collection of the Customs duties, Excise duties and Excise taxes applicable on imported and domestically produced goods, and the prevention of smuggling and other fraudulent or evasion practices in respect of the non-payment of Customs and Excise revenues.

The department also performs a number of functions on behalf of other departments in the enforcement of laws which relate to international travel, trade and shipping. These non-revenue functions include primary immigration screening of persons entering Canada, the enforcement of various controls imposed on imports and exports and on the inward and outward movement of shipping.

The Customs administration is primarily involved with the movement of goods across our national border. In addition to collecting revenue, it ensures that Canadian industry receives the benefits extended by the Customs law. Excise activities, on the other hand, are almost exclusively concerned with the collection of revenue in respect of domestic transactions.

The department is comprised of six branches, namely, Customs,
Operations, Excise Tax, Inspection, Financial and Management
Services and Personnel Administration, each engaged in a number of
specific activities, as reflected in the chart shown on page (iii).

Although the department is concerned essentially with the collection and protection of revenue, it has a Customs and Excise Laboratory engaged in chemical analytical work. As well, Customs and Excise officers are interested in a continuing study to streamline controls, refine procedures, standardize documents, provide for the

maximum use of manpower and to devise new measures for expediting and facilitating the entry and release of goods, and the movement of people.

In the light of the foregoing, this brief has been prepared in three parts, as follows:

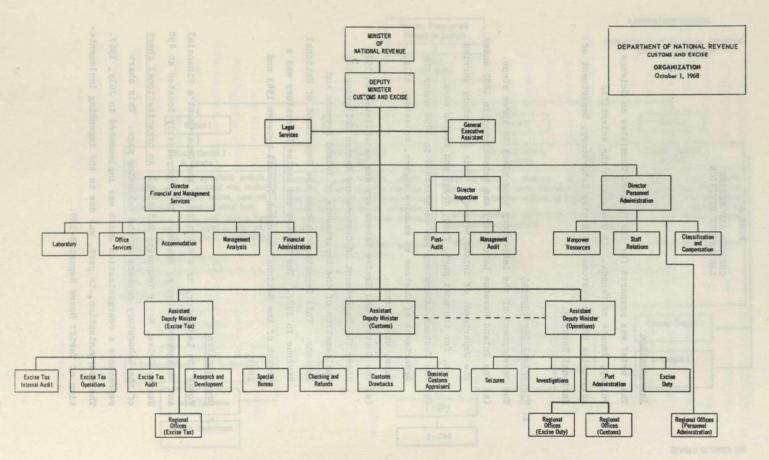
Part A - Customs and Excise Laboratory.

Part B - Possible Improvements due to technical

developments and the type of technical

advice sought in the past.

Part C - Research in the Excise Tax Branch.



PART A

CUSTOMS AND EXCISE LABORATORY DIVISION

Introduction

This brief was prepared for the Special Committee on Science
Policy, Senate of Canada. It deals with the scientific
activities of the Customs and Excise Laboratory, Department of
National Revenue.

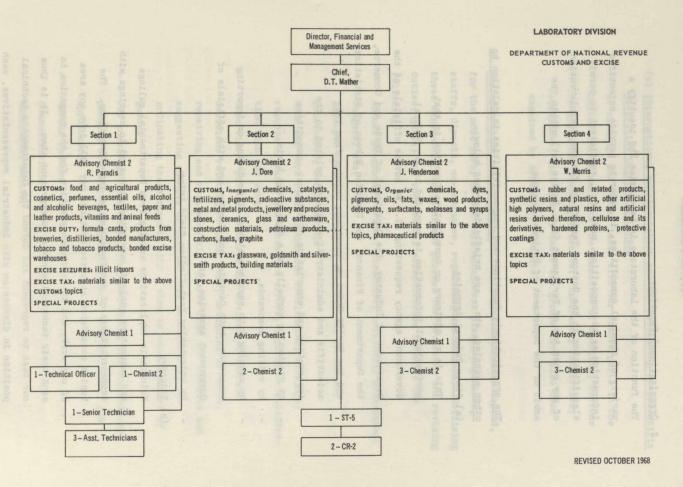
1. Historical Development

The development of the Laboratory took place in three steps.

- (a) The Inland Revenue Laboratory was established in 1887 under the Department of Inland Revenue. This laboratory carried out, for the most part, food, drug, and excise work.
- (b) The Customs Laboratory was established in 1898 under the Department of Customs to examine sugars, molasses, oils, fats, waxes, etc.
- (c) The Customs and Excise Laboratory was established in 1921 under the Department of Customs and Excise following the amalgamation of the Departments of Inland Revenue and Customs. This Department became the Department of National Revenue in 1927. The Customs and Excise Laboratory was a branch of the National Research Council between 1943 and 1954.

2. Organization

Today the Laboratory is a division of the Department's Financial and Management Services Branch. It is physically located at 490 Sussex Drive, No. 9 Temporary Building. An organizational chart of the Laboratory appears on the following page. This chart represents a reorganization which was implemented in July, 1967. The reorganization, in part, was due to the impending implementation of Tariff Board Report R-120.



3. Organizational Functions

The function of the Laboratory is to examine and identify a variety of chemical commodities, in order to provide scientific information as to composition, use, etc., sufficient to permit classification in the Customs Tariff, or for the administration of any other Act of Parliament (i.e. Excise Act) within the ambit of the Department of National Revenue.

The organization's functions and responsibilities in relation to other agencies, etc., are briefly described below:-

(a) Other Federal Agencies

This is an advisory or consultative function in that professional information is supplied to any Federal Government agency requesting it. We advise officials of the Department of Industry, the Department of Trade and Commerce, the Department of Finance, the Dominion Bureau of Statistics, and the Tariff Board on questions arising from the scientific and administrative aspects related to the importation and exportation of chemical commodities

- by discussing verbally on a day-to-day basis,
- by writing memoranda,
- by meeting with representatives of producing or importing companies, both Canadian and foreign and with officials of Government agencies, and
- by undertaking fact-finding field trips.

(b) Industry

Scientific implications arising from Departmental rulings and Laboratory analysis are often discussed in meetings with representatives of manufacturing or importing firms. The topics considered at these meetings may fall into any area of our work, and it is common practice for the companies to send their technical experts to represent them. It is thus our task to represent and defend the Department's technical position in discussion with industrial representatives, each of whom is a specialist in the particular field under consideration.

(c) International Representation and the Monitoring of Scientific
Activities Outside of Canada

We exchange and review ideas with our counterparts in the United States and with the Committee of Chemists, Customs Co-operation Council, Brussels. Laboratory facilities, equipment, etc. used by these two groups have also been examined by Laboratory chemists.

- 4. The operational effectiveness of any organization will depend, for the most part, on how well management plans, organizes, staffs, directs, co-ordinates, regulates, and budgets. Utilizing these management functions our process for reviewing and revising duties, goals, and operational effectiveness includes the following:
 - Annual programme reviews: structure; personnel; procedures;
 budgets; etc.
 - Employee records: turnover; absenteeism; tardiness; grievances; merit ratings
 - Work and work flow: production bottlenecks; backlogs;
 records of waste and excessive errors; reports on satisfaction with our work
 - Supervisory policy: chemists are advised of current decisions relating to their work; assigning of cases; receiving and reviewing all reports from the chemists and suggesting changes or further work as necessary; coordinating these reports with a view to establishment of guides
 - Job knowledge: technical, administrative, and supervisory phases; on-the-job training; special courses, etc.; job application
 - Morale factors
 - Communications
 - Management audits.

In the past, the major hindrances to the effective performance of our work have been a lack of:

- (a) scientific equipment
- (b) manpower
- (c) opportunities for advanced training, special courses, etc.

These obstacles to our technological progress have now been removed.

No major changes in organizational functions are probable during the next five years. The Laboratory was re-organized and streamlined in July of 1967.

5. Personnel Policies

In the area of recruitment, the Public Service Commission is responsible for the selection and placement of personnel. This process is shared with us. We work together as closely as possible to ensure that we are fully informed as to the sources of supply and that every effort is made to find qualified people and to bring them into the service. This is important in those professions which are in short supply. This is particularly true in our case as we like to recruit chemists with at least an honors degree. We inform the Commission in advance of our needs. This enables the Commission to make plans to secure the personnel we require, in the numbers we require, from university graduating classes. The initial steps of identifying and hiring the most effective researchers involve recruitment, selection (academic performance, experience, personal suitability) and placement.

Training, development, transfer, and promotion of personnel follows the selection process. Those with potentiality as researchers, administrators, or both are identified by a combination of factors which include the following:

- (a) formal qualifications
- (b) experience and training background
- (c) job knowledge of technical, administrative, and supervisory phases

- (d) leadership qualities
- (e) ability to communicate orally and in writing.

Staff members are encouraged to take courses offered by our Department or the Public Service Commission in such fields as supervision, public and basic administration, management, and languages. Extramural education in the form of approved university courses, special courses, etc., is also encouraged.

6. Personnel Associated with Scientific Activities

- (a) Current personnel establishment by category of personnel
 - 18 Chemists (professional)
 - 1 Technical Officer
 - 4 Technicians
 - 3 Clerical
- (b) One of the above professional staff devotes most of his time to administrative duties
- (c) Tabulated information regarding professional staff associated with scientific activities

Table I

(1)	Country of birth	Pass BSC (8) 4-Canada 1-Italy 1-England 1-Yugoslavia 1-Scotland	Honors BSC (8) 4-Canada 1-U.S. 1-Italy 1-China 1-Hungary	Master (2) 1-Canada 1-Pakistan
(11)	Country in which secondary education taken	7-Canada 1-Italy	8-Canada	1-Canada 1-Pakistan
(111)	Country in which University degree taken	7-Canada 1-Italy	8-Canada	2-Canada
	(a) Number of working years since graduation (b) Number of years employed in present organization each individual	1)a)33 b)30 2)a)25 b)24 3)a)17 b)12 4)a)8 b)1 5)a)2 b)2 6)a)0 b)0 7)a)0 b)0 8)a)0 b)0	1)a)38 b)33 2)a)7 b)7 3)a)5 b)5 4)a)4 b)4 5)a)2 b)2 6)a)2 b)0 7)a)0 b)0 8)a)0 b)0	1)a)39 b)33 2)a)4 b)1
(v)	Average Age	37	30	48
(vi)	Percentage able to operate effectively in Canada's two official languages	13	25	0
(vii)	Number of staff on education leave	0 93	0	0

Table II

		1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973
Total number of professional staff for each of the years	BSC Pass	7	6	4	4	5	6	8	8	8	8	8	8
1962 to 1968 and estimates for each of the years 1969 to 1973	BSC HONORS	3	5	6	6	6	6	8	10	10	10	10	10
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Masters	1.	1	1	1	1	2	2	2	2	2	2	2
Percentage turnover of professional staff for each	BSC Pass	28	33	0	0	0	17			State of the	prost.	3 03	Nation .
of the years 1962-1967	BSC Honors	0	0	0	17	0	17		ariot e	parado pura e	pare;	Dogger Togger	9 3
	Masters	0	0	0	0	0	0	CLTOS	Ser. Se	o fal	Daniel C	MPTT	o trans
Number of university students given summer employment in the field of scientific activities for the the years 1962-1967	order of the state	0	0	0	0	0	of she sho	edputdreus	normagnumb	Tage, spec	Whi disapen	up or the	TEN GO COM

- (d) The percentage of current professional personnel who, since graduation, have been employed
- (1) by industry is 35%
 - (2) on the staff of universities is 6%
- (3) by provincial departments or agencies is 18%
 - (4) by other Federal agencies is 35%.

7. Expenditures Associated with Scientific Activities

A break down of Laboratory funds into categories such as functions, scientific discipline, and areas of application is not available. No correlation exists between the above categories and the system used by our Department. Capital and operating expenditures, funds spent for training courses (administrative, technical, and supervisory) and funds expended to further professional university education are listed below.

Fiscal Year	1962- 1963	1963- 1964	1964- 1965	1965- 1966	1966- 1967	1967- 1968	1968- 1969
Operating and capital funds (including salaries) - Total expenditures (thousands of dollars)	not avail- able	not avail- able	not avail- able	not avail- able	170	208	252
Funds spent for training courses (dollars)	not avail- able	not avail- able	425	650	720	1450	not avail able
Funds expended to further professional University education (dollars)	not avail- able	not avail- able	0	0	0	440	not avail able

Fiscal Year	1969-	1970-	1971-	1972-	1973-
	1970	1971	1972	1973	1974
Operating and capital funds (including salaries) - Total expenditures (thousands of dollars)	265	285	287	289	291

8. Intramural Research Activities

We are involved with <u>programmes</u> that are selected, initiated, and monitored either intramurally by the Department of National Revenue or extramurally by another Federal agency. The role played by the Laboratory through projects which support Federal programmes is quite obvious if one understands our organizational functions and responsibilities. Most projects which we complete are therefore selected by a Federal agency. However, some projects are initiated by the Laboratory. These projects, for the most part, involve research into analytical methods. The results facilitate the analysis of difficult chemical commodities. Examples of our participation in Federal programmes and projects are illustrated under "Projects".

Our function could be described as advisory. Priorities are therefore only meaningful when expressed in terms of projects which we initiate. All other projects must be completed within their terms of reference.

9. Research Output

Prior to 1962 many papers arising from research activities were published by members of the Customs-Excise Laboratory. These articles appeared in such journals as Journal of the Society of Chemical Industry, Transactions of the Royal Society of Canada, Journal of the American Chemical Society, American Journal of Pharmacy, Industrial and Engineering Chemistry, The Analyst, and Chemistry in Canada. The Laboratory, in recent years, has become involved in several large projects. Priority had to be given to these projects. Research activities initiated by us had to be very selective. The results of these activities remain, at this time, unpublished and are used to facilitate the work within the Laboratory. Many of these research activities involve new products where patents are pending and are quite confidential.

Reports, both intramural and extramural, have been issued by the professional staff of the Laboratory. Most of these reports are of the "day to day" type but many deal with applied research.

Our work is non-routine and of a complex nature, therefore, no

attempt has been made to differentiate between either of the above categories. An approximate summary of the number of reports issued is listed below.

Year	1962	1963	1964	1965	1966	1967
Number of reports (in thousands)	5	5	4.5	5	4.5	4(5)

Apart from using reports to transmit information, conferences are held with representatives of other departments or of industry to discuss problems, relative to the classification of imported goods, and to find a solution for them.

An average of fifty conferences a year have been held with representatives of industry for the period 1962 - 1967. An equal number of meetings over this same period, have been held with other federal agencies.

"Field trips" and attendance at meetings of professional societies are also used to collect and transfer information.

The impact of our scientific activities on Canadian economic development is illustrated and discussed under "Projects".

10. Projects

Examples of projects which were conducted during each of the years from 1962 to 1967 inclusive are listed below.

(a) 1962 - 1967

Tariff Board Report, TR-120

Our Laboratory has completed a series of projects in support of the above mentioned reference over the past six years. This report was ten years in preparation and recommends the introduction into the Customs Tariff of a completely new schedule for chemicals, chemical preparations, and plastics, and the elimination or modification of corresponding existing items.

- (b) 1962
 Butadiene content of Styrene-Butadiene Copolymers.
- (c) 1963
 Synthetic Elastomers and Notation of Acceptability within
 Rubber Definitions.

(d) 1964

- (i) The Physical and Chemical Parameters Used to Determine the Difference Between First and Second Grade Cellophane.
 - This was part of a programme established to determine

 if first grade Cellophane was being dumped on the

 Canadian market as second (reject) grade Cellophane.
 - (ii) Proof Spirit Sikes and Gay-Lussac Systems of Alcoholometry
- This project compared two systems used for the fiscal gauging of spirits. It was part of a programme initiated by our Excise Duty Branch.
 - (iii) Production of Sodium Carboxymethyl Cellulose
 - This project was part of a programme initiated by the Department to explain the low valuation of a Swedish product for Customs purposes.

(e) 1965

- (1) The Classification of Polyethers
- This project was part of a programme set up by the
 Department to study the classification of those polyethers which are suitable for use in the manufacture
 of flexible polyurethane foams.
 - (ii) Determination of Benzoyl Peroxide
 - A method for determining the active content of benzoyl peroxide was required for Made-in-Canada
 Purposes.

(f) 1966

- (1) Chemical Substances which Are Used to impart Wrinkle-Resistant Properties (Permanent Press) to Textiles.
- (ii) Acrylonitrile content of Styrene-Acrylonitrile Copolymers.

- (g) 1967
 - (1) PVC content of ABS-PVC Blends.
 - (11) Preparation of Fatty Acid Methyl Esters for GLC
 Analysis.
- 10.1 <u>Case histories</u> of what we consider to be <u>our most significant</u>

 <u>completed projects</u> of the last five years are discussed below.

 They are presented, as requested, under the two broad categories of "applied research" and "development" since no projects involving "basic research" have been undertaken.

(A) Applied Research

- (1) Butadiene Content of Styrene-Butadiene Copolymers

 The percent by weight of styrene or butadiene can be determined by infrared spectroscopy. This determination must be made by the Customs-Excise Laboratory since those copolymers with a butadiene content of more than 50 percent by weight are classified as synthetic rubber. A fast reliable method independent of most other constituents and impurities was developed.
 - (ii) Acrylonitrile Content of Styrene-Acrylonitrile
 Copolymers

The percent by weight of acrylonitrile or styrene can be determined by infrared spectroscopy. Most commercially available SAN copolymers are composed of approximately 76 parts atyrene and 24 parts acrylonitrile or minor variations thereof. A method of expressing acrylonitrile in terms of styrene is required in order to facilitate the analysis of ABS in polymer blends, etc. A relatively consistent relationship was obtained even though the nitrile band departs from Lambert's Law. The results obtained will resolve those polymers with an acrylonitrile content of up to 40%. This is satisfactory for the analysis of most commercial polymers which contain it.

(iii) Identification of Vegetable Oils

The Customs Tariff contains thirty-six tariff items dealing with various vegetable oils with rates of duty varying from free to 25%. Distinguishing between these oils posed a difficult analytical problem for the Laboratory. Several methods involving gas chromatographic analysis of the naturally occurring triglycerides, the liberated fatty acids, and the synthesized methyl esters had been reported. Research conducted in the Laboratory. with known samples showed chromatographic analysis of the triglycerides to be difficult and of limited value. Chromatographic separation and quantitative analysis of the methyl esters gave good results. However, the methylating procedure using conc. sulfuric acid in methanol produced an undesirable side reaction between the sulfuric acid and any unsaturated fatty acids present.

A methylating procedure using perchloric acid in methanol gave complete methylation of fatty acids in five minutes with no undesirable side reactions. Methyl ester standards of vegetable oils were then prepared for future reference.

(iv) Determination of Ethyl and Methyl Alcohol in Mixtures with other Materials

It is necessary for Custom purposes to quantitatively determine ethyl and methyl alcohol in mixtures with other materials. This presented a difficult problem with samples having complex solvent systems, including low molecular weight ketones, esters and hydrocarbons which were difficult to separate from the alcohols. Experiments with new solid supports and liquid phase packings were carried out. A column and a set of operating conditions were developed to solve this particular problem.

(v) PVC Content of ABS-PVC Blends

This information is required to permit classification in the Customs Tariff of moulding compounds and sheet materials and is very important as the predominant resin determines the classification and thus the rate of duty applicable. An infrared spectroscopic method utilizing some of the information obtained in (A)(1) and (11) above was coordinated with new data. Compounding ingredients, with the exception of plasticizers were not removed. The method developed is fast and reliable.

(B) Development

(i) Tariff Board Report TR-120

Our inadequate chemical tariff structure is one of the main reasons for Reference 120. The basic structure of the present chemical tariff has not changed since it was established in 1906. Many of the chemical and allied group tariff items are outmoded due to changing times and rapid technological advances. These tariff items contain anomalies, inconsistencies, obsolete wording, and difficult to administer "Class or Kind" items.

It was quite evident that changes had to be made. With this in mind interested associations, commissions, etc., approached the Department of Finance. The main aims of their proposals were to provide Canada with a consistent, modern, reliable, chemical tariff that would promote and protect manufacturing in Canada.

The Minister of Finance, in September 1956, decided that it was desirable to refer to the Tariff Board a section of the Canadian Customs Tariff relating to chemicals.

This reference was to cover various tariff and drawback items which relate generally to basic industrial chemicals, coal tar products, dyes, pigments, paints, industrial alcohols, fertilizers, insecticides, fungicides, explosives, miscellaneous preparations, and chemicals

for producing soaps, detergents, and rubber. The Board was directed to study and provide a revised schedule with rates if amendments to the Customs Tariff were desirable.

The scope of Reference 120 has been widened several times since 1956 to include items covering synthetic resins and plastics, etc.

The Tariff Board decided to use the headings of the Brussels Nomenclature, as proposed by the Industry Committee early in 1960, for scheduling the public hearings which took place in May of 1960. Members of our staff were present at these hearings. After the final submissions were heard by the Board in June of 1963, the enormous task of preparing a report and new schedule began. The hearings had produced some 28,500 pages of stenographic transcript. Over 1200 submissions were filed on behalf of 370 interested parties to deal with the more than 200 chemical tariff items.

Our role in the development of Reference 120 is as wide in scope as the Reference itself. A chemist on our staff was a full member of the Rules and Notes Committee established for the adaptation of the Interpretative Rules, Chapter Notes and Explanatory Notes of Brussels Tariff Nomenclature for Canadian use, and for the wording of new notes where none exist. This was necessary to facilitate the implementation and administration of the Recommended Schedule of Tariff Board Report TR-120, Vol. 1, thus giving effect to Canada's part in the Kennedy Round Negotiations, as it affects chemical and related products. It will be appreciated that Notes, such as are under discussion, are virtually unknown in the existing Customs Tariff; hence, our work in this area may be regarded as a pioneer effort for Canada. Lag assessing asymptotic table

The Laboratory contributed many projects to the over-all development of this programme. A description of each is beyond the scope of this brief. For illustrative purposes, an outline of a project has been listed below.

EXAMPLE

The Tariff Board Report directs that the Notes for the Recommended Schedule shall conform "as nearly as may be" with the Brussels system. The Recommended Schedule of that Report provides for organic surface active agents under Recommended Item 34.02, and for polyethers under Recommended Item 39.01(a)8. Certain polyethers, such as the ethylene oxide-propylene oxide block copolymers, are also organic surface active agents. The Compendium indicates that, in the Brussels system, such polyethers are to be classified in Heading 34.02 and not in Heading 39.01. The draft Canadian Notes have been written to reflect this view.

A thorough understanding of the chemistry of polymers and surfactants was required to complete the above project as well as a knowledge of the following:

- Tariff Board Report, R-120, Chemicals
- Brussels Tariff Nomenclature with Section and Chapter Notes
 - Brussels Tariff Nomenclature, Explanatory Notes
 - Compendium of Classification Opinions of Customs
 Co-operation Council, Brussels.

Our projects have explained to the non-chemists involved in this massive programme the chemistry involved in the Recommended Schedule, the effect of the Notes and Rules, and the relationship between the existing Schedule and the Recommended Schedule.

NOTE: The Brussels Nomenclature consists of approximately 1096 well defined category headings for classifying all goods in commerce along with explicit rules and explanations for the interpretation of the classification. The arrangement of chemicals is based on a combination of established scientific and commercial groupings recognized generally in world trade. This flexible, periodically updated system is used by over 80 countries.

(ii) Tariff Classification of Polyethers

A dispute arose involving the Department and several companies regarding the correct classification of those polyethers which are suitable for use in the manufacture of flexible polyurethane foams, a material currently of great importance in the furniture and automobile body industries.

The following are possible classifications for such materials:

	Tariff Item	Rate
Chemicals, not made	20839-1	(0% BP, 15% MFN)
Chemicals, made	71100-1	(15% BP, 20% MFN)
Synthetic Resins,	90109-1	(0% BP, 0% MFN)

The dispute was precipitated when Company A started manufacture of those materials in Canada, and obtained a "Made in Canada" ruling which covered them. As a result, Company B, which was both a manufacturer of polyurethane foams and an importer of some of the polyethers involved, was faced with an increase of duty from 15% to 20%.

This company then claimed the materials it imported to be "synthetic resins" and not "chemicals", and, therefore, dutiable at 0%, and unaffected by the "Made in Canada" ruling, thus challenging a Department ruling of long standing.

In an attempt to resolve this difficulty, a study, in depth, of the problems of "liquid resins" was initiated with the objective being the development of a consistent Customs classification for liquid polymers. This involved a review of the tariff treatment accorded not only to the polyethers, but to other liquid resins and polymers, including conventional epoxies, cycloaliphatic epoxies, hydroxyl terminated polyesters, other liquid polyesters, liquid polystyrene, liquid polyacrylates, etc. Technical literature and submissions from interested companies were carefully studied. In addition, a trip was made to Washington to consult with the appropriate sub-committee of the ASTM. Our trip caused this Committee to abolish its published definition of "liquid resins". This removed the main prop of Company B's case, and strengthened the Department's ultimate decision. As a result of this project a complete report was made to the Assistant Director, Appraisers Branch with final decision by the Director.

(iii) Cellophane - First or Reject Grade

Universal standards governing the grading of cellulose film do not exist. Instead, each manufacturer has his own set of specifications which are changed and adjusted from time to time. Some factors which help to determine specifications are buyers, competitors, and competition from other film types.

There are two different kinds of buyers for first grade Cellophane. "Direct users", such as bread manufacturers, are not as critical as "converters" and will tolerate certain minor defects such as loose and telescoped rolls. "Converters", such as bag manufacturers, printers, etc., demand a high quality film free of defects. Company A and Company B, both manufacturers of Cellophane in Canada, felt that first grade Cellophane was being imported as second or reject grade Cellophane.

This Cellophane was being sold to "direct users" but not to "converters" as the latter require technical services along with a high quality cellulose film. A set of physical and chemical parameters was required to differentiate between first and reject grade Cellophane. It became quite obvious, after trips to plant sites, that many chemical and physical tests are "not used for control" and are therefore not used to grade the film. A tedious study, which recognized the effects of moisture and repeated handling, produced a set of specifications. A complete report was made to the Director, Appraisers Branch.

- (iv) Classification of "Permanent Press" Chemicals

 Chemical substances which are used to impart wrinkleresistant properties to textiles could fall into one of
 - (a) single chemical
 - (b) mixture of chemicals

the following categories:-

- (c) aqueous solutions of synthetic resins
- (d) chemicals which form synthetic resins on the fabric
- (e) compositions of synthetic resins.

A project was initiated to study this entire question.

The substances themselves were analyzed, current technical literature and company information was reviewed, and a number of meetings with representatives of companies interested, both domestic and foreign, were held. Conclusions were then drawn as to the kind of reaction the chemical substances involved were capable of undergoing. A classification system was developed.

In the light of the above, it was decided that condensation products of formaldehyde with urea, or with melamine, were in either (c) (Free/Free) or (d) (Free/Free) depending on the state of advancement of the reaction, or (e) (15%/15%) if precatalyzed or otherwise compounded, while other substances, such as substituted imidazolidines, substituted perhydropyrimidines, and methylolated carbamates fall into

(a) (Free/15%) or, if catalyzed, into (b) (15%/20%). The companies involved contended that all the materials fall into (c) or (d). All that part of the Canadian textile industry whose interests include permanent press fabrics is affected by the above project.

masives to electronic data processing applications. In the data established assessments, essential factors for consideration in the data established factors for consideration in at benefits, improved quantity or quality of service of art to be assigned by the management consultants of art to be assigned by the management consultants paring the planning and development programs for the name that there can be a maximum integration of the new of the management consultants as sound tests for expansion and the integration of the at applications.

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PART B

POSSIBLE IMPROVEMENTS DUE TO TECHNICAL DEVELOPMENTS AND THE TYPE OF TECHNICAL ADVICE SOUGHT IN THE PAST

1. Electronic Data Processing

In the past the use of electronic data processing for various Customs and Excise activities has been examined. Although no overall plan has as yet developed, electronic data processing continues to be regarded as a means of assistance for promoting increased efficiency in the department's operations.

Recently, an outside firm of management consultants has been employed to make a study of the electronic data processing potential of the department. The purpose of the study is to obtain guidance as to the most desirable course to be followed by the department in developing the use of electronic data processing for its operations. The study is to extend to all functional and operating units and will include the consideration of applications currently in effect and those which will be required in the future. Under the consulting firm's terms of reference, there is to be a review of all activities with an evaluation made for purposes of assessing those areas which lend themselves to electronic data processing applications. In making the assessments, essential factors for consideration include cost benefits, improved quantity or quality of service and assistance in the field of general departmental management.

Priorities are to be assigned by the management consultants when preparing the planning and development programs for the department. The priorities and the planning schedules proposed are to ensure that there can be a maximum integration of the processing systems initially developed and that these will provide a sound basis for expansion and the integration of subsequent applications.

The final report of the management consultants is to set forth a program for the next five years. This report is to be submitted to the department late in 1968.

2. Types and Sources of Advice Sought

Technical advice from sources outside the department is essential, in many instances, in order that departmental officers may render decisions which are based on a full knowledge of the factors involved. Expert technical advice is also required in connection with cases which are appealed to the Tariff Board and, in some instances, taken in turn to the Exchequer Court of Canada and the Supreme Court of Canada.

In addition to working in close liaison with the staff of the Customs and Excise Laboratory, ruling officers seek advice from government agencies, various associations and individual manufacturers and producers. The types of advice which they have sought, within the past five years, fall within the following general categories:

- (a) Specifications of and the operating features of equipment such as machines, electrical goods and precision instruments;
- (b) Manufacturing processes by which materials and articles are fabricated;
- (c) Comparisons of quality and other characteristics of materials and articles;
 - (d) The composition and nature of materials and articles.

Sources from which technical advice has been obtained are given on the following page.

SOURCES OF TECHNICAL ADVICE

GOVERNMENT DEPARTMENTS AND AGENCIES

Department of Agriculture

Canadian Broadcasting Corporation

Department of Defence Production

Dominion Coal Board

Department of Energy, Mines and Resources

Department of Fisheries

Department of Forestry and Rural Development

Department of Industry

Department of National Defence

National Film Board

Department of National Health and Welfare

National Research Council

Department of Transport

OTHERS

American Textile Manufacturers' Institute (USA)

Canadian Electrical Manufacturers' Association

Canadian Food Processors Association

Canadian Horticultural Council

Canadian Machine Builders' Association

Canadian Petroleum Association

Canadian Refrigeration Manufacturers' Association

Canadian Textile Institute

Canadian Tooling Manufacturers' Association

Fabric Research Institute (USA)

Graphic Arts Industries Association

Hain's Research Laboratories Inc. (USA)

Individual manufacturers and producers

PART C anoldened Lancidesinegeo S.S.

RESEARCH IN THE EXCISE TAX BRANCH

1. General Comment

We have an Excise Tax Research and Development Division whose task is to plan measures to improve:

- a) the administrative feasibility (i.e., in terms of certainty, simplicity, effectiveness and cost of administration and compliance) and,
- b) the economic neutrality,

of the Excise Tax Act and the various administrative instructions (i.e., tax regulations, circulars, bulletins) that are issued by the Department of National Revenue under this Act.

When these measures require amendments to the Excise Tax Act,
they are forwarded to the Department of Finance for its approval
and possible introduction into the legislative process.

Sometimes a study by this Division originates with a request from the Department of Finance to develop a possible amendment to the law which stems in turn from fiscal or tax policy objectives.

On the other hand, a study may originate within the Excise Tax Branch, but it may have fiscal or tax policy ramifications that must be discussed with Finance.

In addition to tax (sales and excise) structure planning and research described above, the Audit Division and Collections Section in Ottawa are involved in research and planning activities with the principal goal of improving the operational efficiency of the audit and collections operations in the field offices across the country (e.g., audit work measurement and work organization).

2.1 Organization

The organizational chart of the Excise Tax Branch is shown as Appendix "A".

The organizational chart of the Excise Tax Research and Development Division is shown as Appendix "B".

2.2 Organizational Functions

The Research and Development Division is two years old. It is still in the process of defining the scope of its responsibilities, particularly in drawing a demarcation line between work that should be done by operational units, and work that should be done by the Research and Development Division.

Objectives are set annually, and agreed with senior management. Typically, the setting of objectives is essentially one of setting priorities for the large backlog of projects that await research and planning. Requests from the Department of Finance and projects related to operational crises receive first priority.

2.3 Personnel Policies

At the senior researcher level, our practice is to use experienced tax administrators who are then trained to be tax researchers and planners. At the research assistant level, we select university graduates in commerce or economics, and teach them tax administration policy and tax research.

Our organization is too small to justify research administrators, and the director of the division is a combined administrator and senior researcher.

The virtual absence of formal educational courses on commodity
tax administration forces us to rely on a combination of acquired
or internally developed tax administration knowledge and developed
research ability.

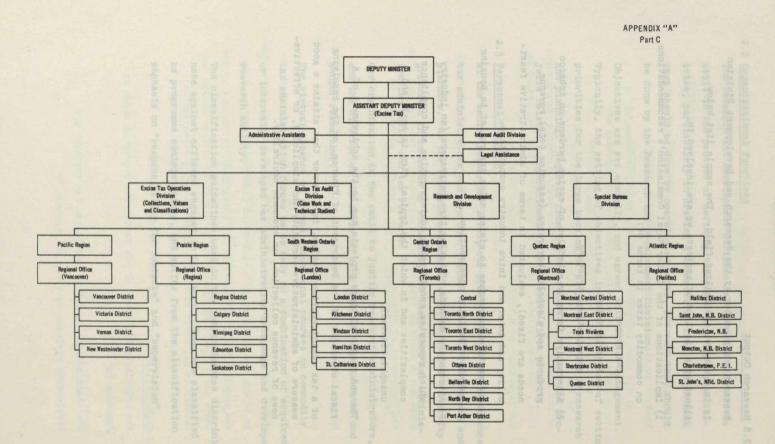
The classification guidelines used in the Public Service discriminate against officers engaged in this work. They are classified as programme administrators, and suffer from the classification emphasis on "responsibility for contacts" and "supervision".

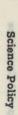
2.8 Research Output

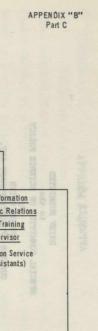
Research and planning by the Research and Development Division is in a narrow, specialized field. The sample list below illustrates the kind of projects we are involved in.

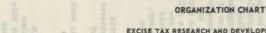
- 1) Implications of the Carter Royal Commission's recommendations on commodity taxes in terms of:
 - a) tax scope;
 - b) taxable value;
 - c) organization structure.
- 2) Alternative forms or schedules of excise burdens on tobacco products and alcoholic beverages (assuming total revenue needs are fixed), evaluated in terms of administrative feasibility and inter and intra industry competition.
- Alternative approaches to giving sales tax relief to housing and other building construction.
- 4) Alternative methods of taxing tire retreaders (an industry which generates considerable administrative and compliance complexities and in which the typical firm is small and unsophisticated).

The end result of these projects may be the achievement of a fiscal objective of the Department of Finance, or the resolving of a tax administration problem, in a manner that attains a good measure of administrative certainty and simplicity, or effectiveness of revenue collection, or economic neutrality.

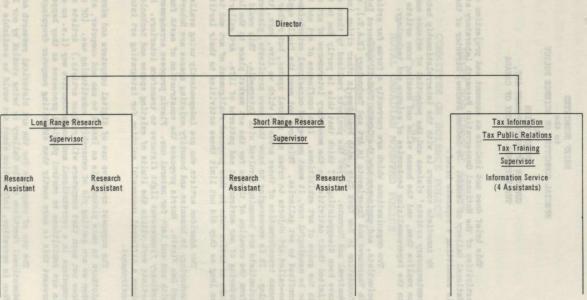








EXCISE TAX RESEARCH AND DEVELOPMENT DIVISION



APPENDIX 46

BRIEF SUBMITTED
to the
SPECIAL COMMITTEE ON SCIENCE POLICY
by
BRYDON SMITH
CURATOR OF CONTEMPORARY ART,
THE NATIONAL GALLERY OF CANADA

- This brief does not include an account and projection of the activities of the National Conservation Research Laboratory at The National Gallery of Canada. Dr Nathan Stolow, Director of the N.C.R.L., is submitting a separate brief.
- 2. My immediate concern is with the interrelationship between some contemporary artists' visions and the potential of science and technology to realize them, and the human value and meaning some artists can give to the impersonalizing tendencies of science and technology.
- Two organizations which are currently a forum for artists, scientists, and engineers are the Canada Council sponsored Intermedia in Vancouver and Experiments in Art and Technology (E.A.T.), a private foundation in New York City, with branches in other cities including Montreal and Toronto. As yet the projects realized by these organizations have been disappointing. I think that this is partly due to their having limited their activities to the momentary intercourse of art and technology in the guise of art exhibitions. If a confluence of art and technology is to be meaningful now, it must go beyond occasional entertainment programmes confined to art galleries. This does not mean the facile application of so-called art objects to urban and natural spaces, but rather the imaginative human transformation of those areas in which we live, work, travel, and play. It is encouraging to know that more architects, planners, and social scientists are becoming involved with Intermedia. This could mean a shift from the creation of things for the art market place to the larger reordering of our environment and patterns of life. Art galleries could take an active role in this proposed realignment of art and technology, as long as they did not limit these activities to their institutions.
- 4. Two American artists who are independently using available technology to humanize and beautify existing spaces are Robert Morris and Dan Flavin. Morris proposes the construction of earth forms covered with sod and left for natural use. Flavin proposes arrangements of ordinary fluorescent light fixtures to transform interiors. Both artists work within the limits of existing spaces and technologies; each shows a different successful solution for integrating art into the environment.
- The supposed creative use of digital computers and microfilm plotters to make pictures is an insult to man and computer, at a time when we are getting rid of ownership, substituting use. (Of course this does not mean that computers will replace artists.) Artists can use computers in a recretational and non-productive way (i.e. no end product) in art exhibitions to control physical processes as they happen; at present this is more costly than exhibiting computer droppings.
- 6. The use of computers for the art historical research and public educational functions of the Gallery is being studied by our librarians. When in operation, information about art would be available when and where needed throughout a system comprising museums, galleries, universities, archives, and libraries.

APPENDIX 47

BRIEF FOR SPECIAL SENATE

COMMITTEE ON SCIENCE POLICY

BY THE

ROYAL CANADIAN MOUNTED POLICE

CRIME DETECTION LABORATORIES

OTTAWA, ONTARIO

TABLE OF CONTENTS

	ional Callery or Charles JAIDERS SOT, TELEStor of the N.C.R.	Page
I.	Preface YOLLOW HOME HO HETTIMMOD	5053
II.	Introduction	5057
III.	Organization GATALOW WALGAMAS JAYOR TO	5058
IV.	Organizational Functions	5060
V.	Personnel Policies	5068
VI.	Distribution of Activities	5069
VII.	Personnel Associated with Scientific Activities	5070
VIII.	Expenditures Associated with Scientific Activities	5071
IX.	Research Policies	5072
X.	Research Output	5073
XI.	Projects	5074
XII.	List of Tables	

- I. Preface -
- Royal Canadian Mounted Police, exist as part of a National Police Service to provide scientific and technical assistance to Canadian police forces and enforcement agencies at the Federal, Provincial, and Municipal levels in relation to criminal investigation and security matters. Although these laboratories are primarily service-oriented rather than research-oriented, there is an urgent need for continuous research and development work in the forensic sciences.
- 2. Because the forensic sciences do not constitute a single discipline but include any of the physical and biological sciences which may be applied to help ascertain the true facts in the course of police investigations, the problem of developing a balanced research and development program becomes cumbersome to coordinate. It requires direction by competent research scientists who are fully knowledgeable in not only the basic scientific disciplines to which they belong, but also, in the applications of their disciplines to the law and the inherent and often unique problems associated with analyses of materials of forensic value in criminal investigations. For instance, the techniques employed in grouping dried blood stains on clothing are completely different from those used in clinical laboratories wherein the analyst has the advantage of using fresh blood with intact cells for grouping tests. The nature and condition of materials received for forensic analyses are often such that normal analytical procedures carried out in industrial, clinical, and other laboratories are not applicable. Also, some examinations such as those pertaining to firearms and tool marks are not carried out at all in other than forensic laboratories. Hence, forensic examinations are often of a highly specialized nature and are, at present, learned through in-service training and experience upon employment at the forensic laboratory.

- 3. Courses in the forensic sciences are not taught in Canadian universities. It, therefore, becomes necessary to provide longer periods of in-service training to new incumbents, be they at the technician level or the Ph.D. professional level, than would otherwise be necessary. Very rarely does a student set out to become a forensic scientist. It has usually been through chance that a person has "drifted" over to this specialized field. Such a situation is not desirable, and because the freedom or imprisonment of an accused person may, at times, depend on the results of chemical or other analyses, it is imperative that personnel of high calibre be employed to staff forensic laboratories. Because there is a scarcity of well qualified scientists who become attracted to this field, it is exceedingly difficult to adequately staff the forensic laboratories situated across Canada in order to meet the quickly increasing demand for forensic laboratory services.
- 4. It must be emphasized that the role of the forensic scientist is not that of merely providing routine analytical data, but involves the additional complex functions of evaluation, comparison and interpretation of this data before the Courts in an objective and impartial manner to ensure that the true facts are revealed, leading to a just enforcement of the law.
- National Research Council of Canada is recommended to advise the Commissioner, Royal Canadian Mounted Police, and through him, other interested Canadian police departments, police associations and forensic laboratories, on the scientific aspects of research for the police service including forensic sciences.

 An N.R.C. Associate Committee on Forensic Science and Police Equipment could function in much the same manner as the Home Office Scientific Advisory Council which was set up in the United Kingdom in the autumn of 1965 by the Secretary of State for the Home Department. Members of the Council are drawn from

academic and industrial fields and are representative of a wide range of scientific disciplines; they are, therefore, collectively equipped to take an embracing view of the problems of police research. As a council, they consider the projects in hand and subject them to careful analysis, sometimes suggesting a fresh approach or an improvement of methodology; they do not undertake projects although, on occasions, individual members are able to furnish assistance out of the scientific resources at their command or which they are able to influence. The Council meets, on an average, four times a year, but its two committees, one for police equipment and the other for forensic science, meet more frequently to consider projects in detail.

- 6. The establishment of a high-level Central Research Establishment within the R.C.M. Police Headquarters organization at Ottawa, as a part of the existing National Police Services is recommended to conduct research and development work in the field of forensic science and police equipment. This again is based on a similar step which was taken in the United Kingdom at the beginning of 1967 at which time a Central Research Establishment at Aldermaston was set up by the Home Office. The establishment of this research group in the U.K. is already universally recognized as a very important advancement in the field of forensic science research.
- 7. Up to now, the R.C.M.P. Crime Detection Laboratories have been almost exclusively functional police laboratories. The limited research which has taken place to date has been in connection with immediate case-work problems and, in the main, operational funds have been used. This is not a satisfactory situation and when trends in other scientific disciplines are noted, it becomes apparent that specific funds for research and development projects in the forensic science field are essential. If, therefore, we in the R.C.M.P. are to expand our functions to include those recommended in this brief, we must provide our scientists with compensation related to professional performance

and brought into line with salary scales of scientists doing research and development work in other agencies of Government.

Additionally, as expressed in the Glassco Commission on Government Organization under the heading of "Professional and Scientific Personnel":-

"...It (the government) should offer challenging and rewarding work in environments fully compatible with professional values. Outside contacts need to be encouraged and supported, as well as opportunities to obtain scholarly recognition by publication and similar means..."

- 8. Because of the difficulty in getting trained forensic scientists, we are forced to the conclusion that Federal Government assistance in some form should be available to one or two universities for the purpose of graduating forensic scientists who will be available to work in Canada. Support of research work and graduate students at the universities might come, primarily, from sources such as the Medical Research Council of Canada and the National Research Council of Canada.
- One or two Canadian universities should be encouraged, therefore, to establish, within their faculties of Medicine or Science, departments of forensic medicine and forensic science at the graduate level leading to M.Sc. and Ph.D. degrees in such specialized disciplines as forensic toxicology, forensic pathology, forensic immunology, forensic chemistry and other forensic sciences. Establishment of such graduate school departments within the Ottawa area, for example, near the Central Research Establishment proposed above, would provide for coauthorship, on the part of scientists of both establishments, of research works and publications, exchange of lecturers on specialized topics and other obvious mutual benefits. This latter co-operative arrangement would only be feasible, however, if the proposed Central Research Establishment became a reality. It would not be possible, for example, to impose this arrangement on our present set-up. Hence there is a very close inter-relationship between our recommendations for establishment of a Central

Research Establishment and university graduate schools in foren-

- 10. In summary, future scientific policy in the forensic sciences should include provision for the following:-
 - a) the establishment of an Associate Committee of the National Research Council of Canada on Forensic Science and Police Equipment;
 - b) the establishment of a high-level Central Research Establishment within the k.C.M. Police Headquarters organization at Ottawa as part of the existing National Police Services; and
 - c) the establishment of Departments of Forensic Medicine and Forensic Science within one or two Canadian universities to provide post-graduate programs leading to M.Sc. and Ph.D. degrees in such specialized disciplines as forensic toxicology, forensic pathology, forensic immunology, forensic chemistry and other forensic sciences.
- If it is agreed that the above provisions are necessary 11. and that the K.C.M. Police Crime Detection Laboratories should participate in these programs -- expanding beyond their present basic police laboratory functions -- the Force would have no objection, in principle, to such increased participation. This would require that the R.C.M.P. Laboratories play, both nationally and internationally, a much more prominent role in the scientific community, particularly the forensic sciences' community, in conducting research and development work in the forensic sciences and in cooperating with academic institutions to provide a source of trained forensic scientists. It would only be possible, therefore, if, apart from provisions for the normal growth of their present operations, the M.C.M.P. Crime Detection Laboratories were supplied, on a high priority basis, additional financial resources with which to provide for the expansion in manpower, equipment and functions that would be required.

II. Introduction -

1. The Crime Detection Laboratories exist as part of a National Police Service to provide scientific and technical assistance to Canadian police forces and enforcement agencies at the Federal, Provincial and Municipal levels in relation to criminal investigation and security matters. They provide "expert" testimony in all criminal courts on evidential materials submitted to them and undertake

limited research and development work in specialized areas of forensic science which is not conducted by other laboratories. They provide training in all areas of forensic science operations to members of Canadian police forces and enforcement agencies of other government departments and to representatives of police departments from other countries under External Aid and similar programs.

- In order to deal effectively and efficiently with materials submitted for examination and evaluation, the operations of the five laboratories located at Sackville, New Brunswick; Ottawa, Ontario; Regina, Saskatchewan; Edmonton, Alberta; and Vancouver, British Columbia, have been grouped into the following Sections:
 - Administration Section
 - Chemistry Section

 - Toxicology Section
 Serology Section
 Hair & Fibre Section
 Firearms & Tool Marks Section
 - Questioned Documents Section Alcohol Section
 - Photographic Section.

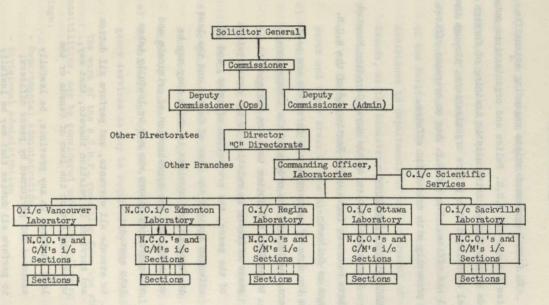
In addition, the Ottawa Laboratory has two special sections which function on a nation-wide basis. These are:

- The Central Bureau for Counterfeits
 - The Special Services Section.

In the current year, the five laboratories have a total establishment of 138 persons.

III. Organization -

The Crime Detection Laboratories, under the command of a Central Commanding Officer, who is the senior scientific officer, is a Branch of the H.C.M.P. "C" Directorate under the command of the Director of Criminal Investigations (D.C.I.). The D.C.I. is, in turn, responsible to the Deputy Commissioner (Operations), and he takes direction from the Commissioner. The Commissioner is, of course, responsible to the Minister, the Solicitor General. The following partial organizational chart illustrates the chain of responsibility and command:



2. No formal agreement exists regarding scientific activities between the R.C.M. Police and organizations outside of Canada except limited criminalistic training of foreign personnel associated with police organizations, through the External aid office. The h.C.M.P. has no overseas offices dealing primarily with scientific affairs.

IV. Organizational Functions -

1. The general duties of the Royal Canadian Mounted Police have been set forth under Section 18 of the R.C.M. Police Act as follows:

"It is the duty of members of the force who are peace officers, subject to the orders of the Commissioner,

- a) to perform all duties that are assigned to peace officers in relation to the preservation of the peace, the prevention of crime, and of offences against the laws of Canada and the laws in force in any province in which they may be employed, and the apprehension of criminals and offenders and others who may be lawfully taken into custody;
 - b) to execute all warrants, and perform all duties and services in relation thereto, that may, under this act or the laws of Canada or the laws in force in any province, be lawfully executed and performed by peace officers;
- c) to perform all duties that may be lawfully performed by peace officers in relation to the escort and conveyance of convicts and other persons in custody to or from any courts, places of punishment or confinement, asylums or other places; and,
 - d) to perform such other duties and functions as are prescribed by the Governor in Council or the Commissioner."

Moreover, Section 44 of the Regulations under the R.C.M.
Police Act states:

"In addition to the duties prescribed by the Act, it is the duty of the force

- a) to enforce such laws made by or under authority

 of the Parliament of Canada and to render such

 assistance to departments of the Government of

 Canada, as the Minister may direct;
- b) to maintain law and order in the Yukon Territory
 and the Northwest Territories and in such national
 parks and other areas as the Minister may designate;
- c) to maintain law and order in those provinces and
 municipalities with which the Minister has entered
 into an agreement under Section 20 of the Act and
 to carry out such other duties as may be specified
 in those arrangements;
- d) to guard and protect such buildings, installations,
 dockyards and other property of Her Majesty in
 right of Canada as the Minister may designate; and,
- e) to maintain and operate such security and intelli-
- 2. The work of the R.C.M.P., resulting from the above responsibilities, may be considered under the following eleven headings:
 - Departmental Administration
 - Divisional Administration
 - General Detachment Policing
 - Municipal Policing
 - Highway Patrol
 - Federal Law Enforcement
 - Training
 - National Police Services
 - Police Services for Other Federal Departments
 - Air Services
 - Marine Services

- 3. National Police Services embrace the operation of the Identification Branch and the Crime Detection Laboratories.

 The Identification Branch is primarily a central repository of criminal records and information. Its main function is the identification of criminals by their fingerprints for all law enforcement agencies in Canada. The Crime Detection Laboratories consist of the operation of five R.C.M. Police Laboratories at Sackville, N.B.; Ottawa, Ontario; Regina, Sask.; Edmonton, Alberta; and Vancouver, B.C. Their prime objective is to develop and apply scientific methods to crime detection and, to some extent, national security.

 4. As one of a number of branches within the R.C.M.P., the Crime Detection Laboratories estimate for establishment positions and funds in the same manner as other branches.
- the Crime Detection Laboratories estimate for establishment positions and funds in the same manner as other branches.

 The allotments requested for the various branches may be altered through executive decisions within the R.C.M. Police, and if cuts are necessary, then the C.D. Laboratories must attempt to manage with reduced funds and establishment positions as do any of the other branches. In general, it seems fair to state the policy of the R.C.M. police regarding its science "arm", the Crime Detection Laboratories, is that the Laboratories are maintained to provide a support service for its main task of law enforcement and, as such, the Laboratories constitute only one of several branches. As a National Police Service, however, many law enforcement agencies other than the R.C.M. Police depend on the C.D. Laboratories for scientific support service.
- 5. Although participation has been on a very small scale with respect to international representation at forensic conferences, the C.D. Laboratories have been able to send representatives to annual conferences of the American Academy of Forensic Sciences and the American Society of Questioned Documents. Abroad, in 1966, two representatives attended and presented papers at the Fourth International Meeting in Forensic

Immunology, Medicine, Pathology and Toxicology at Copenhagen,
Denmark, and the Second Congress International Association
for Accident and Traffic Medicine at Stockholm, Sweden. In
1963, a representative presented a paper on the Scientific
Aspects of Police Work at the Interpol meeting in Paris.
Leading scientists of the R.C.M.P. Laboratories should be
involved in the international forensic science community to as
great an extent as those in other areas of science within the
Federal Government Agencies.

- 6. Aside from having their operational effectiveness, duties, and goals reviewed annually through the recently established government Program Review procedure for annual estimates, the C.D. Laboratories maintain detailed statistics of all work functions carried out, including number of cases, number of examinations, types of examinations, time spent per examination, time for cases to be completed, man-days away on duty (attendance at Court, etc.), man-miles travelled, and so on. From such data, "work units" have been devised, which is a measure of the work each member is expected to perform. In turn, by projecting the total work load anticipated for future years on the basis of work load data from past years, with each laboratory section being considered separately, estimates on manpower requirements are made in five-year forecasts. These forecasts, however, rest on existing situations and functions and, therefore, are not necessarily applicable by the time the forecast period has arrived. Performance indicators have also been developed in order that Senior Command Officers may measure both the effectiveness and efficiency of the management of the Laboratories.
- 7. The major hindrances to the effective performance of the C.D. Laboratories' functions have been severalfold.

 One has pertained to the extraordinary increase in the demand for laboratory services, particularly in the blood-alcohol field, requiring support services for newly instituted breath

whereby Laboratory Scientists provide the interpretation
evidence in Court on the effects of various concentrations
of blood-alcohol, requires the employment of highly qualified
personnel. As the Laboratories have not been able to recruit
personnel for specialization in this field at a sufficient
rate, it has placed unfair burdens on the present incumbents.

If, however, the need for interpretative evidence is substantially reduced through revisions in the Criminal Code setting
levels of blood alcohol, then the situation should ease considerably and scientists with less qualifications may be
employed as designated analysts.

8. A further hindrance is the increasing amount of time scientific staff spend away from their benches giving or waiting to give evidence in Court. During the period 1967-68, a total of 2,196 man-days were spent attending court which represents an increase of 21.7% over the previous fiscal year. The total man-miles travelled by the Laboratories' staff during the same period amounted to 942,693 as compared to 819,042 man-miles for the 1966-67 period. Situations occur, all too frequently, where a scientist is required in two or three Courts in widely separated locations on the same day. Upon arrival at many Court hearings, it is found that the evidence of the Laboratory scientist is not required due to an agreement on the part of both Crown and Defence counsels to accept the findings as stated in the Laboratory report. These problems have brought about the suggestion, both in Canada and in England, that a considerable number of Laboratory findings could be made available to the Courts by way of certificate rather than through personal attendance. This would be a great improvement, reducing both the time spent away on duty and the mileage travelled by the Scientific staff. In this regard, an N.R.C. Associate Committee on Forensic Science could be of great assistance in reviewing and recommending to appropriate agencies and legislative bodies, those scientific procedures and

methodology which they consider fully acceptable from a scientific standpoint, for reporting findings by way of certificates issued by designated analysts.

- 9. Forensic sciences can involve a great number of scientific disciplines, such as chemistry, biochemistry, pharmacology, physiology, immunology, biology, haematology, medicine, physics, and mathematics. Application of any of the natural or physical sciences to the law would give it a forensic connotation. Naturally, no one person can become competent in them all. The team approach, therefore is necessary. As emphasized above in para. #4 of the preceding Section I, it is not enough that a forensic scientist be competent in his field as it would be applied to industry or a number of other government departments. The nature of many materials received for examination, as a result of criminal investigations, may render them unsuitable for analysis by means which are satisfactory in many other laboratories. Biological materials, in particular, are susceptible to deterioration and decomposition and so the forensic biochemist or serologist is often faced with analytical and interpretative problems which the clinical chemist, for instance, need not face. Special methods, analytical tools, and analytical pitfalls are facets with which the forensic scientist must become familiar to perform and EVALUATE his analyses. At present, the new incumbent, at all levels from non-degree technician to the Ph.D. professional level, undergoes a period of in-service training before he is permitted to perform tests or interpret results on cases submitted to the Laboratories. As a result, there is a considerable time-delay from the time a member commences employment until he becomes an effective, functional member of the Laboratory system.
- 10. The fact that university courses in the Forensic Sciences are not provided in Canada means that a new incumbent must start afresh in the forensic field on commencing employment in a forensic laboratory. In spite of the fact that he may be a chemist or physicist, the new person enters, to some extent,

a foreign field. Most university students take their courses with specific purposes in mind, and very rarely does one set out to become a forensic scientist. In almost all cases, the forensic scientist has come into the field through some accidental set of circumstances. This fact is not especially surprising in view of the lack of university courses, particularly at the graduate levels and the lack of good facilities to carry out research and development work. The Crime Detection Laboratories are, at present, competitive with other government agencies with respect to salaries for those at the Bachelor's degree level and to starting salaries for persons at the M.Sc. and Ph.D. levels. As the professionals in these latter two degree categories increase in number, as they must, and become more experienced, it is realized that provision will have to be made for higher salaries in order to make forensic science highly attractive on a career basis. The reason for not offering better pay and advancement opportunities earlier was the concern over the increased manpower costs that would result in extending the operations of the Laboratories. While this concern still exists, it is felt that if we are to carry out the forensic science research and development which is now considered essential and keep up the morale of the professionals in that field, we must treat them in the same manner as senior scientists in other Federal Departments and agencies. This means providing them with the opportunities for satisfying their professional goals, aspirations and needs and with the freedom to participate in those areas, such as publications and professional meetings with their peers, which motivate scientists to do superior work. The Government must be prepared, therefore, to increase and upgrade the present establishment of the Crime Detection Laboratories to include this recommended extension into research and development work, because, as explained previously, our present establishment is geared mainly for functional police laboratory duties.

- 11: On the other hand, there is not an unlimited demand in Canada for forensic scientists. Therefore, if proper forensic courses were provided at the universities, it is not likely that more than about two universities should consider introducing degree courses in the forensic sciences. It is not likely that more than about twenty-five forensic scientists and technicians can be absorbed per year in Canada. Because the size of a Forensic Science Department in a university would necessarily be small, it is considered that such a university program should be operated in conjunction with an established Central Research Establishment attached to a forensic laboratory. Moreover, such an association would help to provide a good balance between the purely theoretical and the practical teaching offered. It is felt that graduate study programs could be especially fruitful if the graduate student carried out part of his research at the forensic laboratory and part at the university. Lecturers should be available from both institutions. A program such as that envisaged above should surely alleviate the present major problem relating to the shortage of properly trained forensic scientists. As noted earlier in this report however, this co-operative arrangement would only be feasible if the proposed Central Research Establishment became a reality. It would not be possible to impose this arrangement on our present set-up within the R.C.M.P. Laboratories.
- 12. Considering the rapid advances being made in the related fields of science, the heavy demands placed on the forensic scientists in the Courts and the fact that the forensic scientist cannot afford to err, aspects of research, training, salary schedules, promotional opportunities, and facilities must be given very high priority insofar as forensic scientific policy is concerned.

V. Personnel Policies - Person

- 1. Hiring of new Civilian Member scientists is accomplished mainly through a normal university recruitment procedure, a small scale summer employment program, and contacts made through the presentation of talks on forensic services by Laboratory scientists and administrators to professional and other groups. Also, some uniformed members of the R.C.M. Police, who indicate good potential for laboratory services and who have at least university entrance requirements, are afforded the opportunity to train as understudies in areas such as Firearms Identification or Document Examination. The most promising uniformed (i.e. Regular) members who become attached to the Laboratories after at least three years police "field" service, are afforded the opportunity to take university degree courses at public expense. In most instances, courses in chemistry or biochemistry have been taken. Extramural short courses in specialized scientific studies, plant tours and attendance at scientific conferences are also permitted.
- on such a small scale and the number of staff who would qualify as research administrators have been so few, the matter of identifying members with high potentiality as research administrators and related functions has not been pressing. Plans have been formulated, however, for the establishment of senior specialist scientists, representing each of the laboratory sections, who will be responsible for conducting the necessary developmental research on immediate problems in their specialized fields. Therefore, these questions are now assuming considerable importance.
- 3. Scientists and technicians within the R.C.M.P. Laboratories include two types of members, regular (or uniformed) members and civilian members. The six regular members who are now commissioned officers all hold university degrees (2 Ph.D.'s, 1 M.Sc., 2 B.Sc.(pass) and 1 B.A.) and formerly filled functional specialist positions. Five of these Officers moved into

Laboratory administrative positions with attendant promotions to Commissioned ranks. With the exception of the Commanding Officer, Laboratories, who is a Superintendent, all Laboratory Officers hold the rank of Inspector. Four Civilian Member Scientists now hold grades equated pay-wise with the rank of Inspector and fill functional scientist positions rather than administrative positions. Up to this point in time promotion of regular members of the Laboratories (both Commissioned Officers and other ranks) has been geared to the promotional mainstream of all regular members of the R.C.M. Police. With the increasing requirement for scientists holding advanced degrees, the time is perhaps at hand when the higher salary and career structures of scientists and professionals employed in other Government departments and agencies will have to be taken into account for all scientists, both regular and civilian members, within the R.C.M.P. Laboratories.

VI. Distribution of Activities -

1. The five Crime Detection Laboratory units are situated so as to provide service to law enforcement agencies throughout Canada. Located at Vancouver, B.C.; Edmonton, Alberta; Regina, Saskatchewan; Ottawa, Ontario; and Sackville, N.B., these five regional laboratories receive exhibits resulting from criminal investigationa in each of the ten Provinces and the Yukon and Northwest Territories. In order to testify in the Courts respecting their findings, the scientific staff of the C.D. Laboratories travelled a total of 675,930 man-miles last year and spent 2,196 man-days away from the Laboratories on duty. The total budget spent by the C.D. Laboratories last year was \$\pi\,266,721.00\ including salaries and rental of laboratory facilities where applicable. These were distributed as follows:

Vancouver Laboratory - \$317,044.00 (Includes \$107,300.00 for New Temporary Accommodation)

Regina Laboratory - \$341,294.00 Ottawa Laboratory - \$439,049.00 Sackville Laboratory - \$169,334.00

The Edmonton Laboratory did not open until 1968.

2. Table I shows the number of reports issued from each laboratory during the 1967/68 fiscal year, according to the type of offence. Table II shows the number of reports according to geographical location.

VII. Personnel Associated with Scientific Activities -

- Table III indicates the current personnel establishment of the C.D. Laboratories according to the laboratory and categories of (1) scientist; (2) technician; (3) administration; and (4) stenographers, typists and clerks. Those who carry out research and/or examine and analyze exhibits in connection with case work, submit. laboratory reports, and attend court in an expert witness capacity are included in the scientist category. Their minimum academic qualifications will vary according to the Section (reference page 6) in which they are employed. Technicians carry out work under the supervision of the scientists but do not submit reports or routinely attend Court. Employment at a scientist level in a Chemistry Section requires at least an Honours Chemistry degree. A person with a Pass or ordinary degree in Chemistry is employed as a technician or technical officer. On the other hand, a university degree is not a prerequisite for one to be employed as a technical officer in a Firearms Identification Section.
- 2. Table IV tabulates information regarding professional staff associated with scientific activities according to degree level. Civilian Member Scientists now outnumber Regular Member Scientists by a ratio of 40 to 17.
- 3. Table V shows the total number of professional staff (by Senate Committee definition) in each degree category for each of the years 1962 to 1968 inclusive and projections estimated for each of the years 1969 to 1973.

- three degree categories for each of the years 1962 to 1967 is shown on Table VI. It is believed that interest in, and dedication to forensic science accounts for the low turnover rate in the Laboratories. As in the case of the R.C.M. Police as a whole, there is a remarkable esprit de corps existing in the Laboratories.
- 5. The percentage of current professional staff who, since graduation, have been employed by industry at one time is 7.3%; those who have been on the staff of a university represent 7.3%. None of the present staff has been previously employed by Provincial departments or other Federal agencies. Only one member in one of the three degree categories is on education leave. This is in the M.Sc. category wherein the incumbent is commencing studies (September, 1968) for his Ph.D. degree in toxicology at the University of Maryland, Baltimore, Md., U.S.A.
- 6. University students who have been given summer employment in a scientific activity are numbered in Table VII.

VIII. Expenditures Associated with Scientific Activities -

1. The total funds spent by the C.D. Laboratories on intramural R & D in 1967/68 approximated \$14,000.00, that on data collection \$2,955.00, and scientific information \$11,115.00. None was spent to support R & D in universities or to support higher education in engineering and science. It should be recalled that the C.D. Laboratories have been primarily service-oriented and that operational funds have been used to finance the R & D carried out to date thereby severely limiting research in this field. The scientific discipline involved, falls into the general category of forensic sciences, and the area of application is in law enforcement and national security. Table VIII indicates the funds spent on intramural R & D, data collection, and scientific information from 1962 to 1968 and those projected for the next five fiscal years.

This projection does not include provision for the recommended Central Research Establishment. No one on the C.D. Laboratories' staff is employed full-time in a research capacity and, as indicated above, to date R & D has usually been carried out in conjunction with specific operational case problems. Therefore, the exact funds spent in this area cannot be tabulated accurately since they constitute a part of the overall operational expenditures. Funds expended to further university education of staff for each of the fiscal years from 1962/63 to 1968/69 are tabulated in Table IX.

IX. Research Policies - to to amount with International vid hevolume

1. Intramural research projects are selected in accordance with those areas of service operations wherein the greatest problems exist. Criteria for such selection are based on whether it will be of significant advantage to develop analytical methods which are more sensitive, more specific, faster, and quantitatively more accurate than present procedures. Also, procedures developed for basic research techniques reported in industrial and other research laboratories are investigated to determine their possible forensic application. Those which appear to promise more efficient and effective analyses than are conducted at present are selected for detailed study so that they may be modified and adapted to forensic investigations with a view to replacement of existing techniques. This approach applies to all Sections of the C.D. Laboratories. Priorities are established on the basis of requirement and available staff, equipment, and funds. In view of the rather small scale of the research program, confined as it is at present to only immediate operational problems, network methods such as Critical Path Network or Program Evaluation and Review Technique are not used to plan and monitor programs and projects. Several Laboratory Officers have, however, taken management courses conducted by the Bureau of Management Consulting Services, Public Service Commission of Canada, in which these techniques were studied.

- X. Research Output -
- 1. A major area of research in the C.D. Laboratories during recent years has involved drinking, driving, and breath tests. As a result, the following journal articles have been published:
 - a) Alcohol Levels in Body Fluids After Ingestion of Distilled Spirits, by B.B. Coldwell and H.W. Smith, Canadian Journal of Biochemical Physiology, 37:43-52(1959).
 - b) Some Characteristics of Suspected Drinking Drivers by B.B. Coldwell and G.L. Grant, Third International Conference on Alcohol and Koad Traffic, London, England, September 3-7, (1962).
 - c) A Study of Some Factors affecting the Accuracy of the Breathalyzer, by B.B. Coldwell and G.L. Grant, Journal of Forensic Sciences, 8:149-162(1963).
 - d) The Disappearance of Alcohol From the Blood of Diabetics, by B.B. Coldwell and G.L. Grant, Journal of Forensic Sciences, 8:220-230(1963).
- e) A Note on the Estimation and Disappearance of Alcohol in Blood, Breath and Urine from Obese and Diabetic Patients, by B.B. Coldwell, Journal of Forensic Sciences, 10:480-489(1965).
 - f) Rate of Metabolism of Radioactive Ethanol in Cold Environment, by N. Platonow, B.B. Coldwell, and L.P. Dugal, Quarterly Journal of Studies on alcohol, 24:385-397(1963).

Much data pertaining to the role of alcohol in traffic accidents and the correlation between blood alcohol level and degree of impairment have been obtained through research during the last three years which is, as yet, unpublished.

- 2. The major annual conference, by which information regarding the results of projects is given to extramural groups, is that of the Canadian Society of Forensic Science. Each year, the locale of the annual meeting alternates between an eastern and a western centre. Information is also transferred through the presentation of papers at the regional conferences of the Chemical Institute of Canada, the meetings of the American Academy of Forensic Sciences, and the presentation of papers by invitation, to miscellaneous professional groups.
- 3. Research tools and procedures of value which have been added or developed during the last five years include:
 - a) Routine use of Thin Layer Chromatography and Gas Chromatography for the analysis of alkaloids,

barbiturates, hallucinogenic and other drugs, affording improved sensitivity and specificity in the analyses.

- b) Use of Nuclear Magnetic Resonance instrumentation to determine constituents of unknown compounds.
- c) Applications of Neutron Activation Analysis to forensic problems.
 - d) Design of a program to provide the necessary support services for large scale enforcement breath testing programs in connection with drinking and driving offences.
 - e) Development of a system of reference drug standards, whereby specimens of all drug tablets and capsules are obtained, coded, and filed for reference purposes.

XI. Projects - Day II

1. Although research in the C.D. Laboratories mas, to date, been primarily a by-product of operational activities and has taken place on a small scale, some projects are, nevertheless, worth noting.

a) Basic Research

Further research has been conducted correlating blood alcohol levels and impairment of ability to carry out tasks related to driving. Approximately 400 drinking subjects whose blood alcohol concentrations have ranged from 0.20% to 0.03% have been tested on simulated driving devices and have undergone visual acuity, distance judgment, and other examinations to determine the extent of deterioration of performance as compared to their sober performances. Because considerable controversy exists in older literature, it is of extreme importance that all C.D. Laboratory personnel employed in this specialized field gain as much first-hand experience as possible. These experiments have, therefore, served a two-fold purpose; namely, to gain more data for basic research purposes and to provide training for the professional personnel who enter this field.

b) Applied Research

- i) Tests on factors affecting the accuracy of the
 Breathalyzer have been conducted in detail.

 In view of the increasing demand for breath
 tests as an alternative to direct blood analysis for alcohol, it was considered necessary to
 critically test the various possible parameters
 associated with the Breathalyzer. Factors such
 as cylinder temperature or the quantity of reagent in the ampoules or the ampoule size have
 been investigated to ascertain the reliability of the Breathalyzer. Numerous correlation
 tests have been conducted, wherein Breathalyzer
 and blood tests taken at the same time have
 been compared. Numerous correlation tests involving urine have also been carried out.
- ii) Many "on-the-spot" or "roadside" tests for alcohol in breath have been placed on the market. While the products from different manufacturers appeared to be similar in most respects, considerable differences existed with respect to the claims made for the devices. In order to assess these "on-the-spot" tests and learn their limitations, a project was commenced to investigate the test devices. The tests proved that the roadside testers such as the "Alcotest", "Mobat", and "Alcolor" cannot be used further than as preliminary screening tests which require independent confirmatory analysis. They are not a substitute for the Breathalyzer (which is a specific, patented, instrument), or any other accurate test.

c) Development

 i) In recent years, extremely potent drugs such as LSD (Lysergic Acid diethylamide) have become drugs of abuse by some individuals and groups.

This remarkable potency, wherein 50 to 70
micrograms of LSD, when ingested, can cause a
"trip" of considerable proportion, required the
chemical analysts to devise extremely sensitive
analytical techniques in order to identify LSD
and related compounds with certainty. It will
be appreciated that 50 micrograms is equivalent
to 1/20,000 grams or 1/600,000 ounces. As a result
of basic and applied research, much carried out
by research workers at the FDA Laboratory,
Washington, D.C., personnel at the C.D. Laboratories have developed an orderly and systematic
analytical procedure for this class of drug, which
is extremely sensitive, rapid, and accurate.

ii) Cases involving theft of gasoline from bulk -cold storage tanks have caused a problem with respect to the identification of the gasoline which has been stolen. To assist, a testing kit has been developed for ascertaining the presence of an added marker in a sample of gasoline or other petroleum product. The advantages of this kit are its simplicity, an elimination of any requirement for retaining a specimen of the gasoline in question, and the fact that the initial on-the-spot tests do not necessitate the use of any chemical reagents. The test involves sampling the questioned gasoline; however, in withdrawing a sample from a tank with the kit, the investigator draws the sample through a filter which retains the marker that had previously been added. The marker material becomes visible in the filter and for a confirmatory analysis, only the filter need be forwarded to the Laboratory.

2. This brief has been prepared for the information of the Special Committee of the Senate on Science Policy which has been appointed to consider and report on the science policy of the Federal Government.

OTTAWA 30-9-68 (cre & akb)

LIST OF TABLES

TABLE I	- Reports Issued by RCMP Laboratories According to Type of Offence
TABLE II	- Reports Issued by RCMP Laboratories According to Geographic Location
TABLE III	- Establishment - C.D. Laboratories (As of Sept. 6, 1968) Number of Personnel
TABLE IV	- Professional Staff - C.D. Laboratories - September, 1968
TABLE V	- Number of Professional Staff - 1962 to 1968 and Estimated to 1973
TABLE VI	- Professional Staff Turnover - C.D. Labs. Percent Turnover
TABLE VII	- Number of University Students Given Summer Employment - C.D. Laboratories
TABLE VIII	- C.D. Laboratory Expenditures (\$)
TABLE IX	- Funds to Further University Education - C.D. Laboratories.

TABLE I

REPORTS ISSUED BY R.C.M.P.

LABORATORIES ACCORDING

TO TYPE OF OFFENCE

1967-68

Type of Case	Ā	83- <u>R</u> 21	<u>o</u>	<u>s</u>	TOTAL
Murder & Attempt	108	94	8	41	251
Suicide & Attempt	9 42	14	¥0 1	12	69
Sudden Death & Coroner's Act	126	121	10	167	424
Sexual Offences	112	138	5	53	308
General Assaults	6	0 11	3	5	basibauo25
Impaired & Drunken Driving	232	171	0	40	443
Fail to Remain at Accident & Hit and Run	76	69	14	44	203
Forgery & Uttering	216	88	206	74	584
Counterfeiting	1808 3	1	6954	0	6958
B.E. & T. and Armed Robbery	204	152	42	92	490
Arson	23	8	3	20	54
Customs & Excise	12	2	4	0	18
Narcotic Control Act	24	36	9	15	84
Food & Drug Act	2	9	2	0	13
Game Acts (Prov.)	4	18	0	3	25
Liquor Acts (Prov.)	3	10	0	7	20
Vehicle & Highway Acts (Prov.)	2	9	0	1	12
Others & Unknown	595	332	764	238	1929
TOTAL REPORTS	1790	1283	8025	812	11910
	-				

TABLE II
REPORTS ISSUED BY R.C.M.P.
LABORATORIES ACCORDING TO
GEOGRAPHIC LOCATION

1967-68

Geographical Source	To A	<u>R</u>	0	<u>S</u>	TOTAL
Yukon Territories	71	3	10	0	84 9000
North West Territories	poling.	61	11	oratorie	74
Newfoundland	0	0	21	104	125
Prince Edward Island	0	141 0	\$88 4	38	42
Nova Scotia	0	0	20	261	281
New Brunswick	0	0	133	407	540
Quebec	0 200	88 0	1185	0	1185
Ontario	0	5	6067	0	6072
Manitoba	. 2	220	192	0	414
Saskatchewan	4	630	9	0	643
Alberta	3	339	156	0	498
British Columbia	1709	24	209	JOA O	1942
Outside Canada	0	0 1	8	1,	na gardlo boo
TOTAL REPORTS	1790	1283	8025	812	11910
7 20					

TABLE III

ESTABLISHMENT - C.C. LABORATORIES

(As of Sept. 6, 1968)

NUMBER OF PERSONNEL

LABORATORY	Administrative	#3455 E 195		Stenos Clerks	
# 5 5 5 5 B 5 B 5 B 5 B 5 B 5 B 5 B 5 B	Scientists - Others	Scientists	Technicians	Typists	TOTAL
IAB HO	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2			2	4
Vancouver		17	8	3	29
Edmonton		6	8	1	17
Regina		17	10	4	33
Ottawa	1 2	7	21	6	37
Sackville	branch br	9	5	2	18
TOTAL	7 4 5 5 6 5	56	52	18	138

TABLE IV
PROFESSIONAL STAFF - C.D. IABS. SEPT., 1968

	Country			ntry n Received		
	of		Secondar		Years Since	Years Employed
Ph.D.	Birth	Age	School	University	Graduation	with RCMP Lab.
Supt. Eves	Canada	49	Canada	Canada	8	26
Insp. Bergh	Canada	39	Canada	Canada	3	15
Dr. Beveridge	Scotland	28	Scotland	Scotland	4	1
Dr. Singal	India	33	India	India	5	1
Dr. Baird	Ireland	32	Ireland	Ireland	5	1/4
Dr. Rodgers	Scotland	28	Scotland	England	2	1 4
Masters				real street		72.3
Mr. Radych	Canada	41	Canada	Canada	7.07	20
Mrs. Rouen	France				17	17
		49	France	France	17	12
Insp. Kerr Mr. Peel	Canada	36	Canada	Canada	4	12
	Canada	29	Canada	Canada	3	3 2
Miss Pawlovich	Canada	29	Canada	Canada	4	
Miss Kotylak	Canada		Canada	Canada	2	TUTAL 1
Mr. Wood	England	25	England	Wales	3	1
Mr. Joynt	Canada	28	Canada	Canada	1	1 2
Bachelor (Honours	2					
S/Sgt. Picton	Canada	37	Canada	Canada	5	12
S/Sgt. Tweed	Canada	38	Canada	Canada	7	110
S/Sgt. Hoday	Roumania	35	Canada	Canada	5	10
Mr. Corrigan	Canada	39	Canada	Canada	16	10
Mr. Reeve	Canada	27	Canada	Canada-USA	3	3
Mr. McLeod	Canada	29	Canada	Canada	4	2
Miss Hiebert	Canada	26	Canada	Canada	î	i i
Mr. Smith	England		England	England	3	i i
Mr. Sumner	Canada	25	Canada	Canada	2	
Mr. Robertson	Canada	25	Canada	Canada	2	1
Mrs. Matthias	Canada	24	Canada	Canada	2	2
Mrs. Somers	Canada	25	Canada	Canada	1	1 1844
	Variaua	2)	Vallaua	Valeua	- 7	700
Bachelor (Pass)						
Insp. Huber	Canada	47	Canada	Canada	9	19
S/Sgt. James	Canada	42	Canada	Canada	18	17
S/Sgt. Gazey	England	37	England	Canada	9	17
Mr. Renaud	Canada	39	Canada	Canada	17	17
Insp. Headrick	Canada	37	Canada	Canada	5	16
Insp. Duke	Canada	39	Canada	Canada	9	16
S/Sgt. Hodgins	Canada	42	Canada	Canada	9	16
S/Sgt. Robertson	Canada	38	Canada	Canada	9	12
Sgt. Paynter	Canada	32	Canada	Canada	4	
Sgt. Mooney	Canada	30	Canada	Canada	2	9 7
Cpl. Elves	Canada	32	Canada	Canada	ı	6
Mr. Nelson	Canada	27	Canada	Canada	4	4
Mr. Saturley	Canada	23	Canada	Canada		3
Miss Long	Canada	26	Canada	Canada	3 2	2
Miss Fahl	Germany	26	Canada	Canada	4	2 2 2
Miss Smith	Canada	23	Canada	Canada	2	2
fiss Williams	Canada	22	Canada	Canada	2	2
fiss Bates	Canada	22	Canada	Canada	ĩ	ĩ
fiss Beaumont	Canada	22	Canada	Canada	ī	ī
Miss Berkan	Canada	23	Canada	Canada	2	ī
fr. Evers	Canada	27	Canada	Canada	î	i
frs. Ferris	Canada	27	Canada	Canada	6	i
Mr. Gass	Canada	23	Canada	Canada	1	i
fiss Heuchert		22		Canada	2	1
	Canada		Canada			3
Mr. Deobald	Canada	23	Canada	Canada	1 2	1
Miss Brown	Canada	21	Canada	Canada		1
Miss Boyd	Canada	25	Canada	Canada	4	7
Miss Mrazek	Canada	22	Canada	Canada	411222	034-87-44-44-44-44-44-44-44-44-44-44-44-44-44
st. Towson	Canada	27	Canada	Canada	2	4
Miss Vinnick	Canada	22	Canada	Canada	\$	7
fiss Wells	England	22	Canada	Canada	专	#

TABLE V

NUMBER OF PROFESSIONAL STAFF - C.D. LABS.

1962 to 1968 & Estimated to 1973

DEGREE	1962 -	1963	- 1964	- 1965	- 1966	- 1967	- 1968	- 1969	- 1970	- 1971	- 1972	- 1973
Bachelor	12	14	15	15	21	29	45	51	55	62	65	67
Master	2	- 2	3	1964	4	5	6	8	8	8	9	10
Doctorate	1	1	1	2	2	4	6	8	9	9	9	10

No. of Students

TABLE VI

PROFESSIONAL STAFF TURNOVER - C.D. LABS.

PERCENT TURNOVER

DEGREE	1962	1963	1964	1965	1966	1967
Bachelor	0%	0%	20%	20%	0%	2%
Masters	0%	0%	0%	0%	0%	0%
Doctorate	0,%	0%	0%	50%	0%	0%

TABLE VII

NUMBER OF UNIVERSITY STUDENTS GIVEN SUMMER EMPLOYMENT C.D. LABORATORIES

Year	1962	1963	1964	1965	1966	1967	1968
No. of Students	O EXP	0	0	0	2	3	4

TABLE VIII

C.D. LABORATORY EXPENDITURES (\$)

Fiscal Year	Intramural R & D	Data Collection	Scientific Information
1962/63	4,000.00	1,000.00	5,000.00
1963/64	5,000.00	1,000.00	6,000.00
1964/65	5,000.00	1,000.00	7,000.00
1965/66	8,000.00	1,000.00	8,000.00
1966/67	10,000.00	1,000.00	9,000.00
1967/68	14,000.00	2,955.00	11,115.00
1968/69	25,000.00	5,000.00	9,327.00

TABLE IX

FUNDS TO FURTHER UNIVERSITY EDUCATION - C.D. LABS.

Fiscal Year	Expenditure
1962/63	17,000.00
1963/64	15,500.00
1964/65	10,000.00
1965/66	15,500.00
1966/67	16,500.00
1967/68	17,500.00
1968/69	51,725.00

APPENDIX 48 THE SCIENTIFIC POLICIES AND PROGRAMMES OF THE NATIONAL MUSEUM OF NATURAL SCIENCES OTTAWA, CANADA BY A.W.F. BANFIELD, DIRECTOR

20103-17

Resume

Canada is woefully behind most other civilized countries
in promoting museums as national cultural and scientific institutions.

The important role national museums can play in uniting its citizens
in an appreciation of their natural and human heritage seems to have
been sadly underestimated by successive Canadian federal governments.

The biological and geological research undertaken in natural science museums is not normally duplicated by universities or other federal departments. Museological subjects are seldom emphasized at universities in spite of their practical importance in many modern related studies.

There is a current shortage of museum personnel and inadequate training facilities in Canada in the face of a surge in the construction of new provincial museums.

Museums play a unique role as public communication centres

keeping the public informed of developments in the scientific fields, and

providing an avenue of appreciation of the human environment.

History of Museums

- 1. Museums have a long history. The first was founded by the Greek
 Pharoah Ptolemy in Alexandria, Egypt, in 285 B.C. It was the World's
 centre of learning and was called the <u>Museion</u> temple of the Muses.

 It contained a great manuscript library, laboratories, workshops and
 collections of scientific instruments and natural history specimens.
- 2. During the middle ages kings, princes, and bishops continued the museum concept in their private "Royal Cabinets" which preserved the curiosities of nature for their own amusement and for the study of their scientific protégés. The first modern public museum was the Musée d'Histoire naturelle in Paris which was established in 1636, followed by the British Museum in London in 1753. Most of the great museums of the World, including the Smithsonian Institute of Washington, were founded during the nineteenth century.
- 3. The role played by museums in the cultural life of the community has changed over the years. Originally the collections were just for the appreciation and study of private scholars. During the eighteenth and nineteenth centuries the museums opened their doors to the public, to observe the wonders of nature. Often nineteenth century museum galleries looked like frozen arks with pairs of stuffed animals male and female, in endless queues. Museums during the twentieth century have developed a new dimension as public communication centres with the development of their extension services: lectures, films, scientific demonstrations, lively exhibitions, popular and scholarly publications and finally participation in the television medium. To-day there is hardly a civilized country which does not recognize the importance of having strong museums to foster national pride in the cultural, historical and natural heritages of its citizens. The important unifying role of a strong national museum is recognized by almost every government.

History of the National Museum of Canada

4. Almost 1200 years after the first Museion was destroyed by the Arabs, the National Museum of Canada was founded by a native Montrealer, Sir William Logan, in 1842. Logan was appointed first Provincial Geologist of the United Provinces of Upper and Lower Canada and he is known primarily as the founder of the Geological Survey of Canada. Before he took up his post, Logan had been curator of the geology department of the Royal Institution of South Wales in Swansea. Quite naturally he had strong museum interests and soon commenced the formation of a collection of Canadian rocks and minerals. His interests extended to other natural sciences as well. He was a bird taxidermist and a botanist as well. In 1856, he obtained the appointment of Elkanah Billings as the first palaeontologist and the following year a Mr. D'Urban was hired as naturalist and botanist. The Geological Survey moved to the new Capital in 1880 and occupied the Clarendon Hotel on Sussex Street, where it set up its museum exhibits.

- 5. With such an auspicious pre-Confederation start one might have expected the Museum to have developed into a strong national institution, but this was not the case. Its development was extremely slow and subject to numerous frustrating relapses.
- 6. In 1904, fifty years after Logan's recommendation, a start was made on building the Victoria Memorial Museum over a bed of clay in central Ottawa. In 1910, the Geological Survey and its museum moved in and, shortly afterwards, serious structural defects developed. By 1915, the entrance tower commenced to separate from the rest of the building and the tower was therefore removed. On February 3, 1916, the Centre Block of the Parliament Buildings was destroyed by fire and Parliament moved into the museum and continued to occupy the building until May, 1920.
- 7. The East Wing of the building had been made available to the National Gallery in 1911, and much of the remainder of the building was occupied by offices of the Geological Survey. As a result of this use of the Museum's building, very little space was available for the traditional museum functions of exhibition, research and extension from 1910 to 1960.
- 8. However, in 1959, the Geological Survey moved to new quarters and the

next year the National Gallery moved out as well. As a result, the building that had been designed as a museum was finally made available for that purpose fifty years after construction. However, the building was obviously unsound and, after an engineering survey, plans were approved in 1962 to construct a new National Museum, to be opened July 1, 1967. Subsequently the Government has postponed the start of construction on a number of occasions and as of October 1, 1968, there are no plans approved for this project. Currently the research divisions of the Museum of Natural Sciences occupy quarters in five different buildings. The Palaeontology Division moved on October 12 from the Clarendon Hotel Annex which it has occupied since the first move to Ottawa in 1880.

9. While there have been these long delays in providing a suitable building for a National Museum, the responsibility for the administration of the Museum has also passed through several departments. From 1842 to 1950, the Museum was part of the Geological Survey of Canada. In 1950, the Museum was transferred to the Department of Resources and Development (the predecessor of the current Department of Indian Affairs and Northern Development). In 1964, it was transferred to the Ministry of the Secretary of State. Finally this year it has become part of the National Museums of Canada Corporation, responsible to the Secretary of State as envisaged by Vincent Massey in the Royal Commission on National Development in the Arts, Letters and Sciences, 1949 - 1951.

Legislative History

- 10. The first statement of the Museum's functions seems to have been in the Geological Survey Act of 1890:
- 4(b) "To maintain a museum of geological and natural history and to collect, classify and arrange for exhibition in the museum ... such specimens as are necessary to afford a complete and exact knowledge of the geology, mineralogy ...; fauna and flora of Canada."

This antiquated scientific terminology was repeated in Act after Act until

- 11. The Museum has had its functions clearly defined for the first time in modern terms under the new National Museums Act, 16 Eliz. II, Chapter 21, 21 December, 1967. The purposes and powers of the Museums Corporation are stated in section 5:
 - (1) The purposes of the Corporation are to demonstrate the products of nature and the works of man, with special but not exclusive reference to Canada, so as to promote interest therein throughout Canada and to disseminate knowledge thereof.
 - (2) In furtherance of its purposes the Corporation may
 - (a) collect, classify, preserve and display objects relevant to its purposes;
 - (b) undertake or sponsor research relevant to its purposes;
 - (c) arrange for and sponsor travelling exhibitions of materials in, or related to, its collections;
 - (d) arrange for the acquisition or publication and the sale to the public of books, pamphlets, replicas and other materials related to its purposes;
 - (e) undertake or sponsor programs for the training of persons in the professions and skills involved in the operation of museums;
 - (f) establish adequate liaison with other museums and universities with a view to securing maximum collaboration of all activities in this field and, for such purposes, establish a committee or committees pursuant to section 13;
 - (g) arrange for or provide professional and technical services to other organizations whose purposes are similar to any of those of the Corporation, on such terms and conditions as may be approved by the Minister;
 - (h) generally, do and authorize such things as are incidental or conducive to the attainment of the purposes of the Corporation and the exercise of its powers.

The Role of Museums

- 12. The fundamental feature which separates museums from universities as teaching institutions is the possession of collections. Museums collect three-dimensional objects (the facts of life) in order to preserve them for immediate and future study. Often two-dimensional representations of these objects are found in text books that are studied by university students. Although in art and ethnographic museums the specimens are usually unique, this is not the usual case in natural science museums. In our museums the specimens are taken as samples of the infinitely variable universe. In order to have important collections in the natural sciences the collections must be well-documented, well-curated and must be significantly large. Like atomic piles there is also a critical size in collections, above which they contain much intrinsic information that scientists may expose through study. Such collections are important national biological research facilities just as surely as are other scientific installations in the fields of physics and chemistry. Museums of natural sciences also contain some truly unique specimens. These are the so-called type specimens upon which the original description of the species were based. Other valuable specimens of extinct animals and plants may be considered unique and, similarly, most fossil specimens may be considered unique.
- 13. Research is the second basic function of museums. The Alexandrian Museion was a research institute and this tradition has been continued in . most, if not all, of the World's great museums ever since. The importance of research in museums has recently been reconfirmed by a resolution of the International Council of Museums Eighth General Conference at Munich, Federal Republic of Germany, August 9, 1968.
- 14. Museums are the traditional home of research in systematic and evolutionary biology one of the core disciplines of biology. One can recall the names of famous French biologists Buffon, Cuvier, Lamarck and St. Hilaire, whose researches were centred at the Musée d'Histoire naturelle in Paris.

 To-day this subject is not fashionable at universities where the emphasis has

been placed on experimental molecular and cellular biology. Few students are attracted to systematic biology in spite of the growing need for systematists to identify organisms important in other research studies.

- 15. Some of the various investigations in which the Museum is cooperating by providing identifications are listed below.
- (a) Environmental studies to improve the quality of mans environment: ecology.
- (b) Public health surveys identification of bats carrying rabies.
- (c) Water pollution and air pollution studies identification of indicator species.
 - (d) Oceanographic surveys: search for new proteins foods for an exploding human population.
 - (e) Bird strikes in modern jet aircraft engines identification of the bird remains.
 - (f) Stratigraphic dating of geological beds by means of fossil identification.
 - (g) Identification of economically important minerals.
 - (h) Identification of specimens used in biological research at universities.
- 16. Public exhibition is another traditional museum function. In modern society, museums serve as important communication centres. They constitute an important interface between the sciences and the citizen. Here again the teaching methods are quite different than those of universities. The emphasis is on three-dimensional exhibits and demonstrations and the importance of the text is de-emphasized. Attempts are made to appeal to at least four senses of the visitor: sight, touch, hearing and even smell! Exhibits are planned for the casual visitor as well as for the elementary and advanced student. The casual visitor may obtain a knowledge of the world about him which he can assimilate at his own pace with a minimum of effort. No wonder museums have been described as "the poor man's universities".

Visitors now demand the most modern display techniques utilizing colour, action, good design, and personal involvement in the exhibits.

- 17. The final basic museum function is extension the means developed to extend its program beyond the visitors to its galleries. These means include publications, both scholarly, and popular pamphlets to explain exhibits to non-technical audiences. There is the presentation of lectures for the young and adults. The production of films and filmstrip and the arrangement of travelling exhibits to schools, fairs and other museums.
- 18. In spite of the severe limitations outlined in the previous paragraphs 6, 7, 8 and 9, the Museum of Natural Sciences has developed a full program in all these areas to the best of its limited resources.

Current Canadian Situation

- 19. In 1951, Vincent Massey described the public apathy to museums in Canada, which, placed this country far behind other European and Commonwealth countries in this field. However, the situation changed dramatically by 1967. A number of provinces and cities chose to build museums, art galleries and related institutions as Centennial Projects. Starting with the Charlottetown Confederation Centre, completed in 1964, the Canadian Museums Association has estimated that 100 million dollars will be spent on the construction of new museums by 1970, when most of the projects will be completed. Seven provinces accepted Federal Government Centennial grants to build provincial museums and there were one hundred and forty museum projects at the community level. The Canadian Museums Association estimated 30 million visitors to Canadian museums in 1967.
- 20. Unfortunately in the face of this great surge of new museum construction, there is a national shortage of qualified curators, trained technicians and experienced museum administrators. Many of the new staff for these museums must be recruited from abroad. Often the salaries offered for university-trained professional curators are not competitive with salaries offered by Canadian universities for comparable positions. This discourages

good Canadian students from training for museum posts.

21. To-day the traditional museum subjects of systematic and evolutionary biology, palaeontology and mineralogy are not favoured by Canadian universities. There are no fadulties that specialize in training students for museum and related positions. Very few universities have established research collections in these fields. Most university museums contain small collections primarily for teaching purposes. University administrators are loath to assume the heavy responsibility for maintaining large collections, such as providing expanding space, curatorial technicians, laboratories, documentation facilities and staff. Most university officials that I have interviewed believed that such facilities are peripheral to the universities central teaching responsibilities.

The Museum of Natural Sciences Proposed Program

- 22. From the review of the current situation in Canada presented in the previous sections, it is evident that there is an urgent need to develop a national policy in museum research in the natural sciences. Furthermore, the resources now available to us for development both in manpower and collections are limited. It would appear reasonable to integrate our limited museum resources, rather than to duplicate our efforts or compete.
- 23. As a general policy statement: our museum proposes to play a leading role on a national basis in interpreting man's natural heritage and Canada's natural resources to Canadians through an integrated program of basic research, lively exhibitions, and a vital extension program. In order to fulfil this role, we must develop the following individual programs.
- 24. The national collections in botany, zoology, mineralogy and palaeontology must be enlarged in order to provide research facilities for visiting. scientists and university students as well as to provide strong core collections from which exhibits, loans and travelling exhibitions can be made. Such growth could be assured if collections made on federal funds in other departments would normally be deposited in the National Museum upon completion of

the initial studies. The National Museum should also be considered the natural depository for new biological and mineralogical type specimens described by Canadian authors. The museum intends to proceed with the development of its automatic data processing methods for the national collections. In this field we are already among the leaders in the international museum field.

- 25. We propose to develop our intramural research program in systematic biology, palaeontology and mineral sciences in order to keep abreast of the other great national museums in the World. This type of research is not being conducted to any large extent by any Canadian university and they do not indicate any desire to assume the responsibility of maintaining the necessary large collections. We propose to fill in the gaps in research conducted by provincial museums.
- 26. We propose to develop our role as a national identification centre for the many practical surveys in oceanography, pollution, etc., now under way.

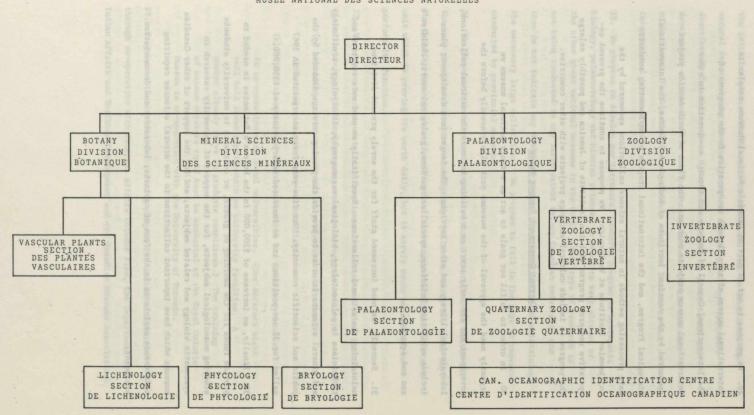
 Our Canadian Oceanographic Identification Centre may be mentioned here as a unit which is proving its worth daily, but it sorely needs more staff to perform its function.
- 27. We propose to co-operate with Canadian universities and other institutions to train professional museum personnel through the media of:
 - (a) awarding grants or contracts to professors and students conducting research in the museums fields.
 - (b) the presentation of courses, lectures and laboratory courses in co-operation with local universities. (Our curators might well hold cross appointments on university faculties. A number already serve on graduate committees.) The training of museum curators could best be conducted at the Royal Ontario Museum in co-operation with the University of Toronto.
- 28. We propose to continue our training program for museum technicians through co-operation with External Affairs Colombo Plan, the Department of Indian Affairs and Northern Development and the Canadian Museums Association.

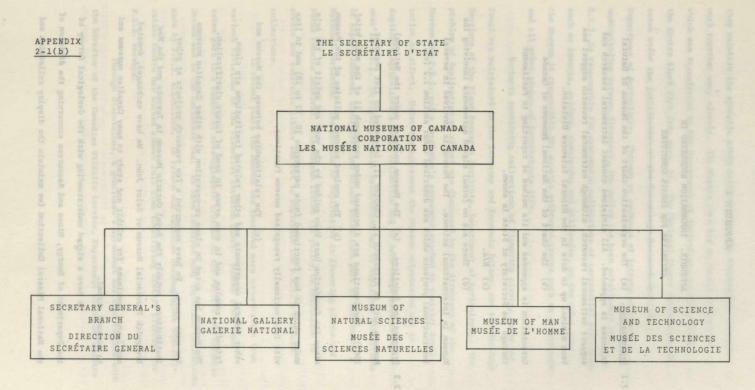
29. We propose to act as part of Canada's National Museums complex in international museum affairs through co-operation in the programs of the International Council of Museums and through co-operation in other international museum projects such as: the Flora of North America project sponsored by the American Institute of Biological Sciences, the International Biological Program, and the international program of implementing automatic data processing methods in natural science collections sponsored by the Smithsonian Institute at Washington. We propose to continue the present co-operative research program with the Institute of Jamaica and possibly enlarge the program to include cultural exchange projects with other countries.

Current Government Support Needs

- 30. In order to fulfil our goals to act as a truly national museum we urgently need the approval of the museums park plan presently before the government and the early start on a building to house the national collections, laboratories, library and other services. The longer term development plans include exhibition buildings, specialized gardens, geological court, children's zoo and aquarium.
- 31. Secondly, we need increased staff for the sorely pressed divisions maintaining the national collections. Specifically we need more curators and technicians in palaeontology, biological oceanography, ichthyology, ornithology and mineral sciences in order to provide the growing services demanded by the public and scientific community. Our five-year forecast presented in 1967 called for 32 new positions and an increased salary primary of \$350,000.
- 32. Finally, an increase of \$200,000 in the Museum's Estimates is needed to provide funds for the awarding of grants, or contracts to university students studying museological subjects, for the support of university research in systematic biology and related subjects, and for the support of other Canadian museums which have important collections in the natural sciences requiring maintenance assistance in the form of cabinets, laboratory and documentation equipment.

Special Committee





APPENDIX 1

APPENDIX. INFORMATION REQUESTED IN GUIDELINE FOR SENATE COMMITTEE

- 2.1 Organization. (a) The organization chart of the Museum of Natural Sciences is appended. All divisions conduct intramural research and support extramural research, although extramural research support has been minimal up to date in the Mineral Sciences Division.
 - (b) The chart of the National Museums of Canada Corporation is appended and its method of reporting to Parliament through the Secretary of State is shown.
 - (c) N/A.
 - (d) There are no formal signed agreements involving the Museum in international science. The Museum is involved in several international projects which are described under section 2.2 (c).
- 2.2 Organization functions. (a) The Museum operates under the National Museums Act, 16 Elizabeth II, Chapter 21, (assented to 21st December, 1967). The functions are discussed under paragraph 11 of the main brief.
 - (b) The evolved science policies of the Museum since its foundation have been guided by the word and spirit of the Acts under which it has functioned (note paragraphs 10, 12 to 18) and in line with internationally recognized museum functions.
 - (c) The relationships between the Museum and other federal departments and other related institutions are close, friendly, complex and in some areas in need of future clarification.

 The Museum has acted in close co-operation with other Canadian museums for many years. We have supported a few research projects at other institutions, notably the Royal Ontario Museum in Toronto and the New Brunswick Provincial Museum at Saint John. We have exchanged, donated and loaned specimens for exhibit and study to many Canadian museums and to museums abroad.

We have a signed understanding with the Geological Survey of the Department of Energy, Mines and Resources concerning the division of the National Mineral Collection (we maintain the display collection and they maintain the synoptic study collection). The responsible curators work together very closely. The Museum once had an insect collection which was transferred to the Department of Agriculture in 1916, after the Centre Block fire (see para. 6). The National Insect collection now comes under the jurisdiction of the Entomology Research Institute,

Department of Agriculture. Through an exchange of letters of mutual understanding between directors, the policy has been established that

E.R.I. is responsible for systematic collections of terrestrial arthropods such as insects, spiders, centipedes and millipedes, on the other hand the Museum is responsible for aquatic arthropod groups such as crustaceans and all other groups of invertebrate life.

Herbaria containing collections of flowering plants, ferns and fungi are maintained in the Taxonomy and Economic Botany, and the Mycology Sections of the Plant Research Institute, Department of Agriculture. The problem of duplication of effort was discussed by the directors of the Museum and P.R.I. and a gentleman's agreement reached to restrict duplication of effort. Under the agreement the Museum volunteered not to duplicate Agriculture's fungi collection and to turn fungi collections over to P.R.I. In return, P.R.I. volunteered not to duplicate collections of algae, lichens, liverworts and mosses which form part of the Museum's National Herbarium. The problem of duplication in flowering plants and ferns remains unsolved. The Museum stated its policy to specialize in arctic and subarctic plants and not to duplicate the P.R.I.'s tropical collections.

In recent years the Museum has received warm co-operation from various divisions of the Fisheries Research Board. Museum staff have taken part in a number of oceanographic cruises in the Pacific and Atlantic Oceans and in the Caribbean Sea. We have received many important collections made by F.R.B. scientists. In return our Canadian Oceanographic Identification Centre has worked almost full time identifying oceanic plankton for F.R.B. surveys.

Through discussions, a gentleman's agreement has been reached with the Director of the Canadian Wildlife Service, Department of Indian Affairs

and Northern Development, whereby that Branch would not conduct or sponsor research in systematic biology, while at the same time the Museum would not sponsor research in wildlife management. The Museum has received valuable collections from C.W.S. scientists and, in return, has identified many collections of plants and animals for special C.W.S. investigations.

The National Research Council does not conduct intramural research in any of the subjects studied at the Museum. The N.R.C. university research grants program does occasionally cover applications for support in systematic biology. However, this area is not currently given a high priority by N.R.C., and most university specialists in this field state that there is inadequate Canadian support for such studies at present. The Museum's modest extramural research contract program may be said to complement N.R.C.'s more important role in this field. The President of the National Research Council is an ex-officio member of the Board of Trustees of the National Museums of Canada. At a recent meeting of the Policy Committee he stated he wished to see the Museum's program continued. Museum staff members sit on some N.R.C. Associate Committees.

Three N.R.C. postdoctoral fellowships in systematic biology and palaeontology are tenable at the Museum of Natural Sciences.

International Co-operation. Several members of the staff serve on international scientific organizations. For instance I serve as Secretary of the International Council of Museums' Committee for Natural History Museums. The Museum is involved in several international programmes. One of the most important is the International Biological Program. Our Canadian Oceanographic Identification Centre was organized upon the request of the Canadian Committee for I.B.P. (a N.R.C. Associate Committee) to serve a national need in the identification of plankton obtained on Canadian oceanographic surveys. Another international project is the Flora of North America sponsored by the American Institute of Biological Sciences and supported by North American botanical associations.

Of particular interest is the Museum's co-operative research project with the Institute of Jamaica, Kingston, Jamaica, which was initiated upon the

research programme in Jamaica whereby we train Jamaican museum
technicians and share collections. It has been commended by the

The Museum has supported museum expeditions undertaken by curators of other museums to such places as the Falkland Islands and the Fiji Islands.

(d) The effectiveness of research projects,
duties of officers and divisional goals are constantly under review
by section heads and division chiefs. Proposed changes are discussed
at curators meetings and decisions are made by the director. The
basis for changes are: (1) findings in the scientific literature of
the World, (2) the discovery of gaps in knowledge, (3) the research
programs of other Canadian, or foreign museums, (4) specific requests
from other agencies and societies, (5) the completion and publication
of our own research current projects.

(e) Outside consultants have been employed to appraise performance and to conduct feasibility studies. In 1967-68,

DCF Consultants, Toronto, were engaged to conduct a feasibility study of the implementation of automatic data processing methods in our collections. During the same year Dr. John Wickstead of the Plymouth Marine Laboratory was engaged to establish guidelines and appraise performance in the Canadian Oceanographic Identification Centre. Five years ago the total museum program was reviewed by a consultants firm in a departmental study of financial program review.

(f) The divisions and sections of the Museum are discipline oriented in a hierarchical system. (The curator of molluscs is in the Invertebrate Zoology Section of the Zoology Division. He is responsible for intramural research in malacology and the supervision of extramural contractees). The policies follow the functions outlined in our Act.

(g) Major hindrances are the scarcity of technical support staff, the scarcity of sophisticated research equipment

and facilities, the general scarcity of storage facilities (cabinets),
the lack of funds for research support, the long delays in publication
of reports through the facilities of the Queen's Publisher, and above
all the small research staff available to respond to the challenging
demands of expanding science, and public inquiries.

(h) Some of the major desirable changes in organization within the next five years have been listed in paragraphs 22 to 29 and 31. In addition it would be desirable to split the research and curatorial functions to permit research scientists to pursue studies in theoretical studies such as numerical taxonomy while junior scientists supervised the collections and made routine identifications. All plans for expansion unfortunately must be postponed for two years or more as a result of the current staff freeze.

Unofficial discussions have taken place concerning the possibility of transferring the Entomology Research Institute to the Museum because of the clarity of the pure research functions expressed in the National Museums Act which covers the similar functions of E.R.I. If the Museum had satisfactory research facilities to offer, it would appear reasonable to transfer both E.R.I. and the taxonomy section of the Plant Research Institute to the jurisdiction of the National Museums of Canada Corporation under section 6 (e) of the Act (the inclusion of other museums).

2.3 Personnel Policies. (a) We prefer to hire experienced museum curators rather than members of the graduating classes. In any event the number of museum professionals is extremely small and we usually learn of them directly by application for employment, or from museum colleagues. When a vacancy occurs, applications are collected and transmitted to the Public Service Commission which arranges an appraisal board. The applicants are usually interviewed and a successful candidate chosen through regular P.S.C. procedures. The main problem in the museum personnel field is finding qualified Canadian applicants. Up to this time there is no Canadian university which offers specialized courses for curators of science museums. (I understand that the Royal Ontario Museum and the University of Toronto are planning in co-operation such a course at the Masters level.

This is a commendable project and merits support). Therefore we are obliged to look for graduates of foreign universities. Museums are therefore more involved in talent transfusions to the Canadian scene rather than in "the brain drain".

- (b) Creative researchers are usually recognized on the basis of their published papers, and motivation observed during interview. The confidential appraisals of colleagues are also used.
- (c) Staff with high potential for research administration are recognized on the basis of their performance. Factors such as objectivity in their reports, ability to supervise team research projects, and ability to submit position papers on research areas are good indicators. We have no positions classified as research managers because of an arbitrary decision by the Bureau of Classification Review that our divisions were too small to merit research managers. Therefore our division chiefs are classified as research officers and feel that they are not being rewarded for their administrative loads while at the same time their research productivity is restricted.
- (d) Education leave to complete advanced degrees is a regular policy.

2.4 The regional pattern of scientific activities.

The Museum is interested in the flora, fauna, fossils and mineral occurrences of all of Canada. Quite naturally some studies are restricted to suitable areas: for instance marine biologists undertake field investigations in coastal areas and the best dinosaur-bearing sediments are found in Alberta. Generally our field activities are directed to areas where there are gaps in our knowledge. For that reason the Arctic regions receive relatively more attention than southern areas. We are also interested in regions contiguous to Canada such as the United States, and the Pacific and Atlantic Oceans.

The following table lists the number of museum expeditions to the provinces and territories since 1962:

Newfoundland	6	Alberta	20
Nova Scotia	9 11 10	British Columbia	26
Prince Edward Island	1	Yukon Territory	10
New Brunswick	4	Northwest Territories	12
Quebec	14	Extraterritorial	31
Ontario	19		
Manitoba	13		
Saskatchewan	10		

The Canadian Oceanographic Identification Centre (C.O.I.C.) was established within the Division of Zoology, Museum of Natural Sciences, in 1967, as the result of a recommendation by the Marine Productivity Subcommittee of the Canadian International Biological Programme Committee. It is a national sorting and identification service centre for zooplankton and fish larvae and eggs, and will be extended for benthos and phytoplankton in due time. Many oceanography-oriented institutions have made usage of the service since the establishment of the C.O.I.C. The service has relieved the scientists who are most interested in the ecology and the productivity of the sea from a great burden of taxonomy. The following table gives the requests of service that we have received to date and also reflects the pattern of scientific activities of Canadian biological oceanographers:

Organization & & Project Leader	Lots of Samples	Area Studied	Type of Service requested
FRB, St. John's Dr. A. May	190	Newfoundland & Labrador coastal water	Identification of zooplankton.
Bedford Institute of Oceanography Dr. R.J. Conover	36	Gulf of St. Lawrence	Identification of zooplankton and determination of stages of life cycle of euphausiids and copepods.
FRB, St. Andrews Dr. B. Barrett	294	Bay of Fundy, Gulf of Maine & Nova Scotia coastal water	Measurement and identification of fish larvae, identification of zooplankton.
FRB, St. Andrews Dr. A.C. Kohler	65	Gulf of St. Lawrence	Identification of zooplankton and fish larvae.

Science Policy

Organization &	Lots	Area Studied	and her matrials the
Project Leader	Samples	A g sadd	Type of Service requested
FRB, St. Andrews Mr. T. Platt	63	St. Margaret's Bay	Identification of zooplankton.
FRB, St. Andrews Dr. W.J. Ross	564		Identification of zooplankton and fish larvae.
Ontario Lands & Forests, & C.O.I.C. Dr. D.J. Faber	129	Lake Huron	Identification of fish larvae.
FRB, Nanaimo	174	Strait of	Sorting and identification of
Dr. T.H. Butler		Georgia	decapod and fish larvae.
FRB, Nanaimo Mr. A.J. Dodimead	86	B.C. coast	Identification of zooplankton.
FRB, Nanaimo Mr. R.J. LeBrasseur	476	Pacific Station	Identification of zooplankton, determination of biomass (wet weight) & numerical composition of plankton samples.
FRB, Nanaimo Dr. M. Waldichuk	14	B.C. coast	Identification of zooplankton.
University of British Columbia	1387	Indian Arm,	Sorting and identification of zooplankton (low priority).
Dr. B.M. Bary		AN VERNET WERE AND AND	All Mar magnuo.
Bellairs Research Institute Dr. J.B. Lewis	169	Barbados	Sorting and identification of zooplankton (low priority).

Not listed in the above table is the IBP Gulf of St. Lawrence Project. Dr. D.M. Steven, leader of this project, has already indicated the need of service but has not given the type of service in detail.

2.5 Personnel associated with scientific activities.

(a) Current personnel establishme	ent	47
Employees on strength by cate	egory	
Austria 4 3 77 Togitab	New Zenland Hee	
Director	malans 1	
Physical Sciences	ARU ARU	
Scientific Research	13	
Biological Scientists	ANTHO: ANTHO:	
25 L 32 yes	Canada Canada	
General Technical	12	
Engineering and Scientif	Fic Support 6	

Drafting and Illustration 2

	Administrati	ve Support		5					
	TOTAL	abil support		Tuken Te				46	
(b)	Number of profess to administrative		f devoting	time 1					
(e)	Tabulated informa	tion regar	ding profe	ssional s	taff				
	Bachelor Degree	i	ii	iii	iv		v .	1.0.0vi	
	Godfrey, W.E.	Canada	Canada	Canada	14yrs	21yrs	58	English	only
	MacDonald, S.D.	Canada	Canada	USA	21	9	41	English	only
	Smith, M.F.I.	Canada	Canada	Canada	27	2	49	English	only
	Master Degree								
	Baldwin, W.K.W.	Canada	Canada	Canada	36	21	58	English	only
	Cook, F.R.	Canada	Canada	USA	14	8	33	English	only
	Harington, C.R.	Canada	Canada	Canada	17	3	35	English	only
	Rafi, F.	Pakistan	Pakistan	Pakistan	13	3	35	English	only
	Youngman, P.M.	USA	USA	USA	12	8	41	English	only
	Doctorate								
	Banfield, A.W.F.	Canada	Canada	USA	26	15	50	yes	
	Bousfield, E.L.	Canada	Canada	USA	in the	18	42	English	only
	Brodo, I.M.	USA	USA	USA	10	3	33	English	
	Clarke, A.H.	USA	USA	USA	10	9	42	English	only
	Faber, D.J.	USA	USA	USA	10	1	36	English	only
	Ireland, R.R.	USA	USA	USA	10	2	36	English	only
	Lee, R.K.S.	Hawaii	Hawaii	Canada	22	2	37	English	only
	McAllister, D.E.	Canada	Canada	Canada	15	10	34	yes	
	Powell, N.A. N	ew Zealand		Austria	4	3	31	English	only
	Russell, D.A.	USA	Zealand USA	USA	13	3	31	English	only
	Scoggan, H.J.	Canada	Canada	Canada	33	21	57	English	only
	Shih, C.T.	China	China	Canada	10	1	34	English	only
	Soper, J.H.	Canada	Canada	USA	25	1	52	yes	

(d)	Staff degrees	1962	1963	1	964	1965	1966	1967	1968
	Bachelor	3	3		3	3	3	4	4
	Master	2	2		2	2	385 4	4	4
	Doctorate	6	6		6	6	808 9	11	14
	Estimate	1969	1970	19	971	1972	1973		
	Bachelor	4	6		7	9	11		
	Master	4	5		7	8	10		
	Doctorate	8	10	been 1	11	13	15		
(e)	Turnover	1962	1963	19	964	1965	1966	1967	
		d -blo	90,000-		20 10	1%	Instigute	1%	

(f) Previous experience

bergan se	Industry	University	Prior Dept. or Agencies	Other Federal Agencies
Bachelor	25%		25%	75%
Master	25%	75%		50%
Doctorate	7%	42.8%	21.6%	42.8%

(g) 1 employee with Masters degree - currently on educational leave.

(h)	1962	1963	1964	1965	1966	1967
		5	9	11	9	13

2.6 Expenditures associated with scientific activities

(a) It is very difficult to obtain accurate figures because the information requested does not follow usual analysis in departmental estimates. The following information was obtained from the Dominion Bureau of Statistics <u>Federal Government Expenditures on Scientific Activities</u>.

Functions: in thousands

Year	(1) Intramural R. and D.	(2) Scientific (3) Data Collection	Scientific Information	(6) Support of R. and D. in Universities
1962-63	141	261	25	25
1963-64	294	261	156	11

	1) Intramura R. and D.	cientific Collection	(3) Scientific Information	(6) Support of R. and D. in Universities
1964-65	284	312	187	9
1965-66	308	334	199	efero 31
1966-67	476	601	361	55
1967-68*	691	762	457	57
1968-69*	790	750	460	93
* Estimate	d			

Scientific discipline. All of the above figures should be listed under (2d) biological sciences with the exception of \$100,000 R. and D. in 1968/69 which should be listed under (2h) oceanography. I have included palaeontology in biological sciences but it might be argued that it should be in (2j) earth sciences.

Areas of application. These funds could be applied to (4) agriculture,
(8) health and (14) educational techniques and policies.

(b) Operating and Capital expenditures by units. I regret that it is only possible to supply total agency figures. These figures relate to cost of administering the unit. Projected figures are theoretical because of current "freeze". Figures are in thousands.

Year	Operating	Capital
1962-63	52	nil
1963-64	entropy of plateau leven sollor	- A - A - A - A - A - A - A - A - A - A
1964-65	101	min animolion and Apantal
1965-66	139	on of Statisfice Rederal Co
1966-67	168	astris 4 1 Married
1967-68	354	Sa shaspodi-nt Tanolis
1968-69	Sciencia (c) 294	(SI la linearith (1) 57 Eng

(c) Funds expenditure for further professional university education: 1965-69, \$3,000; 1968-69, \$5,000.

2.7 Research Policies

- (a.1) Intramural Units. See reply to 2.2(d) how scientific goals are selected. Monitoring is mainly supplied by (1) acceptance by the scientific community of findings published in scientific reports, (2) acceptance by other departments of reports (identifications). Logistic co-operation has been supplied by Department of E.M.R. Polar Continental Shelf Project, Geological Survey of Canada as well as by Fisheries Research Board and Canadian Wildlife Service (see 2.2 c)
- (a.2) Priorities are established in committee with division chiefs
 based upon outside requests for action and funds available in the
 Estimates.
- (a.3) The programmes are too small for the application of CPN or PERT and we do not have the personnel to conduct the analyses.
- to support intramural R. and D. The funds expenditure have been listed in 2.6(a) under item 6. The general policy is described in para. 26 and 37 of the main brief and discussed under section 2.2(c) of the appendix. The disciplines supported are systematic biology and palaeontology. An analysis of Extramural R. and D. performers (Sectors) is listed below (data from the Education Support Branch of the Secretary of State), in thousands.

Year Fellowshi	ps Can. Educ. Institutes	Other Canadian	Foreign
1964-65	enva hazifelassa to	39	and the second of
1965-66	The state of the state of	65	S-HARW TELLEY
1966-67	24	29	6
1967-68	bearing 35	37	605 evil 607 (d)
1968-69 25	30	32	51115

- (a.5) Extramural research projects are commissioned by means of professional service contracts. The contracts fall into two main groups (1) applications for support of research projects submitted by university professors and students, (2) mission-oriented projects suggested to independent investigators. As an example of (2) we have contracted to a retired minister, who is also a world renowned authority on a family of clams, to identify our collection of these clams. Applications received under (1) are reviewed by an internal committee of specialists and contracts are issued on the basis of merit and availability of funds. Our program complements the university grant program of N.R.C. (see 2.2(c)). It is not duplicated by any other department.
- (a.6) Research resources are shifted when appropriate. Programs are terminated when completed. Professional service contracts are terminated when the project fails to meet requirements. Examples of such failures are: failure to submit report, or the submitted report was not up to standards. Changing research environment necessitates programme changes. As an example: several foreign researchers showed the importance of ethological studies (animal behaviour) in determining systematic relationships. We therefore shifted a curator from taxonomic ornithology to vertebrate ethology where he has made significant contributions during the past three years. He is now considered a leader in the field in Canada.
 - (a.7) Intramural and extramural research reports are transferred by the publication of papers, by the presentation of papers at conferences, by the sponsorship of specialized symposia and by the submission of manuscript research reports to inquirers.
 - 2.7 (b) We have no units exclusively concerned with extramural research activities.

- (b.8) All funds made available for the support of extramural research
 was actually expended each year.
 - (b.9) Percentage of total funds requested which were granted in

1962-63	?
1963-64	90
1964-65	80
1965-66	75
1066 67	70

2.8 Research Output

- 1) N/A
- 2) Books and journal articles arising from research activities. The Museum staff publishes in the Museum's bulletin and paper series, as well as in scientific journals. Following is a list of staff publications since 1962.

List of books or journal articles arising from research activities - 1962 - 1967, inclusive.

Botany Division

- Baldwin, W.K.W. et al. 1962. Report on Botanical Excursion to the boreal forest region in Northern Quebec and Ontario. National Museum of Canada, Special Publication. 107 pp.
- Baldwin, W.K.W. 1964. "Hudson Bay Lowlands," pp. 87-92 in A Naturalists

 Guide to Ontario. (Edited by W.W. Judd & J.M. Speirs) Univ. of

 Toronto Press.
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 pennsylvanicus from Northeastern North America with Descriptions
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- 3) Routine requests for identifications submitted by individuals, university staffs, other government departments and foreign scientists are answered by telephone, letter, or report. All these requests probably number a hundred or more per month and are too numerous to enumerate here.
- 4) It is normal policy to send scientists to conferences in their disciplines to represent the Museum, to present papers, to keep abreast of international developments in their field, to make contacts with colleagues in their field and, finally, to prepare a report on their conference attendance. Listed below are conferences attended since 1962.

Canadian Scientific Societies

Annual Meeting of the Canadian Museums Association - 1964, 1965, 1966, 1968.

Annual Meeting of the Canadian Society of Zoologists - 1963, 1964, 1966, 1967, 1968.

Annual Meeting of the Royal Society of Canada - 1962, 1965, 1967.

Northeast Fish and Wildlife Conference - 1967.

Annual Meeting of Canadian Society of Fisheries and Wildlife Biologists - 1962, 1963, 1964, 1965.

Annual Meeting of the Arctic Institute of North America - 1963, 1966.

Federal-Provincial Wildlife Conference - 1966.

Symposium on Grouse Research - 1965, 1966.

Annual Meeting of the Computer Society of Canada - 1968.

- Meeting of the Canadian Committee on Oceanography 1967.
- Annual Meeting of the Canadian Botanical Association 1964, 1965, 1966,
- Canadian Geological Association 1965, 1966, 1967, 1968.

American International Societies

- Annual Meeting of the American Ornithologists' Union 1962, 1965, 1966, 1967, 1968.
- Annual Meeting of the American Association for the Advancement of Science 1962, 1964, 1966, 1967.
- Annual Meeting of the American Society of Mammalogists 1963, 1964, 1965, 1966, 1967.
- Annual Meeting of the American Malacological Union 1963, 1964, 1966, 1967,
- Annual Meeting of the American Society of Ichthyology and Herpetology 1962, 1963, 1964, 1965, 1967.
- Annual Meeting of the American Society of Limnology and Oceanography 1963, 1964, 1966, 1967.
- Annual Meeting of the American Institute of Biological Sciences 1965, 1966, 1967, 1968,
- Annual Meeting of the American Association of Museums 1964, 1967.
- Annual Meeting of the Association of Science Museum Directors 1964, 1966, 1967.
- Annual Conference of Directors of Systematic Collections 1964, 1965, 1966, 1967, 1968.
- Annual Meeting of the American Society of Vertebrate Palaeontologists 1965, 1966, 1967.

International Congresses

Congress of the International Council of Museums - 1965, 1968.

Pacific Science Congress - 1962, 1966.

European Malacological Congress - 1962, 1965, 1968.

International Congress of Zoology - 1963.

International Congress of Limnology - 1962, 1965, 1968.

International Ornithological Congress - 1962, 1966.

International Conference on Bryozoology - 1968.

International Ethological Conference - 1967.

International Association of Biological Oceanography - 1968.

International Congress on Quaternary Research - 1965.

International Geological Congress - 1968.

Special Symposia

Conference on the Physiology and Evolution of the Crustacea - Harvard,

Special Conference on Problems in Malacology - Smithsonian Institute,

Symposium on factors affecting the distribution of Arctic plants and animals - Nat. Mus. Can., Ottawa, 1964.

Conference on the Limnology of Lake Champlain - Burlington, Vt., 1965.

Committee for the Scientific Exploration of the Atlantic Shelf (SEAS)
Washington, 1966, 1967.

Colloque, Problemes actuels de palaeontologie - Paris, 1966.

Symposium on the productivity of St. Margaret's Bay - Bedford Institute

of Oceanography, 1967.

Symposium on application of automatic data processing methods in the natural sciences - University of Mexico, 1967.

Symposium of Scientific Committee on Oceanic Research (UNESCO) on preservation of zooplankton - Washington, 1968.

Symposium on role of museums in support of systematic research in Canada University of Toronto, 1968.

International Permafrost Conference - Purdue Univ., 1963.

Symposium on Terrestrial Ecology - St. Francis Xavier University, 1966.

Symposium on Ethnobotany - Yale University, 1966.

- 5) Information is transferred extramurally by lectures and correspondence.
- 6) During the period under discussion only one curator has resigned to accept a professorship at an American university. He had undoubtedly

gained a good international reputation through his research at our institution.

- 7) An important research team is to be found among the staff of the Canadian Oceanographic Identification Centre which can be of great benefit to Canadian oceanographic surveys. Others curators have acted on extramural research teams in pollution and public health.
- 8) Valuable research tools added during the period include: X-ray instruments for study of skeletons, desk computers, automatic data input machines, chromosome cytology laboratory and a sound spectrograph.
- 9) It is difficult to appraise quantitatively the impact of the Museum's scientific output on advancement of knowledge and on Canada's economic development, since the Museum's activities are mainly in the pure science area. As far as advancement of knowledge is concerned, our publications are deposited in the libraries of approximately 500 universities, museums and research institutes. Our publication titles are often listed in authors' literature references. Some of our books are used as texts for university courses, others are standard reference texts in popular demand such as W.E. Godfrey's <u>Birds of Canada</u>, 1966. Our scientists are well known in scientific circles and several hold executive positions in scientific societies. Many are internationally recognized specialists in their fields.

Our impact on Canada's economic growth is indirect through research on an inventory of Canada's terrestrial and marine resources as well as research on the quality of the human environment in such research areas as agricultural pests, pollution and public health surveys. One fact is of economic significance. Lack of information on the identity, distribution and populations of our natural resources could lead to loss of income in the long run. Misidentifications of potential resources, pests, or research material can be costly in the first instance.

We also serve as an important interface with the community in the field of scientific education through our popular lectures, day camps, junior naturalist clubs, exhibitions and school loan exhibits. 10) The Museum tries (within its inadequate budget) to represent

Canadian federal activity in the important international museums sphere

of culture and science.

2.9 Projects to ad the dalaw extred moltachliment

1) List of Titles or other brief descriptions of projects, 1962-1967.

Botany Division

A. Completed Projects

- 1. Flora of the Canadian Arctic Archipelago. 1962-1964. A.E. Porsild
- 2. Revision of the genus Antennaria in eastern arctic and subarctic

 America. 1962-1965. A.E. Porsild.
- 3. Flora of the Southwestern Yukon Territory. 1962-1966. A.E. Porsild.
 - 4. Revision of the genus <u>Cerastium</u> in North America. 1962-1967.

 A.E. Porsild.
- 5. Flora of the Clay Belt region of northern Ontario and Quebec. 1962.
 W.K.W. Baldwin.
- 6. Taxonomic Revision of the genus <u>Plagiothecium</u> for North America, north of Mexico. 1966-1967. R.R. Ireland.
- 7. Lichens of the Ottawa region (foliose and fruticose species). 1965-

B. Continuing Projects

- Flora of the Alberta portion of the Rocky Mountains. 1962-1967.
 A.E. Porsild.
- Flora of the Continental Northwest Territories. 1962-1967.
 A.E. Porsild (in collaboration with W.J. Cody, Plant Research Institute).
- Studies on the flora of the Boreal Forest Region of Canada (Upper English River Section, Hudson Bay Lowlands Section, Mixedwood Section and Nichicun Lake in Quebec). 1962-1967. W.K.W. Baldwin.
- 4. Flora of Eastern and Central Canada. 1962-1964. H.J. Scoggan.

 This project was enlarged and continued under the revised title

 Flora of Canada. 1965-1967. H.J. Scoggan. A major work on the

- native and naturalized vascular plants of Canada, Alaska and

 Greenland, which will contain descriptive "keys" for the identification of some 5000 species of flowering plants.
- 5. Revision of the North American species of the <u>Lecanora subfusca</u> group. 1965-1967. I.M. Brodo.
- 6. Monograph of the North American species of the lichen genus
 Pertusaria. 1965-1967. I.M. Brodo.
- 7. The lichens of the Queen Charlotte Islands. 1967. I.M. Brodo.
- 8. Checklist of the Mosses of Canada (a co-operative project with other Canadian bryologists). R.R. Ireland.
- 9. Mosses of the Maritime Provinces of Canada. 1967. R.R. Ireland.
- A morphological study of moss <u>Pseudoparaphyllia</u>. 1966-1967.
 R.R. Ireland.
- 11. A systematic and phytogeographical study of the marine benthic algae of the Canadian Arctic. 1967. R.K.S. Lee.
- 12. A morphological and phylogenetic study of the melobesioid algae (Corallinaceae). 1966-1967. R.K.S. Lee.
- 13. Checklist of marine algae of Canada (a co-operative project with other Canadian phycologists). 1967. R.K.S. Lee.
- The Flora of Ontario: Distribution of the Vascular Plants. 1967.
 J.H. Soper.
- 15. Manual of the Shrubs of Ontario. 1967. J.H. Soper (in collaboration with M.L. Heimburger, University of Toronto).
- 16. Application of data processing methods to herbarium procedures (i.e. recording, storage and retrieval of botanical information, semi-automatic production of specimens labels and machine-plotting of distribution maps). 1967. J.H. Soper.

Palaeontology Division

- 1. Completion of revision of North American mosasaurs.
- 2. Description of Cretaceous vertebrates from arctic Canada.
 - Description of dinosaur faunas of southern Alberta this is the most important and largest project.
 - 4. Pleistocene mammals of the Yukon Territory.

- 5. Evolution and distribution of Pleistocene muskoxen of the genus <u>Ovibos</u>.
- 6. A bibliography and catalogue of Canadian Pleistocene vertebrates.
- 7. A biostratigraphic study of Pleistocene non-glacial deposits at Fort Qu'Appelle, Saskatchewan.
- 8. The postglacial vertebrate fauna of the Champlain Sea.

Zoology Division

Pro	ject and the second sec	Category
1.	Post-glacial Dispersal of Littoral Marine	Major: MS near
	Invertebrate of the Camadian Atlantic Region.	completion.
2.	Shallow-water Invertebrates of the Gulf of St.	Major: MS in
	Lawrence and Eastern Nova Scotia regions.	preparation.
3.	Shallow-water Crustaceans of the Gulf of Maine	Major: MS in
	region.	preparation.
4.	Amphipod Crustaceans of Sable Island, Nova	Minor: MS
	·Scotia.	completed.
5.	The Haustoriidae of New England (Crustacea:	Major: Published
	Amphipoda).	1965.
6.	Adaptive Radiation in Sand-burrowing Amphi-	Medium. MS
	pod Crustaceans.	completed.
7.	Revision of Sand-burrowing Amphipods of the	Major: Partly published (1967)
	family Dogielinotidae.	by another author.
8.	Haustoriidae of the South-eastern and Gulf	Major. In
	States.	preparation.
9.	Shallow-water Amphipod Crustaceans of the	Major. In preparation
	south-eastern and Gulf States.	since 1963.
10.	New Beach Hoppers from the Gulf States of	Minor: MS in
	the USA.	preparation.
11.	The Amphipod Genus Gammarus in the Middle	Major. In press.
	Atlantic States.	
12.	Check-list of Gammaridean Amphipod Crusta-	Medium. MS
	ceans of the Canadian Region.	completed.
13.	Animal Life in Canada Today. General Inver-	In press.
	tebrate and Arthropods.	

Science Policy

14.	Studies on Littoral Marine Invertebrates of the borganal	Major.	3 station
	Canadian Pacific region, 1955-1966.	lists pu	iblished.
15.	Amphipod Crustaceans of the Pacific Coast of	Major.	In
	Canada. Families Gammaridae, Haustoriidae, Talitridae,	preparat	ion.
	Hyalidae, Dogielinotidae.	Continui	ing.
16.	Talitridae of the Western Atlantic Region.	Major. complete	Plates
17.	Shallow-water Amphipod Crustaceans of New	Major.	Since 1963.
	England.	MS near	completion.
18.	The Land Amphipods (Talitridae) of	Major.	Since 1962.
	Australia.	MS comp	Leted.
19.	Fresh-water and Terrestrial Amphipods of the Noona	Major.	MS near
	Dan Expedition of the Bismarck Archipelago and	complet	
	Rennell I.		
20.	Talitridae of Campbell I., Sub-Antarctic Islands	Medium.	Pub-
	of New Zealand.	lished :	1964.
21.	Talitridae of South Africa (with E. Dahl, Sweden).	Medium. prepara 1962.	In tion since
22.	Terrestrial Adaptations in Crustacea -	Minor.	MS
	Amphipoda.	submitte	ed.
23.	New Records of Talitrid Amphipods from	Minor.	Published
	California.	1967.	
24.	Estuarine Amphipods from Prince William	Minor.	Published
	Sound, Alaska.	1968.	
25.	Stomach Contents of Gray Whale, Alaska.	Minor. prepara	In tion.
25.	A Fresh-water Gammarus from Western Texas.	Minor.	In press.
27.	Fresh-water Amphipods from Florida.	Medium. Publish	ed 1963.
28.	Freshwater molluscs of the Hudson Bay and	Nearly	completed.
	Canadian Arctic Watersheds.		
29.	Revision of three Families (Lacunidae, Aciculidae,		s (Lacunidae culidae)
	and Sequenziidae) for the Treatise on Invertebrate	and und	

rymoreovali to molehyer - (Sequenziidae).

Zoology.

30. Rare and Endangered North American Mollusca. Underway.

31. The ecology of Acroloxus coloradensis in eastern Nearly completed. Canada.

32. Studies on Pleistocene, Lake Iroquois, southern In final Ontario. With P.F. Karrow.

draft.

33. Fishes of the Arctic coast of Canada. A scientific In progress.

study on our northern marine fishes to be coauthored with Dr. J.G. Hunter of the Fisheries Research Board.

In progress.

34. Evolution of scales in teleostome fishes. A scientific study on the scales of bony fishes, to be co-authored with Dr. T. Uyeno of Tokyo.

35. Guide to the freshwater sportfishes of Canada. A popular guide to be published in French and English.

manuscript.

36. Key to amphibians and reptiles of Canada.

In progress.

37. Analysis of the herpetofauna of the Canadian prairies.

In progress.

38. Herpetile collections from Jamaica.

In progress.

39. A morphological, ecological, behavioral and cytogenetic study of hybridization of the toads Bufo americanus and Bufo Hemiophrys in Manitoba. In progress.

40. Identification of the salamander Ambystoma tremayi, new to New Brunswick.

In progress.

41. Information sheets on amphibians and reptiles of Saskatchewan,

In progress.

- 42. Bryozoa of North New Zealand.
- 43. Bryozoa of the South Red Sea.
- 44. Bryozoa of the Bay of Fundy Region.
- 45. Intertidal Bryozoan Fauna of coastal British Columbia.
- 46. Trans-migration of Red Sea Bryozoans into the Eastern Mediterranean.
- 47. A taxonomic revision of Dicrostonyx torquatus in North America.

- 48. The Mammals of Yukon Territory.
- 49. Insular populations of Microtus pennsylvanicus from northeastern North America.
- 50. A revision of Clethrionomys rutilus in Canada.
- 51. Serum protein electrophoresis and systematics of the Arctic Ground Squirrel.
- 52. The cytotaxonomy of Arctic mammals.
- 53. The Birds of the Dease Lake Telegraph Creek and Cassiar Mountains. (B.C.) 1962.
- 54. Ethology of Blue Grouse a study correlating behaviour patterns with habitat selection in the foothills of the Rocky Mountains. (Alberta). 1963.
- 55. The Birds of the Lytton, Lilloet and Williams Lake areas in British Columbia. 1964.
- 56. (1) Ethology of Blue and Franklin's Grouse. 1965.
 - (2) The Birds of Banff, and Waterton Lakes National Parks (Alberta), 1965.
- 57. Ethology of Blue and Franklin's Grouse (Alberta). 1966.
- 58. Courtship and Territorial Behaviour of Grouse (Alberta, British Columbia, Kansas, U.S.A., Forserum, Sweden, Banchory, Scotland). 1967.
- 59. Ethological and Zoological research at Bathurst Island, N.W.T. 1968.
- 60. Geographic variation in Zonotrichia leucophrys, Strix varia, Hylocichla guttata, Plautus alle, Anser albifrons (in co-operation with a Washington ornithologist), and in the Branta canadensis hutchinsii-parvipes complex.
- 61. The affinities of the gulls Larus thayeri, glaucoides, and argentatus.
- 62. The status of Larus schistisagus in Canada. Published.

63. The status of Himantopus mexicanus in Canada. In press.

64. Schizochroism in several bird species. Published.

- 65. Biology of the freshwater whitefish of Lake Huron. 66. Methods of freshwater larval fish study. 67. Computerization of museum collection. 68. Taxonomy dictionary of Canadian fauna. 69. Behaviour of larval golden shinners (in co-operation with D. Shepard of Ontario Department of Lands and Forests). 70. Fish larvae and eggs of Nova Scotia coastal water. 71. A revision and biological study of an amphipod family, Phronimidae. 1962-1966. 72. Systematic and ecological study of the Hyperiidea in the adjacent waters of Barbados. 1966 - . 73. A compilation of systematic list of the Hyperiidea (Crustacea: Amphipoda) since 1888. 1968 - . . . 74. The Phronimidae collected by the United States Antarctic Research Project 1968 - . 75. A revision of the giant isopod genus, Bathynomous 76. A new species of the genus Monstrilla (Copepoda; 77. The Hyperiidea of the North Pacific Ocean in the Lamont Geological Observatory collection. 1968 - . 79. Identification manual of coastal zooplankton of Nova Scotia. Ima (Calculations adapatement a date and accommon at)
- 2) The most significant completed projects of the last five years, 1963 1967, inclusive. <u>Basic Research</u>.

Botany Division

1. Flora of the Canadian Arctic. - The revision of the "Illustrated

Flora of the Canadian Arctic Archipelago" (218 pages) by A.E. Porsild

in 1964 made available once more an internationally recognized reference
on the vascular plants of one of the most important areas in Canada.

This is an example of a book based on many years of field experience and museum research which presents in concise form information needed for the identification of indigenous plants within a large geographic area. The "Flora" contains descriptions and "keys" for identification as well as illustrations and distribution maps showing the known ranges of the plants described. It is a model for this type of publication, i.e. a field guide and identification menual.

- 2. Revision of the genus Antennaria. Although the publication in 1965 of this monograph occupied only 34 pages in a botanical journal, the results were based on careful field observations and painstaking research on herbarium specimens spread over several years. The genus Antennaria is one of the most difficult groups of flowering plants in Canada's flora and has long been in need of an "in-depth" study. The revision by A.E. Porsild contains descriptions and a key, together with notes on the ecology and distribution (with maps) of the 18 species of Antennaria recognized by him as native to eastern arctic and subarctic North America, including Greenland. It also contains an evaluation of the diagnostic characters helpful in separating members of this critical genus. Before the flora of Canada is completely understood, there will have to be more monographic studies of this type in many groups of flowering plants as well as in the mosses, lichens and algae.
- 3. Contributions to the Flora of the Southwestern Yukon Territory, This publication (86 pages) by A.E. Porsild appeared as the first

 paper in a recent series issued by the National Museum of Canada under
 the title "Contributions to Botany IV". It was intended primarily
 as a report of significant additions or range extensions to the vascular
 flora of southwestern Yukon since the publication of Hultén's "Flora
 of Alaska and Yukon" (1940 1950) and Porsild's "Botany of Southeast
 Yukon" (1951). It deals with 267 taxa (kinds of plants) and contains
 discussions of the ecology and taxonomic status of some critical or

little known species of that region, together with distribution maps for over 160 species.

This is an example of a careful regional study of the type which forms the basis for phytogeographic studies of wide scope.

The citation of actual specimens preserved in the research collections of the National Herbarium makes this a valuable reference to botanists, both to those working on the flora of western North America and to those doing monographic studies on vascular plants which occur in that area.

4. Lichens of the Ottawa Region. - Two groups of lichens (foliose and fruticose species) have been covered in the first two articles published in 1967 by I.M. Brodo in a popular journal read by local naturalists and, no doubt by professional biologists as well, in the Ottawa region. These articles explain the structure of those interesting plants known as lichens and provide descriptive "keys" for the identification of the species commonly found in the Ottawa district.

These short papers represent an attempt to interpret the work of specialists to the laymen, to stimulate further the interest of naturalists in the native flora of their own local area and to provide them with a means of broadening their interests and pursuing particular lines of scientific enquiry to greater lengths.

Zoology Division

1. The Birds of Canada by W. Earl Godfrey

"The Birds of Canada" has been enthusiastically received by both amateur and professional bird students in Canada and elsewhere as evidenced by uniformly favorable reviews (in various countries), newspaper articles and editorials, hundreds of letters, and by sales. It is frequently cited or quoted in the ornithological literature of the world and was recently included in the basic list (there were two other secondary lists) of ornithological works (22 in all, four North American) by the President of the International Ornithological Congress for use

by a committee of professionals in preparing a "Check-list of holarctic birds". Particularly useful to professionals is the mass of data on the status of each of the 518 species treated, as well as ecological information, taxonomic treatments, nomenclature, certain original species distinctions, and the most accurate compilation of incubation periods available for North American birds.

Amateurs particularly like the range maps and identification aids.

Over 21,500 copies of the English edition of 29,000 copies have been sold, and ca. 2,380 copies of the French edition (of 9,000 copies). For at least two weeks it was the best seller among non-fiction books in the city of Toronto.

 Annotated List and Bibliography of the Abyssal Marine Molluscs of the World. by A.H. Clarke, Jr., 1962. Bull. Nat. Mus. Canada No. 181, 114 pp.

This is the only annotated list and bibliography on deep sea molluscs of the world which has ever been published. Oceanographic laboratories, especially in the northern hemisphere, frequently consult this monograph concerning the identification and further study of the 1,152 species and subspecies living deeper than 1,000 fathoms. The catalogue also enables basic generalizations to be proposed on the composition, zoogeography, origin and age of the deep sea molluscan fauna.

 Evolution of branchiostegals and classification of teleostome fishes. by D.E. McAllister. Bull. Nat. Mus. Can. (221) 1-239, 21 pls., 3 figs.

This study presents the only recent complete reclassification of living and fossil groups of bony fishes of the class Teleostomi. The Chondrostei, Holostei, and Teleostei are re-established and reconstituted as supra-ordinal groups. New interpretations are given in the phylogeny of the Teleostei with major realignment of ordinal and sub-ordinal groups. The monograph has been favourably reviewed recently in Nature 219 (5149): 11.

4. Polyzoa (Bryozoa) Ascophora - Cheilostoma from North New
Zealand. by N.A. Powell, 1967. Discovery Reports.

This comprehensive study treats 100 species and 2 varieties of these sessile, colonial marine invertebrates from Northern New Zealand. Complete descriptions and figures are given for all species, including 1 new genus and 30 new species. The fauna is analyzed zoogeographically and divided into several components of which the largest group (one-third) is indigenous. As a result of this study the author was elected Fellow of the Linnaean Society of London, 1968.

5. Haustoriidae of New England (Crustacea: Amphipoda). by E.L.
Bousfield, 1965. Proc. U.S. Nat. Mus. 117 (3512): 159-240.

This study embraces a heterogeneous group of sand-burrowing filter-feeding crustaceans of coastal north-eastern North America, including eastern Canada. The animals are probably the most common, ecologically most important, yet were taxonomically the least understood macro-invertebrates of American Atlantic beaches. They form an important food item of shore birds and fishes. Herein are described two new subfamilies (Pontoporeiinae and Haustoriinae), five new genera, and twelve new species, increasing the regional total to 10 genera and 20 species. This paper has formed the taxonomic basis for all other more recent ecological, behavioural, and life history studies on these animals.

APPENDIX 2

9th GENERAL ASSEMBLY OF ICOM

9th August 1968

Motion 2

Museums and Research

ICOM,

Considering the reports presented to the 8th General Conference, and the discussions which followed,

Affirms the principle that museums are by nature scientific institutions and that consequently every museum which possesses qualified personnel and suitable material and technical means should promote, encourage, undertake or develop individual or collective scientific research, the field of which will be dictated by the museums' collections and programme,

Launches an appeal to the authorities and private or public administrations and institutions responsible for museums that they accord to museums their support and the necessary financial means for the purpose of scientific research,

Adopts the following principles and recommendations:

Personnel

In conformity with points 1 to 4 of the annexe to Motion 8 passed by the 7th General Conference, it is emphasized that museum scientific personnel responsible for research must possess the necessary qualifications and be accorded appropriate recognition. The lack of scientific personnel in museums of different categories is beginning to be felt and to cause harmful effects upon research. In order to remedy this situation, museum personnel should receive a status equal to that of staff in universities and other research institutions who possess similar qualifications and responsibilities. This solution would permit museums to retain on a permanent basis highly qualified research staff who at present too often find salaries and working conditions more attractive elsewhere.

If a museum is not in a position to maintain research workers on a regular basis in order to conduct the minimum of scientific work, it is desirable that it find means to have such activity conducted at least on a temporary basis by scientists from other museums, universities or centres of research.

The Museum as Research Institution

As Motion 4 passed by the 7th General Conference affirmed, it is of prime importance that the results of findings about collections be elaborated and published in the form of scientific catalogues and reports. Catalogues should be edited and published

Motion 2 (Cont.)

according to standards appropriate to each discipline particularly with regard to the description and interpretation of objects. It would be desirable to establish international standards for such tasks.

Experiments performed in a number of countries concerning the use of computers in museums have given interesting results and deserve to be continued on account of their importance for the future international collaboration of museums and above all for the contribution computers can make to research: facility, rapidity and precision of information.

Besides study of collections, research activities should be completed by programmes directed to the exterior: field missions on archaeology, ethnology, natural sciences, etc.

The Museum and other Institutions of Research

The tradition of cooperation, which has proven so fruitful, between museums and other scientific institutions, notably universities, is to be emphasized, maintained and developed. Museums should be readily open to researchers from other institutions, either for consultation or for participation in the staff's own work. Similarly, on an exchange basis, museum workers should have access to other institutions of research. In addition, museums should take a more active and permanent part in the planification and coordination of scientific research, whether on a national, regional or international level. In this manner museums will take part in collective research activities.

A grave problem arises in this connection which needs to be resolved in the framework of relations between museums and other institutions: the attribution of results obtained, and notably of objects collected, during study missions. Since museums have the specific function of collecting, classifying and conserving objects and documents, and of making them accessible, they should lend assistance to other institutions in this connection: by helping them make available the results of their research and to conserve and exhibit objects.

Recommendations to International Organisations

It is desirable that Icom, through the intermediary of its International Specialized Bodies, undertake the establishment of catalogue norms for museums of different disciplines, as well as their application, particularly in view of the possibility of the use of computers in the future.

It is proposed that Unesco envisage the publication in its magazine "Museum" of an article on the topic of "Information and Data Retrieval in Museums: Present and Future".

Motion 2 (Cont.)

Icom should in forthcoming years strengthen its connections with International Professional Organisations and the representatives of different scientific disciplines in order to arrange an exchange of views on problems affecting the Museums and Research.

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Motion 2 (Cont.)

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