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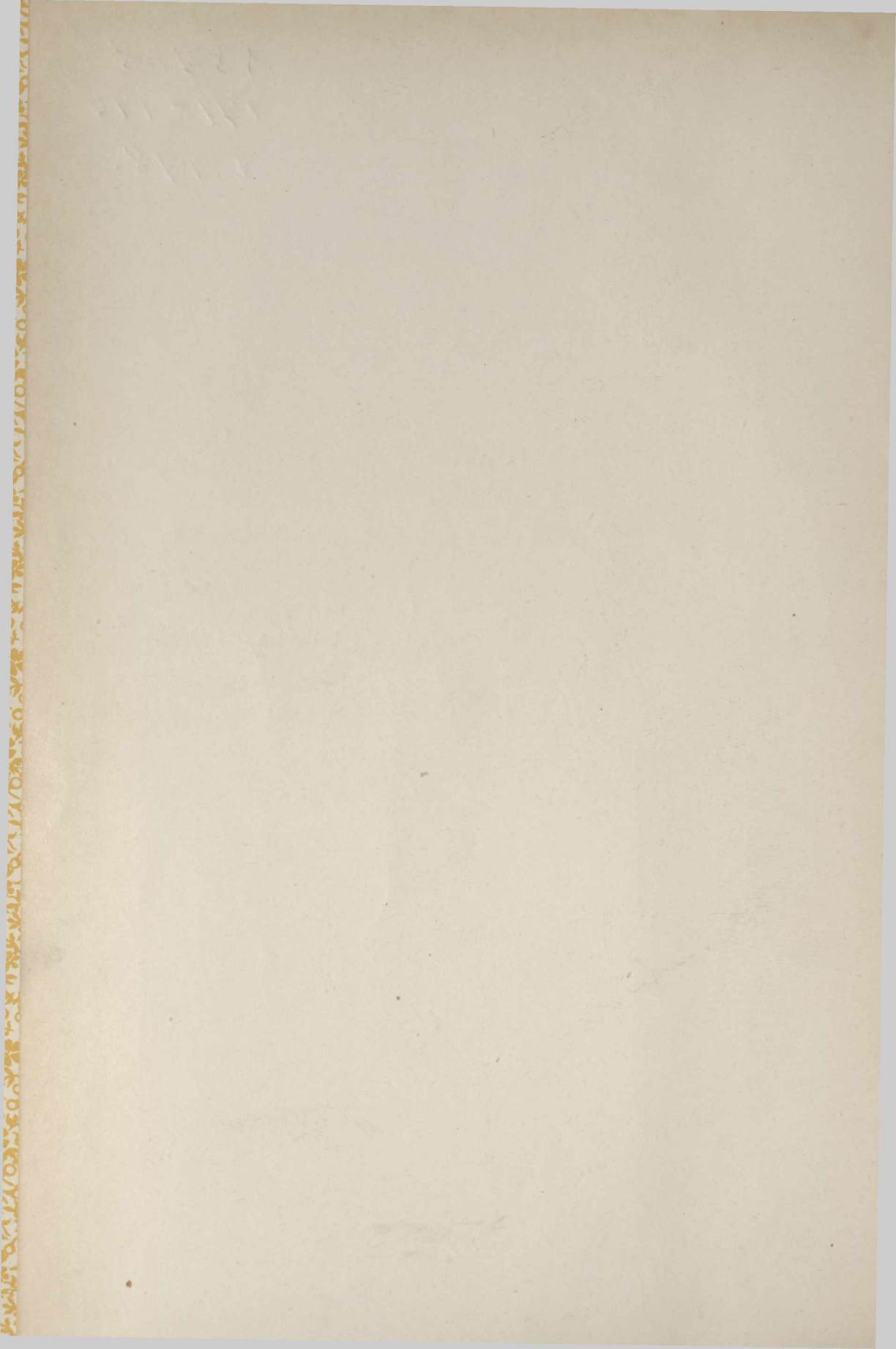


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MEMORANDUM FOR THE RECORD

OPERATIONS

NATIONAL RESEARCH COUNCIL

MINUTES OF PROCEEDINGS AND VOTING

No. 1

THURSDAY, MAY 4, 1950

MONDAY, MAY 8, 1950

MEMBER

Dr. C. I. Weir, Chairman, C.M.G. Program, National Research Council

SESSION 1950

HOUSE OF COMMONS

SPECIAL COMMITTEE

on the

OPERATIONS

of the

NATIONAL RESEARCH COUNCIL

MINUTES OF PROCEEDINGS AND EVIDENCE

No. 1

THURSDAY, MAY 4, 1950

MONDAY, MAY 8, 1950

WITNESS:

Dr. C. J. Mackenzie, C.M.G., President, National Research Council.

OTTAWA
EDMOND CLOUTIER, C.M.G., B.A., L.Ph.,
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
CONTROLLER OF STATIONERY
1950

SPECIAL COMMITTEE
on the
OPERATIONS
of the
NATIONAL RESEARCH COUNCIL

Chairman: George J. McIlraith, Esq.,

Messrs.

Breithaupt	Gibson	McCusker
Brooks	Green	Murphy
Bourget	Kirk (<i>Digby-Yarmouth</i>)	Pinard
Coldwell	Low	Stuart (<i>Charlotte</i>)
		Winkler

A. L. BURGESS,
Clerk

ORDER OF REFERENCE

TUESDAY, April 18, 1950

Resolved,—That a special committee be appointed to examine into the operations of the National Research Council: that the said committee be empowered to sit during the sittings of the House and to print such papers and evidence from day to day as may be ordered by the committee; and to report from time to time; that the said committee consist of Messrs. Breithaupt, Brooks, Bourget, Coldwell, Gibson, Green, Kirk (*Digby-Yarmouth*), Low, *Yarmouth*), Low, McCusker, McIlraith, Pinard, Stuart (*Charlotte*), Winkler.

Attest.

LEON J. RAYMOND,
Clerk of the House.

MINUTES OF PROCEEDINGS

THURSDAY, May 4, 1950.

The Special Committee on the Operations of the National Research Council met at 10 o'clock a.m.

Members present: Messrs. Brooks, Coldwell, Gibson, Green, Kirk (*Digby-Yarmouth*), Low, McCusker, McIlraith, Pinard, Stuart (*Charlotte*), Winkler.

On motion of Mr. Winkler:

Resolved,—That Mr. McIlraith be Chairman of the Committee.

Mr. McIlraith took the Chair and thanked the Committee for the honour bestowed on him.

The Clerk read the Order of Reference.

On motion of Mr. Gibson:

Ordered,—That the Committee print from day to day 500 copies in English and 200 copies in French of its minutes of proceedings and evidence.

Discussion followed as to the procedure to be followed by the Committee. It was agreed that Dr. C. J. Mackenzie, President of the National Research Council, be called as the first witness, to be followed by Messrs. E. R. Birchard, Vice-President, and F. T. Rosser, Director of Administration.

At 10.30 o'clock a.m. the Committee adjourned until Monday, May 8, at 11 o'clock a.m.

MONDAY, May 8, 1950.

The Special Committee on the Operations of the National Research Council met at 11 o'clock a.m., the Chairman, Mr. George J. McIlraith, presiding.

Members present: Messrs. Brooks, Coldwell, Gibson, Green, Kirk (*Digby-Yarmouth*), Low, McIlraith, Murphy, Pinard, Stuart (*Charlotte*), Winkler.

In attendance: Dr. C. J. Mackenzie, C.M.G., President, National Research Council.

The Chairman tabled the thirty-second Annual Report of the National Research Council of Canada, 1948-49; also a copy of *The National Research Council Review 1949*.

Dr. Mackenzie was called, tabled a statement of estimates of the National Research Council by character of expenditure for the fiscal year 1951, and was questioned thereon.

At 12.25 o'clock p.m. the Committee adjourned until Thursday, May 10, at 11 o'clock a.m.

A. L. BURGESS,

Clerk of the Committee.

MINUTES OF EVIDENCE

HOUSE OF COMMONS,
Monday, May 8, 1950.

The Special Committee appointed to examine into the operations of the National Research Council met this day at 11 a.m. The Chairman, Mr. G. J. McIlraith, presided.

The CHAIRMAN: Gentlemen, we now have a quorum. Before I call upon Dr. Mackenzie, the President of the National Research Council, I would like, with your permission, to table in the committee and to present to each member of the committee a copy of the 32nd Annual Report of the National Research Council of Canada for the year 1948-49. The members have all seen the report, but you will recall that it contains, in addition to the Annual Report, a copy of the Research Council Act. I thought it would be very convenient for you to have it before you.

I would like also to table another publication entitled The National Research Council Review 1949. That document was not tabled in the House of Commons because it is not a type of document which is tabled there. But I think it does give rather a good coverage of the work being done by the Council, and I think it might be particularly helpful to the members. If I have your permission, I shall also table and distribute this document.

Perhaps it would be well if we had right from the very start of our work in this committee the names of the ministers who form the body called the Committee of the Privy Council Committee on Scientific and Industrial Research. Those ministers are: The Minister of Trade and Commerce who is the chairman, and the ministers of Agriculture, Fisheries, Mines and Technical Surveys, National Defence, National Health and Welfare, and Resources and Development.

Mr. GREEN: The number has been increased since last year, has it not, Mr. Chairman?

The CHAIRMAN: I think there is just the change with respect to the Minister of National Resources and Development, and adding the Minister of Mines and Technical Surveys. There are now two ministers where formerly there was but one.

Mr. GIBSON: And the Minister of Fisheries has been added as well?

The CHAIRMAN: The Minister of Fisheries has been added. You will note that is different from the indication in the Annual Report.

In addition, I would draw the attention of the committee to the fact that the Act provides under section 4 subsection 1 for an honorary advisory council for scientific and industrial research and that the council shall consist of the president, the two vice-presidents, and not more than 17 other members, to be appointed by the Governor in Council.

There are in fact 15 other members at the moment and I shall, with your permission, give their names.

NATIONAL RESEARCH COUNCIL

President: C. J. Mackenzie, C.M.G., M.C., D.Eng., D.Sc., LL.D., F.R.S., F.R.S.C., Ottawa, Ontario.

General Secretary: S. P. Eagleson, M.B.E., Ottawa, Ontario.

Members:

C. W. Argue, C.B.E., B.A., B.S.A., M.Sc., D.Sc., Dean of Science and Professor of Biology, University of New Brunswick, Fredericton, N.B.

- H. P. Armes, B.Sc., Ph.D., LL.D., 126 Kingsway Avenue, Winnipeg, Man.
 Percy Bengough, C.B.E., President, Trades and Labour Congress of Canada,
 172 Maclaren Street, Ottawa, Ont.
- Albert Bertrand, B.A., M.D., Chief of the Bacteriology Laboratory, Notre
 Dame Hospital, Montreal, and Professor of Bacteriology, Faculty of
 Medicine, University of Montreal, Montreal, P.Q.
- C. H. Best, M.A., M.D., D.Sc., (Lond.), F.R.S., F.R.C.P. (C), F.R.C.S.,
 Head of the Department of Physiology and the Banting and Best
 Department of Medical Research, University of Toronto, Toronto,
 Ontario.
- E. R. Birchard, O.B.E., B.A.Sc., Vice-President (Administration), National
 Research Council, Ottawa, Ontario.
- Ignace Brouillet, B.A., B.Ap.Sc., C.E., D.Sc., Dean of Ecole Polytechnique,
 Montreal, Quebec.
- Paul E. Gagnon, B.A., B.Ap.Sc., D.I.C., Ph.D., D.Sc., F.R.S.C., Director
 of the Department of Chemistry and Chemical Engineering and Director
 of the Graduate School, Laval University, Quebec, P.Q.
- A. R. Gordon, O.B.E., M.A., Ph.D., F.R.S.C., Professor of Chemistry and
 Head of the Department of Chemistry, University of Toronto, Toronto,
 Ontario.
- J. H. L. Johnstone, M.B.E., O.B.E., M.Sc., Ph.D., Head of the Department
 of Physics and Dean of the Faculty of Graduate Studies, Dalhousie
 University, Halifax, N.S.
- D. A. Keys, M.A., Ph.D., F.R.S.C., Vice-President, National Research
 Council, Atomic Energy Project, Chalk River, Ontario.
- O. Maass, M.Sc., Ph.D., F.R.S., Macdonald Professor of Physical Chemistry
 and Chairman of the Department of Chemistry, McGill University,
 Montreal, P.Q.
- Wilder G. Penfield, C.M.G., M.D., D.Sc., F.R.C.S. (C), F.R.C.S. (E),
 F.R.S., F.R.S.C., Professor of Neurology and Neurosurgery, Faculty of
 Medicine, McGill University, Montreal, P.Q.
- G. M. Shrum, O.B.E., M.M., M.A., Ph.D., F.R.S.C., Professor and Head of
 the Department of Physics, University of British Columbia, Vancouver,
 B.C.
- W. P. Thompson, M.A., D.Sc., Ph.D., F.R.S.C., President, University of
 Saskatchewan, Saskatoon, Sask.
- F. C. Wallace, D.S.O., M.C., Executive Vice-President of Duplate, Canada,
 Ltd., Oshawa, of Smith and Stone, Limited, Georgetown, Ontario, and
 of Fibreglas Canada, Limited, Oshawa, Ontario.
- R. C. Wallace, C.M.G., M.A., Ph.D., LL.D., D.C.L., F.G.S., F.R.S.C.,
 Principal, Queen's University, Kingston, Ont.

Now, with these preliminary remarks I think that puts before us all I had
 in mind to bring forward this morning. So before I call upon Dr. Mackenzie,
 are there any questions from any honourable members?

MR. GREEN: What about the executive committee?

DR. MACKENZIE: The executive has never been set up, Mr. Green.

MR. GREEN: But the Act provides for an executive committee of the Council
 consisting of the president, the vice-president (administration), the vice-president
 (scientific) and at least three other members selected by the Council.

THE CHAIRMAN: The three other members have never been appointed.
 Are there any other questions?

Now, gentlemen, it is a rather pleasant task for me to call upon the President of the National Research Council, Dr. Mackenzie. I have asked Dr. Mackenzie if he would in the early stage of his remarks deal with the origin and development of the Research Council, that is, the historical development of it, and then from that point go on as the committee wishes with his evidence. I might add that Dr. Mackenzie will not be available for any further sittings this week. But Mr. Birchard, the Vice-President in charge of administration, will be here as well as other officers of the Council as required.

I now call upon Dr. Mackenzie.

C. J. Mackenzie, C.M.G., M.C., M.C.E., D. Eng., D.Sc., LL.D., F.R.S.C., M.E.I.C., called:

The WITNESS: Mr. Chairman, I would like at the outset to file a statement of the estimates of the National Research Council by character of expenditure. I do not want to talk about expenditures this morning, but this statement does give the set-up of the various divisions so that the members may see that the types of activity, the ramifications and the organization of the Research Council are, or at least may appear to be rather complex.

It is quite different from the Atomic Energy Project which this same committee investigated last year. The Atomic Energy Project is a converging operation and everything is designed to the one end. On the other hand the Research Council is a diverging operation. It is like a university with different departments, with the ultimate objectives being reached in a divergent way.

I would ask you this morning just to consider the divisions which I have put upon this sheet. The first section relates to the Research Laboratories, and you will see that in the first stage there are six, and then four, making ten. There are ten research divisions in existence and most of them are in Ottawa. There is one in Halifax which is being built, and there is one in Saskatchewan.

By Mr. Coldwell:

Q. Does "cost per position" include the cost of maintenance of the equipment as well as salaries?—A. Yes. I would like, if I could, to leave the figures to be dealt with later.

Q. I just wanted to get that clear in my mind.—A. We consider that this is a very effective way to rate the laboratories. You can follow them along by cost per capita, and you can criticize our costs on that basis. We know what it should be. I put those facts on this sheet because we want to use it for two purposes. I would like first to get the organization before the committee.

The next general heading covers "Extra-Mural Research", that is, activity which is quite apart from the operation of the laboratories of the Council. For instance, we are responsible for a certain amount of medical research. But the Council itself has no medical laboratories, so we make grants to qualified medical research workers in existing universities.

Under "N.R.C. General" there is quite a sizeable item which has to do with our activities of an extra-mural nature in connection with post graduate scholarships, grants in aid of approved research projects, conferences and general scientific activities with which the Council is charged. It is a sizeable amount of money.

We think our extra-mural research activity is very important. Our Research Council carries on activities very much like those of the Rockefeller and Carnegie foundations. All of this work is directed by an Honorary Council.

Standing Committees of the Council which are made up of a very senior body of university and industrial people across Canada, consider the details and recommend action to be taken by Advisory Council.

The third item is "Services", such as information services, administration and personnel, plant engineering, and workshops.

We hope that this committee will want to go into the details of these three groups. We hope this committee will visit some of our laboratories, and we think they would enjoy it very much. We would be very glad to go into details of the accounting and the factual details in connection with extra-mural research. The administration is particularly anxious to have you scrutinize it, because we think it is very good.

Perhaps I might give a little of our background to show you how we got into this position. The Research Council idea originated in 1914 when the first great war broke out, and when the old country realized that Germany had a very great scientific advantage in that she was thoroughly organized scientifically. The war of course made it very apparent immediately. So Britain in 1915, realizing that she was under a disability in that regard, set up what later was called in Britain, a Department of Scientific and Industrial Research, in order to remove these shortcomings. I shall not say more about Britain. But over the years that organization has increased. In fact, it was that organization which gave radar and all the scientific defence equipment which saved England in 1940.

At the same time England suggested to the Dominions that they should do likewise.

(At this point discussion took place off the record.)

The cabinet set up a National Research Council. I do not think they were very clear what they were to do because our situation in Canada was far different from that in the United States or the United Kingdom. The general terms were, as I recall them, that the Council was to foster, stimulate and coordinate scientific and industrial research in Canada.

But at that time in Canada, as some of you will remember, we were not very highly industrialized. We were concerned almost entirely with primary industry. The number of scientific institutions was very limited or small. Even the scientific work in the universities was limited in extent although its quality was good. There were practically no industrial research laboratories, and we were really in an agricultural economy, or at least in a primary industry economy. We had agricultural research, geological services, and a certain amount of forestry research as well as fisheries, but we had practically no industrial research as we use the word in industry. So the Council of that day realized that it had nothing in the way of a foundation and that it would have to build from scratch.

They were very wise men and they realized that you must build up your corps of qualified research workers. So the first thing they did was to institute a system of scholarships in order to encourage students to go on and to take graduate work in science; and they made restrictions at that time which have proved very wise, in that the scholarships could only be held in Canadian universities. That was not a nationalistic idea at all. But before you can develop a plan you must have the staff at the universities. So those two things went hand in hand, the provision of grants in aid of research and the awarding of post graduate scholarships, and this policy greatly aided the building up of graduate schools and at the same time the training of scientists. That was the main activity of the Research Council for the first ten years of its existence, from 1919 to 1929; but in saying that I am not trying to depreciate it at all; it was a very big thing, but it was their chief activity; and over the years they built up a very large corps, in proportion to the population of Canada, of very well trained scientists. In the next ten year period, up to 1939, the emphasis was put on building up scientific staffs in colleges and universities until today

we have very good scientific schools. Over the years the Research Council has built up its scholarship program and we have given about 2,000 scholarships some 65 per cent of the grantees, if I am correct, securing a Ph.D., and a very high percent of them have remained in Canada. It is hardly possible to look down the list of scientific organizations today without finding that many of the personnel held scholarships under the National Research Council. If you go through our list of advisory committees, you would not expect many of them because of the age grouping, to have had scholarships, but they have; and we feel that there has been an extraordinarily high return on the amount of money involved.

While we were building up scholarships we were also building up grants in aid of research, to university professors. No grantee may derive any personal emolument from such a grant. He must agree to direct the project without compensation. However, we would grant an individual professor an amount to pay for assistance such as a graduate student, taking a small salary for the work he did with the professor perhaps during the summer; and for equipment which the professor could not get from his university budget. The Council approached that in a very objective way and their general philosophy was to support any good man who desired to undertake research work and could not get the required support in any other way. The result of that has been, and I think it is an extraordinary thing, gentlemen, that in twenty to thirty years the university picture in Canada has changed very much and today we have first rate scientific departments, scientific research centres, in all the universities from one coast to the other; and it is no longer necessary for any young man in any region of Canada to leave his region for the specific purpose of doing research or being educated; and I think that while the Council cannot claim complete credit for that it did play an important part in it.

We have another activity in connection with major research projects. The Council built up a mechanism which they called an associate committee. The associate research committee is different from departmental organizations due to the nature of our body. The National Research Council is not a department, it is a corporation. I want to stress that. However, we try to fit in to the normal public service pattern. We do not use our special powers except when it is necessary for the benefit of the country. But we are a corporation. We can arrange for co-operative research whenever a big thing confronts us. When we have a problem of sufficient importance we call in the best informed persons in the field concerned, from government departments and other organizations, for a conference. We survey the field and then arrange for a program of work. One of the things the Council did in that way was grain work in western Canada. rust work, soil diseases and crop diseases; all matters which were of special importance from the standpoint of national economy in Canada. We do the same thing in a number of other fields. At one time we had about forty of these committees. The responsibility of the Council is in the selection and appointment of the committee, and then to back that committee up. The Council gives the committee real authority in the spending of the monies allotted and the carrying out of the projects. You see, without authority you do not get efficiency. If you appoint a competent committee and do not take its advice you won't get the real results you want; so our associate committees have become a very real and effective means for organizing and directing research on major projects. Their general responsibility is to investigate the projects assigned to them.

Our assistance to the university professors has had the result of the creation and development of research centres at universities. In that program we made the grants in aid to those individuals who were best able to deal with a particular subject or project. Generally, the idea is to refer a particular problem to them and when it reaches the point that results of a broader nature are

required we appoint an associate research committee to deal with it. These things are all done by the committees or university professors to whom they are referred; no one in the ordinary Council had any responsibility for carrying on what we call extra-mural activities. We feel that they are very significant, and in our budget for this year you will see that our Council has about \$1,400,000 devoted to this type of extra-mural activity which in essence is the foundation of our activities. The personnel of our laboratory divisions or our administrative officers have nothing to do with the direction of these extra-mural research projects, yet we all feel that it would be the last vote we would like to see cut down, because they are the essence of strong science, at the root of the university work in the training of young men.

We have over the years raised the status of Canadian science to a point where we feel it is second to none on a general basis, and in some particular fields we certainly feel that we are not second to any country in existence. Nationally, we feel that we are in the front line and I think that is a very important thing; and that has all happened within a matter of thirty years.

I just give you that brief review in an effort to present a picture of what we mean when we talk about these extra-mural research activities. I feel confident of support in my assertion that in my estimation this is the best money we spend in our scientific activities.

About 1928, at the instance of the Research Council, the government agreed that there should be both a National Research Council and national research laboratories, because there was very little if anything in the way of co-ordinating function, and it was felt that if we were to develop scientific research properly and adequately there should be some co-ordination between industrial research and the research being carried on in the universities. In the development of that aspect of the work our first concern was to build laboratories, and the first laboratory built was the one on Sussex Street with which you are all familiar, and it is a very fine building. It was opened in 1932 at the depth of the depression. That was a very unfortunate time for a laboratory to be opened in one way. However, there is a very bright spot there. I was not connected with the Council at that time, but it was a very difficult time. I do not think until about 1939 there were ever more than three hundred people in that building where there are a thousand now. It was very difficult to build up rapidly. But what did happen—and this to my mind is a most fortuitous thing—was we were able to get an extraordinarily fine staff, a skeleton staff that was a very highly qualified young staff. When war broke out we became the military research organization.

This now comes within my own history. When I came to Ottawa in the fall of 1939 I found a Research Council staffed by three hundred young employees with a budget of \$800,000. They were magnificent people, an excellent skeleton staff of young people just absolutely made for that sort of responsibility; a very fine group of confident scientific workers, young, vigorous and well trained. So when the war broke out we had this nucleus of three hundred young scientists and technical staff and very good facilities. We turned from peace to war, and from 1939 to 1945 the Research Council—and this is my history with the research council—became a military establishment. We were appointed to be the research organization of the three armed services; and, of course, we took charge of the development of the atomic energy work and all the radar work that was done in Canada and all the innumerable war research activities. The staff of the Council grew from three hundred to two thousand in a matter of months and our budget went up from \$800,000 to \$10,000,000. One of the most interesting things to me in this whole situation was that we were able to build up our young trained staff without going outside, with one or two exceptions, to get supervisory staff to carry on our war research activities; by that I mean, we had all our senior personnel, we just moved them up as it were from lieutenants to lieutenant

generals. You will all agree with me, I know, that that was a very important work for us to do. We had all the laboratory facilities throughout Canada at our disposal. We established offices in London and Washington and had people travelling all over the world and we were in contact with nearly everything of a military nature. That was the next period and I do not want unduly to stress it.

The end of the war came along and decisions had to be taken as to the future plans of the Council. The government, I think very wisely, decided that it was very clear that the scale of effort carried on during the war should not be decreased in peacetime; that the challenges for industrial expansion were as great as had been the challenges of war, and considerations of industrial problems were just as vital to the country as had been those of war. That was the first decision taken. It had nothing to do with the details. We just said we feel the scale of operation should be about the same. The next decision taken was that we should divorce the Research Council from the military end, which I think was very wise because we could not carry the responsibilities for staffing these two fields; general planning for war and general planning for peace are quite the opposite. So we recommended the setting up of a Defence Research Board which would carry the responsibility for the defence research activities. Therefore, it was set up and is operating very well. As president of the council I sit on that board and am fairly conversant with what is going on; and our general relation today with defence is this: We are not responsible for defence research in the way that we had been throughout the war, but we do keep up to date with their developments and we co-operate with them when they have any specific research problem which we are particularly well equipped to do. We did carry on atomic research, but you know our policy in connection with atomic energy is not focused on defence weapons. We do a certain amount of defence research upon request because we have a personnel of well trained scientists in certain fields in which the Department of Defence has not; and they are very wise to use certain of these facilities. We try not to duplicate facilities or services, but we do keep in close touch with the Defence Research Board, and where they have a particular scientific problem we will undertake to work it out for them.

The organization that has come out of the work of scientific research to the end of the war is pretty well shown on this chart which you have before you and I might perhaps just say a word or two about that.

First, let us take these research divisions. We feel that these divisions, as I have said, are dealing with different fields of research and the whole operation is diversified; for instance, the people engaged on biology are working on something quite different from the mechanical engineering division. The ultimate use of the work on biology is in one direction, but the mechanical engineering work is in another. They do not come together in any final position.

We have applied biology which deals with the utilization of agricultural wastes. Generally speaking, we work very closely with the Department of Agriculture. There is quite a close connection between our division and the scientific work in agriculture and fisheries.

The reason our division of applied biology was set up was this: In agriculture, the scientific work of growing a crop until harvest is one type of science but, if you take production utilization—the making of alcohol out of it or glycol, or any other chemical,—then you are getting into technical work which is not agricultural science but rather industrial chemistry and therefore a secondary industry. We start with an agricultural raw material but later it becomes a raw material for secondary industry.

Dehydration of food is one thing on which we did a great deal of work during the war. On all these matters the lines are not rigidly defined. One man in one department may feel that his bent or genius is such that he must go across the line. That happens in our division and in agriculture.

Now, applied biology in our prairie regional laboratory is merely an extension of the division of applied biology here. The origin of that was bound up in surplus crops. These things do change as time goes on but, when there was a surplus of wheat a number of years ago, there was a great demand for rather vigorous efforts to solve the utilization of agricultural products of the land. I think that laboratory is pretty well established now and is going very well. It is serving a regional need.

Mr. GREEN: That is the P.R.L.?

The WITNESS: Yes, the Prairie Regional Laboratory. Those first two matters constitute our work in the general applied biology field.

The next division is chemistry, fundamental. We have work going on of fundamental character in chemistry and in physics. Most of our other divisions are engaged on engineering, or applied research. Fundamental chemistry is basic to a great many other activities and is a division which I hope you will visit. We are very proud of it; it is a very high grade operation. We have people there from thirty universities taking instructional work under post doctorate scholarships—people from thirteen other countries of the world. Our post graduate scholarships tenable in our laboratories are sought by young scientists from the best universities in the world.

Mechanical engineering, the fourth division, is mainly aeronautical. I hope you will visit that laboratory because it would be a very interesting visit. We do all the aeronautical research that is done in the government services. We have large wind tunnels; we have structure laboratories, we are testing wings of the A. V. Roe jet fighter and the Avro jet liner. It is a very intricate program. It is a very complicated thing to test the wing of a large aircraft. The instrumentation is very complex. We do a great deal of work on de-icing which, in Canada, is an important thing. We are probably more involved than any of the other country with which we co-operate. The de-icing of jets is an important thing. There was actually no protection against icing on a jet engine. Icing on an aircraft affects it in three places—the engine, the propeller, and then the wings themselves. The engine is the first thing. If the engine goes it is a pretty serious matter. We have done a great deal of work on jets.

We have also done a great deal of work on oils and gasolines. During the war we did a lot of work on standardizing those products to obtain a reduction in the number of demands as between the three services. We did a great deal of work on what we call cold weather work. I do not mean just low temperature work but we have one of the finest cold temperature laboratories in existence. We can take tanks into a room, take the temperature down to 60 or 70 below, fire guns and operate the mechanisms. It is not difficult to get a laboratory down to 60 degrees or 70 degrees below zero but ordinarily you cannot operate anything in there. The low temperature rooms in universities are for holding the temperature down to a certain level but they cannot do anything mechanical in there at that time. However, we have had people living in this large room testing suits, cooking, and eating. We have facilities there which I suppose the armed services occupy 80 per cent of the time—in these chambers—but we have the responsibility for the scientific nature of the tests.

We also do work in connection with supersonic research; there is a very important borderline as you know. We are just going through that frontier into new territory. We have been through the sonic field—we know a great

deal about the sonic field as far as aero dynamics are concerned, but we know very little about anything beyond the barrier. So, as from sometime in the recent past, we are really exploring this supersonic range which is a range or field that will be used, quite prominently, I am sure, within a few years. At any rate, guided missiles are always in that field and we are carrying on research in that very new field.

We do a lot of work in hydro dynamics—in connection with model tests. We have models built for all sorts of things. We have a model of the Fraser river delta, Mr. Green. That is located at Vancouver at the present time. We did some work in Ottawa, too, in connection with the Westminster bridge piers. The channels shift—they are scoring it; and the only way you can attack that kind of problem is by model study. We have done a great deal of model study and you will see some of it at the Montreal road laboratories.

Mr. GREEN: Have you got anything on the Red river?

The WITNESS: I am afraid that is not model work—you need somebody to stop the rain.

We have done a lot of work in connection with power development on rivers—logs getting into the power intakes. You cannot study these things analytically—the factors are too big, but it is amazing what you can do by model studies.

Fishing is another matter which presents problems—I mean fish ladders and fish getting upstream.

Another thing which interests me is the scientific study of log jams. If you could solve that problem there would be no romance left to river driving. However, it is amazing what can be done with small models and these techniques.

There is also a study and testing of boat hulls. We have a long tunnel in which you tow a vessel and make recordings. That will give you some idea of what is going on in our aeronautical and mechanical engineering division.

The next is physics, the fundamental science which is basic to mechanical engineering and electrical engineering. We have some very fine fundamental work on in physics. Our director of physics left a full professorship at the University of Chicago to come to Canada. That is a very great tribute to our organization. He is one of the world's best scientists. We have heard a great deal of the flow of knowledge from north to south but you do not hear so much of the flow from south to north. We have a very fine exhibit of that south to north flow.

We do a lot of fundamental work on practical standardization as in the physics division of the bureau of standards. We are, for instance, custodians of the standard weights and measures in Canada. We have to check our standard metre in Paris against the International standard metre, and, to keep up the standards, we are at present sending all over Canada secondary standards for comparison. Then, we have all the electrical standardization; we have the work on light, heat, industrial radiology, and similar things which come under this section. We do electron microscopic work, and x-ray defraction, which are ordinary things in the physics division.

The next division is the radio and electrical engineering division. This is a very active division and many activities were pursued during the war. This division was the radar expert group in Canada. Some of you may not have realized it but the Research Council installed radar equipment in Halifax in 1940 before many people knew there was radar. The British disclosed radar information to a selected group of scientists in Canada in 1939 before the war. It was one of our really top secrets. We did a great deal of radar work and it has been a great success. We would hope that some of the members of the committee could take a trip up the river for half an hour in our boat. We run a navy, Mr. Stuart—we bought this boat from the navy and we carry on work every

summer. We go down to Lake Ontario and through the rivers to the Great Lakes. We have all this radar equipment in there and you can sit in the bottom of the boat, sailing up the river, and you can read from the radar screen and see birds flying and men in small boats. If you have not seen radar we would be very glad to give you a demonstration. We would arrange a demonstration for any group. We think we have made one of the greatest radar sets in the world and it is an extraordinary thing to see. We demonstrate it to ship captains; and this boat has been able to take vessels through the narrow harbour entrance into Toronto—through that narrow gap—in dense fogs. That is just one of the many things we do. The radar and electrical engineering division is a very interesting division.

Mr. GREEN: Do you run the radar sets in the first Narrows approach?

The WITNESS: Yes, that is harbour control. We put harbour control in Halifax in 1940. Our people installed them and they are operated in connection with the Department of Transport. That is an excellent example of how boats can be guided into the harbour.

As Mr. Green knows very well, there is a very sharp turn as you come in through the Narrows and a very high current. If you have to get boats in during a fog they might get through the Narrows but they might run into each other. This is a complete radar control which sweeps the inner harbour and the outer harbour. Also in Halifax we have had installations that you should see. Our radar section does a lot of travelling and we are serving as experts to the army, navy, the air force, and the Department of Transport. Our people do a very great deal of travelling. For instance, we have some people in Halifax all the time and also in Vancouver. We have a large number of other activities in that division which is essentially an applied division.

If you will look at this table you will note I have single spaced the first six items and then left a double space. I wanted to bring out this point that we feel those six divisions are pretty nearly as large as they should be. They will have to be rounded off. We think they have reached effective size for divisions, so in making our budget we say we do not expect those six to grow at all. They will round out, they will become more efficient, and there will be little change in their operations.

Now, the next four are divisions which are in process of being built up. Building research has not even a building yet. That is a division which the government has thought it wise to set up. We are using that division in a rather unnatural way at the present time. Most of these divisions start by building up a laboratory, but in Building Research we have had to accept the difficult housing situation and to limit the building up to this division to the *ad hoc* sections of work we could do in the immediate future on housing, particularly on low cost housing. We do not carry any responsibility for housing, but our staff aids and assists the Central Mortgage and Housing Corporation and other industries. This Division will need to be increased.

Chemical engineering is another division which is being built up. We feel we never had the fullest chemical engineering facilities. We built up a fundamental chemistry division. We do quite a lot of applied chemistry but we feel the way industry is developing in Canada today we need a rather strong applied chemistry division.

Communications is a secret division we operate for the Department of National Defence, due to our skills in electronics and electrical work. It is secret and we cannot talk about it.

The Maritime Regional Laboratory was the last laboratory to be established. It was established to assist the maritime region in very much the same way as the prairie regional laboratory assists the prairie region.

By Mr. Brooks:

Q. Is there anything being done on that now?—A. The building is not finished, Mr. Brooks.

Q. Do you not think you need some money to finish it?—A. These estimates that I show here are all for operating, and the reason I put them in was just to show the committee the order of magnitude of expenditures which are involved in those various units and the number of people that are employed, and the increase this year. With Halifax laboratory there is no operating budget because we do not expect it to be—

Q. —completed this year?—A. The steel work of the building is up and I think we will be able to do something this fall. The operating budget will have to come as a supplementary or out of our contingencies. We probably could carry the small amount we need from contingencies, but I just put the item in there to round out the picture for you.

By Mr. Gibson:

Q. Where is that building to be constructed?—A. In Halifax.

Now, that is the picture regarding Research Laboratories which does, of course, represent a large percentage of our activities. Our whole administration and our internal staff is concerned very much with this activity. We go into much detail in the National Research Council Review that has been handed out. You will find there the names of all the staff in those particular divisions, the projects they are working on, the publications they have made. We feel that the best way for members of the committee to get the complete picture would be to visit the laboratories and we would like you, if you could spare the time, to visit the Sussex Street laboratory at least twice and the one on Montreal Road at least once. We can make any arrangement the committee desires. We have cafeterias in both those places. We do not feel it is possible to satisfactorily understand these activities until you have seen those laboratories.

Now, the Extra-Mural Research—

By Mr. Coldwell:

Q. Where is the prairie regional laboratory situated?—A. At Saskatoon.

Q. All at Saskatoon?—A. Yes.

Q. I thought they were scattered, one in Winnipeg, for example?—A. No. A few years ago we appointed a general committee to study these regional laboratories and the decision was made that a regional laboratory should be on a university campus. If you isolate a small group of scientists you do not get the greatest advantage out of them. They need a fraternity, they need to be somewhere where there is a large scientific group, so they can have scientific intercourse with them. We were not at all concerned where that laboratory should go as long as it went on a university campus. The western people decided that Saskatchewan was the centre and it should be located in Saskatchewan and that decision led to it being located in Saskatoon. It is the same way with the maritimes.

Are there any other questions, Mr. Chairman, on the laboratories before I leave that subject?

By Mr. Murphy:

Q. Doctor, in one of those sections, for instance, would industry come in, say, in the cold processing of synthetic rubber?—A. Yes. That is done in two ways, Mr. Murphy. That is an excellent example of the working of our associate committee. All during the Polymer development days in the war we had an associate committee on synthetic rubber in which we had all the scientists and experts with Polymer, and we had cooperation with the rubber corporation in

the United States. Polymer built up a laboratory. That is an excellent example of how we cooperate with industry. In the associate committee field we do not bear any policy responsibility, we merely get the experts together and we make the arrangements for carrying out the research. In that field some work is being done at McGill; London is doing a great deal, and we are doing some in our laboratory. Toronto is doing some and Polymer itself has large ad hoc laboratories. They like to do the work in the laboratory which is nearest to the industrial process.

Q. Are there any revenues from industry?—A. Oh yes, we have a considerable outside revenue although our objective is not to make revenue. We are making revenues out of patents which we can discuss under patents. We have all the facts on the business end which we can give you in detail, but I have not the facts before me this morning. We had a revenue in one year of \$400,000. That would, of course, be spread over government departments and industry and patents, and the rest of it. But we are not anxious to make money, we are not set up to make money out of industry, we are set up to assist industry; but we do not want to spend government money on industry when industry should be paying the shot. We have three types of arrangement with industry. If the research to be done is essentially of public concern, and sometimes railways fall into that category because there are just two railways, and anything that can be done to make them more efficient really reflects on freight rates, and they pool everything. If the problem is general we might bear all of that expense or we might bear fifty per cent. We make an agreement to cover that. On the other hand a large industry or a group of industries might be interested in a problem but all the people in Canada are not interested, so we say we have a type of contract that we will go fifty fifty and share all the patents.

Then there is the other case where an industry may want a problem solved that we can solve and nobody else can, so we say we will charge you the entire cost plus one hundred per cent overhead and everything belongs to you.

We have those three types of activity and we do give industry a very great deal of advice. We have technical information service, and we have field men all over Canada advising small industry, not big industry.

By Mr. Gibson:

Q. I was wondering about this maritime regional laboratory. What special problems would they have in the maritimes not existent in any other section of Canada? Would there not be a duplication there?—A. That is a very good question because the objectives of the Maritime Regional Laboratory are clearly fixed as the prairie regional laboratory. The feeling is that in the various regions of Canada we require scientific centres, and the maritimes have been particularly poor in that regard; that is, there are no government scientific organizations there. There is a fisheries research station in the maritimes, but it is a technological one. It was felt that we should establish a laboratory there which would mean doing down there some of the work we might do here. We would do the basic work which underlies their problems. We do not know exactly what those problems will be, they might change from time to time; but I think, and I certainly agree with this very much, that you need laboratories in each region of Canada if you want to make the whole of Canada strong. You must not have those barren areas where there is no science.

British Columbia has a very strong university, one of the big ones in Canada, and the British Columbia Research Council have laboratories of their own.

Q. Who runs them, the provincial government?—A. The Research Council of British Columbia. It is a special board set up under the provincial government.

Mr. BROOKS: The maritimes have just been supplying the scientists, is that it?

The WITNESS: It was a political decision in the sense that the government made the decision. We did not make that decision.

Mr. GIBSON: Some of your speeches may have been doing some good.

By Mr. Kirk:

Q. In addition to working with Dalhousie, Tech, and others, there will be close co-operation with the Nova Scotia Research Foundation?—A. Oh, yes, and we may even give them space in the building. We want to deal with the provinces pretty much the way we do with National Defence: we do not want to carry responsibility for the policy of the province. If we did that we would get into trouble immediately. We cannot take a general staff position, all we can say is we will try and give you the supporting scientists, techniques, and the provincial research councils will have to say where they are going.

By Mr. Green:

Q. What about Newfoundland?—A. Newfoundland we consider a maritime province.

Q. Are there any research facilities there?—A. No, and we have that very much in mind, that is another reason why it is important: Newfoundland is a province that should get attention.

I am getting away off my territory, but this is the sort of thing we have done, and this is an interesting story: the maritime fishing boats have used engines which were designed many many years ago, and the one virtue of those engines is that you can use them for an anchor as well as an engine. Literally, you can throw that engine overboard, you can subject it to salt water, haul it up again and install it in the boat and it will go.

By Mr. Gibson:

Q. What kind of an engine was that?—A. It is a simple sort of a two cycle engine. And, of course, if you can do that with an engine it is not going to be very efficient, but on the other hand there are little industries, as you know, down through the coast of Nova Scotia where those engines have been built, and they have supplied the Newfoundland fishermen and the Nova Scotia fishermen for over twenty, thirty to forty years and quite a small industry has been built up. Now, there is a movement on behalf of some of the American companies to get into that field. That means if they do, that we lose. The fishermen may get engines, but we are going to lose a little activity which is a very important thing. So we are trying to develop with one or two of the companies down there an engine which will still be rugged, and simple, and anybody has to be able to start it, but we are trying to get a little more efficiency into it.

By Mr. Murphy:

Q. Suppose a company was interested, let us say, in research work on corrosion, and they sent you the problem, how would it be dealt with?—A. We have an associate committee on corrosion. Corrosion is one of the very big problems. It faces all operators and it is very expensive. The navy, as well as metallurgical industries, have a very large corrosion problem. So we have an associate committee made up of scientists from our research organization and from the Bureau of Mines, the Mining Companies, the Navy, the Army, and from Public Works.

Q. And the oil companies too?—A. And the oil companies too. This committee reviews the field, holds conferences every year, and reports on what they have done. And when you get these representatives together they give

freely of their information. But an individual cannot do it so easily because if an individual should write to one of the big companies for information, it gets bogged down. However, those big companies will send their scientific people and will disclose information to the committee. Thus the committee has the information.

In addition we have exposure sites across Canada. We find out what has been done and what has not been done. We find out what a given laboratory is best suited to do, and we try to co-ordinate the work. It is a major problem.

Q. Do you have any association with research groups in the United States which are working on the same projects?—A. Yes. We have liaison officers. Under "general services" we operate a very large information division. We are in the publishing business; not propaganda, but real publishing. For instance, we publish about 2,000 scientific papers per year and we publish the *Journal of Scientific Research*. In addition, we run a liaison office in Europe, one in London, and one in Washington. We are in touch with scientific organizations in England, on the continent and in Washington.

If we attack a problem, we do not just sit down and go at it. We canvass the literature and we may send somebody to the United States or to England. We thereby save money and make speed.

We can say that we know as much as anybody in any country knows about what is going on in other countries.

By Mr. Gibson:

Q. Do you do any marine borer work at all?—A. Yes. You mean biological work?

Q. It is a very great industrial problem, I understand.—A. I know it is. We would attack it from the standpoint of preservatives.

By Mr. Murphy:

Q. Do you maintain liaison, let us say, with big corporations such as the big chemical corporations or the big oil companies on the other side?—A. Yes.

Q. Can you go into Texaco or Standard?—A. Yes. We can go as freely as anybody. As you know, any big company working with primary studies has trade secrets. But once the thing develops, we can go in freely. Nearly all the scientists know each other. There is quite a good fraternity among them at the top level.

The CHAIRMAN: There are very few minutes more this morning. Could you just outline the names in connection with the development of the Council in the early days, giving us the names of the presidents first?

Mr. GREEN: Are you not going to give us some details of the services rendered?

The WITNESS: Extra-mural research, Mr. Chairman; that includes general scholarships and grants in aid. I was hoping that that would be taken up in detail under the administration of that particular item. They would be better able to give you that figure than I am and tell you where these people are located and what scholarships are being given. They have all the statistical information. I have merely tried to emphasize the importance of these extra-mural activities. I thought we could leave it with our administrative officers, such as Mr. Birchard and Mr. Rosser, to give you the details of these activities.

The CHAIRMAN: I thought, with your permission, that we might well give more time to that. Perhaps that could be dealt with briefly now.

The WITNESS: There is a great deal of detail there. We have all the detail and we would be only too happy to make it available to you. Take our information service. That in itself covers a variety of activities such as

our laboratory research work and the work generally done in the field in support of that. It covers all these technical services. It is under this section that our fieldmen, our field representatives come. As you know, we have them out all over Canada—there are thirteen of them at the present time—contacting small industries, farmers, fishermen and so on, giving them an idea of the type of service that is open to them, getting them to appreciate the service and at the same time to acquire an appreciation of their needs. We could give you detailed information and particulars on that at a later stage.

Administration and personnel is something which comes under Mr. Birchard's general supervision and Mr. Rosser's particular supervision. We have to be very careful about the administration of the Research Council because we haven't got any automatic checks such as you have in other departments, and when you haven't got them you have, of course, to be very careful as to the staff you build up. We have, however, checked our administrative efficiency against absolute figures, I mean as to what it costs us to do a certain job in terms of the number of stenographers, clerks, telephones and so on engaged in the work; generally the number of technical people in proportion to scientists—so as to get the most out of it. We find that is very important as it affects the administrative set-up and we find that we are away ahead not only of other units of the same kind in this country but of those in other countries as well.

Plant engineering, that also is a big thing. Normally that operation would be carried on by Public Works, but a non-scientific group cannot handle the maintenance of a complicated laboratory set-up. One untrained individual could do a terrific lot of damage to laboratory equipment through lack of knowledge. For that reason we have our own maintenance staff, and this is another thing which will be dealt with by Mr. Birchard in his submission. We will give you all the information about our research activities, about our whole plant and set-up, and we are perfectly willing to go into every detail of it with you.

Mr. GREEN: Do you include in these figures the costs with respect to the atomic energy plant?

The WITNESS: No, we have excluded the atomic energy project. That comes under us administrative-wise; or, I should say administrative-wise with respect to Mr. Birchard; and, of course, it is mine generally.

The people from the Research Council do not go to Chalk River; they are not permitted to go to Chalk River unless they are working on the project. They know nothing about it and there is no flow of information between the two divisions.

Mr. GREEN: There are no expenses for atomic energy included in this statement?

The WITNESS: No, we have separated them completely.

The CHAIRMAN: I wanted to have in the first day's evidence a list of the past chief executives of the Research Council. The first Research Council Act was passed in 1917?

The WITNESS: Yes.

Dr. A. B. Macallum, Administrative, Chairman; 6 December, 1916, to 31 October, 1920.

Dr. R. F. Ruttan, Honorary Administrative, Chairman; 1 November, 1920, to 15 October, 1921.

Dr. R. A. Ross, Honorary Administrative, Chairman; 15 October, 1921, to 6 March, 1922.

Dr. Frank D. Adams, Honorary Administrative, Chairman; 30 May, 1922, to 4 October, 1923.

Dr. H. M. Tory, Honorary Administrative, Chairman; 5 October, 1923 to 18 July, 1924; Honorary President; 19 July, 1924, to May, 1928; President, 1 June, 1928, to 31 May, 1935.

General A. G. L. McNaughton, President; 1 June, 1935, to 17 October, 1939; On leave of absence on military duty, 18 October, 1939, to 12 October, 1944.

Dr. C. J. Mackenzie, Acting President; 18 October, 1939, to 13 October, 1944; President, 13 October, 1944 to present.

The CHAIRMAN: It is almost 12.30.

Mr. COLDWELL: I move that we adjourn.

The CHAIRMAN: We shall meet again on Thursday at 11.00 a.m.

Mr. GREEN: Will that conflict with the meeting on External Affairs?

The CHAIRMAN: No, and I expect that we will not conflict with External Affairs at any time.

The committee adjourned.

SESSION 1950

HOUSE OF COMMONS

SPECIAL COMMITTEE

on the

OPERATIONS

of the

NATIONAL RESEARCH COUNCIL

MINUTES OF PROCEEDINGS AND EVIDENCE

No. 2

THURSDAY, MAY 11, 1950

WITNESSES:

Mr. E. R. Birchard, O.B.E., Vice-President, Administration, National Research Council.

Mr. F. T. Rosser, Director of Administration, National Research Council.

OTTAWA
EDMOND CLOUTIER, C.M.G., B.A., L.Ph.,
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
CONTROLLER OF STATIONERY
1950

SPECIAL COMMITTEE
on the
OPERATIONS
of the
NATIONAL RESEARCH COUNCIL

Messrs.

Chairman: George J. McIlraith, Esq.,

Breithaupt
Brooks
Bourget
Coldwell

Gibson (*Comox-Alberni*) Murphy
Green Pinard
Kirk (*Digby-Yarmouth*) Stuart (*Charlotte*)
Low Winkler
McCusker

JOHN T. DUN,
Acting Clerk.

ORDER OF REFERENCE

WEDNESDAY, 10th May, 1950.

Ordered,—That the following Bill be referred to the said Committee, viz.
Bill No. 179, An Act to amend The Research Council Act.

Attest

LEON J. RAYMOND,
Clerk of the House.

MINUTES OF PROCEEDINGS

THURSDAY, May 11, 1950.

The Special Committee on the Operations of the National Research Council met at 11:00 o'clock a.m. The Chairman, Mr. McIlraith, presided.

Members present: Messrs. Brooks, Bourget, Gibson (*Comox-Albernd*), Green, Low, McCusker, McIlraith, Stuart (*Charlotte*).

In attendance: Mr. S. P. Eagleson, M.B.E., General Secretary, National Research Council.

Mr. E. R. Birchard, O.B.E., Vice-President, Administration, National Research Council was called. He furnished copies of:

- (a) A list of Associate and Special Committees, together with a tabulation showing the amounts of money allotted to each of these Committees, and
- (b) A chart showing the divisions and sub-divisions of the staff of the National Research Council.

Mr. Birchard was heard and questioned.

Mr. F. T. Rosser, Director of Administration, National Research Council, was called, heard and questioned respecting the duties performed by the administration staff.

At 12:45 p.m., on motion of Mr. Low, the Committee adjourned to meet at the call of the Chair.

JOHN T. DUN,
Acting Clerk of the Committee.

MINUTES OF PROCEEDINGS

February 11, 1924

The Board of Directors of the National Board of Fire Underwriters met at 11:00 o'clock a.m. in the Chamber of Commerce Building.

Members present: Messrs. [illegible names]

In attendance: Mr. [illegible name], Secretary; Mr. [illegible name], Treasurer.

Mr. [illegible name] presided over the meeting.

- (1) A list of directors and special committees.
- (2) A report on the work of the committees.
- (3) A report on the work of the committees.

Mr. [illegible name] was heard and discussed.

The meeting adjourned at 12:30 o'clock p.m.

Attest: [illegible name], Secretary

W. H. [illegible name]

[illegible text]

MINUTES OF EVIDENCE

HOUSE OF COMMONS
Thursday May 11, 1950.

The Special Committee appointed to examine into the operations of the National Research Council met this day at 11 a.m. The Chairman, Mr. G. J. McIlraith, presided.

The CHAIRMAN: Order, gentlemen. We have Mr. Birchard, Vice-President (Administration) here this morning. Perhaps we could have him start with his evidence now. Mr. Birchard:

Mr. E. R. Birchard, O.B.E., B.A.Sc., Vice-President (Administration), National Research Council, called:

The WITNESS: Mr. Chairman and gentlemen: At the last meeting of the committee Dr. Mackenzie made a general review of the organization and set-up of the National Research Council. At the conclusion of his evidence last week some questions were raised with respect to the associate and special committees. I have prepared a list of these associate committees, and I have also put the page number of the National Research Council Review, 1949, at which they appear. Using that you will be able to find a list of the representatives from the various departments, university, government or industry who make up each committee.

The CHAIRMAN: If I might interrupt for a moment; is it the wish of the committee that we print the names of the committees in the evidence, just the names only without the page numbers.

Some Hon. MEMBERS: Agreed.

The WITNESS: I do not know whether you would like to have examples of these committees but the list is as follows:

NATIONAL RESEARCH COUNCIL

Associate and Special Committees

- Associate Committee on Aeronautical Research.
- Associate Committee on Applied Psychology.
- Associate Committee on Artificial Limbs
- Associate Committee on Corrosion Research and Prevention.
- Associate Committee on Dental Research.
- Associate Committee on Forestry.
- Associate Committee on Geodesy and Geophysics.
- Associate Committee on High Temperature Metals.
- Associate Committee on the National Building Code.
- Associate Committee on Parasitology.
- Associate Committee on Petroleum.
- Associate Committee on Photographic Research.
- Associate Committee on Seaweeds Research.
- Associate Committee on Soil and Snow Mechanics.
- Associate Committee on Survey Research.
- Associate Committee on Synthetic Rubber Research.
- Associate Committee on Wild Life Research.

Associate Electrical Committee. (See Page 156 Review, 1948. Not active 1949. Anticipate renewed activity 1950.)
 Canadian Committee on Culture Collections of Micro-Organisms.
 Canadian Committee on Food Preservation.
 Canadian Government Specifications Board.
 Co-ordinating Committee on Western Crop Investigations.

Working under that committee there are the

Associate Committee on Grain Research of the National Research Council and the Dominion Dept. of Agriculture.
 Associate Committee on Plant Breeding of the National Research Council and the Dominion Dept. of Agriculture.
 Associate Committee on Plant Diseases of the National Research Council and the Dominion Dept. of Agriculture.

Joint Committee on Oceanography.

Special Committee on Applied Mathematical Statistics.

Special Committee on Fresh Water Fisheries Research.

I have noted the special activities at the bottom there and I may say that those are not shown in the Review. These are some of the special activities which are carried on from time to time and take in:

Special Activities

Canadian Congress of Mathematics

Canadian Standards Association

Fraser River Model

Heavy Metal Production

Special Medical Committee—ACTH and Cortisone

The page numbers opposite each committee refer to the pages in the National Research Council Review, 1949, at which you will find the names of the gentlemen who are members of the various committees, together with a short review of their activities over the year. For instance, if you wish to refer to the Associate Committee on Artificial Limbs, you turn to page 174 and you will see the list of members, followed by a brief outline of the Committee's activities. I do not know whether there may be any questions you would like to ask on that.

By Mr. Brooks:

Q. Do the members of these associate committees receive any salary, any pay from the National Research Council?—A. No.

Mr. GIBSON: Their expenses are paid when they come to Ottawa, are they not?

The WITNESS: Yes, their actual expenses. There is a vote set up for each of these associate committees. They must operate within that amount.

By Mr. Green:

Q. How do you come to set up these different committees? Where does the idea originate?—A. It might originate at any point. It might originate from any professional group, it might originate from industry, it might originate within a University, or the need for co-ordination, such as a committee provides, might be indicated by the Council receiving a considerable number of applications for research grants in the same special field, from individual research workers. The Council would consider all aspects in each such case and if it deems it to be advisable an associate committee would be set up.

Q. For example, take this Committee on Applied Psychology, how would the setting up of that committee come about?—A. That is a good example. The proposal to establish an Associate Committee on Applied Psychology originated

many years ago from University sources, but the Council did not consider that it should expand its activities to psychological research at that time. However, just before the recent war when universities, the Canadian Psychological Association, the Department of National Defence and the Department of National Health and Welfare were all concerned with research in this field, the Council agreed to establish an Associate Committee on Applied Psychology. This Committee rendered valuable service during the recent war in connection with personnel selection in the Armed Services, and to other organizations, and those concerned believe that it is now rendering valuable service in peace-time in this field.

Q. Have you got anyone on it from the Department of National Health and Welfare?—A. Oh yes.

Q. Where would the committee get that? Would that come from some of the interested medical men?—A. Oh yes, we are in contact with everyone who is interested. If you will turn to page 173 you will find that the Department of National Health and Welfare have a representative on that committee.

Q. Yes. I was just wondering—it seems to be a little out of line—why there should be all these volunteer committees. I notice that you have picked out two of the leading men in Canada on this particular subject. I understand they give their time to this work.—A. Yes, we have representatives of the Departments of Government serving on the Universities and of Industry, these associate and special committees set up by the National Research Council. Most committee members are persons who are actively engaged in research in the field concerned. We find that in Canada we have sufficient men thoroughly informed and interested in each particular field of work, and they know all the other scientists or medical men who are actively interested. Consequently they are glad to give their services as members of such Committees.

Q. They come all the way down here to Ottawa for the purpose?—A. Some of them are at Ottawa. They come to a meeting and consider what research work should be undertaken in Canada in the assigned field, and quite often it is not possible to proceed immediately with the full development of the program and they have to wait until certain facts are secured, or they may have to wait for certain special types of machinery or equipment to be procured or built before they can approve projects and recommend grants in aid.

Q. The Research committee also gets whatever it requires; if it requires further information with respect to certain aspects of its investigations you arrange to get that information for them?—A. Our associate committees work, as Dr. Mackenzie explained, pretty well on their own; although if they require information the facilities of the Council are available to them. The members of associate committees know the assigned field pretty well and know where to get required information.

Q. Well then in effect the Research Council just sets up these committees, selecting men for the purpose who have special qualifications in the subject or subjects concerned, and then let them go ahead and carry on the work.—A. They plan their program themselves. No, they don't do the work. Some of them may do it in a particular line of research, but in the estimates they are given an allotment and it may be that they will make grants to some outstanding men in that field who are prepared to direct research projects in that particular field of research, and report the results to the associate committee.

Q. Have you got the amounts of the grants for each of these committees this year?—A. I have them, yes; but I thought perhaps you might like to take that up when we came to a review of our estimates.

Q. Could we have the amount of the grants given to each of these associate committees? I think we should know something about what they are doing.

Mr. McCUSKER: Yes, I think we should know something about what they are doing, and I think we should have some explanation about their activities in order to appreciate their extent.

The WITNESS: I have it right here, Mr. Chairman; it is just a matter of when you want it.

Mr. McCUSKER: How would it be if we allowed Mr. Birchard to proceed as he chooses. I think we ought to get an idea of what we are looking at here. Perhaps if we were to let him go ahead in his own way we would get the information we need more readily.

The WITNESS: Mr. Chairman, I have endeavoured to outline a program of presentation of material which, if it is agreeable to them, might conserve some of the time of the committee, and which may give them much of the information they want; and my thought was that the committee might first like to get a picture of the over-all National Research Council organization, and then as we presented each phase of the Council's activities, as outlined on the chart which you have before you, we might give you more complete details. Dr. Mackenzie covered the general organization in his evidence the other day in general outline, and when he was through certain questions were raised in connection with it and I have prepared this material as an answer to those questions. My thought was that it might be the wish of the committee to have laid before them our organization chart and then to pass to the administrative end of our organization chart and possibly have that covered this morning by Mr. Rosser, who is here. He is the Director of our office of administration and personnel and I thought he might cover the administrative part of it, and then we could cover some of the other activities outlined in the chart, including our Technical Information Service which provides a tie in with industry—you might say that that is the point at which we deliver our goods although, of course, it is very difficult to put a value on a scientific report. If it is the wish of the committee I would pass these charts out now. This also ties in with a review of our estimates which I presume you will wish to do.

The CHAIRMAN: Yes, I take it that it would be the wish of the committee to review the estimates. Is it the wish of the committee that we now deal with the organization chart?

Some Hon. MEMBERS: Agreed.

The WITNESS: This chart is similar to the organizational chart which appears in the 1949 review, except that there has been a slight re-arrangement, as you will see; but going down the chart we have now joined the line from the vice-president—scientific—as this has just been revised, and then continue that down to the line across, thus co-ordinating all scientific divisions.

We turn now to the left-hand side, the vice-president, administration, who is responsible for what we call our services, as well as the Canadian Patents and Development Limited. Our services cover the workshops, the plant engineering, administration and personnel, and our patent activities within the Council.

Our workshop is maintained to form and produce special instruments or equipment that we are unable to purchase. In research as we advance along we come to points where no equipment or instruments or any other device are manufactured on the commercial market at the present time that we can use to carry on that piece of research, so in such cases an order is placed with the workshop to have that special equipment made. There is a little point there which I would like to bring out. It is difficult sometimes for us to assess whether it may be a piece of equipment that at a later date industry or universities will use. To attempt to determine what additional instruments of that kind will be required in the near future is exceedingly difficult. If we have a type of instrument we wish to make then we search through industry in order to find

someone in an appropriate industry who has the personnel or the equipment and who could build that piece of equipment. We are not a production organization, we want to get on with our research, and if there are orders to come in from universities or from industries for a piece of equipment we are anxious to get industry interested at that point so that they will be prepared to supply that equipment when and where it is required. Plant engineering is maintained to do special work of a type peculiar to research activity from time to time. You might say, we are a unit of government; why do we not use the Department of Public Works? Well, the answer to that is that our plant engineering does more than just maintain the building; it may be required to erect some special room in which research will be carried on; or, again, they may install a piece of scientific apparatus and for that purpose we must have trained personnel. If there are no questions in connection with workshops and plant engineering I will go on.

By Mr. Brooks:

Q. I would like to ask a question there in connection with machines or instruments which you have to design for your own use and which, as you say, you later give out to other people in industry to produce for general use. Do you hold patents on those?—A. Usually there are no patents on it because it is not a new idea or it may be a combination of instruments or machines that are either already being used or produced. There are some cases in which we might get a patent to cover a new invention. I can give you an example of that. There is a wrist-type of electro-scope which we have just developed, it is still in the development stage but it is covered by a patent. In that particular case we have developed that up to the present time but we are endeavouring to determine from the Defence Research Board or any hospitals or anyone else whether they feel that there might be a requirement for this wrist-type electro-scope. If there is, then we will go to industry with it in order to get them to manufacture it for us.

Q. And would they make that sort of thing for you?—A. In the development stage, yes, they will; but it might be just a little difficult to answer that because we yet have not determined in our own mind that there will be a market for it and we do not want to go to industry before we have some idea whether there will be a market for it. If we can determine that, which I think we can, in the light of the use we have made of it ourselves, then we are in a position to go to industry with it.

Q. Would you patent that?—A. We have a patent on it at the present time. We have to use our own judgment. If the development is satisfactory, by placing a patent on it we have protected the instrument to the Canadian people, because if it is thrown out to industry without a patent and somebody else puts a patent on it in the manufacturing process they would stand to benefit materially from it.

Q. Who would get the benefit of such a patent?—A. It would be under licence from the National Research Council under the Canadian Patents and Development Ltd. That is an activity which comes under Canadian Patents and Development Limited. I think you might find it of interest to note the progress we have made in respect to Canadian patents. We had Sir Percy Mills, who is Chairman of the National Research Development Corporation for the United Kingdom, in last week. He came over to discuss some of the problems that they are having and to find out if we could throw a little light on them because we got started long before they did. At the same time, we got some information from him.

Q. Do all your patents come under Canadian Patents and Development?—A. Once we have made an application for a patent it comes under the Canadian Patents and Development Limited, but much work requires to be done by way

of search to see whether an invention already has been patented before you apply for patent. The little group we have shown on the chart includes the officer in charge of patents. That is the office in which a search is first made, on each invention, to find out whether we have developed anything that is new and patentable. That is why that comes under the officer in charge of patents. I thought, Mr. Chairman, the committee might be interested in knowing how patents are developed and something about our work under that heading. That all comes into one little parcel. Are there any questions up to that point?

If not, I will go on then to office administration and personnel. May I say that the office of administration and personnel comes under myself and I am very proud of the work they are doing in that department. They have streamlined the organization of that branch and it is quite competent; as a matter of fact, there are a number of other organizations coming to us now to determine how we handle our administration, and we are happy to have some of the other government departments referring to us for assistance because we have progressed to a point now where we may be of some help to them. With your permission, Mr. Chairman, I am going to ask Mr. Rosser, who is the Director of the Office of Administration and Personnel to carry on in connection with administration.

The CHAIRMAN: Is it the wish of the committee that we hear Mr. Rosser at this point?

Some Hon. MEMBERS: Yes.

Mr. F. T. Rosser, Director, Office of Administration and Personnel, National Research Council, called:

The WITNESS: Mr. Chairman and members: The organization chart, which Mr. Birchard has put before you, shows that the work in the Office of the Administration and Personnel is organized into five units each of which deals with a particular phase of the Council's activities. General Services carries on the administrative work normally required for the functioning of a large department. The importance of good equipment in furthering scientific work is recognized and a highly specialized group has been brought together in the purchasing office whose duty it is to obtain quickly and to the best public advantage the many and diverse commodities required by the laboratories. The personnel office handles all matters concerning the employment and subsequent welfare of the staff. The Awards Office is charged with the administration of all the Council's activities in the field of scholarships and university assistance. The Security Office is not only concerned with the physical security of property and the fulfilment of government regulations regarding security, but also handles immigration and emigration problems and makes arrangements for visits of scientists to foreign classified laboratories.

The aim of all our offices is to provide the scientific staff with an efficient administrative service so that their maximum effort might be directed into the research work for which they are employed.

I would like to review for you the work in each of these units. General Services is the largest, and it is divided into six sections. The accounting office in addition to processing invoices, travel claims, credit notes; etc., handles the extensions and bookkeeping for work done in the laboratories on a charge basis. We make use of International Business machines now installed in one of the divisions to do this cost accounting work.

The members of the accounting staff are also responsible for the distribution of the Council's publications. You may be interested in having some of the figures for last year's work; 54,000 copies of the Canadian Journal of

Research, a scientific periodical, sent to 50 different countries; some 70,000 reprints of scientific articles distributed to interested scientists throughout the world; and some 30,000 documents, such as codes, specifications, scientific reports, etc., sent to interested parties. We have a duplicating and stationery unit to do reproduction work. Last year 5½ million prints were run from the multilith, blue-print, photostat and multigraph machines. More than 9,000 photographic prints, exposures or plates were also produced.

Central Registry handles all the mail and files, approximately a million pieces annually. During the past year over a quarter of a million papers were filed.

We have an efficient stenographic pool which serves all the laboratories.

The transport office looks after the transport at all our stations, including those at Arnprior, the Metcalfe Road, the Montreal Road and the main office. At these stations we now operate a fleet of 67 vehicles, including tractors and trailers as well as ordinary transport vehicles. One branch of this office makes arrangements for travel and travel accommodation for staff.

Another small unit looks after the estimates. More than 200 pages of detail were required by the Treasury Board in support of our estimates for this year; and a number of special statements are needed from time to time.

The purchasing office shown on the chart, placed approximately 30,000 orders last year, representing an expenditure in excess of \$6 million. We have been giving constant attention to the improvement of methods in the purchasing office and we are now pleased to report that the cost per order is approximately \$2, which we consider to be a very low figure. Invoices are checked in the purchasing office and passed to Treasury for payment.

The work in the personnel office falls into three main categories pertaining to: staff relations, employment, and organization. The staff relations unit is responsible for administrative matters concerned with employees from the time they are selected until their resignations have been finalized. During the past year we made a total of 747 term and summer appointments in the following categories: 288 scientific, 141 technical, 137 administrative and 181 prevailing rate. Perhaps I should explain that these figures on personnel that I am going to give you are over-all figures for all our laboratories, including Chalk River. The purchasing figure also included Chalk River.

The CHAIRMAN: Might I ask you a question on one point there? Does that figure you have just given us, 747 appointments, include some of the students as well?

The WITNESS: Yes, that figure does, but it does not include the casual appointments which we make for short periods. There were 263 casual short term appointments at Ottawa and 346 at Chalk River in the same period. The turnover on staff last year was, I believe, proportionately less than it has been for some time. There were altogether 305 terminations. Percentage-wise the terminations were: 7.9 per cent for the scientific staff; 9.2 per cent for the technical staff; 13.3 per cent for the administrative staff; and 10 per cent for the prevailing rate staff.

By Mr. McCusker:

Q. Would that apply to all your staff?—A. Yes it includes Chalk River, and relates to a staff slightly over 3,000 at the moment—the exact figure as at 1 April was 3,038.

Q. And your average personnel would be, what?—A. The average would be about that.

You might be interested to know that for the two-year period, April 1, 1948 to March 31, 1950, 101 scientists resigned; in that connection you might be interested in noting that 9 resigned to accept positions in the United States;

and that 4 of those went into industry or commerce, 1 went to a research institution and 4 went to American universities; I should point out that it is, I think, fair to predict that some of those who went to the American universities will probably return to Canada upon the completion of their studies.

Six accepted positions in Canadian universities. Thirteen transferred to other governmental departments, federal or provincial. Twenty accepted positions in Canadian industries. Two accepted positions in universities other than Canadian or American. Twenty-five resigned in order to continue their studies. Sixteen—and this applies to the female employees—resigned in order to get married or on account of other household duties. Five established businesses of their own. Five gave miscellaneous personal reasons for resigning.

Perhaps I should say something to you about salaries. The report on Civil Service statistics issued monthly by the Dominion Bureau of Statistics will show that the average salary in the National Research Council on 1st April was \$2,709 per annum.

But that figure should not be taken as the average salary that we are paying to our scientists. If we break the salaries out into the various groups, the average salary for the scientific group, in which we have 710 employees, is \$3,837. But it is still hardly fair to say that that is the average salary for our scientists, because included in the group are 56 post-doctorate fellows whose scholarship stipend is \$2,820 per annum [Most of them are overseas doctors who have come to the laboratories in order to carry on research work.] We should also remember that our scientific staff has a very low age level. The average age of the scientific staff on the Council is now 33 years. 82 per cent of our scientific staff are under 40 years of age. 39 per cent are under 30 years of age. And as I mentioned a while ago, we did some heavy recruiting last year. The fact that we thus have a large group of young people tends to reduce our salary average.

By Mr. Brooks:

Q. Would not that mean the temporary staff, or a lot of students coming in from universities for part time work?—A. No. I am speaking of our regular staff. Our regular staff is initially appointed on a term basis, usually for a term of one year. The term basis may run for a good many years before the appointment is made permanent, in which case the individual then comes under the Civil Service Superannuation Act.

By Mr. McCusker:

Q. You say there are reasons given for resignations of 100 people. Are there any discharges?—A. You mean on the scientific staff?

Q. Yes. What I have in mind is, let us say, a scientist who was employed, but who was so unsatisfactory that he could not be retained?—A. I do not think we could say that. Since our appointments are made on a term basis, a scientist who is not fitting in usually realizes that his term may not be renewed and so resigns. On the other hand, if he did not resign, we would probably have to advise him that his term would not be renewed. I cannot give you the figure of how many people—

Q. I do not want the figure, but it seemed a bit curious. They are not discharges; they are just resignations?—A. There are scientists whose terms we would not renew, but the record may show that they resigned.

Continuing the discussion on salaries I should point out again that we have a large number of young scientists which tends to reduce our salary average. It might therefore, be fairest to give you the figure for our doctors of science. The average salary for our doctors of science is \$4,658 per annum.

By Mr. Green:

Q. And what is the highest salary?—A. You mean in the entire organization?

Q. No, I mean in the scientific group.—A. In the scientific group our salary scale is modelled after that of the universities. The junior grades correspond to the junior lecturers and demonstrators on a university staff; and our assistant research officers to assistant professors; associate research officers to associate professors; and senior research officers full professors. Corresponding to the dean and senior research professor we have the principal research officers. The salary scale goes from a base of \$2,160 to a ceiling of \$7,500 for the principal research officer.

The full senior research officer grade spreads from \$5,300 to \$6,300; and that of the principal research officer runs from \$6,500 to \$7,500. But we have very few in the principal research officer grade because of the age level of our staff. They are hardly senior enough.

The average salary for the technical officers is \$2,391; for the prevailing rate workers, it is \$2,497; and for the administrative staff, it is \$2,149. The prevailing rate workers received a considerable increase during the past year as a result of a survey which the Department of Labour conducted at the Chalk River plant, and to increased rates in the Ottawa area.

By Mr. Brooks:

Q. What is the range? What is the lowest and what is the highest salary of the technical staff, and what particular work do they do?—A. The technical people are those workers who assist the research men with their laboratory work; they arrange apparatus, take readings, and give general assistance. We recruit them from the High Schools or from the Technical Schools and their range is—

Q. The qualification would be a High School graduation?—A. A High School or Technical School graduation is the minimum qualification. And the minimum rate for laboratory helpers, just the beginners, is \$1,200; but we have not been starting people quite that low. We simply cannot meet competition there; so we start them at \$1,320 and in some cases up to \$1,500, in that grade. The top salary is \$4,020 which takes us up to the technical officer grade 3; but those are very specialized technicians and in our entire organization we have only a few positions in that grade.

By Mr. Gibson:

Q. Among the people who left your employ, were there any who were let go for security reasons within the last two years?—A. I think the direct answer to that is "yes".

Q. It may have been a matter of opinion, or perhaps just a lack of confidence?—A. The record will show that the people resigned, of course.

Q. Yes.—A. But the reasons back of the resignation vary a great deal.

Q. There are so many intangible things?—A. That is right. You ask about security, and if that was a reason. It may have been a reason, yes, in one or two cases.

By Mr. Brooks:

Q. But the percentage was small, though?—A. Very very low.

By Mr. McCusker:

Q. If a man's resignation was accepted for security reasons, is the man followed up in order to see that he does not get employment in a similar position somewhere else within the country?—A. That is really not our business.

By Mr. Gibson:

Q. There are agencies of government who make it their business, are there not?—A. Yes.

By Mr. Green:

Q. Do you have to go through the screening process?—A. We do, yes. And I would like to make one statement on that point. To my knowledge no Canadian scientist has been discharged for security reasons.

Mr. GIBSON: Excellent.

Mr. LOW: Hurray!

The WITNESS: Are there any other questions?

By Mr. McCusker:

Q. The salaries here seem to be small. Is there some pension scheme in operation along with them?—A. We come under the Civil Service Superannuation scheme.

Q. Only that?

By Mr. Green:

Q. And are you able to hold your staff at that salary?—A. We seem to be able to, yes. There is one thing about salary scales: we feel that we have to tie in with the Canadian situation, especially with the universities because it is to our interest, and it is part of our function, for our staff to move out into industry and into the universities. In fact, we are proud of the percentage which I gave you, which shows the flow of staff to the universities and to industry.

Q. Does industry pay approximately the same salaries?—A. I think that now industrial salaries, on the average, are higher.

By Mr. Bourget:

Q. You made a survey of it, did you not?—A. About two years ago. I have not got an up to date survey; but I think Canadian industrial salaries are a bit higher than our level.

By the Chairman:

Q. There are other factors which enter into it such as the question of superannuation and also a wider fluctuation; and another factor is the opportunity of doing advanced research work in self education, if you like, which may not be as great. So you cannot take just the flat figures of the annual rate of pay and always compare them.—A. No. I tried to make that clear. We cannot make comparisons. Two years ago in the survey I made, six universities co-operated by giving me all the information they had about their staff salaries. There were more than 700 people included in that survey, and the average salary over all the universities was about \$4,000. Our average is approaching that, nevertheless our staff is very junior when compared with the average university staff.

By Mr. Green:

Q. Your Research Council is paying more than the universities?—A. No. I think we are paying a little less or a little less in figures, but you must bear in mind that our average age is, I am sure, below the average age in the universities.

By the Chairman:

Q. Your earlier figure was a little below; but you had a much junior group of men.—A. That is correct.

By Mr. Green:

Q. Is that because the Research Council has been doing less extensive work for a long period?—A. I would say it is part of our function. When a scientist graduates from a university at Ph.D. level, the ideal thing for him to do is to get into a laboratory like ours and to work there for two or three years before he goes into a university or into industry.

Q. Then your staff will always be younger than the university staff or the staff of scientific men in industry?—A. I am sure that is correct; because as long as we carry on a post-doctorate fellowship program, our average will remain low—

By Mr. Low:

Q. It could be considered as a sort of internship for a post in industry or in a university?—A. That is an excellent way of putting it, as a sort of internship.

Q. That is right.—A. You may be interested in the number of people coming under the Civil Service Superannuation Act. At the present time 22 per cent of our staff are contributing to the Civil Service Superannuation scheme.

By Mr. Green:

Q. That is a very small percentage, is it not?—A. It appears small again, but when we break it up, the scientific staff comprises 33 per cent; the technical staff 52 per cent; the administrative staff 23 per cent; and the prevailing-rate staff only 2·8 per cent. It has just been made possible to bring the prevailing-rate staff under the Civil Service Superannuation Act if they meet certain conditions, but we have not as yet brought very many of them under the Act.

We operate health clinics in the main building and in the Montreal Road laboratories; and during the year there were 5,853 different visits made by employees to these health clinics.

By Mr. Low:

Q. Would you give me that figure again, please?—A. 5,853.

Q. Thanks.—A. I have mentioned that the scientific staff under superannuation is 33 per cent. That may seem a bit low; but the reason again is because of the movement of the young staff.

Q. They do not stay long?

By Mr. McCusker:

Q. No one goes on superannuation unless he intends to remain with you permanently?—A. That is correct. On the scientific staff I would think the majority of them have about 10 years' service before they are brought under the Act.

By Mr. Low:

Q. What policy do you follow with respect to the number of years of service before they are put in permanently, if they wish to remain permanently?—A. We have no hard and fast policy. The figure is about 10 years of service; that is the figure we have in the back of our minds; but when there are exceptionally good men we may bring them in on a permanent basis.

The CHAIRMAN: When a man is brought under the Act he has the right to pay back and get the benefit of years of employment for superannuation purposes. I think that provision is included in the scheme?

By Mr. Gibson:

Q. I would have thought that your administrative staff would be more permanent than it appears to be because, after all, the administrative staff would not be so inclined to shift around, if they are happy in their work, to

the same degree that the scientists might?—A. That is true and I wondered why that was the case when I studied the statistics. I think generally it is because of the large proportion of women on our administrative staff.

Q. I see.—A. They leave in order to get married. We have a large proportion of stenographers on our administrative staff.

Mr. Low: We shall take a look at it.

Mr. Brooks: To see the reason why.

The WITNESS: In the employment office the usual amount of routine work is carried on with respect to the pay and attendance, leaves, income tax statements etc.

The employment office is responsible for advertising and for the investigation of applicants. We do comparatively little advertising for scientific staff in the regular journals and newspapers. Our contacts for scientific staff are pretty much with the universities.

By Mr. Low:

Q. As they should be.—A. We have made it our practice to visit the universities once a year and interview their high-ranking students, get assessments from the professors, and transcripts of records from the registrar. We did this in co-operation with the Defence Research Board, and last year we indexed 2,000 students. That index served several purposes. For example, when someone applied for a position, we had knowledge of him. And when someone applied for a scholarship,—(90 per cent of the people who applied for scholarships were in our index)—we had pre-knowledge of him.

Then, this index is also of value to other government organizations, to the Defence Research Board; to the Civil Service Commission; and to the Ontario Research Council.

By Mr. Green:

Q. You do not come under the Civil Service Commission?—A. No. We operate under our own Act. We have to advertise, however, for prevailing-rate workers, for some of the technical staff, and for some of the administrative staff. We inserted 88 advertisements in newspapers and trade journals last year and we received 2,500 replies. In addition to that, we had 2,000 people who applied on their own initiative. They either came in or were sent in by someone else.

In the competition for scientific staff we had 800 applications this year. It is not finalized yet; but the number of appointments now stands at 134. It may go slightly higher than that.

The organization and classification unit has been doing very excellent work in reviewing, rating and reclassifying the positions on the Council establishment. They have just completed a "Classification Manual" which covers all the 204 positions on the Council establishment.

By Mr. Low:

Q. How many of a personnel have you in that unit?—A. You mean the organization and classification unit?

Q. Yes.—A. We only have two, one man and a stenographer. But the direction of that work comes under the personnel officer and, again, I have put a great deal of time on it myself. But one qualified man is sufficient for our purposes.

I might say a little about the work in the awards office. The internal post-doctorate fellowships were announced in the fall of the year; and before the closing date of the competition we had received 191 applications from students of 27 nationalities. I have a list here of the countries from which they come, if you are interested.

By Mr. Gibson:

Q. I think so. Let us have them.—A. This is a list of where the post-doctorate fellows presently employed come from. 28 come from Britain. There are 10 Canadians; 3 New Zealanders; 1 American; 1 Australian; 1 Chinese; 3 Dutch; 1 Swiss; 2 Polish. (these are Polish refugees who came from British universities) 1 Belgian; 3 Indians; 1 Frenchman.

By Mr. Low:

Q. When you say 3 Indians, you mean men from India?—A. That is right, and 1 Cingalese.

In addition we had 1 Dane who has completed his term and has gone back to Denmark and we appointed this year 4 South Africans; 1 Norwegian; 1 Israeli; and 1 Pakistani.

By Mr. McCusker:

Q. Do they all speak English?—A. Yes, they would have to to secure full benefit from such a fellowship. This year the internal awards committee made 45 awards. These fellowships are tenable in the chemistry, physics, atomic energy and Prairie Regional Laboratories.

By Mr. Brooks:

Q. The awards are made on merit?—A. Definitely. All our awards are competitive and on a merit basis.

Q. You do not divide them up in Canada between provinces or between universities or anything like that?—A. No. It is all strictly on merit.

By Mr. Low:

Q. How long in advance do applications have to be in for scholarships?—A. All our applications this year had to be in by the 1st of February.

Q. For what?—A. For announcement at about the end of March or the 1st of April.

By Mr. Gibson:

Q. Do they have to submit a thesis to you?—A. No. They file applications and we consider the applications on the strength of their records, but they subsequently must submit reports on their work.

By Mr. Low:

Q. You mean their previous records?

By Mr. Stuart:

Q. Can you tell us which of the universities would produce the greatest number of this personnel?—A. You are speaking now of the Canadian students?

Q. Yes, that is right.

Mr. GIBSON: He is from the Maritimes too, so perhaps I should warn you.

The WITNESS: It is always amazing how these things are divided so evenly. I am sorry but I have not got the report with me. The announcement has been made in the press. I have the figures, the money values, but not the number of people.

They divide amazingly well by size of the university. You would naturally expect that the University of Toronto with 16,000 students or thereabouts would have the most, and in fact they have. The division is almost in direct proportion to the size of the university.

I am now looking at the distribution of awards for 1950 which has been handed to me. The figures are: Acadia, 1; Alberta, 16; British Columbia 31; Dalhousie, 10; Laval, 8; Loyola, 2; Macdonald, 2; Manitoba, 15; McGill, 32; McMaster, 1; Montreal, 2; Mount Allison, 2; New Brunswick, 4; Queens, 17; Saskatchewan, 18; Toronto, 27; Western Ontario, 8; and 1 from New York University, a Canadian coming back to do his post-graduate work in Canada.

I pointed out to you that Toronto got the most; but these figures do not show it, the reason being that in the past year or two the Ontario Universities fall short in our awards because the Ontario Research Council comes into the picture and they make their selections ahead of the National Research Council and their awards are accepted. That has been the case in connection with Queens and McMaster. For example, McMaster has one from the National Research Council; but you will find they have a dozen or so from the Ontario Research Council.

It may be of interest to you to know that I think there were 49 such cross-overs between ourselves and the Ontario Research Council this year; and if the Ontario Research Council had not been in the picture, I am sure that the National Research Council would have awarded the great majority of them.

Q. Do these provincial research councils complement your work? There is no conflict between you, is there?—A. I would say, there is not. I would say that it is entirely complementary.

By Mr. Green:

Q. Do the students prefer to get Ontario Research scholarships?—A. I am afraid that I could not answer that. It is possible that they might, because the Ontario Research scholarships pay slightly more than ours.

By Mr. Low:

Q. What are the amounts of your scholarships?—A. We pay \$450 for a bursary in the first year of post-graduate work; and I believe the Ontario Research Council pays \$500 for a similar scholarship.

By Mr. Green:

Q. Is a student under any obligation to the Council for the bursary?—A. Not under obligation to us other than that he perform his work in a manner satisfactory to the university.

Q. He can go to any university that he wishes?—A. A Canadian university.

Q. And he is not under obligation to work for the Research Council eventually?—A. None whatever.

By Mr. Low:

Q. And he should not be, either, for the purpose of the bursary.—A. There are no strings attached. Our scholarships are: bursaries, \$450; studentships for second year of post-graduate work, \$750; fellowships for senior investigators, \$900. The amount for post-doctorate overseas fellowships is not fixed, but it runs about \$2,500.

By Mr. Gibson:

Q. That is, for a year's work?—A. Yes, for a year's work.

By Mr. Green:

Q. Do you have many getting those scholarships?—A. I will give you the figures. For post-doctorate overseas fellowships there were 22 applicants this year and we made 8 awards; for fellowships, there were 50 applications and 21 awards; special scholarships 32 applications and 7 awards; (special scholarships

are really studentships for work in American universities. We do make a few awards for work at American universities where students cannot get the training they want in Canada and we feel it is essential that they should have it. We have in the past made awards for the same reason to British universities, but there are very few of them.)

By Mr. McCusker:

Q. Do you direct the studies of the student?—A. It is entirely a university matter.

By Mr. Low:

Q. I wondered what courses they would not be able to find in Canada. Would it be such things as petroleum engineering and matters of that kind?—A. That is one field in which we are short in Canada; and there are a number of Canadians who go down to the United States for petroleum engineering courses. Of the 7 special scholarships granted this year one went to Harvard for a particular type of chemical training, since there was no Canadian university giving that course; another went for a specialized mathematical course; and another whom I recall from Nova Scotia went in a specialized biological field.

Q. I understand.—A. There were 170 studentship applications with 81 awards; we received 207 bursary applications and made 82 awards. There were also 41 medical scholarships given this year.

I would like to say a word, if there is time, about the work in the universities. I think Dr. Mackenzie explained that one of the most valuable parts of our work was the assistance given to university professors. Last year we made 283 grants to university professors, totalling \$1,088,000. Under those grants the university professors employed 440 students. It is, in a sense, a supplementary scholarship program. The amount we allow professors to pay these research students, must not exceed the amount that the scholarship students get in the same period of time.

By Mr. Low:

Q. And of the same grade?—A. Yes. The rates of pay are tied in together.

By Mr. Green:

Q. They get as high as a scholarship?—A. That is right.

By Mr. Gibson:

Q. And you allow them to use their own discretion?—A. These are not scholarships because they are not competitive. But we say to the university professors: You may hire first class students for your research program and give them academic credit for their work but you must not pay them more than competitive scholarship winners are paid.

Q. So it is an extension of your scholarship scheme in which you are avoiding the responsibility or opportunity of picking the right men?—A. We take no responsibility for choosing these men. The university professor recommends that a man be employed, but we check on the man's qualifications and see that the salary is in line.

By Mr. Low:

Q. But these are naturally projects closely associated with your work?—A. The selection of a project is entirely up to the university professor, but the problem must be approved by our assisted researches committee. That is, we have to judge on the value of the work and the man who is going to direct it.

By Mr. Gibson:

Q. That is almost one-sixth of your budget, is it not?—A. It is very close to it.

By Mr. Green:

Q. Does public relations come under your branch?—A. No sir. You will see there is a public relations officer on the chart.

Mr. BIRCHARD: You will find that the public relations officer occupies a position up here near the top of the chart. His duty is to prepare the Annual Review and the Annual Report of the National Research Council which is tabled in the House. There is quite a lot of work involved in preparing the review as well as the annual report which is tabled in the House. In addition to that, he is in a position to discuss certain scientific problems with scientists who may visit us from all over the world or from other universities; and he will conduct any visiting scientist through our laboratories to meet our scientists. So that if a scientist is interested in any particular line of science, he can, then, from our work, bring himself up to date on it. That is the chief work of our public relations officer.

By Mr. Green:

Q. The reason I asked the question was that one of the men in the Press Gallery told me recently that your public relations at the Research Council, from their point of view was very poor, and that the Research Council is not getting its story over to the press and to the public to the same extent that other departments of the government are doing it. And he thought it was a tragedy that such was the case. I do not know whether the criticism is well founded, but I have a great deal of respect for the judgment of the man who told me. And I would like at some meeting of the committee to hear what your plans are, to tell your story not to the scientists from abroad or from industries in Canada, but to tell your story to the Canadian people. It may be that there is a weakness there in your organization. I do not know. But that is the suggestion I received.

By Mr. Gibson:

Q. You would not run a popular science magazine, would you? That would not be in keeping with the dignity of the organization?
(At this point discussion took place off the record.)

The CHAIRMAN: Gentlemen, it is now 12.30 o'clock and I wonder if we might adjourn.

Mr. Low: I move that we adjourn.

The CHAIRMAN: What about the time of the next meeting? Has the committee any particular wish on that subject?

Mr. Low: What date would you suggest, Mr. Chairman?

The CHAIRMAN: I would like to avoid Monday of next week.

Mr. Low: Monday?

The CHAIRMAN: Monday; but any other date or time would suit me.

Mr. GREEN: Perhaps we can arrange a date and try not to have it conflict with some of our other work.

Mr. Low: We will leave that in your hands, Mr. Chairman.

The committee adjourned.

SESSION 1950

HOUSE OF COMMONS

SPECIAL COMMITTEE

on the

OPERATIONS

of the

NATIONAL RESEARCH COUNCIL

MINUTES OF PROCEEDINGS AND EVIDENCE

No. 3

THURSDAY, MAY 18, 1950

WITNESSES:

Dr. C. J. Mackenzie, C.M.G., President, National Research Council.

Mr. E. R. Birchard, O.B.E., Vice-President, Administration, National Research Council.

Mr. G. W. MacDonald, General Counsel, National Research Council.

SPECIAL COMMITTEE
on the
OPERATIONS
of the
NATIONAL RESEARCH COUNCIL

Chairman: George J. McIlraith, Esq.,

Messrs.

Breithaupt
Brooks
Bourget
Coldwell
Gibson

Green
Kirk (*Digby-Yarmouth*)
Low
McCusker
Murphy

Pinard
Stuart (*Charlotte*)
Winkler

Clerk: A. L. Burgess.

REPORT TO THE HOUSE

THURSDAY, May 18, 1950.

The Special Committee on the Operations of the National Research Council begs leave to present the following as a

FIRST REPORT

Your Committee has considered Bill No. 179, "An Act to amend the Research Council Act" and has agreed to report it without amendment.

All of which is respectfully submitted.

GEORGE J. McILRAITH,
Chairman.

REPORT TO THE HOUSE

Thursday, May 18, 1900

I be pleased to inform the members of the National Research Council that they have to-day received the report of the committee on the subject of the

report of the

committee on the subject of the report of the committee on the subject of the

All of which is respectfully submitted

FRANCIS B. WILKINSON

Chairman

MINUTES OF PROCEEDINGS

THURSDAY, May 18, 1950.

The Special Committee on the Operations of the National Research Council met at 11 o'clock a.m., the Chairman, Mr. George J. McIlraith, presiding.

Members present: Messrs. Coldwell, Gibson, Green, Kirk (*Digby-Yarmouth*), Low, McCusker, McIlraith, Murphy, Winkler.

In attendance: Dr. C. J. Mackenzie, C.M.G., President, Mr. E. R. Birchard, O.B.E., Vice-President, Administration, and Mr. G. W. MacDonald, General Counsel, National Research Council.

Dr. Mackenzie was examined regarding the information services and public relations of the Research Council.

Mr. Birchard tabled a booklet descriptive of the patents available for licensing, owned by Canadian Patents and Development Limited.

Messrs. Birchard and MacDonald were examined on the policy of the Research Council in respect to patents.

The Committee proceeded to consideration of Bill No. 179, *An Act to amend the Research Council Act*.

Clauses 1 to 8 inclusive, the enacting clause and the title were adopted.

The Bill was adopted without amendment and the Chairman ordered to report it to the House forthwith.

It was agreed that the Committee visit the Montreal Road laboratories of the Research Council on Friday, May 19.

At 1 o'clock p.m. the Committee adjourned to the call of the Chair.

A. L. BURGESS,
Clerk of the Committee.

MINUTES OF PROCEEDINGS

January 15, 1914

The Board of Directors of the [Company Name] met on the 15th day of January, 1914, at [Location].

Present: [List of names]

Called to order by [Name]

Read and approved the minutes of the last meeting.

Report of the [Department Name] read and approved.

Resolved that [Resolution text]

Resolved that [Resolution text]

Resolved that [Resolution text]

Resolved that [Resolution text]

Resolved that [Resolution text]

A true and correct copy of these minutes is hereby certified to be a true and correct copy of the original on this 15th day of January, 1914.

MINUTES OF EVIDENCE

HOUSE OF COMMONS,
Thursday, May 18, 1950.

The Special Committee appointed to examine into the operations of the National Research Council met this day at 11:a.m. The Chairman, Mr. G. J. McIlraith, presided.

The CHAIRMAN: Order, gentlemen, we have a quorum.

The members will recall that at the close of the last meeting we were discussing public relations generally and the items on administration, the public relations officer and information services. We just started into that subject. I think this morning, if it meets with your wishes, we can finish our discussion as to the public relations officer and the information services and the council. We can close up the general discussion on administration and then deal with patents and the Canadian Patents and Development Limited—that is the crown corporation—and, when we finish that we can deal with the bill. I would like, if possible, to have the bill that was referred to the committee dealt with so that we can have it back and sent to the senate for consideration there.

Mr. Low: When would you suggest taking up the bill?

The CHAIRMAN: I think it would probably be disposed of fairly quickly if we have covered patents. The only section I can see in the bill that we would discuss would be the one on patents, and I think the discussion on it will practically disappear when we have dealt with the Patents Corporation. It seems to me that is the way it would work out, so if that plan of procedure is agreeable we will proceed.

Is that plan agreeable?

Agreed.

We were dealing with the public relations officer, the position as shown on the chart, at the close of the last meeting, and perhaps Dr. Mackenzie could continue from that point.

C. J. Mackenzie, C.M.G., M.C., M.C.E., D. Eng., D. Sc., LL.D., F.R.S.C., M.E.I.C., recalled:

The WITNESS: I was not here the last day so that I do not know just exactly what form the discussion took, but I have been reading the report, and apparently the question was raised as to the efficiency of our publicity, not in a scientific or technical way, but for the general public. That is a very difficult question and it is one that bothers us. We set up this public relations office detaching it from the general information directorate, which has the responsibility of disseminating technical information to the people who can use it. We thought that there was some need for a more general type of release and we set up this small office. We do not claim that we are doing a perfect job there, but we do know that there is a very great deal of difficulty in meeting the extreme views. Some of the press at the end of the war said they did not want any public releases at all, they said they wanted to write their own stories, which was

agreeable to us. We said we would draw their attention to the subjects we were working on and would give facilities to any reporters who wished to come and write their own stories. Now, we must admit immediately that scientists are not good publicity people. They are always surprised at what the press find interesting in our work and in our remarks as well. We just do not know. We thought it would be an excellent arrangement to invite the press to come and write their own stories and a great many did. If it is now felt generally that we are not doing enough in the way of general information we will be very glad to receive suggestions because although we do not want advertising in the ordinary way we do wish to disseminate the knowledge that is available to us as widely as possible.

Now, our public relations officer does issue weekly releases. These are sent to members of the press gallery and to the principal newspaper and specialist writers and is available to anyone who wishes to receive them. As I say, the information is not intended to completely cover the activities in a popular way but rather to draw the attention of people to what we think is currently interesting and we are offering facilities to any writer who wishes to come and write a story. If the committee and the government think we should extend this facility we might do it but we do know that there are two extreme views; one view is that we are not doing enough and another view is that it is not our duty to publicize widely in a popular manner.

By Mr. Low:

Q. I find that bulletin called the National Research Council News is a very interesting little publication.—A. The N.R.C. Research News is issued monthly and it regularly contains one or two feature articles. We try to stress what is of current interest.

Q. What form, Dr. Mackenzie, do these weekly releases take?—A. They are just mimeographed sheets. Those are sent out now to the press gallery, as I understand, and the principal newspapers and to specialist writers and are available to anyone who would like to have them. However, we do not wish to flood the country with literature that is not useful.

Q. Of course, you have not got things to sell?—A. No. And most of our work is technical and scientific, and we feel that ultimately the effect of an organization like ours is associated with the use that people in the technical and scientific fields make of our information.

By Mr. Gibson:

Q. Do those go to universities?—A. Yes, and industries; and we have quarterly reports of the divisions which we send to the industries interested. We try to keep the industries of the country as well informed as we can as to what we are doing, telling them what equipment we have and what facilities we can offer. Obviously, that is not of very much public interest and if we distributed this widely there would be an awful lot of money involved; in fact our publication item is quite a considerable one now. Our effort has been to try and hold the circulation down to the people who really want our material and are interested but not to try to restrict it in any sense.

Mr. Low: I think that is as it should be, that only those interested enough to apply for release should get them.

Mr. COLDWELL: It is surprising how little is known of the work of the National Research Council across the country, among the people generally. That is what I think would be one of the values of this committee, to get the members publicizing it.

The WITNESS: It is one of the things, Mr. Coldwell, that gives us a great deal of concern but how to improve it we do not know.

Mr. MURPHY: What policy is followed in the United States or in Great Britain?

The WITNESS: Just about the same thing. I think the Atomic Energy Commission in the United States has rather aggressive publicity policy at the moment for reasons which I do not think obtain in Canada. I would think the problem is associated in a general way with the fact that the number of scientific journals in Canada is limited, and just as many years ago few journalists were as great students of finance and economy and politics as they are today, so there are very few well informed scientific journalists. My feeling is we cannot make a journalist out of a scientist because, generally speaking, a scientist does not know how to write popular articles and therefore we must look to journalists competent in science to do the thing. Now, in the United States we find there are a growing number of such people who are well trained. My journalistic friends in Canada tell me it will probably come here, but that very few, if any, of our large papers could afford the luxury of a thoroughly trained scientific journalist.

Mr. Low: People generally will not read those scientific articles.

The WITNESS: The kind of articles they read are the type that appear in *Time*, *Life*, *Fortune*, and often in the *Saturday Evening Post*; all excellent popular articles and very sound scientifically, and I believe myself that that is the way we should do it if we had the people who could write in this specialized way.

By Mr. Coldwell:

Q. Is it possible for some of your people to do sketches and have the journalists re-write them, so to speak?—A. We have tried that. We have had people on our staff doing that and it just did not seem to work. We are not in the journalistic field. I feel that scientific journalism is increasing on the continent. I read it, and we actually have on file in our technical library a number of these articles appearing in the popular press; they are so well done.

Q. We do not see these articles in the popular magazines in Canada.

Mr. GIBSON: It might interest you to know when Mr. McIlraith and I were over in the old country we had lunch with two top executives of a leading automobile manufacturer there and I made some reference to the tracer isotopes, and frankly, they said, they had never even heard of them. I do not think that would happen with men in comparable positions in Canada.

The CHAIRMAN: That would not have happened in Canada for men in comparable positions.

The WITNESS: I realize the justification of the suggestion that the publicity is not as good as it should be, but it is not that we are unaware of it ourselves. We send out speakers but it is an amazing thing, people generally will not go to these meetings. You send out a speaker and you get a very small audience. But if the subject is controversial you do get a big audience. It is one of the real problems of education that is with us.

The CHAIRMAN: Are there any more questions on that subject before we leave it?

The WITNESS: I might just give you some data. Press clipping service received by the Council shows that more than five hundred references to the Council appeared in Canadian papers since January, 1950. These were based on these press releases. I am not in a position to know whether that is good or bad, but since January 1st as a result of these general press releases there have been five hundred references in Canadian newspapers to the work of the National Research Council.

By Mr. Coldwell:

Q. There is a thirst though among the people for scientific knowledge. Take this technocracy business; people are strong for that and they also pay in a large membership fee.—A. Yes, but I think, Mr. Coldwell, that is not very good science.

Q. I know it is not.—A. The thing that is rather disturbing to us is that there is very little publicity given to what we think is good scientific developments, and people just click on something that is spectacular or unimportant.

Q. But the people have a thirst for some knowledge of these things. There was a chap called Carter from Winnipeg who used to write a lot of pseudo-scientific articles.—A. Yes, he was very pseudo.

Q. Yes, but that illustrates the point I am getting. His little booklets sold by the thousands in this country.—A. Yes, but do you not think that if we had a good journalist to write the scientific things of that sort, that would be the answer.

Q. Yes, that is the answer.—A. I have a very high regard for the talent of the journalists; I do not think the ordinary scientist can write anything for the people that strikes their fancy.

Mr. Low: It takes a special type of training to do that.

The WITNESS: For instance, our people do not see what interests the people; it is not that they do not want to see, but they just do not see those points that are interesting from the public point of view.

By Mr. Murphy:

Q. Do you not think it is only a matter of time, because of the increased interest of the public, before the newspapers will have experienced writers?—A. I think so, Mr. Murphy.

Q. I heard one publisher say that up until just recently there was no public interest in that type of article but it was increasing and he felt many newspapers, before long would have qualified scientific reporters or writers.

Mr. McCUSKER: We cannot entirely blame the newspaper reporters because when we went to a place where we could get things explained we left them at the gate.

By Mr. Coldwell:

Q. I mean the things that really can be popularized.—A. You mean the Atomic Energy plant. Well we have in the National Research Council laboratories much more than we have in the Atomic Energy Establishment and it is wide open, and we are in a centre where there are a lot of journalists and the number that come is very very few.

Q. They are more interested in the squabbles in parliament than they are in science.

Mr. McCUSKER: I was wondering if it might not be possible to send our news releases for publication to all the newspapers in Canada and not only to those in the larger cities. The larger papers have less difficulty in finding news, whereas, if you sent releases to the smaller papers in the more remote areas they might use those releases, and you find a lot of intelligent men there who will study them.

The WITNESS: We will be very glad to look into it. My impression is that our people take the advice of the press gallery who themselves, I understand, serve the county. We certainly would be very glad to do anything of that kind.

Mr. WINKLER: Would it not be possible to have an appointment made at a higher level in the Council itself, somebody, say, promoted to a vice-presidency,

an additional vice-presidency, who would look into the press angle with more authority than say a person just attached to the body?

Mr. MURPHY: Have you a man in view, Mr. Winkler?

Mr. COLDWELL: He would have to be somebody with a particular flair for that kind of work.

By Mr. Winkler:

Q. I can see the reluctance there.—A. I think the reluctance is because you build up quite an expensive project when you start to put a vice-president in charge; you have to build up a department and a staff, and then you would have to be absolutely sure you had the right man. I feel if there was a man who was qualified to occupy that position of vice-president, we would not be able to hire him; he would be in the field of journalism and if he were available and could do this thing, he would be doing it now. It is beyond my field of expectation though.

Q. If he did not have his feet solidly on the ground he would be very dangerous.—A. There is another side to this sort of thing. You can overdo it. And the first thing you know there are enthusiastic people busy building the unit into a great organization and you get something that may be offensive to scientists working as well as being costly.

Mr. GIBSON: You might even start to believe it yourself.

The CHAIRMAN: Are there any more questions on this matter?

By Mr. Low:

Q. Who is the public relations officer at the moment?—A. Mr. S. J. Cooke, who is one of our very senior people in the Council and is probably more knowledgable about these matters than anybody else. It would be pretty difficult to get a very competent man who is also a journalist.

By Mr. Coldwell:

Q. If you got anybody who could explain to the ordinary reporter, who is not a scientist, in ordinary language about the work that is being done, would that be the solution?—A. We try to do that.

Q. It is pretty difficult to do that because scientists usually talk in scientific languages.—A. Yes, and if he could do that he would write it. I am always amazed, when I take people through the establishment, at the things that interest them that I have been walking by every day and did not even notice.

Mr. GIBSON: You do not have many men biting dogs around your place.

The WITNESS: Well, we really got more publicity on the boy who stole a few radium needles than on anything else I can recall.

Mr. COLDWELL: Yes, but if it was explained in ordinary language at the time it might interest people.

Mr. WINKLER: I presume the Research Council has no representative studying such things as floods, which are so much before us at the present time?

The WITNESS: Our Research Council is not responsible for any effort in that field of activity.

Mr. GIBSON: But you do have your Fraser River model? That has been referred to you specifically?

The WITNESS: Yes, that is a general scientific study which was undertaken on behalf of the people who were interested in the project. We act there as an agent or at least as a body which works for somebody else, but it would not

be up to us to concern ourselves with the Fraser River Valley otherwise than to do work for the people who are responsible.

Mr. Low: The international joint commission might refer this other problem to you.

The WITNESS: Undoubtedly, and what is done with it after the proposition is studied is somebody else's responsibility.

Mr. WINKLER: Would you be prepared to turn your attention to problems such as the Red River problem?

The WITNESS: Yes, if we were asked by the proper authorities. We might not be competent to do the job they wanted done, but we are competent in hydraulic models. It would depend on what the suggestions were, but, if any agency asked us to cooperate we would be delighted to do it, but it does not follow that we would have the facilities or have the expertness to do the particular job or thing they want done. For instance, there was a suggestion in the press about a relief canal; we would not have anything to offer in expertness on that. That is hydraulic engineering of a practical nature. If on the other hand the people had a definite problem we would be delighted to go into it.

By Mr. Gibson:

Q. I wonder if there is much to be gained by a popular dissemination of these things. I doubt it. If the people of the community are convinced through this committee that they are getting good value for their money, would not that be the best information?—A. As I have said I speak with diffidence on this policy matter because one cannot be dogmatic but I have a feeling that in an organization such as ours we do not want too much publicity. We want the confidence of the people who use our services and if we have that confidence it is amazing how it is disseminated. I do not know how it happens but it does. People seem to feel that such and such an organization is good and it is respected. Well, as long as we can keep that sort of feeling we in turn will be quite happy.

Q. That is what happened in connection with our Atomic Energy Committee since last Fall. I have always felt that it will be the same reaction entirely.

Mr. COLDWELL: I think you need to disseminate a knowledge among the people of what is being done, although I agree with Mr. Gibson in that I think the value of this committee will probably be to increase the confidence of the people in the National Research Council.

Mr. MURPHY: Dr. Mackenzie, are you going to have another meeting with industry?

The WITNESS: There is a meeting with the Canadian Manufacturers' Association next week where there is to be a section on industrial uses of atomic energy. We do not think we should duplicate that at this time. We are taking advantage of that meeting.

The CHAIRMAN: That is a meeting called by the Canadian Manufacturers' Association, as I understand it?

The WITNESS: Yes.

By Mr. Murphy:

Q. But what I was referring to was a meeting along the lines of the one you help in 1948.—A. Yes, we did not think we would like to call another one while the Canadian Manufacturers' Association meeting was being held next week.

Q. Do you find industry is more interested in your activities—I should have said much more interested—than they were a year ago?—A. That is a very

difficult question to answer. I would not take the viewpoint that they were not interested. The interest is certainly not less and I think it is more in a real sense; there are more people considering putting in some of these devices, but is a very difficult thing to appraise without information.

By Mr. Coldwell:

Q. I think it is important that the Canadian Manufacturers' Association should have confidence in the research organization and receive some benefit from it. I think, too, that you have got to have the ordinary man in the street interested as well because there is a danger always that a feeling might grow up that this is an arm of government that is exclusively for the Canadian Manufacturers' Association or for industry, which would, I think, be unfortunate.—A. I do not think that is the case. This Canadian Manufacturers' conference is being held—

Q. I am not criticizing that.—A. No.

Q. I am saying we need the two things.

Mr. GIBSON: I think those conventions are an excellent vehicle to use.

The WITNESS: One does get a reaction as to who is interested in what and it is very useful to attend the meetings.

The CHAIRMAN: If there is nothing further on this phase of administration we could perhaps deal with the matter of patents now. If you will look at the administration chart you will see there an item, patents, directly at the left-hand side of the chart, and then also Canadian Patents and Development Limited. Perhaps we could have an explanation of that.

The WITNESS: Perhaps I could indicate why the Patent and Development Corporation was set up and then let Mr. Birchard and Mr. MacDonald who are operating it speak about it. Since the National Research Council has been in operation it has taken out patents and the conditions were laid down in the Act. The members of the staff had to assign any patents taken out, to the Council and Council had the right to award bonuses to the individual inventors as the Council thought fit. At the start the activities were not extensive, but during the war and later on we found ourselves in the position of having quite a number of patents and quite an amount of work to do. Patents work is specialized and it is very difficult to be dogmatic about the right way to handle patents. We felt that the Council as such was not very well set up to merchandise or exploit—using the word exploit in a proper sense of getting into use—patents. Our interests are generally speaking in the scientific work, and we did not want to have our scientists concerning themselves with the business of patents; so that is why it was suggested that we should have a patent agency set up which would operate in a strictly business way and would take the burden of details from the scientific staff; and the result was the Canadian Patents and Development Corporation which is a crown company set up under the National Research Council Act. Mr. Birchard is the president of that company and Mr. MacDonald is the secretary-treasurer and also their lawyer. I think, perhaps, I might call on Mr. Birchard to detail the way the patent corporation operates, and then we can have any questions that the members would like to ask.

Mr. E. R. Birchard, O.B.E., B.A.Sc., Vice-President (Administration), National Research Council, Ottawa, called:

The WITNESS: Mr. Chairman, the charter for Canadian Patents and Development Limited was issued, October 31st 1947, organized in December and began operations in March of 1948. The directors of Canadian Patents

and Developments Limited are Mr. V. W. Scully, Deputy Minister of National Revenue; Mr. F. C. Wallace, Executive Vice-President of Smith and Stone, Limited, Georgetown, Ontario—he was working with the National Research Council during the war on electronics, radio and other electrical devices, and is now operating Smith and Stone Limited and following along that line of production; Dr. Mackenzie, President of the National Research Council; J. C. Macfarlane, K.C., Vice-President of the Canadian General Electric Company Limited of Toronto, one of whose principal responsibilities is looking after patents for the Canadian General Electric Company and the radio industry, and he is also former President of the Canadian Manufacturers Association. We thought that was a very good representation to bring into our board of directors to give us advice. The others are R. E. Jamieson, who is Professor of Civil Engineering at McGill University, Montreal, which gives us a tie-in with the universities; Mr. A. C. Halferdahl, the officer in charge of the Patent Division of the National Research Council; and myself, as Vice-President (Administration), National Research Council. Mr. George MacDonald is our secretary-treasurer and legal adviser.

Getting started to publicize the patents which were held in the name of the Council took some little time. But before we go on to that I might also add that the facilities of Canadian Patents and Development Limited are made available to the universities in Canada, to other Government departments or other research organizations, or any organizations supported by public funds.

Mr. COLDWELL: Could you give us examples of other research organizations?

The WITNESS: Such as the Ontario Research Foundation, or the Maritime Research Foundation, or the British Columbia Research Foundation and other provincial organizations of a similar kind. The facilities of Canadian Patents and Development Limited are made available to these organizations if they wish. To get back to publicity, we made a list of Canadian patents which were held in the name of the Council and were available for licensing, then we distributed that list. It might be well if I were to table the list. I also have copies here for members.

Mr. COLDWELL: How many patents have been developed by the Research Council? Are they all in this list?

The WITNESS: No, just those available for licensing are in this list.

Mr. COLDWELL: I see.

The WITNESS: There are agreements in connection with the others. We can tell you the number, if you wish, that we have agreements on.

The CHAIRMAN: This list will be tabled.

The WITNESS: This list was circulated to industry and others in Canada who might be interested, as well as to foreign service officers who made inquiries, and we also received quite a number of inquiries from many parts of the world. We then compiled a mailing list and sent out copies of this little booklet which is prepared in loose leaf form, and as changes are made we circularize them to keep it up to date. To further our publicity or information in connection with what is available we have a nice working arrangement with the industrial magazines that are brought out by associations of various types of industry. For example, the Canadian Manufacturers Association, as you all know, put out "Industrial Canada". We endeavour to write up an article covering our patents and to supply to the Canadian Manufacturers Association an article, if we can, for each issue. I just happen to have a sample here. You will notice this covers a new anti-freeze compound.

The CHAIRMAN: Will you give us the date of the publication?

The WITNESS: This is May of 1950, appearing in "Industrial Canada" at page 45. We endeavour so far as possible to write these articles in plain layman's language. It is often difficult properly to interrupt a patent to make it interesting

as an article for publication. We usually start off by saying that this is a new development made in the National Research Council or in whatever other department of government may be concerned and that that has been assigned to the Canadian Patents and Development Limited by whatever department of government might happen to be concerned, or if it was developed in a university we indicate that that was where it was developed; and then we try in so far as possible in layman's language to describe some of the interesting features of the development; and the last little paragraph will perhaps say this: patent available for licensing through Canadian Patents and Development Limited, National Research Building, Sussex Street, Ottawa. In that way we get as many as we can in industry or in foreign countries interested, and inquiries will then come in. Up to the present time we have put out about 65 such articles which not only gives publicity to the patents but to the National Research Council or other departments of government in which the development was made. Now, I say that we have put out 65 such articles. These articles are invariably copied by other papers or other magazines, not only in Canada but in various parts of the world. The publication put out by them goes to other countries and they pick it up. For instance, we get inquiries of this kind; that an article on such and such an item has been copied in a certain paper.

Mr. MURPHY: Just before you leave this subject, I would like to follow through and see what you do about licensing of the patents for use.

The WITNESS: We get inquiries and then we try to find out what a company wants to do, and then when we find that out we can ascertain whether it will interfere with any operations in Canada, and we can then proceed on a business basis to either licence or work out some arrangement. That is what that publicity is for, to get the inquiries and find out who might be interested in that particular patent. Here is another example of where we pick up publicity which is secured from some of our articles; I brought along this sample of the Manitoba Industry and Commerce Bulletin which is dated September, 1949. In this bulletin is a list of our patents which are available and there is the reprint of the list in our booklet. I just thought you might be interested in that. We never know where this publicity is going to be picked up. This came to my attention in "Ocean Times", published aboard one of the Cunard White Star liners under date of September 17th, 1949; and it says, "Available for industry—new book published by Research Council"—and then follows a little article on the patents which are available, taken from this book. Since our Patent Corporation started and we are getting inquiries from various parts of the world, we have had inquiries from Australia, India, Holland and other points in connection with the set-up of our Patent Corporation asking how it was set up and how we function. These countries seem very interested. We have had visitors from Australia to discuss the problem with us. Last week we had a visit from Sir Percy Mills, who is Chairman of the National Research Development Corporation in the United Kingdom. Over there they are creating a patent corporation to make available to industry various patents which they have in the United Kingdom. They got started in their activities last June and he wished to discuss with us some problems which they experienced. We were happy to discuss these problems with him and further to explore the possibility of the National Research Development Corporation, which is the United Kingdom organization, and Canadian Patents and Development Limited representing each other on patents which they developed in each country respectively, and we believe we will be able to develop some sort of interchange of patents so that each of us can represent the other on a satisfactory basis.

Mr. MURPHY: What other countries are these patents registered in? I see in one case here it just indicates France?

The WITNESS: That depends on what the development has been. We operate on this basis: if a patent is developed, say, in the chemistry division by

one of four scientists, then when we have received confirmation of acceptance of registration we have a committee consisting of the inventor, the director of the division concerned, Mr. Halferdahl, Mr. MacDonald and myself, and any other parties that might be able to throw some constructive information into the discussion, to determine the countries in which it should be registered, because in some countries it may be nothing but an expense to register that patent. We register in Canada to protect people in Canada, should it be considered that they require protection, to protect them against exploitation and things of that kind.

Mr. COLDWELL: I notice here on page 2, for example, one of these patents carries the word "France" and no other country is named; would that patent be patented in Canada, for example—presumably it would be—and also in France? Just what does it mean there? Do we follow these things through and get concurrent patent rights, let us say, in the U.S.A. as well as in Canada and other countries?

The WITNESS: We give there the Council's file number, the patent number and the countries in which patents have been applied for in addition to Canada, the name of the inventor and under title a brief description of the invention.

Mr. GIBSON: I notice that you have patents registered in eighteen different countries, does that include countries beyond the Iron Curtain?

The CHAIRMAN: What page is that?

The WITNESS: That will be on page 6.

Mr. GIBSON: I see there are eighteen countries on that one patent there and one of them in Czechoslovakia—possibly that is an explosive.

The WITNESS: No, it is a fertilizer.

Dr. MACKENZIE: This particular patent originated during the war and the patent was taken out, by companies working for the Department of Munitions Supply when the Patent Corporation was set up these patents we assigned to it.

Mr. GIBSON: Was that the kind of thing that blew up down in Texas? I thought it was nitrate.

Dr. MACKENZIE: No. It was a nitrate, but not what this patent covers.

Mr. MACDONALD: The patent was on the method of making it.

Mr. COLDWELL: I was rather intrigued by this patent on methods of plucking poultry.

The WITNESS: Just for your information that is one which lends itself for use as an illustration of the point under discussion. That method of plucking poultry was developed during the early part of the war but a shortage of the required ingredients caused its production to be discontinued. But considerable publicity has been given to it. It is for use by small operators, and some of the larger operators too. It is a wax which plucks or cleans chickens or fowl very clean without leaving any scars.

Mr. Low: Shouldn't that be used by the Department of National Revenue in plucking us?

The WITNESS: As I said, because of the shortage of materials, production had to be discontinued. In the meantime mechanical pluckers were developed for large industry or large operators, and when the war was over we came back to the question of whether we should resume producing this poultry plucking wax. There was some difficulty there; there were people interested in the manufacture of it but they had no system of distribution. One of the main difficulties was that the people who were interested in manufacturing did not possess distribution systems of the required type that would distribute that poultry plucking wax to small operators or farmers or persons in out of the way places. We were getting hundreds of letters from people who wanted to use this wax asking where

they could purchase it. After considerable discussion with manufacturing companies, wax companies, and distributing companies, we have now made a licensing agreement with the Capo Polishes Limited, of Hamilton with the result that we believe the situation has been satisfactorily taken care of.

Mr. COLDWELL: Are they a shoe polish company?

The WITNESS: No—they may manufacture that, I don't know; they make floor wax and similar products and they have a distributing system and will distribute this poultry plucking wax across Canada, making it generally available to those who want to use it.

Mr. COLDWELL: This is an economical way of plucking poultry, is it?

The WITNESS: Yes.

Mr. MACDONALD: And another point about it is that the wax can be recovered after each operation which you will recognize is very economical.

Mr. MURPHY: Isn't paraffin wax sometimes used for that purpose?

The WITNESS: Paraffin wax was used to some extent but it has not got the grip on the pin feathers which has been developed into this new wax. That is one of the reasons why paraffin wax is not so good.

Mr. MURPHY: I see that some of these patents have been registered in some of the countries behind the Iron Curtain; do they respect our patent rights in those countries?

The WITNESS: That is a difficult question to answer. That patent was taken out in the early days of the war.

Mr. MACDONALD: The Consolidated Mining and Smelting Company were operating the plant at the time that was developed and they made the patent application in the first instance.

Mr. GIBSON: Is there some continuing revenue from that patent?

Mr. MACDONALD: That has been one of our most profitable patents. We worked out a scheme for licensing it on a basis of plant capacity and we do not have any policing to do; they pay us a lump sum.

Mr. GIBSON: Per annum?

Mr. MACDONALD: No, it is a lump sum, once and for all.

The WITNESS: We licenced that patent for so much money depending on the capacity of the plant.

Mr. GIBSON: Payable in a lump sum.

The CHAIRMAN: I wonder if it is made clear for the record that it is the ammonium nitrate patents that we are talking about now, not the poultry plucking wax patents. I just wanted that made clear for the record.

Mr. COLDWELL: Are you getting any revenue from Poland or any of these countries?

Mr. MACDONALD: No, our licences so far are in the United States and France. Two companies in Canada have a patent licence free because they had a part in developing the process.

Mr. GIBSON: Why are your licenced patents not listed in this book? Is it because once you license them they are no longer available to anyone else?

Mr. MACDONALD: In some cases we issue non-exclusive licences, in that case they are listed, but in cases of exclusive licences, they are not listed because they are no longer available.

Mr. GIBSON: How do you determine whether it will be an exclusive licence or not? Is it the economics of the thing that determines that?

Dr. MACKENZIE: The policy of the National Research Council has been carried over to the corporation and our policy was to do all our negotiating in

the interest of the people of Canada, as far as Canada was concerned, and that is the pattern. Outside of Canada our negotiations are based on a strict business proposition. If we are selling something to the United States or a foreign country that has no impact on Canada at all, we get the best price we can. If it is in Canada the public interest philosophy has to enter the picture, and this means we cannot be very dogmatic about saying what is to be non-exclusive or exclusive.

Mr. LOW: On what type of thing would you grant an exclusive patent? Would it be one of these electronic machines we saw?

Dr. MACKENZIE: Generally speaking, the exclusive feature is given when that is the only way to get the greatest distribution or production to the people. No company can afford to take up some of these patents unless they have an exclusive licence over a period as they have to put in a lot of money and development and would not take them up at all on any other basis. If it is something we want to get into distribution in the interest of the people we will make that sort of deal.

Mr. GIBSON: You said, for a period. Is there a finality to it?

Dr. MACKENZIE: Yes, they are all for definite periods. I think it is true in most of our cases we do not give exclusive licences. We give an undertaking, at least we say we will not issue a second licence providing the licensee is exploiting the thing well and his price is low and he is not taking advantage of the position; generally speaking, we have that arrangement.

Mr. LOW: What is the usual period?

Mr. MACDONALD: The life of the patent, seventeen years.

Mr. MURPHY: Doctor, what position are you in, or are we in rather, supposing there is a patent registered for some development, say, on a carburettor. Let us suppose that one of your scientists develops some new gadget, using that term, for this particular carburettor, and then that patent is registered. What use can be made of it?

Dr. MACKENZIE: Do you mean re-develop that?

Mr. MURPHY: Yes, in view of that fact that this patent on this particular carburettor is registered now, and you have made an improvement on it, what happens?

Mr. MACDONALD: Under those circumstances our licensee would have to arrange with the owner of the basic patent to use it. We cannot.

Mr. MURPHY: Is there some bargaining there?

Mr. MACDONALD: That is right.

Dr. MACKENZIE: When we advertise we get the people who are interested. If it were a matter of exploiting an article and one company held the basic patent, the offer of that company would be more attractive than it would be if somebody else held the basic patent; therefore, we would say that the former company is the best company to deal with in the public interest. In other words, we would prefer to deal with the company holding the basic patent.

Mr. COLDWELL: Suppose the holder of the basic patent would not use the improvements?

Dr. MACKENZIE: Well, you cannot do anything about it if you cannot use the basic patent.

Mr. COLDWELL: I think Mr. Murphy had in mind the use of the patent that would improve the carburettor.

Dr. MACKENZIE: I can give you a case of that kind that arose in the war.. Some of our scientists developed a compound which had as one of its ingredients

a substance which was patented, and unless arrangements could be made to get permission to use this patent or licence, the invention could not be put into operation. But that can always be done at a price.

Mr. COLDWELL: Have you had any cases where they refused to do it?

Dr. MACKENZIE: I cannot recall any cases. I do not think that happens very often, at least to my knowledge; I have never heard of it. Have you, Mr. MacDonald?

Mr. MacDONALD: No.

Dr. MACKENZIE: But it does affect bargaining. It would be more valuable to a company with a family of patents.

Mr. GIBSON: You know there is a lot of public mis-information around. I have heard it said that it is very easy for the oil companies to keep down patents that would develop carburettors that would enable a car to go a hundred miles on a gallon of gasoline. Is there any validity in those things? Have you ever run across anything like that in your experience?

Dr. MACKENZIE: We have no evidence at all that such is the case.

Mr. GIBSON: That is very interesting because these canards come up all the time.

Dr. MACKENZIE: We are not a very large patent organization and all I can say is that within our experience we have never met anything like that.

Mr. MURPHY: Do you respect the patents behind the iron curtain?

Dr. MACKENZIE: That is a purely theoretical case. We have nothing to do with them and we have no evidence they are using any of our patents. I do not believe we have had any correspondence with them. It is just an iron curtain. We just do not know. On the other hand, we would have to recognize any patent which was issued by our Canadian patent office.

Mr. COLDWELL: Have the representatives of Russia and their satellites access to our patent records?

Dr. MACKENZIE: Yes.

Mr. COLDWELL: But we have no access to theirs.

Dr. MACKENZIE: No.

Mr. COLDWELL: So we do not know.

Dr. MACKENZIE: We do not know.

Mr. MURPHY: You do not have to respect their patents then?

Mr. MacDONALD: You see, the Canadian patent is valid in Canada; no other patent matters in Canada except a Canadian patent.

Mr. GIBSON: Once you register a patent you have to make it available to all the people?

Mr. MacDONALD: Yes, that is right.

Mr. GIBSON: If our Canadian patent office could issue a patent to a Russian firm for some particular thing, they have to make that article available.

Mr. MacDONALD: The commissioner of patents can issue a licence on it or can cancel the patent.

Dr. MACKENZIE: That has nothing to do with our activities.

The CHAIRMAN: That is under the general patent law. Any further questions?

Mr. COLDWELL: There is an international agreement on patents?

Mr. MacDONALD: Yes.

Mr. COLDWELL: Czechoslovakia, Yugoslavia, Rumania, and those other countries, are they all parties to that agreement?

Mr. MacDONALD: Yes.

Mr. GIBSON: Are the directors of Canadian Patents and Development Limited paid or is it an honorary position?

Dr. MACKENZIE: Honorary.

Mr. GIBSON: It was wonderful the amount of co-operation you are getting.

Dr. MACKENZIE: I am very glad to hear that praise. In our organization we get the very best people in their fields in Canada who will do these things on a voluntary basis; they would not do them unless the activity was sound and efficient.

Mr. COLDWELL: It means a private gain is not always an incentive to work.

Mr. McCUSKER: Must that be incorporated in the record?

The CHAIRMAN: I notice the total administration expenses shown in the annual report in the last fiscal year amount to \$11,500. That is the total administration expenses of the patent corporation. I think that pretty well answers the point.

The WITNESS: In that connection, Mr. Chairman, I may say that this is, from the government standpoint, a new venture, and while we have made great progress we have tried to explore the avenues that we should go down before we spend any money on them. We have tried to operate on a very economical basis, and cover the field as best we could, and an indication of the co-operation or the method in which industry ties in is the publicity which we receive in industrial magazines and newspapers as news items.

Mr. MURPHY: Mr. Birchard, have you had any cases where some of your employees who have been interested in a patent showing some possibility economically of development, leave your organization and then develop the patent, and proceed to follow their intentions?

The WITNESS: Dr. Mackenzie could probably answer that.

Dr. MACKENZIE: I cannot recall a single case.

Mr. MURPHY: The reason I asked was that there seemed to be a rumour floating around last year that someone who had been in the employ of the National Research Council, had left it, proceeded with patents, and proceeded to make a great deal of money.

Dr. MACKENZIE: No, I would certainly think that we would have heard about it if that had happened. We know of no such case. It would be quite legitimate for a man to leave our employ and go to some other organization, and subsequently, out of his later work take a patent.

Mr. MURPHY: You mean there is no instance where a former employee registered a patent in his own name?

Dr. MACKENZIE: We do not know of anybody who has done so. We do not know of any such patent. I am quite sure if anybody made a great deal of money it would be difficult to keep the information away from his former colleagues, and I think one would be perfectly safe in saying definitely no; but all we can say at the moment is we have never heard of such a case.

Mr. COLDWELL: That is a great tribute both to your organization and to the employees.

Dr. MACKENZIE: You see, there is another thing: a man could not do the work without us knowing about it, and this is to be said about patents, there are very few patents that are the work of a single man in these days of advanced technology.

Mr. McCUSKER: Are these patents very remunerative?

Dr. MACKENZIE: Not in the overall picture because we have to protect ourselves against counter-patents. You see, one of the most disappointing

things in the world is to bring out something and not patent it and then find yourself paying royalties on the same work to someone else. So we patent anything which, in our opinion, might fall within that category. The experience of everyone concerned is that the percentage of highly remunerative patents is small.

Mr. MURPHY: Do you have any of your patents challenged?

The CHAIRMAN: Mr. MacDonald could you answer that?

Mr. MACDONALD: Quite frequently at the application stage many of them have to be abandoned due to prior art.

Mr. GREEN: Is it not possible for an employee to work out an invention in his spare time, and then get that patented?

Dr. MACKENZIE: It is not supposed to be done and I do not think it is legal.

Mr. MACDONALD: As a matter of fact, we had one such case which was rather amusing. An employee applied to us for the right to take out a patent in his own name, and of all things it turned out to be a baby toy retriever. We told him that the Council had no interest in the matter.

Mr. McCUSKER: Would that be a bronchoscope?

Dr. MACKENZIE: May I say this as a matter of general information: we have the right to reward an individual. And I think if the case was one where an employee had conceived something, to which the Council had contributed nothing our people would be inclined to reward him a little more generously than they would in the normal case where the idea occurred in the normal course of duty.

Mr. MURPHY: By way of illustration what would some of these men get by way of reward?

Dr. MACKENZIE: Five per cent of the gross receipts.

Mr. GREEN: How much has been paid out to any of these inventors under that arrangement?

Mr. MACDONALD: \$7,313.40, in the last fiscal year. This has been paid as bonus to inventors.

Mr. MURPHY: Is that on the nitrate?

Mr. MACDONALD: No, none on the nitrates, because those people were not employees of ours.

Mr. GREEN: Over what period were those payments made?

Mr. MACDONALD: That is for just one year. It just started on the first of January, 1949.

Mr. McCUSKER: That would be divided among how many people?

The WITNESS: This bonus was retroactive to inventors here on our staff as at January 1, 1949. We went back that far. If one of the inventors was on our staff at that time, then we gave him a retroactive bonus on the royalty that had been paid on that particular patent.

Dr. MACKENZIE: For clarification, no bonus or reward had been paid to anybody at any time up till January 1, 1949.

Mr. McCUSKER: And that is the total amount?

Dr. MACKENZIE: That is the total amount in our whole existence.

Mr. Low: How many people would have received that \$7,313.40?

Dr. MACKENZIE: I think about a dozen. We fixed a minimum payment of \$25.

Mr. MURPHY: Dr. Mackenzie, is it based on a percentage? In other words, the total revenue that you have received is what?

Dr. MACKENZIE: It would be five per cent of the total revenue we received from the particular patent.

Mr. MURPHY: \$140,000 or \$150,000?

Dr. MACKENZIE: All of this would not be in that category.

Mr. MURPHY: I see. Tell me this, I think this raises an interesting point: is that enough to encourage these inventors?

Dr. MACKENZIE: That is a very interesting question and one we have given a great deal of thought to. It is a question on which there is a great divergence of opinion. Up until 1949—the Council started in 1916—there was nothing given at all and there are certain scientists who oppose it. They oppose the granting of any remuneration to the individual inventor on the basis that he is merely the end man on the play and that he is standing on the shoulders of so many other people that he is not deserving of special treatment, and that if we get our scientists patent minded then they may not—I am quoting the argument—devote their attention to their normal duties but will try for gain. Now, that is one school of thought. The other school of thought—and I am inclined to agree with this—is that it is in the overall interest to make a reasonable and nominal payment which is a reward for a bright idea, but we must not get so extravagant that it becomes the whole object in a man's life.

Mr. MURPHY: In your opinion have you enough people working on patents in your employ?

Dr. MACKENZIE: We took counsel with the Research Corporation of America, which is a non-profit organization with a long experience in this field, and long association with universities, and they came to the conclusion as a result of their experience that about five per cent was a very just and reasonable and quite satisfactory because this five per cent is on gross and not on net.

Mr. MURPHY: The point I raised was: in your opinion do you think you have enough people on your staff interested in developing patents?

Dr. MACKENZIE: We have a very good balance. We think the people are conscious of the importance of getting patents but we do not think we have many people who are working in their own interest.

Mr. MURPHY: What happens when a man develops something outside of your laboratory; suppose Tom Jones was developing a patent and was stuck and came to you?

Dr. MACKENZIE: Well, it would normally depend on how he was stuck. We would not work solely for the interest of Tom Jones.

Mr. MURPHY: But you would work with him?

Dr. MACKENZIE: Not unless there was public interest involved in it or unless he put up all the money.

Mr. MURPHY: I mean he could engage your services.

Dr. MACKENZIE: Well, he could if the thing was of public interest, but he could not engage them the way he could buy something from a shop.

Mr. MURPHY: I suppose it is a product that would be in the interest of the public?

Dr. MACKENZIE: It occurs more with industry than it does with individuals and we have three types of contracts that we make with industries depending on the interest. We will enter into a contract with industry but we would not like to with an individual because it usually would not be the type of thing that would be in the interest of the public. But we will enter into an agreement according to the facts as they are presented to us. If it is a trivial thing we

would not consider it at all no matter what the profit was; if it was something that would be of benefit to the country as a whole, industrially, or otherwise, we would do it, but that is a matter of judgment.

Mr. GIBSON: In other words, you would not experiment on bubble gum or things of that kind?

Dr. MACKENZIE: No.

Mr. COLDWELL: Do people send to you their ideas on inventions and so on?

Dr. MACKENZIE: No. We did get a certain amount of that type of mail during the war. Do you know, Mr. MacDonald, if we get any ideas like that?

Mr. MACDONALD: An occasional one.

Mr. McCUSKER: If an individual has invented something and wished to have you to pass upon it as being a satisfactory and useful patent, would you do that?

Dr. MACKENZIE: We would do that.

Mr. McCUSKER: I have an individual in mind who has invented a piston and I think he has written to the National Research Council but they do not want to have any part in it, or they said they were not interested in it.

Dr. MACKENZIE: The difficulty with most of these is that if our opinion is not favourable, they will not take it. That has been our general experience. But we would give an opinion. We would prefer him to have it patented, though, because we do not want to have ourselves exposed to the accusation that somebody stole the idea; so that is why we like to have them patent these things before we look at them. Major industrial companies make that a requirement; they will not look at an invention unless it is patented.

Mr. MURPHY: Take this as a case. Suppose there is a patent registered in Canada covering a tool known as a gun borer, a cylinder borer and so on, which would be useful, maybe in war. Now, I assume there are patents covering that particular project?

Dr. MACKENZIE: Would that not get into the secret category of defence?

Mr. MURPHY: The one I am thinking of is not, but the point I am making is this: what I want to find out now is, knowing that you have the knowledge of that type of machinery and its use, and its importance, does your Council or do your employees then engage in any further research on that project?

Dr. MACKENZIE: We have not to date. We have the power to do so if we wish, but up to the present time we have not met this situation. We want to be in the position to take a very good idea at the stage that it has reached in the hands of a man with limited capital, because it would not be likely to occur with a big company; but there might be the situation of an individual or small company getting an idea and working it up to a certain point where it looked very good to us, and we might then develop it to a point where it would be ready to manufacture.

Mr. GREEN: Dr. Mackenzie, is this Canadian Patents and Development, Limited the only governmental organization which is promoting inventions from the point of view of public interest, or is there some other government body as well?

Dr. MACKENZIE: I do not think there is any other just like it. To my knowledge there is no parallel company under the departments themselves; some departments have to do with patents just as the National Research Council did before the corporation was set up.

Mr. GREEN: You are really dealing primarily with inventions made by your own employees, that is the main work of this company?

Dr. MACKENZIE: Yes but there are a number of departments who have signed agreements with us for the handling of their patents.

Mr. GREEN: You mean departments of government?

Dr. MACKENZIE: Yes. I think in time most of them will.

Mr. GREEN: Well, what proportions of the inventions would come to the attention of this Canadian Patents and Development Limited?

Dr. MACKENZIE: Of the government?

Mr. GREEN: No, I mean of the total inventions in Canada.

Dr. MACKENZIE: I would not know.

Mr. GREEN: I take it that your field is a very small portion of the inventions that are made in Canada.

Dr. MACKENZIE: I would think so, some of the large companies must have very large numbers of inventions.

Mr. GREEN: Now, is there not some incentive left which would further lead to the development and further improvement of inventions? Take, for example, the English scientist who invented the jet engine. It was Sir Frank Whittle. The British government gave him £100,000 tax free for that invention. Now, that, of course, is not in the same category at all as what you are doing. You are giving this amount of five per cent, which you say is purely a nominal payment. Now, are we ever likely to get any really vital improvements or inventions under the present scheme?

Dr. MACKENZIE: I think that Sir Frank Whittle started very much the way we started. It is a long involved history that I know something about. But that settlement was not a simple settlement. He had a private company. He gave a great deal of his rights away. I think if you took the percentage on the gross involved in jet engines you might find that we are more liberal than they were with him. It was a very big development that happens only once in a long while.

Mr. GREEN: There are no doubt desirable inventions which would be very desirable in Canada and for which we could well afford to pay very large sums because we need the development so badly. Is there any provision at all under the present law to provide that incentive?

Dr. MACKENZIE: I do not think that you could say that anything has ever been held back on account of lack of incentive. I think that our plan is a reasonable plan. I can't imagine anybody holding back any invention on the basis of being underpaid by our plan.

Mr. GREEN: Your plan only deals with your own employees?

Dr. MACKENZIE: Primarily it was set up for that.

Mr. GREEN: What about the great bulk of inventions which are outside of your jurisdiction?

The CHAIRMAN: Mr. Green, if I may interject, is not that a matter of policy not related to the subject now before us?

Mr. GREEN: I would like to find out exactly what Dr. Mackenzie thinks.

The CHAIRMAN: I am not sure that Dr. Mackenzie is the one to determine the policy on matters outside of the Research Council.

Mr. GREEN: I am not asking him to determine policy, I am asking him if there is any policy.

Dr. MACKENZIE: I think you are confusing two things there, the patents handled under Patents and Development Limited and patents which have no relation to our work whatever, which are quite apart from our activities; and also that you are thinking of patents developed for war purposes during the war. I understand that the policy in England has been in most cases to give

compensation, and very generous compensation. After each war for military contribution during the war I think the policy we are following here with respect to patents originating within our organization in peace is much to be preferred to the policy they have followed over there during war.

Mr. GREEN: Is any consideration being given to the ways in which important inventions, and some of them are very important, can be furthered? Of course, that applies to people outside of your organization.

Dr. MACKENZIE: Of course, Mr. Green, that is beyond our jurisdiction.

Mr. COLDWELL: Aren't the two cases quite different? The man who is in the Research Council is an employee and he cannot use his invention on his own account whereas the private individual outside, if he can find somebody to back it for him, can go ahead and make whatever he likes out of it. Isn't that the difference?

The CHAIRMAN: Yes.

Mr. GREEN: What I am getting at is whether there is any method to induce people working on open research in a particular field on a particular object to go ahead and develop it.

Mr. MACDONALD: I think you will find there is no lack of incentive in the private field, and that all sorts of people are coming forward with all sorts of ideas.

The CHAIRMAN: I wonder if that whole discussion is not outside the field of the Research Council and outside the functions of this committee, and the activities of Patents and Development Limited?

Mr. GREEN: But Dr. Mackenzie has said that that corporation is the only public body which is trying to encourage invention in Canada.

The CHAIRMAN: Oh no, no; I am sorry; that is quite different. That is not what he said.

Dr. MACKENZIE: Oh no.

The CHAIRMAN: He explained the corporation in his own language and then Mr. Birchard and Mr. MacDonald, who are officers of the corporation dealing with patents made at the Research Council, gave a detailed description of how Patents and Development operates. They also explained how the inventions are developed, patented, and made available by licence to the use of industry, but they did not deal with private inventions outside.

Mr. GREEN: I thought he said that they tried to promote the development of private patents also.

The CHAIRMAN: No, he was quite clear on that and said they did not.

Mr. McCUSKER: May I suggest to Mr. Green that he would get a better understanding of the situation if he would wait until tomorrow and read the evidence that has been given before the committee today. I think if he will read the report of today's proceedings he will have a better appreciation of the subject.

The CHAIRMAN: If that is agreeable I think it would be desirable.

Mr. GREEN: What about the Inventions Board which functioned during the war? Is this Canadian Patents and Development Limited concerned with any of the work of that board?

Dr. MACKENZIE: Not at all.

The CHAIRMAN: Now, gentlemen, I wonder if we could deal with the bill for a moment, if that is agreeable. As we go through the sections of the bill any matters which arise can be dealt with if they have not been dealt with already.

Mr. MURPHY: I wonder if I could inquire in connection with the same subject that Mr. Green raised—I know it is a little complicated—whether this remuneration you give to your employees would be a percentage in each case?

Dr. MACKENZIE: Yes, sir.

Mr. MURPHY: The point which interests me in this is that there might be more incentive to the employee if the potential revenue was higher.

Dr. MACKENZIE: I dealt with that a few moments ago.

Mr. MURPHY: I know you did, but I can't get it out of my mind.

Dr. MACKENZIE: This is what I indicated. There are a large number of people who think they should not get anything at all, quite a number of people; and there are other people who think they ought to get something. We are really experimenting and exploring the situation. We are not dogmatic on the point as to whether it should be 5 per cent, or what it should be. That is what we have fixed for the moment, but if experience over the years shows that is not adequate, I would rather imagine the Council would be perfectly willing to consider a change. But we don't want to go to the other extreme and be working for the inventors primarily.

Mr. GREEN: What system do they use in Great Britain, what is their procedure there?

Dr. MACKENZIE: They are working out a scheme now. We discussed this the other day with Sir Percy Mills, and we found that they have no scheme at all and they thought our scheme, at least Sir Percy thought, ours was a very sensible sort of scheme.

The CHAIRMAN: I wonder if we could not deal with the bill now and possibly get it through?

Mr. MURPHY: This discussion comes under the bill anyway.

The CHAIRMAN: I spoke about that at the opening this morning and if it is agreeable I think we should deal with the bill at this time, because I think everything in the bill has been pretty fully covered in a general way. If there are no further general questions perhaps we could deal with section 1. The only change there is the addition of the word "a". It now reads: "(f) 'Vice President (Scientific)' means a Vice-President (Scientific) of The Honorary Advisory Council for Scientific and Industrial Research."

Mr. GREEN: Who is the official designated?

The CHAIRMAN: That would be Dr. Keys, at the Chalk River plant.

Carried.

Shall Section 2 carry?

Carried.

Shall Section 3 carry?

Carried.

Section 4:

4. Section seven of the said Act is amended by adding thereto the following subsection:

"(2) The Council may be called the National Research Council."

The CHAIRMAN: Section 4 is providing statutory authority for the term "National Research Council". That term has been covered by order in council since 1925 and has been in general use throughout but there is no clear statutory authority for it.

Mr. GREEN: Why not keep it the way it is instead of dividing it up into two names?

The CHAIRMAN: Because we have been using that name since the Council was set up in 1924, both names have been in general use.

Mr. GREEN: You are not going to add anything by putting in two names. Why not have just the one name? Surely only the one name is all you need.

Mr. MACDONALD: I think one of the reasons is that Council felt that this group of scientific men who acted in an advisory capacity with the particular designation of Honorary Advisory Council was really descriptive of the group of men who acted in that capacity, as distinguished from the National Research Council and the men who are doing the work there. I think that is the difference.

Mr. GREEN: Actually they are the same thing, there is only one Council, as set out in section 3 of the Act, which says they should be called the Honorary Advisory Council for Scientific and Industrial Research.

The CHAIRMAN: Yes.

Mr. GREEN: Why don't you change section 3?

The CHAIRMAN: Because we have this situation: we have in section 7 of the 1924 Act a body corporate created with the incidence of that, and over the years there emerged or developed a body which came to be known as the National Research Council; then we have voluntary personnel acting as an advisory council who are representative scientific men determining scientific policy and things of that nature; and it has been found in practice that the one term adequately and accurately describes the body of scientific men and the other is very useful in describing the body corporate, the actual corporation, and it has worked rather well in practice.

Mr. GREEN: That simply means that you can use them either in the right of the National Research Council or you can use them in the right of the Honorary Advisory Council for Scientific and Industrial Research.

The CHAIRMAN: That is quite correct, but there is the question of the legal use of the term National Research Council. There was involved the question of the legality, or should I say the validity, of the use of the term which has been used in general practice for the past 25 years. The reason for making the distinction, as in the case of this bill, is to give legal validity to the use of the term National Research Council; that needs to be clearly established.

Mr. GREEN: It seems to me to be a rather technical distinction.

The CHAIRMAN: It is rather descriptive of their true position; that is more descriptive of the true position of the National Research Council.

Mr. COLDWELL: Does it really matter?

Mr. GREEN: It might be very confusing to the public.

Dr. MACKENZIE: May I say, Mr. Chairman, that the present system is very confusing. I think the amendment as proposed would do away with confusion in the application of the terms and in their use, with the result that when we talk about the National Research Council people will know what we are talking about. I have followed the practice of using these two names because I have tried to avoid confusion. It is not so much a matter of legal description as it is a matter of eliminating continuous confusion, and we do that by using a title which clearly sets forth its function.

The CHAIRMAN: Shall section 4 carry?

Carried.

Shall section 5 carry?

Carried.

Section 6:

6. Paragraph (i) of section ten of the said Act, as enacted by section seven of chapter thirty-one of the statutes of 1946, is repealed and the following substituted therefor:

(i) To license, sell or otherwise grant or make available to others. Canadian or other patent rights or any other rights, vested in or owned or controlled by the Council, to or in respect of any discovery, invention or improvement in any art, process, apparatus, machine, manufacture or composition of matter, and to receive royalties, fees and payments therefor.

The CHAIRMAN: This brings things into line with the Patents Act in the main language of the section,

any art, process, apparatus, machine, manufacture or composition of matter.

Mr. GIBSON: What is meant by "composition of matter"?

The CHAIRMAN: That is when you are dealing with chemical inventions and patents; that is technical language.

Dr. MACKENZIE: These are really legal matters.

The CHAIRMAN: Yes, it is really using legal phraseology.

Mr. GREEN: Have you run into any actual difficulties?

The CHAIRMAN: We have not run into any actual difficulties. What we have run into is this, that without it the definitions are not adequate for the covering of certain inventions. There are no actual difficulties which have been run into yet, but the amendment will be an added safeguard.

Shall section 6 carry?

Carried.

Section 7:

7. Section eleven of the said Act, as amended by section eight of chapter thirty-one of the statutes of 1946, is repealed and the following substituted therefor:

"11. (1) Every discovery, invention or improvement in any art, process, apparatus, machine, manufacture or composition of matter made by a member or any number of members of the scientific and technical staff of the Council or a company and all rights with respect thereto are vested in the Council.

(2) The Council, with the approval of the Governor in Council, may pay to its scientific and technical officers and to others working under its auspices who have made any valuable discovery, invention or improvement in any art, process, apparatus, machine, manufacture or composition of matter, such bonuses or royalties as in its opinion may be warranted."

Mr. GREEN: Section 7 is the one which deals with patents. I would suggest that that might stand over.

The CHAIRMAN: My purpose in wanting to get the bill through today is in order to get it over to the Senate. Is there some particular point?

Mr. COLDWELL: We discussed this kind of thing pretty thoroughly this morning, we were dealing with it for half an hour or more.

The CHAIRMAN: Is there any point in holding it over?

Mr. GREEN: A lot of us want to talk about that section.

The CHAIRMAN: We can cover that in the evidence apart from the bill I think quite adequately. There may be other questions on the matter of patents which members will want to ask. We are not closing off the discussion on patents at all.

Mr. GREEN: There will be an opportunity for discussing this matter of patents?

The CHAIRMAN: Yes.

Shall section 7 carry?

Carried.

Shall section 8 carry?

Carried.

Shall the preamble carry?

Carried.

Shall the title carry?

Carried.

Shall I report the Bill?

Carried.

The CHAIRMAN: Then, gentlemen, if it suits the convenience of the committee, we will meet at the west door at 10 o'clock in the morning on Friday next week and proceed on our visit to the National Research Council laboratories on the Montreal Road. I understand that will be convenient to Dr. Mackenzie.

Dr. MACKENZIE: Yes, sir.

The committee adjourned.

SESSION 1950

HOUSE OF COMMONS

SPECIAL COMMITTEE

on the

OPERATIONS

of the

NATIONAL RESEARCH COUNCIL

MINUTES OF PROCEEDINGS AND EVIDENCE

No. 4

FRIDAY, MAY 26, 1950

THURSDAY, JUNE 1, 1950

TUESDAY, JUNE 6, 1950

FRIDAY, JUNE 9, 1950

WITNESSES:

Dr. C. J. Mackenzie, C.M.G., President; Mr. E. R. Birchard, O.B.E., Vice-President, Administration; Mr. J. H. Parkin, Director, Division of Mechanical Engineering; Dr. W. H. Cook, O.B.E., Director, Division of Applied Biology; Dr. E. W. R. Steacie, O.B.E., Director, Division of Chemistry; Dr. L. E. Howlett, Associate Director, Division of Physics; Mr. B. J. Ballard, Director, Radio and Electrical Engineering Division; Dr. H. H. Saunderson, Director, Division of Information Services; and Mr. R. F. Legget, Director, Building Research, National Research Council.

OTTAWA
EDMOND CLOUTIER, C.M.G., B.A., L.Ph.,
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CONTROLLER OF STATIONERY

1950

SPECIAL COMMITTEE
on the
OPERATIONS
of the
NATIONAL RESEARCH COUNCIL

Chairman: George J. McIlraith, Esq.,

Messrs.

Breithaupt
Brooks
Bourget
Coldwell
Gibson

Green
Kirk (*Digby-Yarmouth*)
Low
McCusker

Murphy
Pinard
Stuart (*Charlotte*)
Winkler

Clerk: A. L. Burgess.

MINUTES OF PROCEEDINGS

FRIDAY, May 26, 1950.

The Special Committee on the Operations of the National Research Council met at 10 o'clock a.m., the Chairman, Mr. George J. McIlraith, presiding, and proceeded to the Montreal Road Laboratories of the Council.

Members present: Messrs. Bourget, Coldwell, Gibson, Power (*Comox-Alberni*), Green, Kirk (*Digby-Yarmouth*), Low, McCusker, McIlraith, Winkler.

In attendance: Dr. C. J. Mackenzie, C.M.G., President, and Mr. J. H. Parkin, Director, Division of Mechanical Engineering, National Research Council.

The Committee reassembled in the Board Room on the Montreal Road, where it was met by Dr. Mackenzie, Mr. Parkin and senior members of the staff of the Division of Mechanical Engineering. Before visiting the laboratories, the Committee heard a brief explanation by Mr. Parkin of the organization and work of his division. Mr. Parkin's remarks are printed as *Appendix A* to this day's minutes of proceedings.

At 1 o'clock p.m. the Committee adjourned to the call of the chair.

THURSDAY, June 1, 1950.

The Special Committee on the Operations of the National Research Council met at 10 o'clock a.m., the Chairman, Mr. George J. McIlraith, presiding.

Members present: Messrs. Bourget, Coldwell, Gibson (*Comox-Alberni*), Green, Kirk (*Digby-Yarmouth*), Low, McCusker, McIlraith, Winkler.

In attendance: Dr. C. J. Mackenzie, C.M.G., President, Mr. E. R. Birchard, O.B.E., Vice-President, Administration, and Dr. W. H. Cook, O.B.E., B.Sc., M.Sc., Ph.D., F.R.S.C., Director of the Division of Applied Biology, National Research Council.

The Committee reassembled in the Board Room on Sussex Street where it was met by Dr. Mackenzie, Dr. Cook and senior members of the staff of the Division of Applied Biology.

Dr. Cook introduced the members of his staff present, and explained the organization and work of his Division. The Committee then visited the laboratories under Dr. Cook's direction.

The following are printed as appendices to this day's minutes of proceedings:

Appendix B: List of senior staff, Division of Applied Biology;

Appendix C: Organization, Division of Applied Biology;

Appendix D: Dr. Cook's remarks to the Committee on the organization and work of the Division of Applied Biology.

At 1 o'clock p.m. the Committee adjourned to the call of the chair.

TUESDAY, June 6, 1950.

The Special Committee on the operations of the National Research Council met in the Board room of the National Research Council at 10 o'clock a.m., the Chairman, Mr. George J. McIlraith presiding.

Members present: Messrs. Breithaupt, Brooks, Coldwell, Kirk (*Digby-Yarmouth*), Low, McCusker, McIlraith, Murphy, Pinard, Stuart (*Charlotte*), Winkler.

In attendance: Dr. C. J. Mackenzie, C.M.G., President, Mr. E. R. Birchard, O.B.E., Vice-President, Administration, Dr. E. W. R. Steacie, O.B.E., B.Sc., Ph.D., D.Sc., F.R.S.C., F.R.S., Director, Division of Chemistry, Dr. L. E. Howlett, Associate Director, Division of Physics, Mr. B. G. Ballard, B.Sc., Director, Radio and Electrical Engineering Division, National Research Council.

Dr. Steacie introduced the senior members of his staff and gave a brief explanation of the work of the Division of Chemistry. Guides were assigned and the Committee visited typical laboratories of the division.

Dr. Howlett introduced senior members of the staff of the Division of Physics, spoke briefly on the work of the division and accompanied the Committee on its visit to the laboratories.

At 1 o'clock p.m. the Committee adjourned until 1.30 o'clock p.m.

At 1.30 o'clock p.m. the Committee resumed and met Mr. Ballard and senior members of the staff of the Radio and Electrical Engineering Division. Mr. Ballard explained briefly the work of the division and assigned guides to accompany the Committee on its visit to the laboratories.

The following are printed as appendices to this day's minutes of proceedings:

Appendix E: Statement made by Dr. Steacie.

Appendix F: Statement made by Dr. Howlett.

Appendix G: Statement made by Mr. Ballard.

At 3 o'clock p.m. the Committee adjourned to the call of the Chair.

FRIDAY, June 9, 1950.

The Special Committee on the operations of the National Research Council met at 3 o'clock p.m., the Chairman, Mr. George J. McIlraith, presiding.

Members present: Messrs. Brooks, Bourget, Coldwell, Gibson (*Comox-Alberni*), Green, Kirk (*Digby-Yarmouth*), Low, McIlraith, Murphy, Stuart (*Charlotte*).

In attendance: Mr. E. R. Birchard, O.B.E., Vice-President, Administration; Dr. H. H. Saunderson, Director, Division of Information Services, and Mr. R. F. Legget, Director, Building Research, National Research Council.

Mr. Birchard and Dr. Saunderson were called, heard and questioned.

Dr. Saunderson tabled a copy of *War History of the Associate Committees of the National Research Council* and of *The War History of the Radio Branch*.

Dr. Saunderson retired.

Mr. Legget was called, heard and questioned.

Mr. Legget tabled the following pamphlets:

1. *Better Building Bulletin—Condensation in the Home;*
2. *Canadian Government Specifications Board;*
3. *Building Research, Progress Report, 1949;*
4. *Building Research—An outline of the Tasks Ahead.*

And also the following charts;

1. *N.R.C.-D.B.R. Dominion Wide Activities, May, 1950;*
2. *N.R.C.-D.B.R. Use of the National Building Code Documents, April, 1950;*
3. *N.R.C.-D.B.R. Organization of Division, Spring, 1950.*

The witnesses retired.

At 5.25 o'clock p.m. the Committee adjourned to the call of the Chair.

A. L. BURGESS,
Clerk of the Committee.

CORRIGENDUM

Minutes of Proceedings and Evidence, Thursday, May 11, 1950; page 35,
line 20:

52 per cent should read *34.5 per cent.*

MINUTES OF EVIDENCE

HOUSE OF COMMONS,
FRIDAY, JUNE 9, 1950.

The Special Committee appointed to examine into the operations of the National Research Council met this day at 3 p.m. The Chairman, Mr. G. J. McLraith, presided.

The CHAIRMAN: Well, gentlemen, we have with us today, Dr. Saunderson, Director of the Division of Information Services, and we have Mr. Legget, the Director of the Division of Building Research.

Since our last meeting as recorded by the printed evidence we have had one meeting at the Montreal road laboratories and two meetings at the main building on Sussex street. That raises the question with respect to the evidence, or a summary of the evidence of these three meetings. Now, I have asked to have notes prepared by the directors of the divisions and I have them here; they have just come to me now. I have not read them nor seen them, nor has the committee clerk. We have them all except for the Montreal road visit and those notes will be along in a day or two.

What is your wish with respect to the handling of that material? Do you want to go over it or have the clerk go over it, and print it?

Mr. GREEN: I would think so.

Mr. LOW: Just what is its form?

The CHAIRMAN: It is just the details of what we saw, and mainly based on the outline of the introductory speech of the director. It is purely descriptive in that way.

Mr. LOW: I would think that it would be a very fine thing to have it printed.

The CHAIRMAN: Well, then, I will check it over as to form, have the clerk correct the form, and then we will print it—

Some Hon. MEMBERS: Agreed.

The CHAIRMAN: —then we will go on with that and hope to get it printed fairly early.

Now, there is a typographical error in one of the figures given in the evidence one day. On page 35, a question was asked by Mr. Green as to what percentage of the staff was contributing to the Civil Service Superannuation scheme. The question was:

Q. That is a very small percentage is it not?—A. It appears small again, but when we break it up, the scientific staff comprises 33 per cent; the technical staff 52 per cent;

That 52 per cent should read 34·5 per cent. I have no idea where the 52 per cent came from, it is an error, a mistake in the figuring. It was not anywhere in that subject or in the notes. I do not know where it came from; it is a pure mistake.

Mr. GREEN: It should be 34·5 per cent instead of 52 per cent?

The CHAIRMAN: Yes, 34·5 instead of 52. So, if we have permission we will have the clerk make a note of that correction in the record.

Now, you will recall on the last day we were sitting here we were dealing with administration and at the end of the meeting we digressed to deal with patents and developments and the Bill, and it seems to me that we could perhaps to our best advantage follow on today with the part of the administration having

to do with the information services. You will recall there were some questions being raised on it. Today we have the director of that division here. Perhaps we could deal with this part of the evidence first and then go on to building research; would that be agreeable?

Agreed.

Then, with your permission I will ask Mr. Birchard just to identify the position in the organization and then he will be followed by Dr. Saunderson.

Mr. E. R. Birchard, O.B.E., B.A., Sc., Vice-President (Administration), National Research Council, recalled:

The WITNESS: Mr. Chairman, in the scientific divisions we have one division called the Division of Information Services through which all scientific reports funnel whether from our own laboratory or from foreign laboratories, and the director of that division is responsible for keeping those reports in proper order so that they are available. I will leave to the director himself to outline to you how it is done.

Dr. Saunderson is the director of that division. He was born in Manitoba. He graduated from the University of Manitoba with B.A. and returned there for his master's degree. He taught at the university for two years and then went to McGill university from which he took his Ph.D. in 1932. After receiving his Ph.D. degree he returned to the University of Manitoba as assistant professor and continually stepped up until he filled the position of professor at the university. He was on the council for a year and a half, that is he was a member of the honorary advisory committee for scientific and industrial research for a year and a half before he resigned to take up an appointment with the council. At the time he resigned he was dean of Arts and Science of the University of Manitoba. With that introduction I will call on Dr. Hugh Saunderson to take over.

Dr. H. H. Saunderson, Director of the Division of Information Services, called:

The WITNESS: Mr. Chairman, and gentlemen, I think perhaps first I should indicate the general purpose of our division. It is primarily to assist in the flow of scientific and technical information either towards the people of the council and to other scientists in Canada from foreign countries and partially a reverse flow from the scientists of the council to other countries or to other people in this country. It is primarily to get the information from the research man who develops the information, and who writes a report or a research paper, to the person who can use that information either in his research or to some one who is interested in applying the information industrially. We are trying to facilitate the flow so that the information can get to the place where it can be most readily used.

I think perhaps, Mr. Chairman, it might be useful for me to point out at this stage that we are a little unlike some of the other information services in the government and in other places in that our job is not dealing with the general public as such. We are concerned primarily with the scientists, the applied scientists, and the industrialists who may use the information. There is a part of the council, I think it has already been discussed by the president—responsible for the general publicity releases for the general public. Mr. S. J. Cook, who is attached directly to the president's office, looks after the general information about the council's activities.

My field is really on the technical or on the scientific side and the audience with which we are dealing is somewhat more restricted.

Now, in our division there are four main sections. We are responsible, first of all, for the library of the council. That library was set up to serve the research workers on the council staff but it is also being used, and quite properly being used rather widely, by scientists in other places because we have, I think, the best scientific and technical library in the country. We have technical journals which many other libraries, even the better equipped universities, do not have, and when a research man, at, let us say, McGill, Queen's or Vancouver wishes to check a reference which his own library does not have, we have facilities for making sure that he has access to that particular article so he can read it and find out what information is contained in it.

By the way, I do not know what the policy of the committee is with regard to interruptions but it would be my preference if it is possible to answer any questions that a member wishes to ask just as we go along.

The CHAIRMAN: That has been our practice.

The WITNESS: Fine. Now, we receive either by purchase or by exchange or by gifts, because we receive journals of the Royal Society of Canada on the scientific side, about 1,200 scientific and technical journals. Most of these are issued monthly, but some are weekly, some quarterly, some fortnightly, from all over the world. It is quite a large collection in one sense but it is a very small total compared to the numbers that are being issued. We try to get the main ones. This matter of the transmission is complicated by the immensity of the flow. I had not realized myself just how much was being written up in journals of varying degrees of usefulness but there are probably at least 30,000 journals that are being issued somewhere in the world.

By Mr. Murphy:

Q. Do you get any from behind the iron curtain?—A. We get a fair number. We are subscribing to about seventy Russian journals. We had quite an extensive exchange arrangement with laboratories in Russia, and that carried on until a few years ago. We are sending to these laboratories the Canadian Journal of Research in exchange for publications of their laboratories. That is quite a common way of getting information from other places. You simply swap.

Q. Do they get ours?—A. Yes, they subscribe on quite a large scale to the Canadian Journal of Research, as we subscribe to the journals which they are publishing. The exchange system broke down and we had to go on to a straight dollar basis. We buy from them and they buy from us.

Q. Are there any other published that you know we do not get?—A. Oh, I am sure there are many we do not get because we are getting only about seventy and I know that there are some we do not get.

By Mr. Gibson:

Q. Do you automatically translate them when they come in?—A. No, not automatically. We have several translators who will translate specific articles.

Q. They scan over them?—A. They scan them but that is not taken care of in our division. There are ways in which you can tell what is being published without having to read the article. There are what we call abstracts, which are published from journals all over the world. Abstract journals give in six or eight lines a summary of what is in the paper itself. It tells us where it is published. Now, our research workers keep reading the abstracts in their own field, and they may see a reference to a paper in one of these journals and then they may ask for that journal to be translated.

By Mr. Murphy:

Q. Do they ever refuse to send out any journals if you specifically ask for them?—A. Yes, I think it is very difficult to get a special journal. Once in a long time we have tried but we did not have much luck.

By Mr. Gibson:

Q. You probably evinced too much interest.—A. I think it is a matter of general policy that they put so many impediments in the way. I do not know whether it is a matter of policy that they will not send us a particular journal. You write and the request seems to shuttle around a good deal from one agency to another and six or eight months after, you may get what you asked for or the thing may just die somewhere along the line.

Q. It might be that someone may hate to take the responsibility.

By Mr. Stuart:

Q. Do you get the same proportion of information that they would acquire from Canada?—A. I think probably about the same proportion although it is very difficult for us to know what is available there. I would guess offhand perhaps the disproportion is not too great. It is purely a matter of guess.

By Mr. Gibson:

Q. Where does the Iron Curtain appear to come? Does it apply only to Russia or to the satellites, Poland, Rumania and those other countries?—A. It applies to a great extent in the satellite countries; it is difficult to say that because our experience with them has been rather short. Now the availability of this material for scientists outside of Ottawa either in university laboratories or industrial laboratories, or in research institutes like Banting and Best Institute in Toronto has been a bit of a problem up to the present time. We feel a very considerable degree of responsibility for making sure scientists in those places should have access to research papers which are of use to them. The normal procedure in the past has been inter-library loans. For example, if a scientist in Winnipeg has not in his library a particular paper where there is a reference of importance to him he asks his librarian to write to the National Research Council to obtain this particular journal.

Mr. GIBSON: How would he know it was available in the first place?

The WITNESS: There are a number of library devices in the way of lists of available things—union lists—and we have done a certain amount in that field in making known our own resources. The librarian would write to us and borrow the journal which contained the paper of interest to the scientist.

That business has been growing at such a rate that it meant a fairly substantial fraction of our material was out of the library on loan, at places where it was not so easily recoverable. You have to leave the material in places like that for a period of about two weeks—that is the normal time. As a result of this difficulty of having the material out of the library where it is of no use to anyone else we have just recently started a photo copying service. We make a photo of the particular article the man wishes (usually it is just a short article of six or eight pages) at cost, and send it to the library of the individual who wishes it and he keeps it. If he wishes to refer to it later he has it available at any time.

Mr. Low: It is a straight photostat?

The WITNESS: A photostat, slightly reduced from the original but it is legible. You do not need to read with lenses. That I think is enough about the function of the library.

The second section is the liaison section. We have a small office in London another in Washington; and a home office in Ottawa. There are these three liaison offices. Those were started during the war in order to enable fairly rapid transmission of material which was of importance to people in Canada who were working on research projects which were also phases of what was being worked on in the United Kingdom and the United States. In many cases those were classified projects and the ordinary channels of communication were not open. It was found to be satisfactory to have one or two resident people in those other countries. We have continued to do that although as the president has pointed out the council work is primarily on non-defence projects. We occasionally do special jobs for the Defence Research Board but not as a main feature.

The research officers in London, for instance, are responsible for the situation in western Europe as well as the United Kingdom. They are almost like trouble shooters in a telephone system. We establish contact with research institutes and organizations in the United Kingdom to provide for an exchange of information. They will send us reports and we will send them reports. Now, through changes in staff and clerical difficulties sometimes arrangements break down. It is then very useful to have a person in the country who can re-establish contacts, get into touch with people, and find out why the arrangement has broken down and get it going again. These men also have a great deal to do in setting up new channels of contact—new laboratories opening, and old laboratories which are developing along new lines. We find out what they are doing so that we will not overlap.

The liaison officers also have a very useful function in those countries in arranging for visits by Canadian scientists—not NRC scientists only but any scientists. A scientist going over to London may have in his mind three or four men to whom he wishes to speak. He will perhaps not know of the existence of half a dozen other men who are also interested in his field and who are knowledgeable in that field. The liaison officer is very useful in telling the visitor that he should see so and so in their labs and he arranges appointments.

The liaison offices are also doing a bit of work in setting up a translation index. You were asking about the translation of specific articles in the journals. There are thousands of foreign language journals. We are translating certain articles in our library but other articles are being translated in other places. It is obviously a duplication if we do a translation and somebody else does the same one. The liaison officers are engaged in setting up a translation index more or less internationally, as far as we can make it work, so when an article is translated all the information about the article will be sent to participating countries. If a man in Canada wants a translation and we know there is a translation at the National Institute of Health in the United States we simply write down there for the translation instead of doing it ourselves. It is a much quicker and cheaper way of doing it. It is a device for avoiding duplication of work.

The third section of the Council division on information service is that on publication. We publish the Canadian Journal of Research which is a scientific journal. It comes out in six different parts. They have different covers and they deal with physics, chemistry, botany, zoology, medical science, and technology. These are for sale and we have subscribers from all over the world. As a matter of fact four-fifths of the total subscriptions are from non-Canadian sources.

Mr. GREEN: How many go to the States?

The WITNESS: It really varies with the different sections but I would think perhaps two and a half times the Canadian circulation goes to the United States. It is the largest by far of the single countries. Just thinking offhand I would suggest that 40 per cent of our circulation goes to the States; it is of that order, but that might be a little high or a little low. Great Britain is the next biggest group and the others are spread all over the world to other commonwealth countries, other European countries, South American, and Asian countries, and so on.

Mr. Low: What is the subscription rate on those?

The WITNESS: For the complete set it is \$8 a year—for the six journals.

Mr. GIBSON: Published how often?

The WITNESS: Two are monthly and four come out every second month.

In addition to this journal our division is responsible for circulating a great many other forms of publications.

Mr. GIBSON: By the way, does the Printing Bureau print those?

The WITNESS: Part are printed at the Printing Bureau and part at the University of Toronto Press. Three are done at the Printing Bureau and three, the ones on physics, chemistry, and technology, are done at the University of Toronto press.

Mr. Low: What is the reason for that?

The WITNESS: It is a difficult publishing job in the technical sense. A great many mathematical symbols and so on are used, and another reason is we find it easier to keep three parts in one place and three in another instead of having an overload on one printing establishment.

Mr. MURPHY: There is no big income from that?

The WITNESS: The income goes into the consolidated revenue fund.

Mr. MURPHY: It would not meet the cost.

The WITNESS: The sales would not, no. We use these on a wide distribution basis other than for sale. We use them for exchange. We can make them apply against subscriptions we do not have to pay for—if we were cost accountants we would not do it that way I suppose.

There are different types of reports which come out. The research divisions are responsible for the material which goes into most of these reports. There are a number of them. This is one which came out during the war through the Associate Committee on Medical Research, "Recognition and Treatment of Shock." This has been fairly extensively printed.

Mr. COLDWELL: Do you have much exchange with the Soviet Union.

The WITNESS: We have not much exchange but we do exchange. We are now on more of a straight purchase deal. We buy theirs and they buy ours.

The CHAIRMAN: Would you care to give the names of some of the other special publications?

The WITNESS: Some of those publications are really books. Some of you were, I suspect, and the Council was quite interested in the Trail smelter investigation. There was a report on the effect of sulphur dioxide on vegetation. It was quite big. It is numbered as a report but it is still bound as a book. There were some three or four hundred pages to it. Obviously it has to be treated as a book in the ordinary sense. Certain Council staff were actually engaged in that investigation.

We also have occasionally subsidized and have done a good deal of editorial work on research volumes by Canadian scientists. We have not done much of this but we have done a little. Professor Maclean Fraser from British Columbia wrote quite a scholarly work on hydroids of the Pacific coast. He covered the Atlantic coast as well.

Mr. GIBSON: Hydroids?

The WITNESS: A special marine name.

Mr. COLDWELL: Was it a big book?

The WITNESS: Yes, a big book. It is not the kind of book which would be commonly useful to a publisher and it is almost bound to be produced at a loss. In this particular case Professor Fraser raised the question with the Council as

to whether they would give some assistance. The Council voted enough money to publish the book and the book was then circulated to scientific libraries which were interested.

Mr. LOW: It is almost as thick as a big dictionary.

Mr. GREEN: Professor Fraser was a good man.

The WITNESS: First class. The Council is very careful when publishing these things and when giving grants for publication that the work is first class scientifically. We are not interested in helping anything but first class scientific work. We are not interested either in helping publish anything which could be published in the ordinary way. There was one done on "Fungi of Manitoba and Saskatchewan". Dr. Bisby was the senior author and Dr. Buller collaborated with him. That was done some years ago but about a month or six weeks ago another volume came out on "Fungi of the Maritime provinces".

Mr. LOW: How is that distributed?

The WITNESS: Normally to libraries throughout the world which are interested in this particular subject. In this case a botanical library would be obviously the place, and research libraries in the field of botany too.

In addition to booklike publications we have a good many others in varying fields. As I say the laboratory work, and in some cases the actual preparation of the report, the getting it into shape where it can be distributed and so on, is done by the research division. In some cases they do the work and ask us to do the editorial work to get it mimeographed and so on; or, if it likely to be a best seller, it would be printed.

Mr. BROOKS: How large a staff would you have?

The WITNESS: Dealing with the Canadian Journals—six people full time and one member part time. They do not do all of the work. It is the research man who really does the work. All we do is the polishing up afterwards. I know that in many cases—for instance Mr. Legget will tell you of his work—the laboratory divisions do everything including the printing work. He sends us some copies for distribution but all we have to do is to sit there and accept his kindness.

One other job we did in connection with the report series was on the war history of the Council. Each of the laboratory divisions which was involved during the war wrote up its own activities. Then, in order that they should all be reasonably uniform, one of our staff went over all the manuscript and checked it for general headings, style of type, and so on, before the things were run off. We have those issued now. Most of them are unclassified documents but there are a couple of them classified.

Mr. MURPHY: Would that book be available to members? That should be of some interest?

The WITNESS: Yes.

There is one thing I might say although I had very little to do with it other than casual assistance. There is to be a book issued (I think it will be ready about the 1st of September or the middle of September this year) written by Mr. Wilfred Eggleston which will be a summary war history of the Council. These ones here are six sectional books which go into more technical detail and they are not of as much general interest, but the Eggleston book I think will be available about the middle of September.

Mr. COLDWELL: They will be available to us?

The WITNESS: Yes.

Mr. GIBSON: Is there nothing in the way of classified material printed in that book?

The WITNESS: This one? No.

The CHAIRMAN: You have no objection to having copies tabled?

The WITNESS: No, but we cannot table the classified ones. I only brought one volume down—this is the radio branch war history.

The CHAIRMAN: I will have them tabled.

The WITNESS: The fourth section of our division is the technical information service. This was started just about the end of the war. It was initially a joint effort of the Council and the old Department of Reconstruction and Supply. It was based on the philosophy that there was already available in published literature—technical and scientific literature—a great deal of information which would be of help to industries and more particularly the secondary industries. The information was available; it was written down for anybody to read who wanted to read it. But most companies are so small they cannot afford to have a big library and they cannot afford to have a big technical staff, and consequently there was information that might usefully be employed in their business but they just did not know about the information. They had no idea the information existed nor would they have known where to look for it even if they had heard of it.

In order to try to help in that problem the two departments set up an organization which, after a year or two was taken over by the Council and it is now part of our division. It is the technical information service which is in two parts. We have representatives in the various centres across Canada; in the larger cities like Vancouver, Calgary, Saskatoon, Winnipeg, Ottawa, Montreal, and Quebec.

By Mr. Gibson:

Q. Are they full time men?—A. Full time officers. It is the responsibility of the representatives to call on the industries of his area. The areas in the west are almost definitely provincial, excepting that the Manitoba man runs down to the head of the lakes because it is easier to service that point from Winnipeg than from Toronto. They have their own respective areas.

Q. Do you get reports coming in from them as to who they have called on?—A. Not specifically as to who they have called on but they do call on industries and talk to the president, or the manager, or the superintendent, or somebody in a senior position.

The CHAIRMAN: I might add that I was very closely associated in earlier times with this matter when it was under the old Reconstruction and Supply Department. At that time—at the end of the war—as the War Assets Corporation was developing and disposing of Crown plants, it became readily apparent there was a great mass of scientific research information available to industries but that industry did not seem to be aware of it nor to be making full use of it. These field men in the research and development branch of that department went out in the different areas travelling around to industrial firms and particularly the small new ones—the ones which would not have any research facilities of their own—acquainting them with what was available and finding out what their scientific and technical problems were. They directed those inquiries to the appropriate research sources—whether it was the Research Council or another government department, a university, or to wherever the work was being done.

Mr. MURPHY: I would think that the committee would be interested in knowing whether any calculation has been made, in dollars and cents, as to what the Research Council has been worth to industry?

I would ask Mr. Birchard if there has been such a calculation?

The WITNESS: I am very glad that the question was directed to Mr. Birchard.

Mr. BROOKS: I would like to ask the witness what training those men would have? They would have to have a very wide knowledge of industry would they not?

The WITNESS: Not too much. They are all graduate engineers or graduate applied science people. We do not expect them to know the answers to all the questions raised. Their function is to call on industry and find out specifically what technical difficulty the company may be having. They write down on a regular report form the details about the difficulties and it is quite important that they should be specific about the exact nature of the difficulties. There are many problems where a slight variation would involve an answer of a different kind. That is one important use of those men.

Mr. BROOKS: They would not be able to say what books were available?

The WITNESS: No, they do not try to do that. They write down not only a statement of the difficulties but they also put in the report some indication of the technical staff in the company. If the company has a graduate engineer or several of them an answer can be written of a type that a non-technical man could not follow clearly. Our field men put down the technical assistance available in the company as a guide to the information officers here, who may be concerned with the problem.

Mr. GREEN: How long have you had that system?

The WITNESS: It has been running now for nearly five years.

Mr. BOURGET: Are those men permanent employees? Have they got an office in every city?

The WITNESS: They have offices in Vancouver, Calgary, Saskatoon, and so on.

The CHAIRMAN: That was what was known as the Research and Development Branch of the Reconstruction and Supply Department. That is where that service started originally.

The WITNESS: They have been operating about three years under the Council.

By Mr. Murphy:

Q. Would it be possible for the Council, following the question I asked a moment ago, to take a brief period of three months or six months of where you know industry has benefited from your research, and give us some estimate in dollars and cents as to what that has meant to industry?—A. That is very difficult because it may be in connection with the production of some particular article that industry is having trouble. We will say the trouble is in making rubber stick to some particular kind of steel. Dr. Saunderson will probably bring up some samples before he is through. By making the information available, or by them getting the information from us as to how it might be done, that manufacturer may be able to improve his product but the advantage is difficult to resolve in terms of dollars and cents.

Q. Have you any projects where it can be specified in dollars and cents?—

A. I would doubt if you could evaluate management skills or selling capacity.

Q. Very often it would mean cutting costs?—A. It might be cutting costs.

Q. I can appreciate the difficulties.

Mr. BIRCHARD: For instance it might be in connection with the reaction of salt water on cement. You go to work and improve it but I do not know how you can assess it in dollars and cents.

Mr. GREEN: Is it possible for industry to get in touch with the Research Council direct—instead of dealing with the local men?

The WITNESS: Oh, yes. We receive each month a fair number of inquiries which are addressed simply to the National Research Council, Ottawa. We also

receive a good number of inquiries which are addressed to the technical information service, Ottawa. Those come down to Ottawa without any reference to the local representative at all and they are answered in the same way—perhaps I should not say in the same way because they are usually not as definitely worded. Not infrequently, queries that come in result in a certain amount of correspondence between the people in Ottawa and the original enquirer. To get the details which the man did not put in his first letter, it is necessary to write back giving only a general answer. We sometimes have to get further information before we can answer the question.

I should point out at this stage that in relation to these queries which come to us, we try to refer the matter when it gets to us to the person who is best able to prepare an intelligent answer to the question. If it is a problem in certain fields we will do it ourselves. We have a number of information officers on our own staff and they search through the technical literature in the library and not infrequently have discussions with the people in the labs. They practically all have a good many friends in other places who are knowledgeable in special fields and they get the best current information that is generally available to answer a specific query. Now, if it is in some field, for example, if it is mining and metallurgy, we do not try to deal with it unless it is a topical question; we normally send that to the Bureau of Mines and they will answer questions which we send them, because they know a good deal more about that field than we do. The same thing applies with the forest products laboratory. There are many problems dealing with the handling of wood where they have better information and far better sources of information than we have. We have a working arrangement with six or seven government departments, and they have been exceedingly helpful to us. Questions involving building research are referred specifically to Mr. Legget who has a number of very competent men in this field, and I can say competent because he “stole” two of them from me. They are dealing with this problem in respect of building research, which is a field where they have far better sources of information than we have ourselves.

By Mr. Murphy:

Q. Has any new industry started or developed because of work in the Research Council?—A. Not directly through T.O.S. There have been a number of cases where they have had started following research work done in the laboratories. We do not attempt to do in our division any actual research work. Ours is an information service.

Q. The question should be directed to Dr. Mackenzie.—A. There are a number of companies that have started in new fields based on information we have provided. They have expanded their operations. In one case a manufacturer who was in one field was interested in another field but he did not know how to get started in it.

Q. That is the kind of answer I would like to have had to my question of a while ago.

The CHAIRMAN: One was sticky paper for flies. Things like that. A new plant I know of got their information for manufacturing fly paper, I think. It is a matter of getting certain formulas and certain materials for the sticking qualities of the paper.

Mr. MURPHY: I think, Mr. Chairman, in the broader aspects we have overlooked just that one feature, the increase in employment, the increase in capital that comes into our industry and economy because of what has been done in the Research Council.

The CHAIRMAN: I was never able to get any statistical or dollar figure on it. I used to have a monthly report of the inquiries, quite an accurate report, a thorough report indeed, from the old research and development branch, but I

never could succeed in getting it down to any statistical basis, as to what value the research information given was in terms of dollars and added employment and so on.

By Mr. Green:

Q. Is there any charge for those services?—A. No, there is no charge for them; the service is free. I should say rather it comes out of the general N.R.C. vote. The individuals across the country pay for it in their taxes. I do not like to use the word "free", because it is not really free.

Q. Suppose a firm wants research work done, will they have to pay?—A. If they want research work done they will have to pay for that and that is covered by a form of an industrial contract of the type Mr. Birchard arranges with a number of companies, or it may be that the research work is done at some closer research organization. For instance, some of the queries that come to us involve additional research and if it is in British Columbia that work may be done in the British Columbia Research Council; if the query originates in Ontario it may be done at the Ontario Research Foundation, and the same thing with the Nova Scotia Research Foundation and so on. We try to put the original enquirer in touch with somebody who can do it. If it is a straight analytical job we will put him in touch with analysts in his own area.

Q. In other words your scouts could turn over a job to the provincial Research Council?—A. Yes, and in many cases do. Also, the provincial people not infrequently use us for additional information which they have not in their own libraries. We receive and answer a good many enquiries from them. The provincial organizations receive the same sort of answer except they are usually even more specific than the requests we receive from industry generally.

Q. What proportion of your work of research comes in through these enquiries?—A. The actual overall research carried on by the council?

Q. Yes.—A. Not very much; I would not like to hazard a figure but it certainly would not be large. It would be difficult actually to gauge that because the research programmes are based on a decision of the division of the council which is concerned with that field. We may go to a man, let us say, in chemistry with half a dozen problems and after the sixth problem has come to him, he may say that is an interesting thing to work on and he may then try to put that in his research program. But in that case it is a decision of the chemistry division.

Q. How many such plans would come in, say from Manitoba or through your representatives?—A. How many requests for information?

Q. No, for research work.—A. I would not know. There would not be very many, I think, for research work. We have many queries from Manitoba.

Q. Your representative also handles these queries?—A. Yes, that is his job. He is the man who, in a sense, puts down in accurate form what the query is because he calls on industry in Manitoba. We try to supply the information and in some cases we know the information has been useful.

The service is confidential in that we do not disclose to any possible competitor or outside supplier the name of any enquirer who is asking any of these questions. Companies do not like their interests in certain fields to be known even if they are not doing anything in that field at the time. They do not want anybody else to know what their interest is until their mind is made up that they want to go ahead, so we try to be very careful that no information gets out to any possible competitor or to a possible supplier. We do not want people to enquire of us as to how to do certain things and where to get equipment and then have twenty-five equipment company representatives going after them. If they want, we will suggest suppliers to them; they may write to them; that is all right, the contact there is direct. But it is a question of keeping their own business interests reasonably and discreetly hidden.

Mr. COLDWELL: Is there an office in the maritimes?

The WITNESS: Yes, we have an office in Halifax and we have an arrangement with the Department of Industry and Reconstruction in New Brunswick. Mr. Paterson, an official of the provincial government department, sends his technical enquiries in to us for answers. It may be in some of the other provinces something similar may be done. We try to work in all cases with the provincial groups concerned so there is no overlapping of any activity.

Now here are a number of things we have done. I am going to give you some of these little folders which we send out. They give lists of addresses of our representatives on the back. Those go out to industries—they are sent in envelopes or left by representatives. On the inside you will see a number of examples of types of queries which have been asked us. You will notice there is no indication here as to who asked the question and in taking examples of this kind we tried to select examples which have enough companies interested in them that one company will not know that it must be their rival in business asking. Mr. Birchard has suggested we might perhaps outline one of these problems. The second one here was how to inflate a plastic toy. The manufacturer of the toys wanted a means of inflating a small plastic toy. The usual procedure for doing that is to put in a small pellet—a chemical soaked felt pellet. This manufacturer did not want to have the pellet inside rattling around afterwards. TIS suggested that he could get away from the difficulty by putting in a small pellet of carbon dioxide which would give off gas and, by taking the right size of pellet, he could fill the toy to the right size.

Mr. Low: Did he follow it up?

The WITNESS: In most cases we do not know. In some cases we do because they write in and tell us we have solved their problem and how happy they are.

Mr. MURPHY: Is there any guarantee that the particular lure mentioned will catch fish?

The WITNESS: There are no guarantees on fishing. It would be a very thoroughly brave service that would guarantee that.

We have all sorts of interesting problems come in. We had one back last year from a canning firm. The firm was anxious to can a new product which had not been canned in Canada before, nor, as far as we could find, anywhere else on this continent. They were having difficulty. They had started trying to can it and were having difficulty with the physical consistency of the product. They wrote in asking us what could be done to improve it. We went through the literature to find out what was known about the product—it was a very unusual material—and it was practically unknown. The only clue we had was that a man in Tasmania, in Australia, had done some work on the consistency of this material. We wrote to him and asked for information. He wrote back later giving all the information which he had developed himself, and most of which had not been published. We sent it on to the company and from the evidence we have had from the company that did solve the problem. How much they are going ahead with it this year I do not know. By the time we got the information from Tasmania—eight or nine months later—it was well past the time for canning that particular product.

On the other hand we had a manufacturer working with grease proof paper and he was having difficulty in getting it to stick. It was going into bags and envelopes but he could not get it to stick. He was hard put to it because he had committed himself to certain orders but he could not make the paper stick together. We found a cementing material which solved his problem. Fortunately we got that through very quickly—it was only three or four days before we got the information and he could get on with the job.

Mr. COLDWELL: Do you ever get inquiries from the soap companies to see whether their competitors are telling the truth?

The WITNESS: No, sir, advertising departments do not deal with us.

The CHAIRMAN: Following up Mr. Murphy's inquiry, what would you say about fire clay?

The WITNESS: Yes, that would indicate one place where the Research Council had been of considerable importance. This is going back in the history of Council experience. It was one of the first research projects that the Council investigated. Prior to the first world war most of the better grade refractories were made from magnesite coming in from Austria. During the war that was cut off and we had to use other materials which we could get locally. Along the Ottawa Valley on the Quebec side near Hawkesbury a small company started to manufacture refractory bricks and products. At the end of the war the Austrian materials began to be marketed again and it looked as if this company was going on the rocks. I think they called originally on the dominion government but it trickled through to the National Research Council and the Council started doing a research project to develop new techniques for handling the materials available in Canada. They made a greatly improved refractory product and during the late '20's and '30's the company not only stopped losing ground but made some headway holding the Canadian and American market. By the beginning of the first world war—

The CHAIRMAN: The second world war—

The WITNESS: Yes,—they were operating substantially and their products were selling competitively not only in Canada but all over the world. During the war years with the increased tempo of industrial production their only problem was to manufacture enough of these materials. They were supplying not only Canada but to a large extent American requirements in certain specialized fields of refractories. The Council was paid for its entire work on behalf of that company. The company purchased all of the patents that had been developed by the Council.

Mr. BIRCHARD: The sales for that company last year were over \$7 millions. They manufacture 52 different products and they were exporting to over 12 different countries.

The CHAIRMAN: That is quite apart from significance during wartime in the defensive picture. I thought you would be interested in having that information, and I knew something about it.

The WITNESS: There are a number of other companies where the Council has done research work—those matters do not come within my division.

I have pretty well covered the four sections of my division. We do additional work. We have translators and we have a certain amount of work with respect to persons receiving grants in universities. I think the president has spoken about that. Those reports at the end of each year come into our division. We process them and so on.

The CHAIRMAN: Are there any more questions with respect to the division of information services? If there are not, we can switch into the other division.

Mr. Low: I think the Dr. has covered it very well.

The CHAIRMAN: Perhaps we can deal with the division of building research. Mr. Birchard will say a word about Mr. Legget.

Mr. BIRCHARD: In approaching the subject of building research I would just like to outline some of Mr. Legget's experience. He is a native of Liverpool, England; he has his degree of bachelor of engineering in Civil Engineering from the University of Liverpool. He has his degree of master of engineering

from the University of Liverpool. He came to Canada in 1929 and was engaged in professional engineering in Scotland and Canada for about 11 years. He has been about 11 years in university work; two years at Queen's University and nine years at the University of Toronto in the Department of Civil Engineering. He also has acted as consulting engineer in special soil and foundation problems while Associate Professor of Civil Engineering for Shipshaw, Polymer, Steep Rock Iron Mines, and the Toronto subway. He joined the National Research Council in 1947 and in addition to other work that he has done he has written two engineering textbooks.

As you know the Division of Building Research is a fairly new division in the Council and Mr. Legget has had considerable—should I say difficulty in securing properly trained men to carry on the work. But he is doing a good job under difficulties in getting men to come, and I would ask Mr. Legget then to speak on the subject.

Mr. R. F. Legget, called:

The WITNESS: Mr. Chairman and gentlemen, it is entirely proper, sir, that the Division of Building Research should be the last to report to you, because in every sense we are the junior of all the divisions of the Council. This division started its work on August 1, 1947. Unlike the other divisions which you visited, we do not yet have any extensive laboratory facilities, and even when we do have them in the building which we are eventually looking forward to, the majority of our work will be carried out as it is being carried out today, not in Ottawa but in the building operations of Canada from one side of this country to the other.

Our division was set up by the Council with the simple objective of providing a research service to the construction industry of Canada. I think it should be remembered that the construction industry of Canada is in many respects the second industry of the country, so you will see that the task ahead of us is a big one. The construction industry is not only very important economically, but it is unique because its operations are conducted through the medium of professional architects and engineers and through a vast number of small building organizations. They receive supplies in the way of building materials from many other industries. But not one of the component parts of the industry is large enough to maintain its own research establishment. So it is that a national Building Research service seems to occupy a very special place in relation to building construction.

The question may naturally be asked why the division of Building Research was only set up as recently as 1947. I think it is a sign of maturity in this country that building has ceased to be the pioneer effort that it used to be. Building in Canada today, while it is still a great pioneering enterprise, has become something in which we cannot brush problems aside, and in which we should call to its aid all the scientific research possible.

Another reason is the increased attention being paid to research as a result of the second World War, just as the formation of the Council arose from attention paid to research in the first World War. The action of the National Research Council of Canada is confirmed in a very interesting way by the fact that within the last four years building research organizations have been set up in Australia, South America, India, Central Africa, to a modest extent in New Zealand and at least in five European countries. So we are in good company.

In the United States there are many notable building research organizations concentrating upon one building material. Recently the American

National Research Council has set up a body called the Building Research Advisory Board, whose job it is to correlate the building research activities carried out by private enterprise and others in the United States.

There is one country which for a quarter of a century has pioneered in the building research field. It is a country which I do not, for obvious reasons, normally mention. I mean Great Britain and I would like to refer to the British Building Research Station. That Station was founded in 1921 and for 25 years it has led the world. I cannot state too emphatically the cooperation and support that we have received in Canada from the British Building Research authorities. Nothing could have been better. And I am privileged to add that there is personal contact between myself and the director of almost every other building research organization in the world with the exception of India and Finland. That to us means a great deal because the field of building research is so vast that it is only by sharing our problems and experience as we are now doing that we can attempt to tackle the job which lies ahead.

Building is an art and not a science. We use the results of the sciences, and the division of building research must therefore always be an applied science division. We have from the very start been cooperating with the scientific divisions of the Council. Your members quite recently saw a demonstration in the division of chemistry on the subject of corrosion in domestic hotwater tanks. That is one of our joint projects. In addition, we cooperate most closely with the Forest Products Laboratories as well as with the Bureau of Mines, in connection with all problems relating to timber and minerals respectively; and we also cooperate with the provincial research organizations and bodies such as the Research Division of Hydro Electric Power Commission of Ontario. It is a pleasure to report to you and to your members on the co-operation we have received and are receiving. It has been most encouraging in the way of making sure that with our limited resources in Canada there is no needless duplication.

With that very sketchy background, perhaps I could now proceed to deal for a few minutes with what we are trying to do. In the first place, two of the services which the National Research Council performs were assigned to our division and it is our task to do them for the Council. In the first place, within our division, we now operate the work of the Canadian Government Specifications Board which consists of the deputy ministers of all the federal departments. The work of the board is not very well known so I have brought with me a small booklet which describes that work. To save your time and that of the members of the committee, I have copies of it to be distributed to all the members.

The CHAIRMAN: I think we might have them distributed. We shall table the booklet. What is the name of the booklet?

The WITNESS: Canadian Government Specifications Board.

The CHAIRMAN: If it is agreeable we will file this and have it listed in the evidence at this point.

The documents filed were:

- Canadian Government Specifications Board;
- Building Research;
- Progress Report, 1949;
- Better Building Bulletin No. 1;

And the following maps:

- Use of national building code documents;
- Dominion wide activities of division, and
- Organization chart of division.

The WITNESS: The Canadian Government Specifications Board is responsible for the preparation of about four hundred specifications. These are used

for the purchasing procedures of all Federal Government Departments. The Division provides the secretarial and technical work to assist the committees by whom the work of the Board is done.

In the second place the Division was given the great responsibility of continuing the splendid work previously done on the National Building Code of Canada. A new Associate Committee of the Council was formed to direct this work and the Division provides all the services for this Committee. Since the Director of the Division is the Chairman of the Committee, the necessary liaison between the Building Code and work on building research is assured.

By Mr. Gibson:

Q. Do you work very closely with the Department of Public Works?—
A. Very closely.

Q. Who is their lumber expert?—A. We refer all questions relating to lumber to the Forest Products laboratory.

Q. I was just wondering who would be the man who would decide the quality of the lumber that should be put in, let us say, a shed built for the government; who would be the man who would say that instead of No. 1 common you would have to use No. 2 clear.—A. That would be governed by the specifications prepared by the Department of Public Works.

Q. Would they consult you first?—A. No, not unless there was some special technical problem involved.

The WITNESS: Shall I continue, sir?

The CHAIRMAN: Yes, if you will.

The WITNESS: This document was prepared in 1941 by a joint committee of the department of Finance and the National Research Council. When it was published it was described in an official British government publication as perhaps the best building code then existing in any country in the world.

The CHAIRMAN: Would you mind moving up here a little closer, I think we will be able to hear you better.

The WITNESS: The National Building Code is now in the process of revision under the guidance of the Associate Committee and we are preparing a brief associated document of a smaller type which will be linked with the code itself. The National Building Code, and our work in connection with it, is largely technical and purely advisory. We hope to make the Code so useful that it will be adopted widely across the country and so assist in the development of uniformity in building regulations within the provinces and municipalities of this country.

Mr. GREEN: You have only one complete code for the whole of Canada? Are you preparing anything special, for example for use in the milder climates such as we have in the Pacific coast province?

The WITNESS: The existing code applies to the whole of Canada but in the revision there is to be a section dealing with climate in the different parts of Canada, the country being divided into climatic zones, and naturally the west coast will be one of those zones.

Mr. GIBSON: Are you making provision in that for buildings suitable to the various types of climate across the country?

The WITNESS: Yes. And, Mr. Chairman, it may interest the committee to know that this code is now in quite general use across the country. There are over one hundred municipalities, as you will see on the map which has been supplied in the material put before you, which are using the code either directly or in part to assist their own building regulations. I might perhaps, Mr. Chairman, usefully mention that one of the activities of this committee

which the division assists is to hold meetings with building officials. We have been doing this now for two years running and at the last meeting we had representatives present officially from almost all the provinces.

Mr. MURPHY: What do you mean by building officials?

The WITNESS: Building commissioners, building officials of individual cities.

Mr. MURPHY: Oh, building inspectors?

The WITNESS: Yes, the building commissioner of Toronto and the building inspector of Regina, that type of official, and we had them present together from almost all the major cities of the country and the provinces.

Mr. GREEN: That is very important, because I think that is one of the big obstacles to the construction of more buildings, more homes in Canada.

The WITNESS: Yes.

Mr. GREEN: The difficulty from time to time is in getting the municipalities to authorize changes in their building by-laws. Will there eventually be just one code?

The WITNESS: We are making more headway than we had reason to expect we might within so short a time. As a matter of fact, there are already a large number of municipalities who are waiting to adopt it as their own building regulation.

Mr. MURPHY: Does Central Mortgage and Housing use your code in their operations?

The WITNESS: It is co-ordinated with the Central Mortgage "Building Standards" but they perform a little different function.

Mr. MURPHY: When will the new code come out?

The WITNESS: I think it will be ready early in 1952, although we might be able to get it out by the end of 1951, but we will certainly have it by the end of 1952. The work of preparing the code must be carried out not by our staff but by technical committees representative of all elements concerned in Canada serviced by the staff of the division.

Mr. GREEN: When you have it completed and put it out will the Central Mortgage and Housing then follow it?

The WITNESS: No sir, Central Mortgage and Housing will still have their own "Building Standards" but the requirements generally will be the same except for certain requirements relating to financing of the houses rather than to construction.

Mr. MURPHY: But will you consult builders in the different parts of Canada respecting what is to go into a house?

The WITNESS: Yes. A draft of every section of the new code will be circulated to every municipality in Canada and to every province and to every trade association concerned.

Mr. MURPHY: I wonder, Mr. Chairman, if this affects this committee and whether we should make a recommendation respecting it. It is a very very important subject and representations from the committee about it might be useful.

The CHAIRMAN: How do you mean, Mr. Murphy?

Mr. MURPHY: By consulting with building contractors in different parts of Canada and discussing with them what should go into a house. I was just wondering how this committee could function in respect to that.

The CHAIRMAN: You have to be very careful there with respect to any committee of the dominion parliament functioning directly in a field that comes under provincial jurisdiction.

Mr. MURPHY: I know, but the point I make there is—

The CHAIRMAN: The municipalities and the provinces naturally are fairly well aware of their jurisdiction, and the degree of co-operation in effect today is very great, it is excellent. I would be very careful about bringing anything in that might be open to misunderstanding.

Mr. MURPHY: I appreciate that. I would discuss it say with an official in Sarnia who wanted to go into housing in my area and require him to get our own National Housing Code. For instance, in building a frame house you have seventeen manual operations. By having the code and studying it he might be able to improve on that. That is the sort of thing I have in mind. That is the point I am making. Industry itself is not going to solve this building problem. Contractors are not going to solve it. If they can get contracts to go ahead and have seventeen manual operations on the construction of a house, they are still going to do it. One thing is certain, the lumber trade is not going to co-operate because they can sell everything they can produce.—A. If I may speak briefly to the point raised by Mr. Murphy: these are the very questions that will be discussed by the committees that will be responsible for the preparation of each section of the revised code which will be, in essence, a new document. When they have come to a conclusion and prepared a draft document, that document will be available for inspection and criticism not only by people it is sent to in the mail but by everyone in Canada, and in every technical paper it will be advertised that this document is available.

Q. The man I would suggest you call in is the man who is going to buy or build a house. He can tell pretty well what should go into the house as well as the builder. He will know, for instance, that you have not got to perform certain operations that are done today and which are required to be done in order to build a house.—A. Since we have to work through committees I can assure Mr. Murphy that our committees will be constituted just as carefully and proportionately as this committee is constituted, so that every interest will be there represented.

By Mr. Green:

Q. Mr. Legget, are you working out your building code on the basis of present methods of building or are you trying to devise cheaper ways of building a home that are more up to date?—A. The building code is a study of minimum requirements prepared in the interests of safety, public health, and structural sufficiency. It is not a manual of good construction.

Q. That has nothing to do with getting more efficient homes?—A. No, that comes after the code or minimum standards.

Q. Is your branch doing anything on getting more up to date homes?—A. That is what I hoped to speak of next. If I may say one more word about the code, we are trying to make the new revision so flexible that it will not be restrictive of any new building method or operation that is proved to be satisfactory.

By Mr. Murphy:

Q. In other words, Mr. Legget, suppose we have something new in the building industry, let us say panels—and I have never got over the idea that houses cannot be constructed by panels, instead of these seventeen operations—will that be considered by your committee?—A. That is being considered by the division.

Q. Are you doing anything in connection with research work on panels?—A. Yes, sir, we have.

Mr. GIBSON: Are you speaking of plywood now, Mr. Murphy?

Mr. MURPHY: Any kind.

The WITNESS: We have done some work and we have made a very intensive study on it.

By Mr. Murphy:

Q. It has not proceeded very far?—A. I hate to get into the technical details but our work has not proceeded very far.

Q. That is your line of work?—A. Definitely.

Q. Are you receiving any co-operation from the industries?—A. Yes, we have all the co-operation we could wish for from industries, from contractors and from the trade unions.

Mr. STEWART: What do you mean, Mr. Murphy? When you put your inside and outside walls up everything is finished? Is that what you mean?

Mr. MURPHY: In order to cut down the cost of building. Costs are so terrifically high today, and if they keep on going up it will be disastrous. Costs have to be cut somehow, and I have always felt we could build houses on an assembly line technique in sections of six, eight, to twelve feet long which would do for the wall outside, inside and outside, as well as for your floor and roof, and then assemble the same as you would assemble a manufactured product.

The CHAIRMAN: I think perhaps we could get to it this way. Mr. Legget was in the process of describing what the division was doing and reference was made to the building code and I think we got so interested in it that we perhaps got discussing that in more detail than is desirable at this point in this evidence. So I think we can ask Mr. Legget to come back to a description of the various phases of his work.

The WITNESS: I would be very glad to do that.

Turning now to what the division is doing apart from those two service functions, the first thing is before the division was formed we were told that one of our important functions would be the processing of information that is already available through building research which has been done and good building practice which is already known. Processing of that information would be for general use throughout the country.

As our work has developed, even in the short course of two and a half years, the importance of this to the division has become very, very noticeable. As Dr. Saunderson has indicated one whole section of the division is what we call the building practice group. Without that group we could not do our research properly. Without that group we could not service the many inquiries which are coming in to us from the technical services and from Central Mortgage and Housing Corporation.

You will find amongst the papers here a small organization chart which shows you how we have been broken up into two major sections. On the right hand side you will see the building practice group and you will see it includes our own special library which supplements the main library of the National Research Council. Our library works in close association with it up to the point that Dr. Saunderson described.

With regard to publications we will have research reports of normal character but right from the start of our work it has been made abundantly clear to us, and I think Mr. Murphy will appreciate this, that one of our jobs is to make available to the man in the street—if I may use the expression—interested in building but not a building expert, something of what good building practice is and something of the difficulties of modern building techniques.

We have given a great deal of thought as to how that great task can be performed and after much consideration we have produced a pamphlet that is unlike anything that the National Research Council has produced before. I almost hesitate to produce it in the presence of Mr. Birchard and Dr. Saunderson. It is a popular pamphlet which we call a "Better Building Bulletin". We have been accused of pandering to our architectural associates by omitting the capital letters! It will be found by members that it deals with one subject only—the problem of condensation in modern homes. It has been written in non-tech-

nical language by a non-technical person and is illustrated with simple diagrams. It includes a list at the end of it of technical publications if one wants to go further. It has been developed in this form to assist in fitting into a man's pocket or a lady's handbag, with the thought that once in the handbag or the pocket it will be reasonably certain of being read.

Mr. MURPHY: Does it say anything about building dry basements?

The WITNESS: No, this is condensation in walls and attics and does not refer to dampness. It deals with condensation because of humidity in the house. We shall in the course of time produce other booklets but so far this is the only one and it is a pleasure to show it to the members of the committee.

An inquiries section has been set up and we are for the first time able to say to our friends the press that we do have a section ready to answer building questions. Without any publicity, we have received several hundred technical enquiries. That will show you what interest there is in the problems that Mr. Murphy and the others have brought up this afternoon.

That, sir, is an outline of the building practice side of our work: it is the service side of the division.

Turning to the other side, building research, we have tried to follow two principles. In the first place there is so much work to be done that in selecting the little bit of work that we can do we have tried to pick those research problems which can only be tackled in Canada, leaving to other countries and to other associated building organizations problems which can be studied anywhere. The second thing we have tried to do is to remember that we are not serving the building industry in the city of Ottawa but rather the building industry in the Dominion of Canada. A map has been submitted to you of the Dominion on which have been indicated a few of the jobs we have not yet been able to attend to. You will see that we have worked in every part of the Dominion.

With regard to the first objective, doing things that must be done in Canada, they appear to fall into five main categories. I would like to speak briefly about those finishing up with the most important of all. In the first place one of the major building problems peculiar to Canada results from soil and foundation problems. You cannot study Canadian soils anywhere else but in Canada. We have set up a small soil mechanics laboratory; we have a small soil and foundation staff and we have already carried out investigations into such matters as dike discussion in the Fraser Valley at the time of the 1948 floods. We have worked on the matter of settlement of larger buildings in Canada in which we have installed plugs which will, in the course of years, show us the rate of settlement of the building concerned. We are studying the cause of house foundation failures and I have come across some most remarkable ones. We have studied peculiar local soils such as those met with in the north at, for example, the Steep Rock Iron mines which are about the most treacherous soils ever met with in construction. And finally we have been studying the Toronto subway.

Mr. MURPHY: Were your people behind the Toronto subway?

The WITNESS: Far be it from me to interfere with any municipal affairs but the Toronto subway, if I may say so seriously, is one of the most magnificent research laboratories the division could have. In that subway we can study some of the major problems of heavy construction right on the job and in a way that could not be done elsewhere.

Mr. MURPHY: You are underneath them?

The WITNESS: We are underneath all right. It is a privilege to say that one member of the staff of the division is resident in Toronto as a member of the construction force of the T.T.C. His sole responsibility is to carry out research in conjunction with the construction staff on the subway in co-operation with

the T.T.C. The division is so close that one could not possibly disentangle the work of the men. If the members would be interested in knowing what we do, one of the things we do is to measure accurately the stresses that are set up in the great steel beams which support the street cars. They were designed on the assumption that they would withstand certain stresses and we are checking them. One other of the great problems concerns the pressure necessarily exerted on the supports along the two sides of Yonge street. We are installing gauges to measure what it is. We are taking a complete record of the entire soil profile revealed from Front street to the Eglinton street end as a contribution to geological knowledge. But I must not digress too far. This is an example of heavy construction research.

The second of the five major groups is a peculiar subject which may surprise you. It is the problems associated with snow and ice. Snow and ice have become such commonplace materials in Canada that very few people stop to think of their tremendous economic importance with respect to building engineering operations generally, such as the pressure of ice against dams, and the pressure of snow on roofs. The problem of handling snow and snow clearance involves an annual expenditure of many millions of dollars. I believe that snow clearance alone means an expenditure of \$20 million a year at least. So one of our jobs is to study snow and ice as materials. I would like to report that at the start of our work we naturally consulted the leading authorities of the world who are in Switzerland. The Swiss Government when asked to assist us offered the services for one year of their chief snow scientist and he came over and spent one year as a member of the staff of the Division of Building Research. The report which he has left behind will prove to be the foundation, I hope, of a continuing program in research with respect to the properties of snow and ice as materials with reference to engineering and particularly to building.

By Mr. Green:

Q. What do you mean by your reference to snow as a building material? Have you in mind igloos?—A. No. I am sorry. We have not got to that stage yet. I was referring to the properties of snow and ice as materials which must be studied before we can determine their effect upon structures. You cannot study the pressure of ice against dams without knowing the physical characteristics of ice as a material. And unfortunately snow and ice, as Dr. Sauderson knows far better than I do, are probably the most complicated materials in the world. They are frozen water.

Now I think I should pass to the next item because snow and ice constitute a wide subject. The third section is the question of fire research; and with memories of the Rimouski and Cabano fires so recent in our minds, I do not need to say anything to stress the importance of fire research in Canada with respect to building.

In the United States there are a number of very fine and very important fire testing establishments, but only in Great Britain, so far as we know, is there a fully developed fire research organization.

If the Council approves, our division hopes to have a fire research establishment on the Montreal Road site within the next five years as well as an outside staff ready to investigate structural and building aspects of any serious fires, so that we can make a small contribution at least to minimizing the loss of life and property in this country through fires, because of the heating problems which are peculiar to this country.

By Mr. Murphy:

Q. Does the subject of fire resisting paint come within your division?—A. No. That comes under the Chemistry Division. But we co-operate with them in investigating the action of paint on the outside of buildings. They,

however, do their work in the laboratory. We can test fire resisting paints when we have installed our special fire research furnace in the new building as soon as it is open.

The fourth group is one again which will possibly surprise you and the members of the committee, Mr. Chairman. It is the whole question of building in the north of Canada which is a problem peculiar to this country. The special problems at first sight may not be obvious. Most building in the north has to be erected on permanently frozen ground. The question of the economics of building in the north is peculiar because it may cost more to transport your building materials than to buy them in the first instance. In fact, it may be cheaper to move men than to move the materials. Buildings in the north are isolated. Therefore fire is a specially important problem. I think this will indicate to you the very special group of problems we have.

It might be interesting to state that tonight the first expedition sent out to study permafrost and foundations in the north is leaving Ottawa. It is a joint expedition made up between our division and the Canadian Army. It is another example of the way in which this matter of building research is being handled. It consists of a small team of four men who will spend the summer in the Mackenzie Valley studying permafrost.

By Mr. Murphy:

Q. Are you doing any research on materials which would, let us say, constitute cheaper ingredients than cinders for blocks? Is there any material in Canada which could be used in place of cinders to make cheaper blocks?—

A. We have just started research on that problem. We have not done anything yet, but we have co-operated on some studies made with cinder blocks at the University of Saskatchewan. But at the moment we know of nothing cheaper than cinders for blocks.

By Mr. Gibson:

Q. Are we doing anything in relation to the problem of binding soils?—

A. Our soil mechanics laboratory would do research on that problem. That is an important part of soils research.

The fifth group is the most important of all. That is what we call the "enclosure of buildings with reference to the Canadian climate," that is to say, the construction of walls, roofs, and foundations, in respect to buildings in Canada and with respect to climatic conditions. That includes the whole subject of house building and house design from the technical point of view.

Here is my first real mention of the Central Mortgage and Housing Corporation. When our division was set up, we were charged to act as the research unit of Central Mortgage and Housing Corporation which had been organized just six months before we started.

Since the Division of Building Research went into operation, more than one-half of the total time of all the members of our staff has been spent in assisting Central Mortgage and Housing Corporation with their day to day technical problems.

Q. Where does the money come from for that operation?—A. It comes out of our vote.

Q. Then where are they spending the money which we vote for them?—

A. I have seen statements of it, and I think it has been spent in various ways on co-operative projects.

Q. Was it not said in answer to a question asked by Mr. Green that we set aside \$1 million for research?

MR. GREEN: I did not ask that question.

MR. GIBSON: I think the minister indicated that we had spent \$200,000 for that purpose, if my memory serves me correctly.

By the Chairman:

Q. Please proceed.—A. Perhaps I might answer Mr. Gibson. We work so closely with Central Mortgage and Housing Corporation that we are fully conversant with its research efforts. The Corporation has a research committee and we sit on that committee. Their money has been used so far for research sponsored by the Corporation apart from work done by the National Research Council. We know that the money is there, but still we have not had to ask for it.

By Mr. Murphy:

Q. Have you in your research progressed beyond what has been done in England? Has your research extended beyond that? You know what has taken place in England?—A. The lines of approach are totally different, because we are tackling problems they do not meet with in England. They have problems in England which we would not meet in Canada. We write and ask them for their reports and we always get them. But our problems are peculiar to Canada and so we cannot make any direct comparison.

Mr. GIBSON: Do you know how far they have gone in research in that field in the United States?

The WITNESS: We have the closest liaison with the United States, to such an extent that one of our most important pieces of experimentation was carried out in the United States under our direction along the lines of a joint program prepared by ourselves and the Housing and Home Finance Agency of the United States, and we will publish a report incorporating something of their results. I do not think you could have any greater measure of co-operation than that. We have never yet had any difficulty whatsoever with regard to the United States in the matter of co-operation. I started to say something of co-operation and our work along that line, but I thought I should explain to you, sir, and to some of the members, why it is that we have not published any reports for public distribution. Most of our reports so far have been for the Central Mortgage and Housing Corporation. In due course when we have the staff the information will be processed for public use.

Now, I am going to speak of some of the technical problems we have looked into. I will try not to be too technical but if I were to indicate to you a few of the projects it might suggest to yourself and the members, sir, the direction in which we are going and the type of practical problem which we have had to tackle because of the insistent demand rather than the over-all problems which we would have selected ourselves. There is a question of insulation of different types and condensation formed in walls, plus the desirability of developing new materials and new methods of construction; and that has been without any question the major direction of our housing work. In order to investigate that we had to develop our own Prairie Regional Station in Saskatoon; which is an indication that we have interests outside of Ottawa, our first laboratory being in the prairies, not in Ottawa. We have developed at Saskatoon special testing facilities which are just about ready to operate in which we can place wall units up to a size of 7' 6" x 7' 6" and subject them to completely controlled conditions of temperature and humidity on both sides. Laboratory controlled testing by itself is not enough and so outside of our regional station at Saskatoon and on the Montreal Road laboratory site, as you saw during your visit possibly, we are developing a series of outside test structures. They have a very unusual shape and size. They have no openings in them being entered through a tunnel from underneath. At Saskatoon there will be six, at Ottawa there will be nine, constructed of different materials and completely insulated so that we can follow in detail the performance of these materials and these methods, when they are constructed as in the walls of a house, heated and humidified inside as though they were in use and yet subjected on the outside to the different vagaries of the

Canadian weather in Saskatoon and Ottawa. While we do not normally make comparisons of one part of the country with another we have an opportunity here to compare the climate of Saskatoon with that of Ottawa. And outside of each of these houses we have two little meteorological stations so that we shall have a complete record of the weather. That work is being done and we are getting close co-operation from the Meteorological Division of the Department of Transport. And we shall hope to extend the work with a hut at Churchill and one of our standard huts possibly in the United States, in which case we shall have four standard checks in entirely different climates to compare the one with the other.

It may perhaps surprise you, Mr. Chairman, and the members of the committee, to hear me stress the matter of climatic comparison. Mr. Green has already mentioned it. It is a division of our work which involves one of the most important factors we have encountered since we started, and that is fundamental in research work. Climate studies are a section of our research work which will always present problems not only in connection with experiments and not only in connection with the building code work but also in connection with the actual exposure of materials, the size of a house and the effect of wind on a house. Wind and condensation are two very important problems. We are using panels in which to make appropriate tests. These are both things which are very important to the building industry in Canada.

Another thing which we are giving special attention to right across Canada is the very great difficulties experienced with paint on the outside of new houses. Some of the members may have seen a new house on which the paint has started to peel. The trouble is sometimes the paint is too good, as building standards are higher than they used to be. In earlier days the paint used on houses was largely a water paint which was very porous. We now use the best paint we can get, which gives a close, tight, oil sealed coat on the outside; and then we get a high humidity in our houses. If they are not properly sealed the humidity will attempt to get out from the inside to the outside during the winter and that causes the paint to swell and pushes the paint off. That is what often happens.

Another problem is an investigation into the structural sufficiency of the standard house frame. You will see that I am coming to some of the points that were raised in discussion. The ordinary standard house in Canada is composed of frame construction. Outside we put a certain amount of sheathing; then we put insulation inside and paper on the outside and some outside finish on top of that. We have asked questions about the structural design of houses and the structural design of house framing and not surprisingly we found that we could not get any specific answer, for instance as to the extent and need for rigidity in ordinary wooden house framing. So we have turned our investigation to that problem and design an experimental structure which is very much lighter structurally than the standard house. That is the type of thing we are working on at the present time and we hope as a result of these studies to be able to cut down the number of braces that Mr. Murphy spoke about, and the materials used in an ordinary standard house.

Another investigation that we have undertaken is the question of house foundations. It has become a common practice in Canada to put a foundation under a house and to think that is the only way you can build housing. There is another way and that is to build your house on a flat reinforced concrete slab placed on the ground. It is by no means certain that this is going to introduce economy into house construction because if you cut out the basement you have to make your house bigger in order to accommodate the heating unit and to provide for that miscellany, that collection of materials which somehow finds its way into the basement. If you make the house bigger you have to increase the exposed surface and therefore increase the size of your heating load. Then, in connection with that, there arises one of the most remarkably

complex problems with which we have been faced, in connection with the migration of soil moisture beneath the concrete slab placed on the ground. I mention this, Mr. Chairman, to illustrate how with a simple thing such as a house basement you get led into some of the most complex problems with which we have yet had to deal. We had hoped to have been able to build some experimental slabs to make our first start on this project in the Winnipeg region this summer. The Winnipeg soils do act peculiarly and therefore they are suitable for certain purposes, but for reasons that I need not even mention that project has had to be indefinitely postponed.

We have two members of our staff in Winnipeg now to assist with the tremendous task of rehabilitating houses that have been damaged by the flood, following work which I did in Winnipeg last week, making a preliminary survey of the damage. That is the type of project in which we are working with the Central Mortgage and Housing Corporation, field studies of the difficulties and the special problems that they meet with in their ordinary operations, which cannot be dealt with in the ordinary way. We accumulate scientific information from the study of these problems, we process it and in time, of course, we shall make that available so that with the experience we gain from these additional observations we can make a slight contribution to steadily improving the standard of housing in this country.

Mr. Low: Is it too early yet to say that the extent of the damage to the walls is going to be?

The WITNESS: It is too early. When I was there the water was still in most of the houses.

By Mr. Murphy:

Q. Can this migration of moisture, be overcome by say, a certain depth of cinders or something of that nature under the slab?—A. We recommend that no slab should be built on a layer of less than eighteen inches of gravel or some porous material in case migration of moisture should take place. My studies of temperature variations by the way, started during the construction of the Polymer plant at Sarnia.

Well, the only thing I would say finally, Mr. Chairman, is that we cannot judge ourselves how successful we have been in steering a middle course, as must be evident, what we are doing today is to try to steer between on the one hand, the many requests that we have received from all over the country for tests and research into specific projects, and on the other hand, the way we would have liked to set up the division,—very quietly and slowly, developing our laboratory facilities consistent with our work. We are trying to follow that course. We are able to look at these problems not from the point of view of any one specific group or interest but in the national interest, with the idea of making Canadian building just a little bit better. The existence of our division in no sense is a criticism of Canadian building or construction. The record of Canadian building is a magnificent one. All we are trying to do is to make it a little bit better.

Q. In your research on foundation blocks, cinder blocks or whatever they may be, to what extent have they progressed with the injection of air to make them lighter, and yet to meet the building requirements.—A. There are two ways that is being done. One is by the use of light weight aggregates into which air has been forced while they were forming. That has progressed a long way but we are doubtful as to how lightweight aggregates will stand up in concrete in Canada due to climatic conditions.

The other way is by the use of an air entraining agent which introduces a certain volume or amount of air into the concrete itself. That is now standard practice with quite a number of Canadian engineering organizations.

By Mr. Green:

Q. Are you doing research work on commercial buildings, as well, office buildings and stores?—A. We will be doing that. We have not done much yet because our total staff is only sixty.

The CHAIRMAN: Now, gentlemen, perhaps we could discontinue the evidence today. What subject would you wish to cover at the next meeting? And when should the next meeting be held?

Mr. COLDWELL: What have you left?

The CHAIRMAN: We have a great deal left. Perhaps one of the things you may want to gather is the estimates. We have not touched the estimates end, the financing end. I say that, merely bearing in mind that we are coming very close to the end of the session. There is no end to the interesting things available to the committee to look into but it is just a matter of deciding how many meetings we want to hold and when.

(Further discussion relating to date of meeting and subjects to be discussed, off the record.)

The committee adjourned.

APPENDIX A

NATIONAL RESEARCH COUNCIL
DIVISION OF MECHANICAL ENGINEERING

INTRODUCTORY REMARKS TO MEMBERS OF THE PARLIAMENTARY COMMITTEE
OF THE NATIONAL RESEARCH COUNCIL—FRIDAY, 26 MAY, 1950.

J. H. Parkin

The Division of Mechanical Engineering is one of the several engineering divisions of the National Research Council. Its work is predominantly applied, rather than fundamental, in character, in that it is concerned principally with the solution of problems encountered by Canadian industry and the armed services, particularly the Royal Canadian Air Force. In other words, the results obtained are in general, immediately applicable.

While the work of the Division lies principally in the aeronautical engineering field, work is also done in hydraulics and certain phases of mechanical engineering. The fact that the facilities of the Division are primarily aeronautical in character does not mean that the scope of the Division is thereby restricted, but rather the contrary, since aeronautical engineering embraces practically all fields of engineering, mechanical, electrical, metallurgical, civil, chemical, etc. Further, the conditions applying in aeronautical engineering are such as to require work of the very highest quality.

Thus, the aeronautical laboratories are of direct use in other fields of engineering, for example, the galloping of conductors in power transmission lines is studied in one of the wind tunnels; housing units are tested for strength in the Structures Laboratory; the development of farm tractor engines has been assisted in the Engine Laboratory, and the fuel system of diesel locomotives was studied for a Canadian Railroad in the Gasoline and Oil Laboratory.

The Division operates in close association with the aircraft industry in Canada, and relations with other industries are developing as the facilities and capacity of the laboratories become known to firms.

As an indication of the volume of work done in the laboratories, during 1949, nearly 200 typed reports of all kinds were prepared, and over 6,500 copies distributed, together with nearly 2,000 printed reports.

Work is undertaken for a firm on one of two bases; if the firm wishes the results of an investigation or test for its own private use the firm pays the cost of the work. On the other hand, if a firm wishes a study to be made which is of general interest, and the results of which may be made available for the information of a whole industry, the Council may bear all or part of the cost.

Routine tests are undertaken for government departments, but, for industry, only when they cannot be made in Universities or Commercial laboratories. Fees are charged for such tests.

New facilities are provided in the laboratories only after study has indicated the need on the part of industry, a government service, or the Council, and before such facilities are provided an investigation is made to insure that facilities already available in industry or universities will not be duplicated. Care is taken to avoid duplication. An effort is made to provide in the facilities a maximum of flexibility and range compatible with other requirements.

The Division is organized in a number of Sections which may be grouped according to subjects as follows:—

Aerodynamics

Wind Tunnels

Supersonics

Flight Research

Hydrodynamics

Hydraulics
Model Testing Basin
Basic Hydrodynamics

Thermodynamics

Engine Laboratory
Gas Dynamics
Fuels and lubricants
Low Temperature

Mechanics

Structures
Engineering
Instruments

In addition, there is a Fire Hazard Laboratory which does not fall within any of the foregoing groups. This corresponds to the Underwriters Laboratories, Chicago, in miniature, and undertakes for the Canadian Standards Association the testing of automatic oil burners, gasoline stoves, heaters, etc. for safety of operation to insure that there is no undue hazard in the appliances when operated in the home. This work is charged for at cost. In addition certain other tests are undertaken from time to time, such as the testing of forest fire hose for forest services.

The Wind Tunnels of the Division include a horizontal general purpose tunnel with a working section 7' x 10', driven by a 2,000 h.p. motor, with a maximum speed of 350 m.p.h.; a vertical spinning tunnel 15' in diameter, and smaller experimental tunnels. These tunnels are the only such facilities available in Canada to the Canadian aircraft industry and the tunnels are practically in continuous use for Canadian aircraft firms and the Royal Canadian Air Force. At the present time, the large wind tunnel is operating two shifts per day. Extensive work was done in the tunnels for A.V. Roe Canada Ltd for the Jetliner, Jet Fighter and the Chinook and Orenda gas turbines. The Jetliner came within a few weeks of being the first civil jet air transport, designed and built as such, in the world, and is in fact the first jet transport to be designed, built and flown in North America.

The all-weather, long range Jet Fighter (CF-100) developed for the Royal Canadian Air Force has no superior. The Orenda gas turbine has, on bench test, shown itself to be one of the best. In all of these developments the wind tunnels rendered invaluable assistance to the firm. Work is continuing on models of the Jetliner and Jet Fighter and you will see in the laboratory models of these aircraft and of components.

Work is also being done for Canadair and Trans-Canada Airlines on the North Star aircraft.

There is presently under construction a new Supersonic Laboratory (of which the corner-stone will be laid next week) to be equipped with a 10" square supersonic tunnel in which speeds several times the speed of sound may be attained. This tunnel is expected to be in operation late this summer and will fill a present need for facilities in which work may be done on high speed aircraft, projectiles and the like. This laboratory constitutes Stage 1 of a planned three stage development.

For some time past work has been proceeding in the Division on instruments and techniques to be used in the operation of the Supersonic tunnel.

The Flight Research Section is located at Arnprior, Ontario, at a former Royal Canadian Air Force station, which is on long term loan to the Council. The section is operating co-operatively with the Royal Canadian Air Force. The section is under civilian Council control with the Royal Canadian Air

Force providing the aircraft, the pilots fly them and the crews to maintain the aircraft. The scientific work and maintenance of the Station is done by Council personnel. Much of the work at this section is co-operative, typical examples being the work on an improved anti-tank projectile for the Army, a radar altimeter for the Division of Radio and Electrical Engineering, uranium exploration in co-operation with the Department of Mines, the Atomic Energy Project at Chalk River and the Eldorado Mining and Smelting Company, and the inducing of artificial precipitation in co-operation with the Meteorological Services.

Much work was done at Arnprior on the development of the Royal Canadian Air Force Jet Fighter using a special technique with a Mustang aircraft. A small model of the wing or other component of the fighter is mounted on an automatic balance within the Mustang wing. The upper surface of part of the Mustang wing is modified to provide a uniform air flow over the model. The Mustang is then flown to about 30,000 feet and dived through several thousand feet; the flow past the model then attaining low supersonic velocities. The same technique was used successfully in connection with the anti-tank projectiles.

In the Hydraulic Laboratory work is done using Hydraulic models. A project recently completed for the Department of Public Works concerned the problem of silting in the navigation channel in the Fraser River at New Westminster. A large number of like arrangements were tested in the model and recommendations were made concerning the most promising. Not the least important result of this investigation was the indication of arrangements of dikes which would not be satisfactory.

The Department has now requested that a study be made seeking the improvement of navigation in both arms of the Fraser River between New Westminster and the Gulf of Georgia. Since this model was too large to construct in the laboratory at Ottawa an arrangement has been made with the University of British Columbia and the model is now nearing completion on the campus of the University.

It is emphasized that the work being done on the Fraser River is concerned only with navigation and not with flooding.

Several models made and operated in the laboratory have been concerned with the passage of logs past Hydro Electric plants. There is here a conflict of interest; the Hydro Electric firms desiring to have every drop of water for the generation of power and the logging firms wishing to use water for the movement of logs past the plants. There, since the information desired is of general interest to important industries, the work is being done co-operatively. Recently an investigation was undertaken of a proposal for the construction of a power plant on the Tobique River in New Brunswick, where, in addition to the movement of logs past the plant there is also involved the problem of enabling salmon to move up the river past the plant. Here the fish-way aspect is being studied in co-operation with the Department of Fisheries. A model of the control structure, channel and spillway of the St. Mary's dam in Saskatchewan was thoroughly tested for the Prairie Farm Rehabilitation Administration, to determine the best design, reduce rock excavation and eliminate scouring.

In the Model Testing Basin models of hulls of vessels are tested to determine their performance. This work is done for naval architects, ship builders and several projects are now under way for the Royal Canadian Navy and the Department of Transport. The problem is usually submitted in either of two ways; the hull has been designed for a certain speed and it is desired to know what engine power will be required, or alternatively, the hull has been designed, and engine is available and the speed which will be attained is desired. In either case it may be that the speed is too low or the power too

high, in which case an attempt will be made in the laboratories to modify the lines of the hull to attain speed or reduce the power required. Models of the new escort vessels being built for the Royal Canadian Navy were recently tested in the basin. An investigation is now under way seeking to develop an improved hull for coastal fishing boats.

The Engine Laboratory was originally built for work on reciprocating aircraft engines. With the advent of the gas turbine the laboratory has been remodelled for work on this new type of unit and there are now four test stands for gas turbines and one for reciprocating engines. In addition, the Division has constructed and now operates a small test stand at Fort Churchill, Manitoba, containing a single test stand for gas turbines.

An arrangement was entered into some years ago with the Ministry of Supply in the United Kingdom under which new types of turbines developed in the United Kingdom were sent to Ottawa for testing under low temperature conditions. This was of mutual advantage since it gave the Council and the Royal Canadian Air Force direct information on the latest types of British engines, and experience in the operation of turbines under low temperature conditions, and it benefited the United Kingdom in eliminating low temperature troubles.

Two general investigations have been proceeding for some years on gas turbines, namely, the investigation of the performance of turbines at low temperatures and the protection of gas turbines against icing. The protection of gas turbines against icing is a vital and difficult problem and it has been under investigation for some years in the laboratory. Different methods are being investigated and progress has been made.

The laboratory is now engaged in co-operation with engine firms, in an attempt to design a diesel engine for small coastal fishing boats.

The Fuels and Lubricants Laboratory is engaged on work concerning liquid fuels and lubricants. It has acquired over many years extensive experience with petroleum products and serves as consultant to the armed services, particularly the Royal Canadian Air Force, on problems encountered in connection with liquid fuels and lubricants. It assists in the drafting of Canadian Government Standards for petroleum products. It recently undertook for the Canadian Pacific Railway a study to overcome difficulties in operating diesel locomotives at low temperatures in winter. It has also developed recently an improved low temperature lubricant for rock drills.

Gas Dynamics is concerned largely with the fundamentals of gas turbines. Stage 2 of the Supersonic Laboratory development on which construction will be commenced this summer will include facilities for work on combustion, compressors and other elements of gas turbines. Theoretical work has been in progress in Gas Dynamics for some years while awaiting provision of experimental facilities.

In the combustion field this group undertook a short time ago a study of the performance of oil fired steam locomotives for the Canadian Pacific Railway, during which tests were run under actual operating conditions in British Columbia and Alberta.

The Low Temperature Laboratory, since it was placed in operation two or three years ago, has been operating almost continuously on tests for the armed services, particularly the Army.

The laboratory contains three cold chambers, the largest, 15' x 15' x 50', capable of accommodating a full scale army tank; in which the temperature may be reduced to -70° F. or lower, and a refrigerated wind tunnel in which icing conditions in the upper atmosphere can be simulated. Many items of military equipment and stores including tanks, vehicles, guns, clothing and the like, have been tested in the cold chambers for the Army. By so doing, troubles are disclosed which can be corrected before the equipment is given service trials at Fort Churchill or elsewhere in the north.

The operation of aircraft lubrication systems at low temperatures have been studied in the chambers and indeed the work on the fuel system of the Canadian Pacific Railway diesel locomotives was done in one of the chambers.

Aircraft icing has been under investigation by the Council since the beginning of the war, using specially equipped aircraft. The latest of these, a North Star, provided by the Royal Canadian Air Force, has recently been modified and fully equipped for icing investigations, and is now being operated by the Royal Canadian Air Force for the Council. The icing tunnel, by enabling preliminary tests to be made under controlled conditions in the laboratory before equipment is fitted and tested in flight in the North Star, will greatly expedite the work on the development of means for protecting aircraft against the icing hazard.

The Engineering Laboratory is occupied with a variety of work. It has been engaged on the development of improved aircraft skis for use in the north country, and in connection with this work has gained much experience with and knowledge of snow. Skis embodying the latest ideas resulting from this work were built in the laboratory and given thorough service trials in actual operation last winter by the Ontario Provincial Air Service. The skis proved very satisfactory.

At the request of the Royal Canadian Mounted Police, the laboratory designed and constructed an Eskimo type dog sled (Komatik), using modern materials, for use in the Arctic. This sled has been undergoing service trials for the last two winters.

Mechanical problems arising in industry are dealt with in this laboratory. For example, not long ago a manufacturer of small air compressors in Western Ontario called on the Council for assistance in solving a difficulty. He had found it impossible to determine the cause of, and to eliminate a knock in the compressor. The Engineering laboratory, after a painstaking study, was able to determine the cause and recommend satisfactory remedies. This section has also been used in the design of certain mechanical equipment for the Atomic Energy Project at Chalk River.

In the Structures Laboratory facilities have been provided for a wide range of structural and dynamic tests and investigations. Facilities are available here for the testing to failure, under flight conditions, of full scale aircraft components. At the moment the complete wing of the Avro Jetliner is being set up for tests. On the results of these tests the Department of Transport will determine the airworthiness of this aircraft. The tail unit of the Jetliner has already been tested, as has the tail unit of the Royal Canadian Air Force Jet Fighter, and one of the wings of the latter.

It is the function of the Instrument Laboratory to design and construct the special instruments required by the other sections of the Division. The laboratory has designed and constructed the special instruments installed in the North Star aircraft for icing investigations including the cloud droplet camera, light transmission motor and hygrometer. It recently constructed a special typewriter for use in the typing of technical reports, embodying a large number of mathematical symbols and formulae.

The Section also undertakes work for the Services and Government Departments, for example, not long ago it designed and constructed for the Royal Canadian Air Force an instrument for recording the rate of fire of machine guns.

It was thought desirable to give members of the Committee a brief preliminary outline of the organization, functions and work of the Division in order that the members may better appreciate the equipment and work they will see during their inspection of the laboratories.

Food Biology

Field: Quality of export foods

Colour of Wiltshire Bacon—to determine the cause and to find methods of avoiding discoloration of export bacon when cut; *Preservation of Shell Eggs*—to determine cause and cure of air cell mould in export eggs; *Halophilic Bacteria*—to study how certain bacteria can live in bacon pickling brine.

Food Chemistry

Field: Processing of Dairy Products

Evaporation of Milk—to produce a better evaporated milk by new techniques; *Frozen Storage of Concentrated Milk*—to develop an acceptable method of storing milk for winter use; *Effect of Heat on Milk in Pasteurizing and Condensing Operations*—to improve pasteurization methods and the quality of milk products; *Concentration and Drying of Whey*—to utilize this by-product of cheese making by preparing from it a protein concentrate for inclusion in foodstuffs.

Food Engineering

Field: The Storage and Transportation of Perishable Foods

Railway Refrigerator Cars—to achieve lower car temperatures by redesigning the car.

UTILIZATION GROUP

This investigation includes biological, chemical and engineering aspects of work on the industrial utilization of agricultural residues and surpluses.

Utilization Biology

Field: Industrial Fermentations

Citric Acid Production by Submerged Cultures—to develop an improved method for the production of citric acid from beet molasses; *Butanediol Production by Fermentation*—to produce butanediol by fermentation of cereals, molasses and waste sulphite liquor; *Utilization of Waste Sulphite Liquor*—to produce glycol, lactic acid, etc. by fermenting waste sulphite liquor; *Fermentations Under Controlled pH*—to determine the effect of acidity on the rate of fermentation and the kind of end product. *Decomposition of Cellulose*—a study of the microbial decomposition of cellulose to enable cellulosic wastes to be used industrially.

Utilization Chemistry

Field: Chemistry of Agricultural Products

Composition and Structure of Straw Hemicellulose—a study of the chemical structure of straw intended to advance the development of industrial uses; *Water Soluble Pentosans of Wheat Flour*—a study of the chemistry of flour carbohydrates which may have applications in bread baking and in the manufacture of wheat starch.

Utilization Engineering

Field: Pilot Plant Developments

Production of Butanediol by Fermentations—to develop plant processes for the commercial production of butanediol by fermentation from molasses and waste sulphite liquor; *Drying of Wheat Gluten*—to develop commercial methods for drying gluten without destroying its bread baking qualities.

OILS AND FATS

Field: Animal and Vegetable Fats and Oils

Properties of Edible Native Vegetable Oils—to improve processing and assess value as edible oils and as a source of margarine and shortening fats; *Flavor Reversion*—to prevent flavor deterioration in edible fats and oils; *Utilization of Oil from Weed Seed Screenings*—for edible purposes and industrial uses such as the formulation of lubricants, plasticizers and core oils; *Improvement of Canadian Lard*—to increase the keeping quality of lard and its acceptability to the consumer.

BIOLOGICAL MACROMOLECULES

Field: Physical Studies of Large Protein Molecules

Nucleoproteins—a fundamental study of the proteins of cell nuclei which may provide information on the chemistry of the hereditary mechanism; *Studies on Carrageenin*—physical measurements of the size and shape of the carrageenin molecule.

PLANT SCIENCE

Field: Photosynthesis

The Photosynthetic Activity of the Green Chloroplast—methods of stabilizing and storing active chloroplasts; *Light Studies*—to investigate the working periods of photosynthetic enzymes.

ANIMAL SCIENCE

Field: Animal Physiology

Acclimatization—to investigate the resistance of warm blooded animals to low temperatures.

MARINE PRODUCTS

Field: Processing of Marine Products Other Than Fish

Carrageenin—to aid the Canadian export of Irish Moss by determining the function of carrageenin and establishing quality requirements; *Chitin*—to determine methods of utilizing lobster shells.

BIOMETRICS

Technical Services—to provide statistical services to the Division; *Sampling Inspection*—to evolve a practical and statistically sound method of inspecting large shipments of imported boxed fruits; *Subjective Appraisal of Food*—to evaluate mathematically food appraisals by tasters selected at random.

PRAIRIE REGIONAL LABORATORY

Saskatoon, Saskatchewan

Fermentation Chemistry

Microbiology

Agricultural Residues

Oil Seeds

APPENDIX D

ORGANIZATION AND WORK OF THE DIVISION OF APPLIED BIOLOGY

NATIONAL RESEARCH LABORATORIES, OTTAWA

As presented to Parliamentary Committee, June 1, 1950 by Dr. W. H. Cook, O.B.E., B.Sc., M.Sc., Ph.D., F.R.S.C., Director of the Division of Applied Biology.

The Division of Applied Biology is concerned primarily with applications of bacteriology, biochemistry and other biological sciences to industry. In a sense it occupies a field between agriculture and medicine. The National Research Council supports a Division of Medical Research so that it is unnecessary for the Division of Applied Biology to undertake work in this field, although some of the more fundamental effort of this Division may be of interest to medicine. On the other hand, the Science Service of the Department of Agriculture undertakes all research directly concerned with agricultural production.

It may be of some interest to review the relationship between the Division of Applied Biology of the National Research Council and the Department of Agriculture in greater detail. In general terms, if the ultimate use of results of a scientific investigation must be made by the farmer to become effective, such an investigation has been recognized as the responsibility of the Department of Agriculture. However, if the ultimate use of the results of scientific investigation must be applied by industry, such as preservation of certain food products and industrial use of agricultural wastes and surpluses, such work falls within the general responsibility of the Division of Applied Biology. The Department of Agriculture already has facilities of an *extensive* nature in the form of branch laboratories in different parts of the country, which are necessary both to obtain and disseminate information that must be put into practice by the farmer. On the other hand, the National Research Laboratories are essentially of an *intensive* nature, suitable for the study of industrial problems. Thus, when the farmer markets his product, his ultimate return depends partly on how well this product can be processed, stored or transported to export markets; however, it is industry, rather than the farmer, that applies these techniques.

While the foregoing indicates the general subdivision of responsibility, many other considerations must be taken into account on the more detailed level. In the food field generally, the Fisheries Research Board is responsible for most of the activities concerned with processing, transporting and storing fish. Similar studies on horticultural products demand consideration of varietal and environmental differences as well as the strictly processing techniques. In consequence, it has seemed desirable that this whole field should remain under the aegis of one agency and the Horticultural Division of the Experimental Farms Service is responsible for studies on this aspect of food preservation. The main phase of food investigation that has fallen to the Division of Applied Biology is concerned primarily with the field of meat and animal products, including studies on bacon; dressed poultry; shell, frozen, and dried eggs; certain dairy products, and engineering studies concerned with the processing, storage and transport of food. In fact, the majority of the Division's studies in this field have been concerned with Canada's export trade of these products.

The work of the several government agencies and industries is co-ordinated through annual meetings of the Canadian Committee on Food Preservation. This Committee has five subcommittees covering fish and fish products, fruit and vegetable products, edible fats and oils, meat and animal products, and food engineering and transport. While the first two subcommittees deal primarily with the work of the Fisheries Research Board and the Department

of Agriculture respectively, the scientific officers from all agencies, together with university personnel and industrial representatives, exchange information on work that is approaching completion and draft plans for future work. In recent years, the Subcommittee on Engineering has devoted a great deal of time to improving the railway refrigerator car and this serves as a good example of co-operation between agencies on a more detailed level. Following requests from industry placed before the Committee, a general program of study was agreed upon. Methods of improving the present refrigerator car were placed under investigation in the Division of Applied Biology. Experimental work on a railway car cooled with mechanical refrigerator equipment was undertaken by the Fisheries Research Board. The railways agreed to modify their cars and make arrangements for their movement under commercial conditions. Following the necessary tests on models in the laboratory, experimental road trials have been carried out during the past two years and another is planned for this summer. The Canadian Pacific Railways have modified a refrigerator car as indicated by the Division's experimental work. The Canadian National Railways have provided a car to carry the mechanical refrigerator. Both cars will be tested on shipments of fish from Prince Rupert to eastern Canadian points, through arrangements made by the Fisheries Research Board. All agencies are contributing to co-operative experiments of this sort, designed to improve the quality of Canadian food products as received by the ultimate consumer.

One section of the Division of Applied Biology devotes attention to potential uses of edible fats and oils of Canadian origin. It has been found possible to bleach and deodorize rape and weed seed oils to bland products suitable for edible purposes. Lard, a product produced in substantial quantities in Canada, has been investigated with respect to methods of rendering, anti-oxidants and other treatments designed to improve its keeping quality. All of this work is aimed at encouraging the possible production of a larger share of our own requirements of fats and oils.

Another large field of work covered by the Division of Applied Biology is the industrial or non-food use of wastes or surpluses of agricultural or marine origin. One group is concerned with the microbiological aspects of this problem, primarily fermentation of waste carbohydrate materials. The raw materials studied so far are grains, beet molasses, cellulose, and sulphite liquor from paper factories. The Division is not concerned with the production of potable or industrial alcohol (fermentations produced by yeasts), which are well understood. We have been concerned with the production of butylene glycol, which is closely related to ethylene glycol, and certain forms of the butylene glycol have similar antifreeze properties. This fermentation is produced by several strains of bacteria, which demand facilities somewhat different from those used in the yeast fermentation. In consequence it has been necessary to provide pilot plant facilities to demonstrate to industry that these fermentations are feasible on an industrial as well as on a laboratory scale. Although this form of glycol has a direct use as an antifreeze, it has other possibilities in chemical industries, and a number of solvents and new plastics have been prepared from it.

In addition to the glycol fermentation, work is also proceeding on the fermentation of molasses to citric acid by deep tank procedures. This phase of the work is approaching completion in the laboratory and should shortly enter the pilot plant phase. The production of citric acid by the use of certain molds growing in shallow trays has been the usual method up to the present time. It is felt that development of a deep tank procedure comparable with that used in producing penicillin would be of considerable practical advantage for industrial developments in this field.

The cellulosic constituents of straw and other wood-like materials, which are often wastes, are being examined from the standpoint of chemical composition and as potential raw materials for the fermentation industry. Some of these materials interfere with the effective separation of starch and gluten. Hemicellulose, which is not a true cellulose, constitutes a substantial proportion of the material found in straw; studies have been made to determine how the inclusion of this constituent with the true cellulose fraction would affect the quality of the paper produced.

In addition to these major investigations concerned with food and non-food uses of agricultural products, a number of independent projects in the Division are concerned with more specialized or fundamental topics. One of these, biometrics and mathematical statistics, gives attention to experimental design, sampling techniques and mathematical tests of significance on data of biological origin. This group assists in various Divisional activities, and undertakes work for other government departments and frequently for industry. As an example of its Divisional activities, the statistical section is responsible for most of the work concerned with the subjective appraisal of foods. It is not always possible to appraise the quality of a given processing or storage treatment of food with objective, chemical or physical determinations. Even when such tests are developed, they must be checked and calibrated against the opinions of consumers. This involves the design of tasting procedures and mathematical tests on the data to ensure that differences observed are attributable to the samples and not to idiosyncrasies of the personnel doing the tasting. Several industrial firms have made use of this taste panel on a contract basis when they could not obtain the necessary information from other sources. This group has also carried out extensive work on the sampling of certain imported food products such as dates. This work was requested by the Food and Drugs Laboratory of the Department of National Health and Welfare, whose inspectors must examine incoming shipments of these commodities. The statistical group has worked out a formula which enables the sampling to be done on a scientific basis so that the desired information is obtained with minimum expenditure and effort.

Another project is concerned with animal science. The fundamental relationship between an animal and its physical environment involves the exchange of matter and energy. The complexities of this exchange have not been worked out, and the animal science group is therefore studying the problem, with particular reference to the effects of acclimatization, including the effect of low temperatures on warm-blooded animals. Since Canada is a cold country, this is a problem of first interest which we cannot expect investigators in warm climates to solve for us. This problem is being studied using laboratory animals under controlled temperature conditions. We are including a number of native wild species, such as the Arctic lemming, to obtain suitable reference points in nature.

A project in the field of plant science is concerned with the nature of photosynthesis. All life on this planet is made possible through the ability of the green plant to absorb and conserve the sun's energy. While the plant is less than five per cent efficient in this task, it remains the source of all our energy supplies up to the present time. It is important that we obtain further information on this most fundamental and vital of all energy exchange problems. A small group has already made a substantial contribution to our knowledge in this field. Such an effort is well justified, since one can consider all the food and industrial work in the Division as an attempt to conserve the products of photosynthesis and to use them more efficiently.

Still another fundamental problem is concerned with the nature of the large molecules of biological origin. Between the smallest bacteria that can be seen with an optical microscope and, say, the sugar solution of the chemist, there are a great many materials that exist in colloidal solution. These include

the viruses responsible for many plant and animal diseases, the enzymes responsible for digestion and fermentation and proteins, carbohydrates and other materials of biological origin. The size and shape of these particles are of considerable interest, as well as methods of preparing them in unchanged form for further investigation. These are some of the problems being studied in the laboratory concerned with biological macromolecules.

Several problems of interest to the Maritime Provinces are being opened up and will be transferred to the Maritime Regional Laboratory in Halifax as soon as it is completed and functional. During the war years, American industry provided a market for the seaweed known as Irish Moss, which grows off the coast of the Maritime Provinces. A hot water extract of this seaweed provides a material that is phenomenally effective as a stabilizing agent, such as the suspension of cocoa powder in milk to form chocolate milk. Prior to the war, the United States imported most of its requirements from European sources. Our investigations are concerned with the maintenance of quality in this product so that it will be attractive to American industry, even at similar or higher prices than the material from other sources. Investigations showed that material having a high suspending power also contributes a high viscosity through reaction with constituents in milk. This was worked out to form the basis of a quality test. Studies in the macromolecule laboratory showed that the better quality material has a larger particle size or molecular weight. With this fundamental fact, we have been able to indicate what drying, bleaching or other processing procedures are likely to reduce the particle size and therefore reduce the quality.

Prairie Regional Laboratory

The Prairie Regional Laboratory at the University of Saskatchewan is essentially a branch of the Division of Applied Biology. This laboratory was established to undertake work on industrial utilization of agricultural products of the prairie region. The division of responsibility is based on the products common to each region. When this laboratory was established, all work concerned with the fermentation of cereal grains and other prairie products was transferred from the Ottawa Laboratories to the Prairie Regional Laboratory.

This Prairie Regional Laboratory is organized into several main sections. One is concerned with microbiology and fermentations, and another with fermentation chemistry. These groups study new fermentation products including antibiotics, enzymes, and materials similar to glycol. The laboratory also has a section on fats and oils, which has concerned itself primarily with the fractionation of linseed oil in an attempt to get better drying oils on the one hand, and fractions that might be suitable for edible purposes on the other. Another group works on agricultural residues including the utilization of straw, protein from oil expression plants, and other materials. Straw has been investigated as a fuel. A satisfactory briquette has been produced without a binding agent, merely by the application of heat and pressure. It is believed that this might prove useful to the individual farmer, should he be interested in converting his surplus straw to a more suitable fuel. The most attractive possibility, however, is the manufacture of insulating boards. Some very satisfactory boards have been produced by essentially continuous procedures on a small pilot plant scale. It would appear that the application of this process would not only return a reasonable price to the farmer for his straw, but would enable the manufacture of a satisfactory insulating material at a lower cost than prevails today.

To undertake work on these diverse problems, both the Division of Applied Biology in Ottawa and the Prairie Regional Laboratory in Saskatoon have been organized on a project basis rather than according to academic trainings

and disciplines. In other words, the Division is not divided into sub-groups representing bacteriology, biochemistry, etc., but these disciplines are brought together in order to work effectively on the solution of a given problem. This enables the biologist to have the assistance of a chemist or an engineer or both, depending on the type of training necessary to advance the project either in its laboratory or development phases.

A number of associate committees enable the Division to co-ordinate its activities with those of the universities, other government departments and industries. The Canadian Committee on Food Preservation has already been mentioned. The Associate Committee on Grain Research provides this liaison and co-ordination in the field of cereal chemistry concerned primarily with the food uses of wheat, durum wheat, barley, and malting barley. The Associate Committee on Wildlife Research brings the Division animal science group in contact with other government agencies and the universities active in this field. A Committee on Applied Mathematical Statistics serves a similar function in the biometrics field. An Associate Committee on Seaweeds Research co-ordinates the biological, chemical and industrial phases of this subject. Other established committees within the Division's field of activity include the Associate Committee on Parasitology, and the Associate Committee on Research on Aquatic Biology. The National Research Council, within limits, provides grants in aid of research to university personnel on the recommendations of these committees.

APPENDIX E

STATEMENT MADE BY DR. STEACIE, DIRECTOR OF THE CHEMISTRY DIVISION
BEFORE THE PARLIAMENTARY COMMITTEE

THE DIVISION OF CHEMISTRY

In addition to the space occupied on Sussex Street, the Division operates the Customs Excise Laboratory on Queen Street, the Explosives Testing Laboratory at the Montreal Road (jointly with the Bureau of Mines), and has one section (Chemical Engineering) stationed at the Montreal Road.

The Division is organized in two Branches: a Pure Chemistry Branch headed by the Director, and an Applied Chemistry Branch headed by the Associate Director, Dr. A. Cambron. The sections, and the names of the section heads follow:

DIVISION OF CHEMISTRY

Director—E. W. R. Steacie

Associate Director—A. Cambron

PURE CHEMISTRY BRANCH

E. W. R. Steacie, O.B.E., B.Sc.,
M.Sc., Ph.D., D.Sc., F.R.S.C.,
F.R.S.

Organic Chemistry

L. Marion, M.B.E., B.A., M.Sc.,
Ph.D., F.R.S.C.

Organic Spectrochemistry

R. N. Jones, B.Sc., M.Sc., Ph.D.,
F.R.S.C.

Spectroscopy

H. J. Bernstein, B.A., M.A.,
Ph.D.

Thermodynamics of Gases

W. G. Schneider, B.Sc., M.Sc.,
Ph.D.

Inorganic Chemistry

E. A. Flood, O.B.E., B.Sc., A.M.,
Sc.M., Ph.D., F.R.S.C.

Colloid Chemistry

I. E. Puddington, B.Sc., M.Sc.,
Ph.D., F.R.S.C.

Photochemistry

E. W. R. Steacie

Surface Chemistry

J. A. Morrison, B.Sc., M.Sc., Ph.D.

Fibre Chemistry

P. Larose, M.B.E., B.Sc., M.Sc.,
Ph.D.

APPLIED CHEMISTRY BRANCH

A. Cambron, O.B.E., B.A., B.Sc.,
M.Sc., Ph.D., F.R.S.C.

Chemical Engineering

P. E. Gishler, B.Sc., M.Sc., Ph.D.

Textiles

C. H. Bayley, M.B.E., B.A.Sc.,
M.A.Sc., M.A.

Corrosion

M. Cohen, B.A., M.A., Ph.D.

Industrial Organic Chemistry

A. Cambron

Paints

C. Y. Hopkins, B.A., M.A., Ph.D.

Organic Synthesis

A. M. Eastman, B.A., M.A., Ph.D.

Rubber

T. R. Griffith, B.Sc.

Applied Physical Chemistry

D. F. Stedman, B.A.Sc., Ph.D.

Analytical Laboratory

A. K. Light, B.Sc.

Explosives Laboratory

M. C. Fletcher, M.B.E., A.R.T.C.

Customs and Excise Laboratory

R. W. Hoff, A.R.C.S.

TYPES OF INVESTIGATION

There is a wide variety of types of problem under investigation in the Division. These may be roughly divided as follows:

(a) *Fundamental investigations in the Pure Chemistry Branch*

These are investigations of a basic kind and are of a long-range, continuing nature.

(b) *Long-term applied projects which originate in the Division*

Projects of this type represent a contribution to industrial chemistry which result from ideas of the members of the Division, and are originated in the Division. They may continue more or less indefinitely, and frequently carry through the laboratory to the pilot plant stage. When such a process is successful, and the investigation is complete, patents are taken out, and the process licensed to a Canadian firm who put it into production. Examples of this type of work are: The production of metallic magnesium, developed in the Division by Dr. L. M. Pidgeon, and put into operation in Canada by Dominion Magnesium Ltd., the development recently by Dr. Cambron's group of a process for the manufacture of ethylene glycol, and the development by Dr. Gishler's group of a process for the extraction of oil from Alberta bituminous sands.

(c) *Problems Sponsored by Industry*

Some of the research projects undertaken by the Division are sponsored and paid for directly by the industry. This makes it possible for the Council to give assistance to small industries who have no adequate research facilities, although a good deal of the work is sponsored by the larger industries when the special facilities required are not available in their own laboratory. In some cases the work is carried out in the National Research Council laboratories by research staff engaged by the sponsor; in other cases the research staff is provided by the Council. As an example of a sponsored project may be mentioned the work being done now on the use of lignin in the compounding of synthetic and of natural rubbers on behalf of a Canadian paper mill. This work is giving very promising results and is expected to lead to a substantial reduction in the importation of compounding materials by the rubber industry, and to an improvement in the quality of some synthetic rubber products.

Other sponsored projects include a lengthy investigation on the preparation and properties of greases for Imperial Oil Limited, and an investigation of special lubrication problems for the Canadian Pacific Railway Company.

(d) *Group Research*

Another example of the way in which the Council co-operates with the industry is the research and service work done by the Textile Laboratory on behalf of the Canadian Institute of Launderers and Dry Cleaners. The research and testing facilities of the laboratory are made available to the Institute under the terms of an agreement between the Institute and N.R.C. Membership in the institute represents, on a volume basis, 75 per cent of the laundering and dry cleaning industry in Canada. It is thus possible for small laundries, which could not possibly afford to employ a chemist, to have the advantage of research facilities, a consulting service, and facilities for process control.

(e) *"Service" Sections*

There are a number of sections in the Division which are devoted to special industrial fields, and which act as consultants, carry on investigations, perform tests and draw up specifications in their field. Examples are the Rubber Section which performs a variety of such services for the rubber industry and for users of rubber; the Paint Section which deals similarly with paint problems for manufacturers, for government departments and organizations such as Central Mortgage and Housing Corporation, and for large industrial users of paint.

Another section of this type which encounters almost every type of industry in its operations is the Corrosion Section. Problems here range from the fundamental question of the way in which metals corrode at high temperatures to the very practical and important problem of the corrosion of domestic hot water tanks.

(f) *Miscellaneous*

In addition to the above a considerable number of routine tests, and short-term investigations are carried out on a wide variety of problems, and all sections from time to time serve as consultants to industry, and to government departments.

RELATIONS WITH INDUSTRY AND OTHER LABORATORIES

(a) *Consulting Chemists*

Our policy has been to avoid, as much as possible, the undertaking of analyses, tests and short-term projects which can be performed satisfactorily by chemical or engineering consultants. In the first place we have no wish to compete with such firms, and they can usually render better service than we can since they are closer and more in touch with local problems. In the second place we are left free for more important long-term investigations for which we have the specialized staff and equipment.

(b) *Industrial Laboratories*

Work is, of course, only undertaken for an industrial organization when they are not able to carry it out for themselves. Even with large organizations with their own laboratories, however, it frequently happens that specialized work can be done with advantage in the Division for which the industrial laboratory does not have the staff, equipment, or experience. In some cases such work may be done in our laboratories by the staff of the company concerned.

(c) *Provincial and other Laboratories*

In general the Provincial Research Organizations are more experienced in local conditions, and are better suited for short term tests and investigations than we are. We therefore work closely with such laboratories, and have avoided duplication and over-lapping of effort.

In line with this policy we have avoided almost entirely work in the pulp and paper field, since the Pulp and Paper Research Institute in Montreal is devoted solely to such work, and is a large and most competent organization.

(d) *Other Federal Government Organizations*

A variety of investigations are carried out in collaboration with the Defence Research Board, the Bureau of Mines, Polymer Corporation, and other government organizations.

VISIT TO THE LABORATORIES

In view of the short time available, it is proposed to visit one laboratory of each type:

The Laundry laboratory as an example of group research.

The Spectroscopic laboratory as an example of fundamental work, and of co-operation with the field of medicine.

The Ethylene Glycol Pilot Plant as an example of long-term industrial research on a project originating within the Division.

The Colloid laboratory as an example of research sponsored by the industry.

The Corrosion laboratory as an example of the "service" type of section.

DOCUMENTS TABLED

(a) For a more detailed and technical description of the work of the Division see "The Chemistry Division of the National Research Council of Canada" by E. W. R. Steacie and A. Cambron, reprinted from "Research", vol. 2, pages 225-229, May 1949.

(b) For a further discussion of the relation of the Division to the Chemical Industry see "Functions of the National Research Council in Relation to the Canadian Chemical Industry".

APPENDIX F

INTRODUCTORY REMARKS MADE ON THE OCCASION OF
THE VISIT OF THE PARLIAMENTARY COMMITTEE
TO THE DIVISION OF PHYSICS

6 JUNE, 1950.

Mr. CHAIRMAN:

I can only give you a very sketchy impression of the work of the Division of Physics in the time at my disposal, but we have selected senior members of our staff to act as your guides and these men will be able to give you supplementary information as you proceed on your tour through the laboratories.

The work of the Division is very diverse. It ranges from investigations to improve our fundamental knowledge of the way nature works, to a very varied application of this and other knowledge to everyday practical problems. Two samples from our publications will illustrate what I mean. Within the last year we published a report of an investigation on the physical properties of the rare isotope He³. During the same period we reported on studies designed to explore the various ways in which another isotope, Co⁶⁰, could be applied to pressing industrial and medical problems. Both isotopes were provided by the Chalk River Laboratories. Problems of the second type represent the major effort of the Division, and it is on the success of these that you and others will tend to judge the success of our overall work. Correct though this criterion is for an organization such as ours, it must not be forgotten that success in the practical way cannot be achieved in the absence of a certain percentage of time being devoted to more fundamental problems with less probability of early usefulness. Association with such work gives to the applied work a vitality not attainable by any other method.

Several documents have been provided to you to help in your overall appraisal of our work. One of these sets forth the organization of the Division as it is at present. This is not a rigid plan of organization, since we believe that in a research division the organization should be very flexible so that account can be quickly taken of new and changing trends. I shall use the present organization as a framework for the information which I am about to give you.

The acoustics group is under the direction of Dr. G. J. Thiessen, a graduate of Saskatchewan and Columbia universities. In his laboratory certain fundamental studies are being made on the velocity of sound in the rare gases and at the critical point. Along with these problems Dr. Thiessen is carrying out an important practical investigation on the improvement of marine fog horns. It would appear that the development of these important mechanisms has been

badly neglected over a long period of time in all countries. It is our expectation that very shortly Dr. Thiessen will have an important contribution to make to the improvement of fog horns by the application of modern acoustic theory.

Dr. D. C. Rose, a graduate of Queen's and Cambridge, England, is in charge of research work in cosmic rays. He has a laboratory both here and in the Arctic where he studies the effect of meteorological conditions on cosmic rays. These researches are designed to obtain further information on the upper atmosphere, and the nature of nuclear reactions.

Work in the same field is carried on by Dr. E. Pickup, a graduate of Manchester, England and Aberdeen, Scotland. His work is done with the aid of special photographic emulsions and balloon flights at high altitudes.

A recently established atomic and molecular beam laboratory is under the direction of Dr. Hin Lew, a graduate of British Columbia, Toronto, and Massachusetts Institute of Technology. This work is designed to get further information on the structure of atoms and molecules, and is closely allied with the investigations in spectroscopy carried on by our Director, Dr. G. Herzberg.

Our electricity laboratory is under the guidance of Dr. J. T. Henderson, a graduate of McGill and London, England. The work of this laboratory comprises the establishment and maintenance of fundamental electrical standards. In this important field a very interesting research has been initiated to establish a standard of time by counting the vibrations of certain molecules in the microwave region. This is one of the laboratories selected for you to visit.

Our metrology laboratory is concerned with the maintenance of the standards of length and mass. This group also designs special instruments for use in the aerial mapping of Canada and for a variety of other purposes. Mr. R. H. Field, a graduate of the University of London, England, is responsible for this work.

As you know, atomic energy research is concentrated at Chalk River but our Division does carry out a small amount of nuclear physics with the aid of a 600 Kv. accelerator. A certain amount of interesting work remains to be done in this range of energies. Dr. W. J. Henderson, a graduate of Queen's and Cambridge, England, is guiding the work.

The optics laboratory is doing work in three main fields; photographic optics, the design of optical instruments, and spectrochemical analysis. You will be shown a high speed motion picture camera that was developed in this laboratory. This camera can take pictures at rates between 100,000 and 200,000 frames per second and you will also be shown samples of these.

The photometry and colorimetry laboratory is under Mr. W. E. K. Middleton who has studied at Purdue and Saskatchewan universities. Mr. Middleton's group maintains the fundamental photometric standards of candlepower, and carries out important investigations on the application of the scientific measurement of colour to industrial needs. Mr. Middleton is also well known for his work in atmospheric physics.

Dr. A. Morrison, a graduate of Saskatchewan and McGill, is responsible for the work of our radiology laboratory in which the application of all kinds of atomic radiation to the various needs of industry and medicine are studied. You will be visiting this laboratory.

In our spectroscopy laboratory Dr. G. Herzberg, the Director of the Division, carries on important investigations in the field of molecular physics. This work brings international recognition to the Division. Physicists from many other countries come to his laboratory to discuss problems or to work with him for varied periods.

In our temperature and radiation laboratory Dr. R. M. LeLachur, a graduate of Dalhousie and Virginia universities, is responsible for the maintenance of the international temperature scale, and for various other researches in the field of heat.

A small theoretical physics group under Dr. Ta-You Wu, a graduate of Nankai, China and the University of Michigan, both conducts independent mathematical investigations and renders mathematical aid to all the other groups within the Division. Dr. Wu has an international reputation in his field.

Dr. J. D. Babbitt, a graduate of New Brunswick and Oxford universities, is studying the thermal conductivity of metals and building material. He combines with this studies on vapour migration through various materials.

Dr. W. H. Barnes, a graduate of McGill university, is studying the crystal structure of various compounds by X-ray diffraction and is applying such techniques to analysis for identification. In addition, he is developing the use of the electron microscope for a wide variety of industrial problems.

To help the Division in its varied activities there are the optical shop and the physics workshop. The former is capable of making any kind of precision optical part, and the latter services the mechanical needs of the various researches.

Statistics are notoriously misleading but it may be of some interest to record that during the past year the Division has published thirty papers in various scientific journals. In the same period some two hundred and twelve Divisional reports have been issued. The latter vary greatly in size and importance, but a substantial proportion have made a significant contribution to the technical development of Canada in a variety of fields.

L. E. HOWLETT,

Associate Director,
Division of Physics,
National Research Council.

APPENDIX G

PARLIAMENT COMMITTEE

VISIT TO RADIO AND ELECTRICAL ENGINEERING DIVISION

(1.30-3.00 P.M., 6 June, 1950)

Introductory Remarks by the Director (Mr. B. G. Ballard, B.Sc.)

Guides: Dr. D. W. R. McKinley, B.A., M.A., Ph.D.; Dr. R. S. Rettie, B.Sc., Ph.D.; Dr. J. H. Simpson, B.Eng., Ph.D.

Tube Laboratory Mr. P. A. Redhead, B.A., M.A.....	Third Floor
Defence Section Mr. W. C. Brown, B. Eng.....	Third Floor
*Suppressed Antennas.	Mr. W. A. Cumming, B.Sc.....	Third Floor
*Solar Noise Research.	Dr. G. A. Miller, B.Sc., M.Sc., Ph.D..	Third Floor
*Shooting Star Radar..	Mr. E. L. R. Webb, B. Eng.....	Third Floor
Radar Development Mr. H. B. Smyth, B. Eng.....	Third Floor
Electrical Engineering	... Mr. N. L. Kusters, M.E., E.E., M.S..	Basement
*Search Radar Trailer.	Mr. E. F. V. Robinson, B.Sc.....	Rear Entrance
*Forestry Communica- tions Set.....	Mr. C. F. Patterson, B.Sc.....	Basement

NOTE: Items marked * brought in for demonstration from outlying Divisional laboratories.

A REVIEW OF ACTIVITIES OF THE RADIO AND ELECTRICAL
ENGINEERING DIVISION, PRESENTED TO THE SPECIAL
PARLIAMENTARY COMMITTEE DURING ITS VISIT
TO THE NATIONAL RESEARCH COUNCIL
ON JUNE 6, 1950

The Radio and Electrical Engineering Division is the electrical counterpart of the Division of Mechanical Engineering, which you visited a few days ago. While we are engaged on some fundamental studies, the emphasis is on applied science rather than fundamental science. We attempt to bridge the gap between theory and practice.

It is unfortunate that you will be able to see only a minor part of our activities this afternoon. The Division developed during the war and being a newcomer was obliged to obtain space where and as it could be found. Furthermore, some of the work requires field stations and as a result, the laboratories are dispersed widely. There are two major groups in the Sussex Street Building, an experimental station on the Metcalfe Road, and another establishment on Green Island in the City. There is also a station at Scarborough, Ontario, and smaller stations are located on the East and West Coasts, Goth Hill outside of Ottawa, and Mount Royal in Montreal. Only about thirty-seven per cent of the staff is located in the Sussex Street Building.

In addition, we have a motor vessel used on our work in Marine Aids to Navigation which is now being fitted for the summer's work. Regrettably it is not quite ready for operation and even if it were, time would not permit an inspection of it this afternoon. It is hoped, however, that you will find it possible to examine it at a later date.

Because we cannot show you all of our activities, I would like, with your permission, to review briefly those projects which you will not see, and to describe some of the work you will see.

I mentioned that the Division grew during World War II. This growth was the result of the demands for radar development from the Armed Services. We have here the greatest concentration of radar development facilities and radar scientists in the country, and while our efforts are not of the same magnitude as those of some laboratories outside the country, we believe that they are equal in quality. I mention this to account for the predominant emphasis on radar within the Division. Some of our radar development for Defence is underway in this building and you will see it presently. As you would expect, it is of a classified nature and it is hardly necessary to ask you to refrain from discussing outside the laboratory the work you will see in these classified areas.

Other important radar applications are: Aids to Aerial Survey and Aids to Marine Navigation. Of these two developments you will see very little in this building. In the former we have adapted wartime radar for surveying purposes and it enables the survey of those vast areas in Canada which are not yet accurately surveyed. The work can be completed in a fraction of the time which would be required otherwise and with an accuracy equal to that obtained by ordinary surveying methods. We measure distances of two hundred miles to an accuracy of fifty feet. That may appear to be a large error, but it is comparable to an error of ten, one-thousandth parts of an inch in twenty feet, which after all is fine work.

Our radar developments in the marine field are perhaps our most successful undertakings in civilian work. During the war we had developed what was called the Type 268 Marine Radar Set for naval purposes and this was adapted for civilian use after the war. We believe that this is one of the world's best marine radar sets.

Radar has proved to be a most useful tool in other sciences and we have been using it to study meteors in collaboration with the staff of the Dominion Observatory. This is one of our more fundamental studies, but it may prove to be extremely valuable in defence work.

We are using radar equipment also to detect radiation from the sun in the radio spectrum. We have complete records of this radiation over a period of the last few years and have correlated it with sun spots and other natural phenomena. Again this is a more fundamental study but this radiation appears in the form of noise in certain communication systems and merits our attention.

These new developments inevitably require new types of vacuum tubes and we have a laboratory especially devoted to this class of work. We do not undertake the development of tubes similar to those used in your home radio set because there are other laboratories, particularly in the United States and Great Britain, better equipped and adapted for this sort of work. However, our tube laboratory is effective in developing extremely high frequency tubes, which, we believe, will be useful in improving the definition of our radar displays and in a variety of other applications, such as accelerator tubes for atomic studies.

We have a laboratory, which unfortunately you cannot see this afternoon, devoted to the general advancement of microwave technique. Microwave, by the way, applies in general to those frequencies used for radar work ranging from three thousand to thirty thousand million cycles per second. This section devotes much of its effort to the design and development of antennas for these new frequencies and deals also with new types of antenna for high speed aircraft. Conventional antennas mounted on the new high speed machines would be torn off by the terrific aerodynamic forces and even if they were not, they would introduce an intolerable drag. As a consequence, it has been necessary to locate the antennas within the skin of the aircraft, or, in some cases, to use portions of the aircraft structure itself as antenna members.

We have developed a unique accelerator which offers some promise for certain types of atomic research. It appears that it may be possible to accelerate electrons over a certain energy range more economically than can be accomplished with other types of accelerators. At the present time it is in a model form only but the model will induce an electron acceleration equal to that resulting from the application of eight million volts.

In the electrical engineering field as distinct from the communication field, which we have been discussing, we have facilities for studies at high voltage, and, indeed, at any voltage and frequency ordinarily used in electrical engineering. In the high voltage work we have a surge generator which will simulate lightning disturbances, and switching surges which develop on high voltage systems. This equipment, and our knowledge and experience, have been useful for both industry and electric utilities.

Very frequently our work is of use to other scientific groups. We developed and built a five million volt generator for studies at Chalk River—I expect you saw that on your visit there. We have been working on a half million volt generator of a similar type and hope to have it in operation in the near future.

We are interested also in the fundamental theory of electrical insulation and we have a group engaged in this field. We are pursuing also the development of regulators and control equipment for electrical purposes. There is an insatiable demand for more and more precise regulating equipment. These you will see in the Electrical Engineering Laboratory. They include also some of the latest developments in magnetic amplifiers which offer much promise in certain applications.

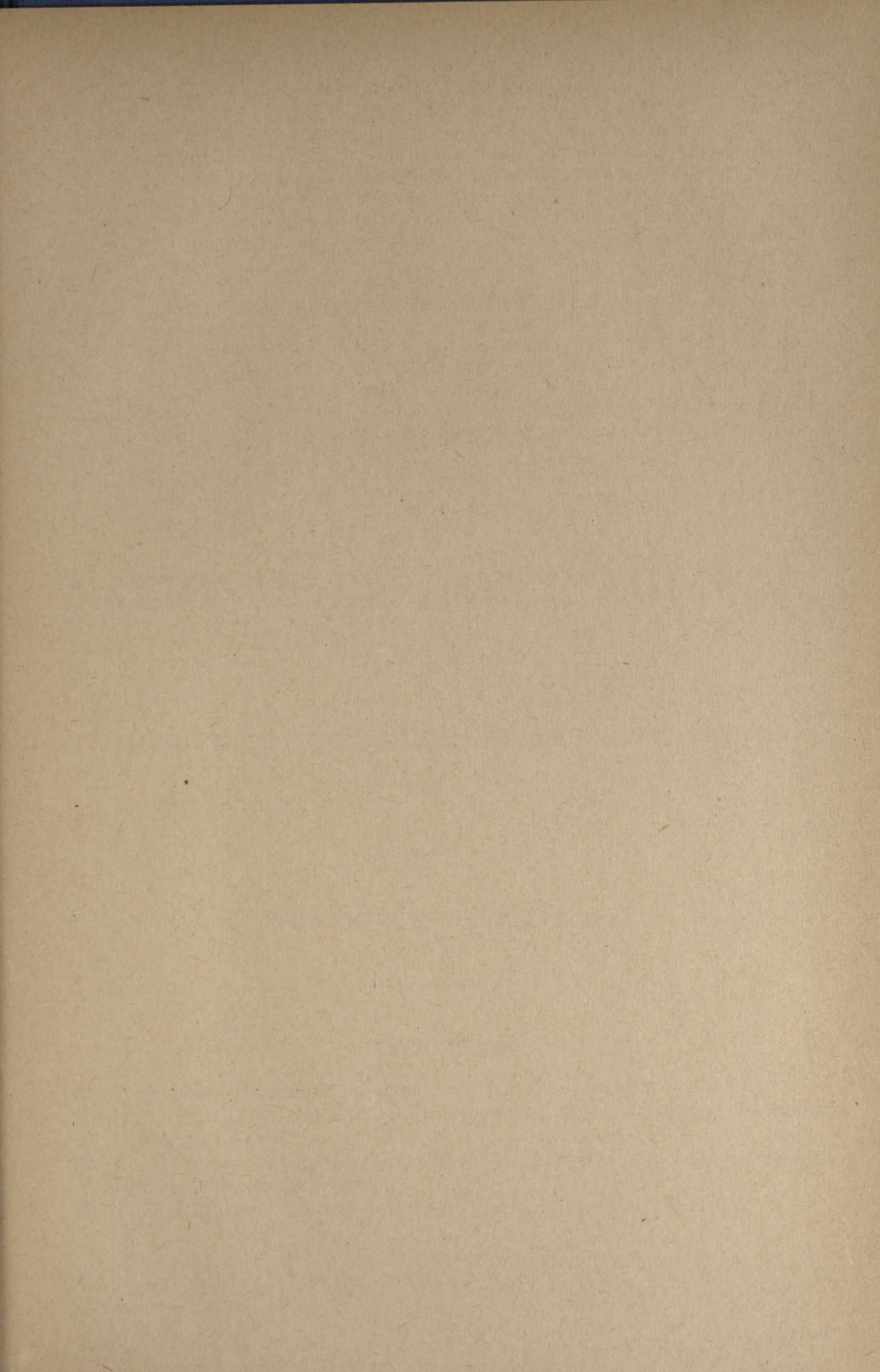
I have mentioned occasionally that we co-operate with other laboratories, and I emphasize that this is an important part of our work. For example, we are now collaborating with the Banting Institute on what appears to be an

extremely important study of the heart. Obviously the major part of this work is being undertaken by the medical men at the Banting Institute, but we are assisting in the development of the necessary instrumentation.

I fear that I must not take more time in this general review and I hope that it will enable you to understand better the work you will see in the laboratories and that it gives you a fair impression of the general type of work we are doing.

I want to emphasize the fact that we try to avoid activity in fields which we are not well equipped to enter, or fields already served adequately elsewhere. For example, television offers an intriguing field for development but it is essential that television standards in Canada be co-ordinated with those in the United States so that independent effort does not appear to be wise and in any event our impact on television compared with that of the great laboratories in the United States would be almost futile. We keep very closely in touch with other laboratories to benefit from their work and avoid conflict.

B. G. BALLARD.



SESSION 1950

HOUSE OF COMMONS

SPECIAL COMMITTEE

on the

OPERATIONS

of the

NATIONAL RESEARCH COUNCIL

MINUTES OF PROCEEDINGS AND EVIDENCE

No. 5

THURSDAY, JUNE 15, 1950

WITNESSES:

- Dr. C. J. Mackenzie, C.M.G., President, National Research Council.
- Mr. E. R. Birchard, O.B.E., Vice-President, Administration, National Research Council.
- Mr. C. H. Bayley, Senior Research Officer in charge of Textile Laboratory, National Research Council.
- Mr. S. P. Eagleson, General Secretary, National Research Council.

SPECIAL COMMITTEE
on the
OPERATIONS
of the
NATIONAL RESEARCH COUNCIL

Chairman: George J. McIlraith, Esq.,
Messrs.

Breithaupt
Brooks
Bourget
Coldwell
Gibson

Green
Kirk (*Digby-Yarmouth*)
Low
McCusker

Murphy
Pinard
Stuart (*Charlotte*)
Winkler

Clerk: A. L. Burgess.

MINUTES OF PROCEEDINGS

THURSDAY, June 15, 1950.

The Special Committee on the operations of the National Research Council met at 8 o'clock p.m., the Chairman, Mr. George J. McIlraith, presiding.

Members present: Messrs. Gibson (*Comox-Alberni*), Green, Kirk (*Digby-Yarmouth*), McIlraith, Murphy, Pinard, Stuart (*Charlotte*), Winkler.

In attendance: Dr. C. J. Mackenzie, C.M.G., President, Mr. E. R. Birchard, O.B.E., Vice-President, Administration, Mr. C. H. Bayley, Senior Research Officer in charge of Textile Laboratory, and Mr. S. P. Eagleson, General Secretary, National Research Council.

Dr. Mackenzie and Messrs. Birchard and Eagleson were called and examined regarding the estimates of the National Research Council for the year 1950.

Mr. Bayley was called, heard and questioned regarding the work of the textile laboratory.

The witnesses retired.

At 10 o'clock p.m. the Committee adjourned to the call of the Chair.

A. L. BURGESS,
Clerk of the Committee.

MINUTES OF EVIDENCE

HOUSE OF COMMONS,
Thursday, June 15, 1950.

The Special Committee appointed to examine into the operations of the National Research Council met this day at 8 p.m. The Chairman, Mr. G. J. McIlraith, presided.

The CHAIRMAN: Order, gentlemen. This evening we have Dr. Mackenzie, Mr. Birchard, and Mr. Eagleson to deal with the financial part of the estimates, and then, it would be my hope that tonight we could finish with that matter in time and then deal with another aspect of the matter that Mr. Murphy raised, that of the chemistry division and its work on textiles. If that is agreeable to you I would call on Dr. Mackenzie to start right in on the question of the finances.

C. J. Mackenzie, C.M.G., M.C., M.C.E., D. Eng., D.Sc., LL.D., F.R.S.C., M.E.I.C., recalled:

The WITNESS: Mr. Chairman, I do not know how the committee would like to deal with the estimates. At the first session we distributed a list of the sections of National Research Council. We find the most realistic way to look at our estimates is to consider the various divisions. The over-all picture does not give me, as the chief administrative officer, the best picture of costs, but we will be very glad to take it up in any way you choose. I would like to suggest that perhaps you would like to glance at this sheet we distributed the first day.

NATIONAL RESEARCH COUNCIL

Vote Title: Salaries and Other Expenses of the National Research Council

ESTIMATE BY CHARACTER OF EXPENDITURE

Divisions	Submitted 1950-1951	No. of positions 1950-1951	Increase in posi- tions over 1949-1950	Cost per position
	\$			\$
<i>Research Laboratories</i>				
Applied Biology—Ottawa.	493,701	109	1	4,529
Applied Biology—P.R.L.	299,170	54	-1	5,540
Chemistry—Fundamental.	609,026	123	10	4,951
Mechanical Engineering.	1,477,365	317	3	4,660
Physics.	878,550	194	10	4,528
Radio & Electrical Engineering.	1,239,337	308	8	4,023
Building Research.	344,020	65	21	5,292
Chemistry—Applied.	444,760	114	25	3,901
Communications.	741,300	201	49	3,688
Maritime Regional Laboratory.	—	—	—	—
Total for Research Laboratories.	<u>6,527,229</u>	<u>1,485</u>	<u>126</u>	<u>4,395</u>

Divisions	Submitted 1950-1951	No. of positions 1950-1951	Increase in posi- tions over 1949-1950	Cost per position
<i>Extra-Mural Research</i>				
Medical Research.	539,830	6	—	—
N.R.C. General.	1,063,995	—	—	—
Total for Extra-Mural Research.	1,603,825	6	—	—
<i>Services</i>				
Information Services.	484,543	95	1	5,101
Administration and Personnel.	883,355	255	16	3,464
Plant Engineering.	748,887	191	3	3,920
Workshops.	142,064	65	7	2,185
Total for Services.	2,258,849	606	27	3,727
Grand Total	10,389,903	2,097	153	
Less estimated revenue	515,000			
Vote.	9,874,903			

You will find in this statement that there are ten research laboratories listed of which you have visited six. Then, under extramural research is medical research and N.R.C. general, under which is the money we grant for scholarships and grants in aid to the universities. Then under the third general title is listed services such as information service, administration and personnel, plant engineering, workshops. Now, the research laboratories are gradually rounding out. At the end of the war we submitted to the government what we thought would be a rounded out research council but we suggested that it would be very unwise for us to fill all the positions at that time because personnel was in short supply. We could not then have obtained the quality of people we got by waiting, so that for the last five years we have been filling the positions we had available, and we have been building up over those five years a staff which I think is an exceptionally good one. We are just about to the levelling off stage of most of those divisions. In the list of Research sections, we have separated the first six from the last four to indicate that the first six are approaching the maximum size we think they should reach. There are four that are still in the process of being built up. In Building Research, the laboratory is not built yet. That work will increase as the years go on. Chemistry, applied: their building is just being finished this year and they will increase a bit. Communications is not essentially a National Research Council activity, it is an electronic research laboratory of a secret nature which we operate for the services. We have not very much control over where that goes, of course. The size of that will depend upon the needs of the Department of National Defence.

By Mr. Green:

Q. Why does not the Department of Defence pay the bill?—A. I do not know. It really does not make very much difference to us. If they pay the bill, I suppose they would think they should control our staff. If we are going to operate this laboratory we want to have complete control. That question would be one of government policy. It might be done that way but it would not make much difference in the long run. We would probably operate it cheaper than they would if we had it incorporated in our own unit.

Q. You do not get paid at all for the work you do for the Department of National Defence?—A. We do for tests and special projects, but this is a complete laboratory. We have operated in this way since the early part of the war and the question of changing the system has not been raised.

The maritime regional laboratory is just being built. There is nothing shown for operating the laboratory this year, but we have included in one of our contingency items under "general" enough so that whatever happens this year we can gather together some of the key personnel.

You will notice that we adopt a yardstick in Research Council for internal use which we think is very good, and that is the cost per person. It gives you a pretty good idea whether you are generally efficient and it also gives you an idea of the rise in cost over the years. For instance, in 1949-50, the cost per capita over these research divisions was \$4,200, and the costs this year are \$4,395.

By Mr. Murphy:

Q. That is because of increases in salaries?—A. Yes, the increase in salaries, the increase in prevailing rates and the increase in costs of materials, equipment and travel; everything is reflected there. That is about the measure of the increase. In our examination of the estimates we look over every division very carefully. You will see some variations here which might bother you. For instance, \$4,529 for biology. The next one is \$5,540, that is the prairie regional laboratory, but that laboratory has just been opened and we are still equipping it, but instead of having a special capital vote we are carrying the increased capital now in our normal vote. This is a small laboratory, there are only fifty-four people there, so that the small increase in capital puts that up. We will watch that carefully and eventually that will have to come back to around \$4,100 or \$4,200.

The Chemistry, fundamental and applied, are still being operated as a unit; the separation is not complete yet. For instance, the fundamental division is still responsible for the operating of the shops and the stores, so if you look at chemistry, fundamental, \$4,951, and then look at chemistry applied, \$3,901, but if you average them cost per person is \$4,426, which is right on the nose. It is the same with mechanical engineering, that is \$4,660. That is a little higher than average but is due to the fact that we are running the Arnprior field station where we have expenses for snow removal and the purchase of gasoline for aircraft, and there is quite a lot of mechanical equipment there, so that is what brings that cost up. We do this as we are examining these items but if we take the special items out the cost per person comes back to the average.

Q. Does that include salaries?—A. Everything including salaries and prevailing rates, and it is a very interesting note how good that figure is for nearly everything. I have checked with industrial costs, checked with everything I can and it is amazing how closely that runs, so if anybody says the research establishment is going to hire 100 people you can say right off the bat it is going to cost you about half a million dollars.

Q. You are speaking about a yardstick, Dr. Mackenzie. How do you apply it in obtaining your top men? I do not mean necessarily your top men, but I mean the average good scientist.—A. Well, we just feel that these things are averaged out. This is just a yardstick. When I look at applied biology I immediately say to my officers, "why is that high? Give me an explanation." And then they come back and give me the items that account for the high cost and we divide it out and say, "All right, that is about in line." We can now look at mechanical engineering, we say that the engineering division should be less than fundamental costs. There are more non-professionals in engineering. For instance, in the theoretical divisions like biology and chemistry and physics, the ration is about one to one. There will be one university-trained man—what we call "professional"—to roughly one or one point two non-professional. But when we come to the engineering division, we find two point five non-professional to every professional—in electrical engineering two point six, and in communication two; and, therefore, they should be a little lower than the fundamental research division.

When I first look at our estimates I said, "Why is mechanical engineering up? It is \$4,660; it should be down around \$4,000, to compare with radio and communications", then we looked through detailed records and found Arnprior snow removal, etc.

Q. There is no capital cost charged?—A. No, this is a yardstick of the efficiency of the operations and it seems to me it is an effective yardstick because when we see that we have 100 people in applied biology, we know that that division if operating normal should not cost more than a certain figure.

By Mr. Green:

Q. Do not the supplies for some of these different departments cost more than for others?—A. No, that is a most extraordinary thing, roughly speaking, if you have a research laboratory with 100 people in it and you take the salary costs—what you have to pay in salaries and wages, it used to be you added 50 per cent and that took care of everything else that you should need. Now it has crept up during the increases in cost of things and today it is around 55 per cent.

If a person comes in and says, "We have \$200,000 in our wages and salaries." we say, "All right, you should have somewhere between 55 and 60 as a maximum for everything else you need.

Q. It does not include machinery?—A. It includes everything but buildings.

Q. New equipment?—A. New equipment. Of course, like all capital equipment you have got to be a little careful because the size of the organization end governs what you call capital. For instance, if we have an expenditure of \$1 million, then two or three microscopes which might last twenty-five years would be considered as routine maintenance and equipment, whereas if we only have two or three people in a laboratory you might have to capitalize such costs. But, generally speaking, we do not capitalize anything but buildings, and the new fittings.

We have developed this yardstick the last two or three years and we find it useful and reliable, we can detect any abnormalities immediately. We can say, "your salary budget is so much, your total should not exceed so much, if the total is too high we ask for explanation?"

Q. Is there not considerable danger in using that basis? It seems to me it is a very inaccurate basis.—A. No, it is not. We do not use it as a law; we use it as the first check on the estimates and if something seems out of high, we ask the reason why.

Q. But the success of the Research Council will depend over the years on the personnel, will it not—the scientific and engineering staff?—A. That is correct.

Q. But it might be that because of the salaries paid by industry in Canada, which are doing more research work all the time, that the prices and salaries paid to professional men will have to go up. In fact, I am not so sure that your salaries are high enough now.—A. That salary figure has gone up each year.

Q. Of course, if these salaries go up, that of course, will affect it?—A. That is correct. For instance, last year the over-all council figure was, for everything—laboratories and everything else—\$4,000, and this year it will be \$4,200.

Q. How do the salaries that you pay to both the scientists and the engineers—how do they compare with salaries paid by private industry in Canada?—A. Well, the way that industry operates is entirely different from a large organization in the government. On the lower levels we are definitely competitive. Our salaries and the intake are good, but where industry may pay \$20,000 to a key man, we cannot. And, speaking very broadly, that is the situation. It is the situation in universities and it is the situation in other countries. Industry pays their top men higher and their lower men not so high as we do.

Q. Take the man in the middle who would represent the bulk of your employees—what is his position?—A. I am speaking without facts in front of me. I would say up to the middle range, say, the \$4,000 or \$5,000 range, we would not be very far off the normal in industry.

By Mr. Murphy:

Q. Have you lost any top men, Dr. Mackenzie, by not paying sufficient remuneration to keep them?—A. We have been very fortunate in that we have not up to the present time. The most serious competition with the States, is for the junior men, students who take their degrees in the United States and are immediately offered positions there but—and I speak subject to correction—I cannot think offhand of anyone who has left our organization solely on a financial basis in the senior ranks.

Now, they have left perhaps for some other reason, but very few have left up to the present time. I think Mr. Rosser presented a paper on the number of people who have left. I would say, Mr. Chairman, that we think that people going from the Research Council to industry or to other governmental departments into senior posts is an excellent thing. That is the way promotion comes about. If industry has a \$10,000 post and they appoint one of our people to whom we pay \$5,000, that is like promoting one of our people internally. We would not consider that as a loss to the country. We are concerned about losses only when they go to the States.

By Mr. Green:

Q. You surely should have the best people in the country in the Research Council, is that not a fact?—A. Well, we want our share of them.

Q. And are your salaries such that there is as much attraction for these people with the council as with industry?—A. Let me put it this way. This spring we had three or four times as many applications as we had positions to fill.

The CHAIRMAN: That is scientific personnel?

The WITNESS: Oh, yes. We had 747 applicants of which 193 were appointed.

By Mr. Green:

Q. Those were beginners?—A. Yes, beginners. As we develop we should not have to go outside. We should be developing our own talent and our effort is not to go outside if we have anyone qualified for promotion.

Q. I think you should be kept in a position competitive with industry in Canada. I do not see how you can expect to keep the best men if you are not competitive with Canadian industry?—A. I think that is true, Mr. Green, but you must use the word "competitive" in a broad sense. Industry's demands on scientists are much more vigorous than ours are. The life is much better in the research organization in the sense that scientists can follow more interesting things. I do not think you can put the competition entirely on the salary rate per year. You know that—we are all in the same position—you know that there are certain returns that are intangible. We would like to see the rates go up as far as possible but we think we have done reasonably well.

By Mr. Murphy:

Q. Your main complaint is from the States?—A. That is so only for people who go to the States for post graduate work. We have had a difficulty, or we have found that a number, not all, have had offers just when they get their Ph.D.'s—offers completely out of line with conditions in Canada or in fact anywhere else in the world. It has been a very unnatural period.

Q. Is there much difference between the attraction offered in the United States and by you?—A. As of when—in the 30's?

Q. Well, say five years ago?—A. We were in the middle of a war five years ago.

Q. Well, four years ago?—A. I would say that four years ago there was a great scarcity of scientists. All the universities in the States shut down during the war and there was a great lag in production. There was very great competition for people who were not always in the top grades. That has levelled off and we think the situation today is much better than it was at that time. I think the situation in Canada is much better. Unfortunately, in pre-war days and in the middle '30's, the years of the depression, our whole organization had only a couple of hundred people whereas now it has 3,000. Industry is in very much the same position. A lot of industries have now established research organizations and the field of opportunity is therefore greater.

Q. I would like to have your opinion on this matter. Some of us maintain that Crown companies and organizations like your own should give leadership to industry in the payment of salaries to these graduates in order to stop them going to the other side of the line. Do you wish to comment on that?—A. Well I have said that of 746 applicants we were only able to appoint 200.

By Mr. Gibson:

Q. No one else has an atomic energy pile?—A. No.

Mr. GREEN: The atomic energy pile salary figures are not included in the figures you have given?

The WITNESS: Those people are included in the figure of 749.

By Mr. Gibson:

Q. We are speaking of general scientific salaries?—A. I just quoted that figure as an over-all number—I was using the figure of 4 to 1.

Q. Has anyone else in Canada got a wind tunnel?—A. The Universtiy of Toronto.

Q. It is a very restricted thing?—A. Yes.

By Mr. Green:

Q. How many engineers or scientists would be getting over \$5,000 a year?—A. Well I cannot give you that information but there are quite a number.

Q. Pardon?—A. Our establishment is not yet filled out but when we get our establishment completed, I think perhaps 25 per cent of the scientists and engineers will be getting over \$4,000.

Q. Over \$4,000?—A. Yes, and perhaps over \$5,000.

By Mr. Murphy:

Q. What do you pay a young graduate who has his Ph.D.?—A. About \$3,500 to \$3,700.

Q. If he has not got a Ph.D.?—A. If he has a master's degree we pay \$2,900 at the start. If he has a bachelor's degree, without any experience, we pay about \$2,760.

By Mr. Winkler:

Q. I would like to ask Dr. Mackenzie if he has any figures as to the average time the higher paid scientists spent with the National Research Council?—A. In comparison with what?

Q. Well, the average length of their employment?—A. Well, we have not lost any yet.

When I say that we have not lost any we have lost some to the Defence Research Board and we have lost some to industry but we do not look upon that as a loss. We make a very definite distinction there, and we watch what

we think is a national loss. We do not believe that it is a loss for people to go to industry or to other government departments. For instance, we have supplied the University of Toronto in the last few years with one dean of engineering, one head of a major department—high positions—and two professors who are immediately below the head of another department. Would you call that a loss?

Q. No, I do not have in mind the matter of loss but I refer to them using the National Research Council as a possible stepping-stone or just a place like the average professor has at a university where he stays for so many years and then either retires or moves on to another position?—A. Generally speaking, we expect the main turnover to be in the younger grades. When a man gets to the middle forties he probably will not move unless it is to an outstanding job. We would expect in the Research Council that very few people would move after they passed forty or forty-five, unless they went as heads of departments of universities or as heads or directors of laboratories. We have lost people who went to head research laboratories in Canadian industry but we do not call that a loss.

Q. Do you say they would last as long or longer at the Research Council than they would at the average university?—A. Again I cannot give you figures.

The CHAIRMAN: Is there not the danger of a wrong assumption creeping in here? That assumption is that it is desirable in the Canadian economy to retain scientists in the Research Council permanently. However, it may be desirable for those scientists to move from one laboratory to another within the country.

Mr. GREEN: I would think the Research Council should always have the best.

The CHAIRMAN: Yes, but should there not be a flow? How do those people become "the best". How does a young scientist who has just obtained his degree become "the best"? He must develop his scientific training and perfect it. That can be done through several institutions in Canada, depending on what line he follows. The Research Council is one place; there are the medical laboratories, and the universities. Which do great work—so there must be a flow in order to develop the man.

Mr. GREEN: The impression I got is that the Research Council has been built up very extensively within the last few years and is doing a grand job. Sooner or later, however, they are going to come to the position where they are in competition with Canadian industry—if they are not already in that position. I do not think the Research Council can expect to retain these key men—and I do not mean necessarily just the very few at the top, but, say, the men over forty years—if the salaries are such that those men can do much better in industry in Canada. Personally, I would be in favour of us granting the Research Council sufficient money so that it can pay salaries which would make certain that the men would stay. The spirit there is wonderful now but I do think that the position must be faced.

It is our responsibility, in the final analysis, not Dr. Mackenzie's, because it comes back to parliament whether we are willing to vote money to pay salaries for those scientists.

The CHAIRMAN: Does that not resolve itself down to the much narrower question of whether or not the Research Council loses any scientific employees by reason of inadequacy of salary? Doesn't it come down to that?

Mr. GREEN: I think that is very definitely the wrong word. There is the same condition here. We haven't lost anybody yet therefore we don't have to face this problem.

Mr. WINKLER: I think I can illustrate that best by reference to the geological work being done for the dominion government. Those working for the

Geological Survey do not receive as much as is paid by private corporations for work of that kind but they probably do not lose very many geologists to private interests. It doesn't seem to be so much a matter of salary as of permanence. You see, even a geologist who works for the government has a family to keep and things of that kind.

Mr. GREEN: Then, too, scientists and engineers get particularly interested in their job; but quite aside from that I do not think we could expect them to stay with you if they can do better for themselves in private industry.

The CHAIRMAN: I think your point is that that is not the danger at the moment but that we should take action to forestall a danger of that kind developing. That is your point, is it not?

Mr. GREEN: That is it.

By Mr. Murphy:

Q. How much do you think we should raise that minimum, that last figure?—A. I cannot answer that off the bat.

Q. I mean this larger group here. I can't understand how you keep graduates at those rates.—A. We pay exactly what industry pays.

Q. Then it is no wonder they are going to the United States.

The CHAIRMAN: His answer was not that they were going to the United States to work; his answer was limited in the earlier question to those who are receiving highly specialized training in the United States and returning to Canada.

Mr. MURPHY: I know that, that is the case with my own son, and I think he will go over there because in private industry it is possible for him to get fifty per cent more than he can here in Canada.

The WITNESS: That is true, but we cannot meet United States conditions. We don't meet them anywhere that I know of.

Mr. STUART: You have 700 applicants for 130 or 150 positions. It would look as though some of them had to go to the States.

The WITNESS: You also have to remember that we require just certain types of people.

Mr. STUART: That is right.

The WITNESS: And another thing, we don't want all the best men. That would be very bad. We don't want the practical men who would be the best men in industry. We are more interested in fundamental research and we are after the best men, men interested in such work. Another thing, if a man gets into industry and they don't like him out he goes. The government service is a little more lenient, there is the element of long term security, if you like, and it is a factor in the picture. We are competitive with the universities. The type of person we want is the type of person universities want. There are many people, very competent, able men who are definitely the industrial type. I think it is fair to say, or at least it seems to be the rule, that if you want the best men you have to be able to pay for them. That is particularly true of industry, but it is not so much so in the case of research activities. What it comes down to is this, that we want the best man for the type of job that our specifications demand.

Mr. GREEN: I am afraid that if we follow this ceiling rule they have now about key positions, there is not very much chance of our keeping these top grade men.

The WITNESS: That does not affect that.

The CHAIRMAN: That is not the fact at all.

The WITNESS: If you take industry right across the board our rates are probably above theirs. As an industry develops, it pays very high salaries to a very few men of great importance, but in the lower groups their salaries are not as good as ours. The government tendency is to do the other thing, for the greater proportion of staff the salary ranges are higher, and that applies throughout our organization.

Mr. GREEN: How many of these men have you who are getting \$5,000 and over?

The CHAIRMAN: It seems to me that we have that figure somewhere. Oh, yes, we have it in the estimates at page 281.

The WITNESS: Yes, that shows the different positions on our establishment where the incumbents are paid salaries ranging from \$5,000 up.

The CHAIRMAN: Here it is. Exactly what you want. You will find it at page 33 of the evidence.

The salary scale goes from a base of \$2,160 for Junior research officers to a ceiling of \$7,500 for the Principal research officer.

The full senior research officer grade spreads from \$5,300 to \$6,300; and that of the Principal research officer runs from \$6,500 to \$7,500. But we have very few in the Principal research officer grade because of the age level of our staff. They are hardly senior enough.

The average salary for the technical officers is \$2,391; for the prevailing rate workers, it is \$2,497; and for the administrative staff, it is \$2,149. The prevailing rate workers received a considerable increase during the past year as a result of a survey which the Department of Labour conducted at the Chalf River plant, and to increased rates in the Ottawa area.

And further detail on that subject as to salaries is to be found in the detail of the estimates starting at page 281.

Mr. GREEN: I see from the figures in the estimates there that you have 31 principal and senior research officers with salaries ranging from \$5,300 to \$7,250.

The WITNESS: But you have 84 associate research officers with salaries ranging from \$4,500 to \$5,100.

Mr. GREEN: Yes, but you have 43 in the group to which I first referred and the minimum salary in that group apparently is \$5,300.

The WITNESS: But you have quite a few of them in the lower salary range and they work up from that, which I think is a very good thing.

By Mr. Winkler:

Q. About the middle of the column there is one general secretary in 1949-50 at \$6,300; and right above it is one administrative officer, Grade A, 1950-51 at \$6,000. Is that the same thing?—A. Yes, that is really the same. It is just a change in the name of the grade for civil service categories.

The CHAIRMAN: I think it is clear, but this sheet we have been using and which has been distributed is really a break-down of item 451 of the estimates shown in a different way from the details at the back of the book. It breaks them down by laboratories. By the way, is it your wish that we print in the evidence the sheet we have been using? The idea is to print it as part of the evidence rather than to table it.

Mr. GREEN: I think so, Mr. Chairman. There has been a good deal of evidence given about the sheet.

The CHAIRMAN: Yes. I think the clerk might see that it is inserted at the early part of this evidence today.

By Mr. Murphy:

Q. I note the heading "Information Services". Those of us who have been associated in this work appreciate what the National Research Council is doing. I think it is of great importance that the same impression be left with the public. Is any program in effect at the moment?—A. We have the Information Service Division. It is for the dissemination of technical and scientific information, the publication of journals, and scientific reports, for scientists, technicians and so on in the country. It is not publicity of a general nature.

By the Chairman:

Q. That is the division of the Council which comes under Dr. Saunderson's jurisdiction, and that is what he was describing in the evidence at the last committee meeting. That is a break-down of the item.—A. Our general public relations office is a very small office. It consists of Mr. Cook and, perhaps, a clerical staff of five at a cost of about \$50,000 a year. It publishes the Annual Report, the Review of Activities, the document you have seen, and year-end results, the results which we give to the press. It maintains a liaison with the press.

By Mr. Green:

Q. What was the result of the open house which you had recently?—A. Oh, excellent. That, I would like to say, is the best form of publicity we can possibly have to show people rather than to talk about it. We had about 8,000 people there in two days. The first day we ran into the visit of the Premier of Pakistan. We had invited people from all over the country for the succeeding days and we could not change the dates. We had industrialists come all the way from Vancouver. Quite a number came from Toronto and Montreal. We are getting letters every day about it. It was one of the best things in the way of publicity that we could have had. We decided to continue that activity. If it gets to be an event which people look forward to, I am sure a lot of people will schedule trips to Ottawa to see it. I feel very proud about it. It was extraordinarily well done. Our boys did a lot of work on it and we have been getting a great many compliments ever since. It was an excellent thing.

Q. Have you any plans whereby you can show industrialists through your plant at ordinary times?—A. Oh, yes. There is not a day passes without several parties going through. We had this public relations office set up to do that work, because previously our people had to do that sort of thing and it kept them from getting on with their ordinary work. A very large number of people visit the Research Council. I think it might be a good idea if we kept a record of them.

Mr. BIRCHARD: At the Montreal laboratory it ran as high as 40 a day for a while.

By Mr. Murphy:

Q. Do you anticipate any change in your "estimated revenue"?—A. We have probably been a little optimistic about it. It is a very good way to keep our budget in order. We find that budgetary control is essential for efficiency. All these divisions check their budgets and expenditures every month; and if we find that our outside revenue is falling below what we anticipated, the divisions are advised to that effect. And if the revenue increases, we can ease up a bit.

Q. That would be from contracts for testing and so on?—A. Yes, for testing. For all the testing we do in the Cold Testing Chamber for the armed services

we make a direct charge. All the work which would come under the general category of "tests" we would charge for. When it is investigation and research, we may or may not charge, depending on the size of it.

Q. How much of this comes from other government bodies?—A. Very little of it. Most of it is not carried in our books. We carry FE's from the government. We would get an order, let us say, from the Department of Defence for \$50,000 and we would bill them for the amount which we spent. But it would not appear in this part.

By Mr. Green:

Q. If the Research Council were paid for the work it is doing for other departments, how much would it cut down your estimates?—A. That is a very difficult thing to say offhand. It would make it impossible for us to operate because, you see, we have got a fixed charge operation; and if we had to depend upon what we got from the departments, the departments could ruin us over night by not placing an order. For example, with respect to the Montreal Road laboratory, if the National Defence Department decided not to have us do these tests for them, we would have to fire possibly 25 per cent of the people. We would not like to work that way. We had a lot of experience during the war when we started out on that basis. But when we found what the normal load was, we preferred to budget it for ourselves.

Q. You like it better the way it is?—A. Oh, yes. It would be very difficult otherwise. We cannot take on a technical or scientific staff in the same way that one would take on a construction gang. We have to guarantee that we can keep those people. If we found the load was decreasing over the years, we could gradually cut our establishment. However, we could not do so suddenly or over night. Suppose the department cut the Cold Weather tests and we were depending on that revenue, we would be in a very embarrassing position. So we prefer to have it this way. It does not cost the country any more.

Q. There is just a difference in the way it is carried?—A. Yes.

Mr. KIRK: Mr. Chairman, we had this statement in front of us for three or four weeks. We went over it once before and we have asked a substantial number of questions on it. It seems to me that the attitude of the committee is that they are more than pleased with what is being done by the National Research Council. In fact, everybody is very happy about what he has seen in the Research Council. I wonder if Mr. Murphy's questions could be got at tonight? I think we would be interested in hearing about them. I think we have covered everything else.

The CHAIRMAN: What about the next item, 452, "Construction of buildings and works"?

Mr. GREEN: The details are set out where?

The CHAIRMAN: On page 284.

By Mr. Green:

Q. Are all those buildings under construction now?—A. No, with the exception of two. I might go through them with you. The Applied Chemistry Building will be finished this fall. The New Waterline for Montreal Road Laboratories is a government housing corporation agreement to carry water out to the Montreal site. Maritime Regional Laboratory will be finished this year. Electrical Engineering and Radio Laboratory is just starting. The plans are being laid but there is no construction started at all.

Q. That is the one which is to be built on the Montreal Road?—A. Yes, on the south side. Thermodynamics Research Plant?

Q. Will that be the total cost?—A. No. That is a rather expensive building.

Q. How much would it cost?—A. Offhand I would say \$1½ million, or something like that. That is an interesting thing. We earned this money one

time. We had money from radar equipment which we sold to the United States during the war. But we could not build the building at the time when building activity was pressing so we have that division housed all over the country, some at Metcalfe Road and some in our main building, and they have to work under a very great handicap for five years, all the time being promised that they would get the building as soon as building activities slowed down. That is something which does not seem to be occurring very rapidly. Now we have reached the point where we feel it is hazardous to carry on any further. A good fire would wipe us out.

Q. How many years would it take?—A. We think about two years. We are not going to slow down. We are going on with the plans of these buildings now. It costs less that way. The more thorough your planning the better the results. The building research laboratory is the same. The architect has just been appointed and this year there will be just preliminary plans made and some of the heating tunnels and roads built around the site. That pretty well finishes up our building program we laid down for 1950.

The CHAIRMAN: You left out one item, the thermo-dynamic research plant.

The WITNESS: Yes, that is being built this year.

By Mr. Green:

Q. Will that be finished this year?—A. Part of it will be, yes.

Q. What is the total cost of it?—A. That is a three-stage proposition. We are building the first stage this year. It will depend upon circumstances as to how fast we will go and how fast the government will let us go, but we are building it in three stages. Each stage can be useful as soon as it is built. The one we laid the corner stone of the other day is the first unit and we will be able to carry on there. We have some of the equipment for the second stage.

Q. What will the total cost be?—A. I think a million and a quarter.

Q. And the Building Research laboratory, when will it be finished?—A. Probably the tenders will be let for that building some time this year, or in January or February, so that the contractor can get a good start next spring with everything tidied up, and we hope it will be under construction and the building completed in 1951.

Q. The total cost of that building will be what? That will have to be a good building, will it not?—A. Yes, as a matter of fact that is why we delayed it.

Q. You cannot make any mistakes on that one?—A. No.

Q. What is the total cost going to be?—A. \$750,000.

By Mr. Murphy:

Q. That building we were in the other day, the second building we visited, that old mill, what is that?—A. You mean where the pilot plant is. That, of course, has been condemned ever since 1938 when we were ordered out of it. That is why the buildings on the Montreal road were started, not on account of the war but on account of being forced out of the old Edwards mill, but then the war came along and that property has been used ever since. There is a hydro-electric plant there also.

Q. It is only a matter of time before you will be out of there?—A. Yes, we will be out of there, I do not know when, but probably when we get our chemistry building built. We have not much interest in that property now.

The CHAIRMAN: Now, are there any more questions on the estimates?

Mr. GREEN: The other item is this grant to the Royal Society of Canada.

The WITNESS: That item which appears in our budget is there for the convenience of the government. We have not anything to do with it; it is a grant the government makes to the Royal Society of Canada and they have

asked to put it in our budget just for convenience, but we do not support it, we do not do anything about it. The Royal Society has to make its application to the Treasury Board.

The CHAIRMAN: Have you any more questions?

Perhaps now we could turn to the subject Mr. Murphy was interested in, having to do with textiles. If Dr. Mackenzie will introduce Mr. Bayley, I think he can deal with that.

The WITNESS: Mr. Bayley is in charge of the textile section which you saw. Mr. Bayley is a chemist with a long experience in that particular field. During the war this was one of the most important sections we had, and in peacetime it is equally important. Mr. Bayley will take up the work of the section in any way you wish. Perhaps he could give a general picture first, and then let the committee ask any questions and direct the way they would like the discussion to go.

C. H. Bayley, M.A., M.B.E., Senior Research Officer in charge of Textile Laboratory, called:

The WITNESS: Mr. Chairman, the Textile Research Laboratory started out in 1930 as a laundering and cleaning research laboratory on the request of a group of launderers and cleaners who came to the Research Council and asked the Council to establish facilities to assist them in improving the quality of their processes and generally raising the technical standards of the laundering and the cleaning industry. At that time, 1930, we were in temporary quarters and it was not until 1932 when we got into the present building that the work could be put forward with any efficiency. However, it was started, and during the early 1930's the laboratory carried on a number of investigations in the field of laundering and cleaning, and this work naturally brought us into touch with the textile industry generally, as laundering and cleaning is a service industry, an industry for reclaiming textiles. By the middle 1930's we had been brought in contact very closely with the textile industry in Canada. As time went on more and more requests came in from the textile industry itself as distinct from the laundering and cleaning industries for the carrying out of work. Most of this work was of a fairly short term type and this is still the case. During the war the laboratory was, you might say, practically taken over by the armed forces because we happened to have facilities there that were unique in Canada—facilities that were required for the prosecution of part of the war effort. So we stopped all of our research activities at that time because we found we could not carry on our peacetime research activities under wartime conditions. At the end of the war we then had to take stock of ourselves and to see what we wished to do in regard to setting up our research activities again. We have done this and our research activities at the present time comprise two main divisions of work. First of all, there is what might be called the short-term or *ad hoc* type of problem undertaken for the laundering and cleaning industry and for the textile industry. This includes, I am sorry to say, a certain amount of testing. We have to do that because we have certain facilities, equipment and experience which is not available elsewhere in Canada, and where we are asked to use these for the benefit of industry we feel we have to do it. We carry out a considerable amount of applied research work for the organization known as the Canadian Research Institute of Launderers and Cleaners which supports the work financially. The other division of our work has to do with the more fundamental type of work and in this field we have three lines of work going on now. The first one has to do with fundamental studies in the field of what we call detergency which is a rather grandiloquent name for washing.

Mr. GREEN: What is the name again?

The WITNESS: Detergency. It is, in fact, an attempt to supply some of the answers that have not been so far found as to why soap removes dirt. That is still a question that has not been completely solved, from the scientific point of view. The work we are trying to do is an attempt to contribute something towards the solution of that problem. We are also doing work in the textile field on such problems as moth resistance of wool or part-wool textiles and shrinkage resistance of textiles. The two latter problems are being worked on for the Department of National Defence because they happen to have rather serious problems in both of the fields relating to these problems. We are working with the National Research Department on a contract basis on these two problems.

That is roughly the set-up of the laboratory at the present time.

By Mr. Murphy:

Q. Now, on this moth proofing work, just how far have you been able to proceed? I understand it is to prevent moths going into the cloth at any time?—A. Yes, the problem arose in an extremely practical way. It arose because at the end of the war there were in ordnance stations in Canada considerable amounts of wool cloth in storage in which there was evidence of a considerable moth attack. Steps were therefore taken to actually treat the cloth to make it unacceptable to moths.

Q. Is that being done now?—A. Yes, sir, that is being done now.

Q. How is it progressing?—A. The treatments now being used on wool and part-wool cloth supplied to the armed services are permanently protecting them from moths throughout the life of the cloth.

Q. That applies to material of different content?—A. Yes, sir, it has been applied to all-wool and part-wool cloths. There are certain cloths that are used which consist of part wool and part rayon. In these cases the treatment is applied to the fibre when the fibres are blended together in the spinning process.

Q. How long have they had that treatment in process?—A. About one year.

Q. Is the textile industry working with you on that?—A. Well, I think we could say they are following the results of our work with considerable interest.

Q. Anxiety, maybe?—A. I do not think so. No, I think the day is past when they need to worry about things like that.

Q. Moths being the textile industry's best customer?—A. That used to be said.

Q. Do you know if the textile industry is going to use this? It is a patent process now?—A. No, sir, it is not; it is a process available to any mill that wishes to use it.

Q. Do you know of any mill using it?—A. Yes, there are a number of mills using it.

Q. They are just making cloths for the armed services?—A. No, there are mills using it for domestic requirements quite apart from what they make for the armed services.

By Mr. Green:

Q. Is it generally used by the textile manufacturers?—A. It is not used in the majority of cloths processed in Canada, although the use is gradually increasing as time goes on.

Q. What about your shrinkage problem?—A. The shrinkage problem arose through another practical problem connected with the armed services. In the last war there was considerable wastage in G.S. socks—general service socks—worn by the troops—because of shrinkage. The socks were found to shrink down to unwearable size long before they were actually worn out and, as a

result, constant replacements were necessary and that put a great strain on the textile industry both in the obtaining of the wool which came mostly from outside country and also in the manufacture and knitting in the socks.

It seemed from the work that had been done in England and some work that we had done right after the war, that it might be interesting to study the effect of putting in fibres other than wool, in small amounts with the wool. That seemed to be an interesting line of work to follow. It was not certain that there would be any beneficial effect, but on sizing the research up that had been done previously, it seemed to be a fairly interesting line of work and one that might give results. So we tried the effect of mixing small amounts of nylon fibre with the wool and since in experiments of this type you go well beyond limits of composition which you think may be practical, we went from 20 per cent up to 85 per cent of nylon. I might say we were rather surprised to find that even the lower mixtures brought about a very considerable reduction in the laundering shrinkage of the socks. In fact, it was so marked we felt that we should have to go on and investigate even lower mixtures than we had been using, we are going to investigate the effect of 5 per cent and 10 per cent of nylon, which we did not previously think would have been effective. We have now to go on and investigate these lower percentages because it seems that a comparatively small percentage of this fibre will control the tendency of these socks to shrink when they are laundered under the poor laundering conditions of the services.

By Mr. Murphy:

Q. Did you develop this moth process or whatever you call it?—A. We did not develop the actual process itself. We collected, sifted and tried out in the laboratory a large number of known processes. Some of them had been in commercial use in Europe and on this continent and some had never been put to commercial use. We selected those which, in our opinion, were the most suitable.

Q. Do you know what they are doing in England or the United States?—

A. In the United States, the question of moth control has not gone as far as it has in this country. It is rather interesting to note that. Certainly in the armed services of the United States no permanent moth-proofing treatments are in regular use. They use D.D.T. which is not a permanent treatment.

Q. What about England?—A. England has done nothing about permanent moth-control for the armed services.

By Mr. Green:

Q. Did I understand you to say that this moth-proofing is done during the course of manufacture?—A. It is done during the finishing process of manufacture.

Q. After the cloth is made?—A. Oh. Yes.

Q. Then, the same process could be used on garments that are already made up?—A. No, sir, not as conveniently. These permanent treatment do not lend themselves to application to made-up garments. They are best applied in the piece. If you tried to apply them to made-up garments, you would be faced with the problem of distortion and shrinkage.

Q. Have you done any work with the use of raw wool—I mean with the use of Canadian wool?—A. No, sir, Dr. Larose of the Fibre Research Laboratory has done considerable work in the testing of wool from Canadian flocks as a cooperative project with the Department of Agriculture.

The Department of Agriculture maintains in Alberta a laboratory where they have their ranges and their flocks, where they are trying to improve the quality of Canadian wool and maintain it over successive generations, and

Dr. Larose has done considerable work on the testing of the fibres from year to year so as to allow a statistical study to be made of fibre quality.

We have not done any work in the laboratory on the utilization of Canadian wool.

Q. I often wonder why we cannot produce more of our wool here, but I guess that does not come under your department?—A. Well, I know a little about it, sir, since it is the kind of thing we have to be informed on, although we are not working actively in the laboratory on it.

The Canadian wool picture is complicated. One complication is the tendency of fine wool breeds of sheep to deteriorate into coarse wool breeds.

Mr. STUART: Why do you not send them down to the maritimes to the salt water?

Mr. GREEN: Why do you not put them in British Columbia, and it will not happen there.

M. STUART: That is correct.

By Mr. Green:

Q. Is that the experience all over Canada? I am rather serious about the question because we sometimes hear that in the mild climates such as the Pacific coast climate good wool can be produced, but there do not seem to be very many flocks.—A. Well, in the wetter and less frigid parts of the country, I think they can produce good wool, but—I am not fully acquainted with the economics of the problem. There are a lot of farmers that do produce wool in Canada. There is a large wool warehouse at Acton, Ontario.

The CHAIRMAN: I do not want to cut off this very interesting discussion, but really this phase of it about the production of wool and so on gets into the Department of Agriculture a little.

Mr. GREEN: I have no more questions.

The CHAIRMAN: I do not want to cut you off, but I thought I ought to point that out for the record.

By Mr. Murphy:

Q. From your experience and technical knowledge, should all material be treated with this moth proofing process?—A. Well, sir, it depends on what you are making and what the material is to be used for.

Q. Well, what materials would you use it for? Let us take that first, then.—A. Well, you would use it for materials that might be exposed to unsatisfactory conditions of storage—

Q. What about ordinary wearing apparel—the suits you wear—the clothes you wear?—A. Well, I think I could put it this way, that with ordinary good housekeeping there is not a great deal of trouble with moths if you take good care of your clothes.

Q. You must be an exception, then.—A. Well, possibly I am moth conscious. I kill them as soon as I see them, but in Ottawa here there is a bit of trouble with moths and the use of these treatments, of course, is of benefit. You do not have to worry about them once you have this process on your clothes.

Q. It does not affect the appearance of material?—A. No, there is no effect on the material.

Q. Then I come to the question I asked first: from your experience and your technical knowledge why should not clothing or material that can be treated be treated?—A. There is the item of cost that comes in there, and I believe that is an important consideration.

Q. About what percentage would it increase?—A. It would depend on the type of process used, but I can only speak with any certainty of knowledge

the processes used on fabrics used by the armed services. In the case of the armed services the increase in cost was in the order of around 12 cents a yard.

Q. Well, what percentage of the total cost per yard is that?—A. About 4 or 5 per cent.

Mr. GREEN: It certainly seems to be a very good development.

By Mr. Murphy:

Q. Is there any indication that the textile industry will use it in general?—A. Yes, sir, I think there is. A number of firms that were not using it two or three years ago are using it now.

Q. Are there any that you know of that have refused to use it?—A. Well, I cannot say. It is a matter of policy with them whether a firm decides to use it or not.

Q. I just mean from your own experience?—A. I do not think there is any feeling against it. Industry is interested in the development of moth processing.

The CHAIRMAN: If we have finished with the witness perhaps we can conclude our inquiry.

The committee adjourned.

SESSION 1950

HOUSE OF COMMONS

SPECIAL COMMITTEE

on the

OPERATIONS

of the

NATIONAL RESEARCH COUNCIL

MINUTES OF PROCEEDINGS

No. 6

INCLUDING SECOND AND FINAL REPORT
TO THE HOUSE

MONDAY, JUNE 26, 1950

TUESDAY, JUNE 27, 1950

WEDNESDAY, JUNE 28, 1950

OTTAWA
EDMOND CLOUTIER, C.M.G., B.A., L.Ph.,
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
CONTROLLER OF STATIONERY
1950

SPECIAL COMMITTEE
on the
OPERATIONS
of the
NATIONAL RESEARCH COUNCIL

Chairman: George J. McLraith, Esq.

Messrs.

Breithaupt
Brooks
Bourget
Coldwell
Gibson

Green
Kirk (*Digby-Yarmouth*)
Low
McCusker

Murphy
Pinard
Stuart (*Charlotte*)
Winkler

Clerk: A. L. Burgess.

MINUTES OF PROCEEDINGS

MONDAY, June 26, 1950.

The Special Committee on the operations of the National Research Council met in camera at 11.30 o'clock a.m., the Chairman, Mr. George J. McIlraith, presiding.

Members present: Messrs. Bourget, Gibson, Green, Kirk (*Digby-Yarmouth*), McCusker, McIlraith, Stuart (*Charlotte*), Winkler.

The Committee proceeded to consideration of the preparation of a second and final report to the House. After discussion of various suggestions advanced by members of the Committee, it was agreed that the Chairman prepare a draft of such second and final report for consideration at the next meeting.

At 12.45 p.m. the Committee adjourned until Tuesday, June 27, at 4 o'clock p.m.

TUESDAY, June 27, 1950.

The Special Committee on the operations of the National Research Council met in camera at 4 o'clock p.m., the Chairman, Mr. George J. McIlraith, presiding.

Members present: Messrs. Bourget, Gibson, Green, Kirk (*Digby-Yarmouth*), McCusker, McIlraith, Stuart (*Charlotte*), Winkler.

The Chairman presented a draft of the second and final report to the House.

Various amendments were proposed, considered and agreed to.

The draft report as amended, was agreed to, and the Chairman ordered to present it to the House forthwith.

The Chairman informed the Committee that arrangements had been made for a demonstration of radar for the following day.

At 4.50 o'clock p.m. the Committee adjourned to the call of the Chair.

A. L. BURGESS,

Clerk of the Committee.

REPORT TO THE HOUSE

THURSDAY, JUNE 29, 1950.

The Special Committee appointed to inquire into the operations of the National Research Council begs leave to present the following as its

SECOND AND FINAL REPORT

Your Committee was appointed on April 18, 1950, under the following terms of reference:

Resolved,—That a Special Committee be appointed to examine into the operations of the National Research Council: that the said Committee be empowered to sit during the sittings of the House and to print such papers and evidence from day to day as may be ordered by the Committee; and to report from time to time; that the said Committee consist of Messrs. Breithaupt, Brooks, Bourget, Coldwell, Gibson, Green, Kirk (*Digby-Yarmouth*), Low, McCusker, McIlraith, Pinard, Stuart (*Charlotte*), Winkler.

By Order of the House, Bill No. 179, "An Act to amend The Research Council Act", was referred to your Committee on May 10. This Bill was reported to the House, without amendment, on May 18.

Your Committee held twelve sittings during the course of which it visited the Montreal Road laboratories and the Sussex Street laboratories of the National Research Council. One meeting was largely devoted to consideration of the policy of the Council in relation to patents and to the activities of Canadian Patents and Development, Limited. At the remaining sittings evidence was heard from the President, the Vice-President and the Director of Administration on the history, organization and work of the Council generally; and from the senior officers of the following divisions respecting their particular fields:

- Division of Mechanical Engineering;
- Division of Applied Biology;
- Division of Chemistry;
- Division of Physics;
- Division of Radio and Electrical Engineering;
- Division of Information Services;
- Division of Building Research.

The budget of the Council for the fiscal year 1950-51 was also examined in detail and approved.

Your Committee finds that the National Research Council is well and efficiently operated and administered. The work of the Council is of great importance to the country and an outstanding factor in advancing human welfare in Canada. It contributes to the economic development of the country and directly to human well being through medical research, and in addition is an important adjunct in the defence of the country. Your Committee believes that not enough is known about the work of the Council and that every opportunity should be taken to inform Canadians generally regarding the services it renders.

Your Committee commends the work of the Honorary Advisory Council for Scientific and Industrial Research. The men forming this Council, with the exception of the President and Vice-Presidents, contribute their services without salary. In addition, there are some twenty-eight associate and special committees advising on broad problems, namely:—

- Associate Committee on Aeronautical Research.
- Associate Committee on Applied Psychology.

- Associate Committee on Artificial Limbs.
- Associate Committee on Corrosion Research and Prevention.
- Associate Committee on Dental Research.
- Associate Committee on Forestry.
- Associate Committee on Geodesy and Geophysics.
- Associate Committee on High Temperature Metals.
- Associate Committee on the National Building Code.
- Associate Committee on Parasitology.
- Associate Committee on Petroleum.
- Associate Committee on Photographic Research.
- Associate Committee on Seaweeds Research.
- Associate Committee on Soil and Snow Mechanics.
- Associate Committee on Survey Research.
- Associate Committee on Synthetic Rubber Research.
- Associate Committee on Wild Life Research.
- Associate Electrical Committee.
- Canadian Committee on Culture Collections of Micro-Organisms.
- Canadian Committee on Food Preservation.
- Canadian Government Specifications Board.
- Prairie Regional Committee,
 - Associate Committee on Grain Research of the National Research Council and the Dominion Department of Agriculture.
 - Associate Committee on Plant Breeding of the National Research Council and the Dominion Department of Agriculture.
 - Associate Committee on Plant Diseases of the National Research Council and the Dominion Department of Agriculture.
- Joint Committee on Oceanography.
- Special Committee on Applied Mathematical Statistics.
- Special Committee on Fresh Water Fisheries Research.

No member of these committees receives any remuneration for his services. Your Committee desires to acknowledge the outstanding work and unselfish contribution made by these men and to place on record its appreciation of their services.

Your Committee commends the policy of the National Research Council in granting aid to students and scientists to continue their studies through scholarships and fellowships and grants in aid to university professors. It believes that this policy has played an important part in elevating Canadian science to the position it now holds among the nations of the world and it recommends that this policy be continued. Your Committee notes with interest that of some 101 scientific employees of the Council who left the Council in the past two years, only 11 have left Canada, and it commends the policy that makes it possible for scientists to move freely from the Council to industry and the universities and from the universities and industry to the Council.

Your Committee recommends that the Council keep the matter of reclassification of scientific employees under constant review to ensure that they are moved to more senior classifications as their work warrants.

Your Committee believes that a valuable service is being rendered to the economy of Canada, and particularly to secondary industries, by the Council's Technical Information Service in searching out scientific and technical problems and obtaining such information as would contribute to their solution. Your Committee stresses the importance of the work of the field men of this service in consulting with business and industry throughout the country.

Your Committee notes that the Fire Hazard Section of the Division of Mechanical Engineering is employed on inspection work on oil burners and the like and not on research. Evidence given would indicate that this work, while

necessary and desirable, does not fall within the function of a research institution, and that steps are being taken to have it transferred to the Canadian Standards Association. Your Committee recommends that it be transferred from the jurisdiction of the National Research Council.

In examining into the operations of the Division of Building Research the Committee noted that this is a comparatively new division of the Council. Your Committee believes that a great service can be rendered to the country through research in the field of building materials and building generally, and by such activities as a revision and standardization of building codes and a standardization of designs of some of the materials in use in the construction industry. Your Committee, therefore, recommends that this division be expanded and its growth accelerated in order to bring its activities up to the level of the older research divisions as rapidly as possible.

Your Committee desires to thank the President, Dr. C. J. Mackenzie, C.M.G., and the officers and employees of the National Research Council for their co-operation in its work.

A copy of the minutes of proceedings and evidence of the Committee is appended hereto.

All of which is respectfully submitted.

GEORGE J. McILRAITH,
Chairman.

