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THE DEVELOPMENT OF SCIENCE AND SCIENTIFIC ENGINEERING IN CANADA

Address by Dr. C.J. Mackenzie, President, Atomic Energy Control Board at dinner given in his honour by the Professional Institute of the Public Service of Canada, Ottawa, January 23, 1954.

I do want to thank you, one and all, most sincerely for all the kindnesses you have shown to me tonight; for the good will which inspired this banquet; for the many generous and flattering things which have been said to me, and for the friendly and warm way in which you received the introductory remarks which I fear were more kindly than critically accurate.

I do appreciate it all very much and feel deeply grateful.

First I want to thank you, Mr. Chairman, for your overly generous remarks, but more particularly I want to say how much it has meant to me that you and all my many other friends in the Public Service should want to honour me in this way.

Naturally I feel greately honoured by the award of the Kelvin Medal, but for me the most heart warming and permanent award one can receive is the respect and personal regards of those with whom one has been associated in his daily work. It is for that reason I feel very proud tonight, and it is for that reason I value very highly the distinction of becoming an Honorary Member of your Institute - the highest honour you can give.

I think you will all agree with me that the Kelvin Medal Award is not only a personal compliment but a recognition of what has happened in Canada during the past 15 years and of the standing science and scientific engineering have attained. I am not being modest in that as I think the honour is greater, not less, on that account as I shall attempt to show.

There is no doubt that wars and the threat of wars have always profoundly affected the development of applied science. This we all now accept, but what is of paramount importance to any particular country is what happens after wars.

For me, and that includes most of those here tonight, who were vigorously engaged in war work between 1939 and 1945 there was a great thrill. There can be no greater satisfaction than being helpful when one's country is in peril.

My greatest personal satisfaction, however, lies not in the credit and recognition we got for spectacular war

service, but in what has happened in Canada since the war - in the realization that what we did in war was not ephemeral but has brought about a permanent, - a revolutionary - change in the scientific structure of this country.

The many tributes being paid everywhere to Canada these days are almost embarrasing - her growth, her potential, her sanity and efficiency in public affairs, her prospects.

We are familiar with the statistics: since 1939 our population has increased 30 per cent, - our trade has increased, - vast new resources have been opened up, - our gross natural product has increased 4 times, - our government revenues have risen 8-fold, but our research expenditures are 16 times greater than in 1939.

Statistics alone, however, are barren. The scientific expenditures have increased twice as much as other comparable expenditures might mean anything, - even waste, - but that is not true.

What is true is that our science has increased in effectiveness and quality - but of greater importance, our Governments and the people have recognized that effective national science is one of the essential activities on which the strength and well-being of a modern nation depends, in peace as well as in war.

It is this public recognition which is responsible for the real scientific revolution of the past 15 years, - and it has been a revolution, and of this I wish to say a few words.

Let me, by way of illustration, recall one well-known story which I think contains all the essential elements.

I go back to one of the real crises in World War I.

This had to do with one of the many critical shortages in chemicals.

You will recall the ammunition position in Flanders in the early days. The demands for cordite could not be met. The situation was desperate. One of the most urgently needed chemicals was acetone - the former sources from hardwood and fusel oil were completely inadequate.

In the frantic search for new sources Lloyd George heard of the work of a quiet, modest research professor of chemistry at Manchester, who in his attempts to make butadiene had found a fermentation method of making butyl alcohol but unfortunately as the professor saw it, there was also produced acetone in quantity.

The Professor's failure was great news for Lloyd George who wanted acetone above all things - he immediately got in touch with the Professor.

Pilot plant studies were initiated and soon plants were being built in the United Kingdom and Canada and later in the United States; the most successful at the time was that at the Gooderham Works in Toronto. One crisis was met and the war went on.

There is in this story an illustration of the nature and unpredictability of fundamental research, i.e., looking for one thing (butadiene) - finding the solution of a different and acute problem.

The moral is clear: (1) Without fundamental, unfocused research there can be no accumulation of scientific capital, (2) but also, without a trained corps of applied scientists to take advantage of fundamental research, there will be no national dividends. (3) Without national understanding, neither of these will be provided.

But to get back to the main point of my story. At the end of War I what happened? In Canada the doors of the acetone plant were closed.

In other countries, notably the United States, the plants were not dismantled but became the nucleus of a great industrial development. The surplus butyl alcohol together with war surplus nitrocellulose became the raw materials of the nitrocellulose lacquer industry based on solvents and cellulose (another component of cordite).

Canada, the country to whom the 20th century was to belong was not scientifically ready in 1918.

Now a flash to 1940, another war and another critical strategic shortage - rubber. This time one of the key components of artificial rubber was the same butadiene that Weitzmann was looking for in 1914 when he discovered a new method of making acetone. (Incidentally Weitzmann might have developed artificial rubber twenty years before the Germans had he not been diverted from his research).

What did Canada do? Again in association with her allies, she built and put into operation with amazing speed and efficiency a most intricate artificial rubber plant based on scientific techniques that we formerly thought were practical only in research laboratories.

This achievement was one of the finest in an exceptionally fine record made by the old Department of Munitions and Supply. But that is not the main point of my story.

The significant thing, however, is that after World War II this factory was not dismantled as was the acetone plant in 1918. The operation known as "Polymer" was kept going and today is one of the vital components of a young, rapidly growing and vital chemical industry - so essential to any country. - Why this different procedure in 1945?

I know that you will all say we had a "knowing Howe" in 1945 and to that I subscribe wholeheartedly. Just as I believe that the peacetime consolidation of our scientific advances made during the war is the important fact, so I believe that the contributions of Mr. Howe in connection with the industrial development of Canada - his understanding, his vision, his drive - after 1945 will be given precedence, by future historians, even over his spectacular and Herculean war efforts.

But there were other factors for success in 1945 that were not here in 1918. - Which is the egg and which is the chicken, I don't know.

In 1918 we had reasonable skills, we had a few competent scientists - but we did not have many experienced scientific engineers, neither did we have a definite public recognition of the vital national need of co-ordinate, vigorous and native applied science.

We were still colonial minded in the scientific sense, and the same was still largely true in 1939.

In 1945 the reverse was ths situation. We had a sizeable corps of highly qualified and experienced scientists, and scientific engineers.

We had strengthened immeasurably all our Government establishments and our Universities, and industry, everywhere, had become interested in the application of science.

We had the resources of men with experience and confidence to organize quickly extensive research and scientific services for "Polymer", and without that service it would not be the success it is today.

What happened with Polymer is only an illustration of what happened in the aircraft, chemical, metallurgical, atomic and other fields.

I do not suggest that any one factor was solely responsible, - national life is not that simple.

I do insist that applied science and scientific engineering were essential ingredients.

I would like to round out my story by mentioning four of the more important factors which I believe helped to develop our national scientific structure:

(1) The system of scholarships and grants-in-aid given by the National Research Council from 1918 on.

(2) The method of selecting, recognizing and rewarding scientific staff which by the organization, given to the National Research Council by wise Governments, enabled it to demonstrate as the effective way of operating Government laboratories.

(3) The methods for giving support to other institutions and projects and arranging for informal cooperation of scientists across Canada which the Council was first able to successfully demonstrate.

(4) The effective work done in wartime by all our Governments, University and Industrial laboratories gave to Canadian science the most important thing of all - public confidence and generous financial support.

Finally, I would like to mention some of the developments that have given me greatest satisfaction as a Canadian.

(i) The equalization of scientific standards and opportunities across Canada. Today a University Professor does not have to leave his position in any region for reasons of prestige or opportunity - that was not always true.

(ii) An evidence of our scientific maturity is the increasing numbers of foreign scientists now visiting Canadian Institutions to observe what is being done. They come to see men not institution - that paradoxically is the test of sound scientific organization.

(iii) Other indications of the healthy scientific Canadian structure are the friendly cooperation which now exists between various scientific bodies, the increase of industrial research establishments and a growing cooperation between Government, University and Industrial scientists.

Mr. Chairman, my thesis tonight has been that a real revolution in Canadian science and scientific engineering has taken place since 1939.

While this revolution rose out of a world crisis, it was, as only a Churchill could put it, "fanned by the crimson wings of war". It was not a mushroom growth; the fundamental structure remains and on its strength we now have a soundly based industrial economy, which will continue over the years to expand and prosper.

I believe that the Kelvin Medal was awarded for the first time to a Canadian in 1953 (and incidentally, to the first native born North American) because the selection committee in the United Kingdom recognized this significant achievement.

I am, naturally, extraordinarily proud that my part as a central figure in this movement brought me the Kelvin Medal, but I am equally proud that in my personal work I was associated in a most happy and co-operative way with a host of Canadian scientists, engineers, military men, industrialists, and public servants.

It is an honour to receive a Kelvin Medal - it is something far more touching to be acclaimed by the people with whom one has worked.

I thank you from the bottom of my heart for this evening's demonstration of your friendly regard and for the Honorary Membership in your Institution, which is the highest evidence of your professional respect, and - I like to think - of your personal friendship.

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