Government sponsored research: a Canadian view

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Government Sponsored Research†— A Canadian View

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THE PARTICIPATION of Government in research has long since ceased to be a matter of debate in Canada. Not only has it been accepted but there are frequent demands for the Government to take an even more active part in research than it does.

One of the keys to this may be the fact that from its inception Government sponsored research in Canada has been developed in very close association with research sponsored by industry. Many Canadian research projects represent joint efforts on the part of industry and Government. Correspondingly, a leading part of federal research activity has been the channelling of funds to university workers for research purposes. In Canada, therefore, there has existed for some time a singularly happy integration of research by Government, by industry and in universities.

This has been possible since Canada, although rather larger in area than the United States, is still a much smaller country in terms of population and industrial achievement. Correspondingly, the political atmosphere of Canada may perhaps be slightly different to that of the United States. Such organizations as the Hydro Electric Power Commission of Ontario, the Canadian National Railways System, Trans-Canada Airlines, and the several Crown Corporations, such as the Polymer Corp., have shown that under Canadian system of government, it is possible to combine the advantages of what may be called *company operation* with complete public ownership.

People are accustomed to the usual comparison of things American and things Canadian, and to statements about the undefended frontier, which suggest (so happily) the similarity of our respective countries. It may therefore be unusual to find pointed reference in a paper such as this to differences between Canada and the United States. In any consideration, however, of Government sponsored research these differences must be stressed. This paper is not intended to be regarded in any comparative way with corresponding situations in the United States. Certainly no statement is so intended.

The Canadian situation is somewhat easier; there are not yet the great industrial research organizations such as those so well established in the United States; and the traditional outlook on the functions of government is favorable to the use of public funds for research. This paper then is a description of the present situation regarding Government sponsored research in Canada, in both a general way and in some detail with regard to a particular activity which may be of special interest, for purposes of record and possibly as a basis for some discussion.

Research at the Federal Level

Research has long been recognized in Canada as one of the responsibilities of the Federal Government. As with other countries, this recognition seems first to have developed in connection with agricultural research, since this is of such importance to the country as a whole and did not have the initial backing of organized research by industrial companies. The history of research in Canada's Department of Agriculture, and the corresponding development of experimental farms and of the work of its Science Service throughout the country, is therefore long-standing and of great distinction. The work has been done in close association with provincial departments of agriculture and with universities and agricultural colleges.

Corresponding developments in publicly sponsored research are to be found in other fields related to the development of natural resources, in which the participation of the federal and provincial governments is to be expected in view of the vital position occupied by resources in the development of the national economy. For example, forestry research has long been a feature of both federal and provincial forestry operations. A development of special interest was the setting up of a Forest Products Research Laboratory under

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the appropriate federal government department in Montreal in 1913 (moved to Ottawa in 1927) with a second laboratory started in Vancouver in 1918. Similarly, the federal departments concerned with the mining industry have long been concerned with research problems, and in the Mines Branch of what is now the Department of Mines and Technical Surveys, Canada has a mining and metallurgical research organization, splendidly equipped, and with a record of great achievement to its credit. These laboratories have been in active operation since 1909.

Other departments of the federal government which are concerned with the natural and human resources of Canada have given similar attention to research in recent years. For example, the Fisheries Research Board of Canada operates in association with the federal and provincial departments of fisheries and directs the fisheries research stations on Canada's Atlantic and Pacific coasts. A more recent development has been the channeling of federal funds through the Department of National Health and Welfare for various aspects of research work in connection with mental and physical health.

In many of these fields research by federal government departments is carried out in close association with the work of provincial government departments in the same field. In recent years some of the provinces have set up their own provincial research organizations. Most of these take the form of research councils which channel funds from the provincial government to research workers in universities and elsewhere for work in which the particular province is especially interested. Much of this work might be described as development, but a steadily increasing emphasis upon basic research is to be noted. The British Columbia Research Council now has its own building on the campus of the University of British Columbia in Vancouver, and has a permanent research staff which devotes its time to research and development problems of special interest to Canada's Pacific province.

Note should be made of one provincial research organization which is unique in Canada, and which has a special interest for this Society in that the ASHVE Director of Research was formerly on its staff. This is the Ontario Research Foundation which is a public agency operating under an Ontario statute and started with a fund provided jointly by industry and the Provincial Government. It maintains well known laboratories in Toronto, and provides a very complete research service for the smaller industries of the province. Although it receives some grants for special work, it is to a large extent self-supporting. It represents a most happy blend between industrial interest and government participation in research.

As is to be expected, there has been little connection between the third level of government in Canada, namely, in the municipal field, and research activity. No general survey of publicly sponsored research in Canada would, however, be complete without reference to the stimulus which has been given to many research projects by municipal officials. The City Engineers of Winnipeg have, in particular, made notable contributions in this way. The development of sulphate-resisting cement by Dr. T. Thorvaldson of the University of Saskatchewan, a Canadian research achievement of world-wide importance, was a direct outcome of the engineering studies made of a special problem faced some years ago in connection with the Winnipeg water supply.

This brief survey reveals a pattern which is similar to that to be found in the United States in the fields described. Research is recognized as a federal responsibility, particularly in connection with the development of natural and human resources. There is no competition with industry since, until very recently, industries have not been directly concerned with resource research. The work is always done within the framework of existing federal and provincial departments using money specially allocated for research purposes, but subject always to the usual control of such expenditure of public funds. It will be noted, however, that nothing has yet been said of research in the more general fields which affect industry. It is in the provision of research in this direction that Canada is fortunate in having a public agency which today is unique. This is the *National Research Council* of Canada, to the operations of which attention may next be directed.

National Research Council of Canada

The *National Research Council* owes its existence and recent phenomenal growth to two world wars. At the beginning of the first World War there were more trained scientists in a few of the great German industries than could be found in the entire British Empire. To cope with the situation, the British Parliament set up a committee in 1915 to foster a scheme for scientific and industrial research in the United Kingdom. Canada followed this example and set up a committee of six Federal Cabinet Ministers on June 1, 1916. As a result of their studies, there was appointed in November of that year an Honorary Advisory Council for Scientific and Industrial Research.

This is still the official name of the *National Research Council* which has continued in operation from 1916 to the present time. It consists now of twenty recognized leaders in the research field in Canada. Among the duties assigned to the Council was that of linking science with labor and capital to bring about desirable economic results. It was also directed to find means of stimulating research work in Canada, of increasing the number of trained research workers and of coordinating their work. The Council throughout its existence has therefore made grants to research workers at universities and has channeled federal money into scholarships for outstanding young Canadians. It has achieved coordination of research in Canada through the medium of Associate Committees of which there are today about thirty. On these Committees sit representatives from government, universities, industry and labor who are interested

in the particular research field assigned to the Committee. The Committees ensure that there is no unnecessary overlapping in their field of interest; they stimulate needed work; and they channel federal funds into approved research projects.

In these respects the *National Research Council* of Canada is not dissimilar from the *National Research Council* of the United States. It has, however, gone farther. In 1927 the first temporary laboratories were set up by the Canadian Council in order to meet certain research needs which it had seen in Canada and which were not being met either by industry or by universities. In 1932 a large permanent building was opened for its use in Ottawa, and at the beginning of the Second World War, this building was comfortably filled with a research staff of about 300, operating through the Divisions of Physics and Electrical Engineering, Applied Biology, Chemistry and Mechanical Engineering.

The demands of World War II provided a remarkable challenge to the *National Research Council*, with the result that at the end of the war its staff had increased to about 3,000, and its responsibilities included the operation of Canada's Atomic Energy Project. Today, atomic energy work has been passed over to a separate Crown Corp., but the research staff of the *National Research Council* still numbers over 2,200. The staff operate through Divisions of Chemistry (Pure and Applied), Physics (Pure and Applied), Applied Biology, Mechanical Engineering (the work of which is very largely aeronautical engineering), Radio and Electrical Engineering, and Building Research, with associated administrative and information services. A special Division of Medical Research is really a form of Associate Committee, since its function is to channel funds from the *National Research Council* to the hospitals and universities of Canada for medical research in all its phases.

During World War II the Council was responsible for research in more than a score of establishments scattered across the Dominion, and was responsible for most of the scientific research carried out by Canada in connection with her wartime effort. This has been admirably described in a popular book entitled *Scientists at War*[1] to which attention may be directed.

Soon after the close of the war, a special Defense Research Board was set up, patterned after the *National Research Council* but within the Department of National Defense. It is now responsible for defense research work in Canada but the various Divisions of the *National Research Council* continue to do a great deal of work for the three armed forces, in liaison with the Board.

Today the activities of the Council have been consolidated into two large regional laboratories at Saskatoon (for the Prairies), and Halifax (for the Maritime Provinces), its Sussex Street building in Ottawa, and its Montreal Road Laboratories on the outskirts of Ottawa. The latter now occupy an area of 400 acres which will be eventually used by all the Engineering Divisions of the Council.

The work of the operating Divisions is directed in each case by a director who reports to the president of the Council. The president reports, not to a department of the federal government, but to the chairman of the Privy Council Committee on Scientific and Industrial Research. The Privy Council of Canada consists of the advisors of Her Majesty Queen of Canada, most of whom, but not all, are members of the Federal Cabinet. The chairman of the Privy Council Committee in turn reports to the Parliament of Canada. Through this unusual and now unique arrangement, the National Research Council of Canada is a public agency but is removed from the normal departmental framework of government. Funds for the operation of the Council are voted annually by Parliament and their expenditure is subject to treasury audit. Current budgets run about $14,000,000 per year apart from capital expenditure. By general North American standards, this is research on a small scale. It is believed, however, that because of the favorable position of the Council and of its close and intimate links with Canadian industry in all its branches, the public funds so expended are put to remarkably good use.

Division of Building Research of the N.R.C.

As an example of how an operating Division of the *National Research Council* works, a brief review of the Division of Building Research may be useful. This is the Division of the Council of chief interest to members of the Society and it is the only one upon which the author is at liberty to speak with any authority, somewhat naturally.

The Council first considered the research needs of the construction industry of Canada at a meeting held in Ottawa on July 12, 1933, and from that time forward it gave repeated consideration to this possible extension of its work. Its first activity in this field was a joint one with the Department of Finance and consisted of sponsoring and arranging for the preparation of a National Building Code. This important document, which is advisory only but which has been widely adopted and used throughout Canada, was published by the Council in 1941. The start of actual building research work by the Council was stimulated by the example of the British Building Research Station, the Director of which visited Canada in 1937. The incidence of war delayed an actual start and so it was not until 1947 that the final step was taken of authorizing a Division of Building Research. The Division started its work on August 1 of that year.

The function of the Division is generally to provide a research service to the construction industry of Canada in keeping with the general function of the Council in assisting industry with its research needs. The start of the Division was no reflection on the construction industry, since it has an enviable record and is today the leading industry of the Dominion. There is, however, no industry in Canada which is in such need of a publicly operated research service, if only because of the fact that the industry consists of a large

number of small organizations, none of which are in a position to do research work on their own. Correspondingly, advances in building technique and corresponding changes in public demands upon building have long pointed the need for an active research program in this field.

Housing research is naturally a dominant responsibility of the Division. In this field it cooperates closely with another public agency of the federal government, Central Mortgage and Housing Corp., which is responsible for almost all federal housing activities. Correspondingly, the Division was given the responsibility for carrying out all necessary work upon the revision and keeping up-to-date of the National Building Code, under the guidance of one of the Associate Committees already mentioned.

As can be imagined, from the day it started work, the Division has been faced with far more problems than it could possibly undertake. Work on the National Building Code alone has provided enough urgent problems to keep the existing staff busy, quite apart from all other activity, for many years to come. The administrative problem has therefore been to know which to select from the innumerable problems demanding attention as those upon which the Division can attempt to work.

The guiding principle in this problem of selection has been the fact that the Division is set up to serve the construction industry of the country and therefore the people of Canada by developing improvements in the economy and standards of building in all its phases. Obviously, therefore, the course to pursue was to concentrate upon those building research problems which are peculiar to Canada. These special Canadian problems have been grouped as follows — the problems of buildings for cold weather including material and heating studies, the study of actual structures under Canadian conditions, problems of building in the far north of Canada including permafrost, fire research, foundation and soil problems, and the engineering problems associated with snow and ice.

Cooperation with other agencies in the building research field has been essential for implementing such a limited program. It has been most encouraging to see this liaison develop, not only with agencies in Canada, but with practically every other building research organization throughout the world. In Canada, for example, the Division does not undertake any studies in connection with wood except in collaboration with the Forest Products Laboratories. The British Building Research Station has been particularly helpful; and cooperation with the Research Laboratories of the ASHVE is a valued feature of the links which the Division has with American research.

After five years of operation, the Division is operating a laboratory in Saskatoon (which has already been described to this Society), test huts in Ottawa, Saskatoon, Churchill and State College, Pa. (as part of a major research program which perhaps may one day be outlined to this Society), an experimental building at the University of Manitoba, Winnipeg, a small permafrost research station at Norman Wells, N.W.T., and its main center of activity in Ottawa. Up to the present the Division has been accommodated in buildings of other sections of the Council (particularly those of the Division of Mechanical Engineering) but a building for its own use now approaches completion. When the building is opened in the Spring of 1953, it is believed that it will be the first building in the world to have been erected especially for building research in its general phases.

Concurrently with its actual experimental research work in the laboratory and in the field, the Division has placed special emphasis upon what is called building practice work — the collection of information on research work already done through individual contacts — by means of a complete library service, and the dissemination of this information through publications. The Division also handles all building inquiries which come to the Council. This work is of very great benefit to the Division as a whole, inquiries, for example, pointing the way to the building problems which are causing most trouble in Canada today. It will be no surprise to members of this Society to know that condensation in building walls and moisture movements through building materials have been found to be problems of paramount importance.

Administration of the Division is in the hands of the director (as with all other Divisions of the Council) and he reports directly to the president. The current budget of the Division is about $500,000 exclusive of capital expenditure for the new building and equipment. A few months ago, with the main lines of the development of the Division well established, an Advisory Committee was appointed by the Council representative of all the main phases of the construction industry in Canada including the trade unions. This Committee will normally meet only once a year, at which time it will review generally the work and program of the Division, and report to the Council itself on what might be called the *scientific audit* of the Division which it has made on the Council's behalf.

The Division is organized into two main groups, one dealing with building practice, the other with building research. In the latter group are sections concerned with building design, building physics, building services, fire research, building materials and foundations and soil mechanics with which are associated the work on snow and ice and permafrost in the North. Necessarily the Division operates on a project basis, most of the projects involving the work of more than one section. The projects themselves are determined within the Division, but only after taking all possible advice from those interested outside the Division and in particular, the technical staff of Central Mortgage and Housing Corp. Some investigations have been suggested by industry but are being paid for by the Division in view of their general interest. Other projects are carried out cooperatively with industry, costs being shared. Finally, a few

studies have been undertaken at the request of industry for which full charge is made, since they are to provide information for the industry's own use. Naturally work has been carried out in all parts of Canada ranging from the Alaska-Yukon border through all the provinces to the Atlantic coast. These field investigations not only permit problems to be studied where they actually occur, but enable the Division to carry out its work under actual climatic conditions (which vary so much across Canada) and in close touch with the building industry throughout the whole Dominion.

Conclusion

This, then, is the pattern of government sponsored research in Canada, sketched in broad and general terms. It will be seen that research allied with the work of operating departments of government is carried out within those departments; research in the more general fields of peacetime endeavour being the responsibility of the *National Research Council.* The Council occupies a unique position; its mode of operation and link with the Privy Council of Canada may seem to some to be strange, if not archaic — but it works.

There is a high degree of personal cooperation between the staffs of the several agencies mentioned, cooperation which, in the experience of the writer, has always been welcomed and encouraged by those in charge. For example, rarely a week goes by but that members of the staff of the *National Research Council,* Division of Building Research are in touch with members of the staffs of the Forest Products Laboratories and of the Mines Branch, even to the extent of exchanging specimens and skilled assistance, on projects which have been cleared in a general way by the heads of the three organizations. There is competition only in meeting the great challenge of research itself since all workers have the same goals in view. Cooperation between federal and provincial research organizations is similarly close and satisfactory. And in the case of all these public research agencies, their links with industry provide vital stimuli and often essential guidance.

On a higher level within government, cooperation and the avoidance of unnecessary duplication is ensured by the review of all federal expenditures on research by an Advisory Panel on Scientific Policy. The President of the *National Research Council* is the chairman, and the members represent all federal departments charged with research responsibilities. It reports to the Treasury Board.

It will be seen that research as a separate and distinct function of government is thus given official recognition. Separation from normal operations is a regular feature of that research which is carried out within departments of government and it is implicit in the basis upon which the *National Research Council* was founded. It is general Canadian experience that separation of research from operation is of vital importance if research is to be well done and objectives are to be kept clearly in view.

There is, of course, another side to the picture. It would be wrong to give the impression that all is perfect in this small part of Canada's national economy. Many of the difficulties, while very real to those who have to deal with them day by day, fade into insignificance when considered on such a broad canvas as that provided by this review. A major difficulty, however, particularly in the field of applied research, is that of personnel. As parts of the public service, federal (and provincial) research organizations must operate within the fixed and rigid framework of salaries paid from the public purse. Departmental staffs must conform to the regulations of the Civil Service Commission; the National Research Council determines its own professional salaries but of necessity these cannot differ much from those in the Civil Service, even though the schedules are somewhat easier and more flexible to operate. Salaries in the public service in Canada are quite good by comparison with standards of but a few years ago but they are naturally at a severe disadvantage when compared with salaries in industry today. The situation is not good even for staff in the pure sciences, but in the case of the applied sciences and engineering, the present situation is critical indeed.

There is, accordingly, a steady loss of good research personnel to industry. The *National Research Council* has looked upon this provision of research workers to industry as a regular part of its responsibilities but this was based upon the happy (*prewar*) assumption that losses would be replaced by recruits of high standing from the universities. Today, however, the competition from industry — and not only from Canadian industry — is so keen that the replacement of men even in the scientific fields is proving to be difficult. The task faced by the *National Research Council,* Division of Building Research in these boom years, of building up the staff for a new research group to serve the needs of the highest paid industry of the Dominion, is one which can best be left to the imagination.

The fact that a staff of over one hundred has been recruited within the five years' history of the Division, with almost no loss of professional personnel, shows that even this major difficulty has its compensations. With the exercise of very careful selection, the staff which is recruited come to the *National Research Council* because they want to do so and despite the fact that they may forfeit some monetary advantage in so coming. This is at once reflection of the standing of the Council in the Canadian community, and an indication of the type of young people who are attracted to research in the public service. It may be thought that possibly the idea of *security* is the real drawing card. The writer can record only his personal experience on this point, but this has quite definitely failed to reveal a single case of this factor being of any significance.

There is still, in some quarters, some critical talk about the idea of *working for the government* but this is usually comment from the uninformed. The fact that *the government* is the means by which the Canadian people as a whole take care

of their own affairs is today widely realized. This is shown by the fact that the Research Council has little difficulty in attracting top ranking scientists to its service. The same trend is slowly coming to be seen with the engineering divisions and may be expected to continue when the salary situation improves and as the work of these divisions becomes better known.

Herein lies another difficulty which some might call a serious disadvantage of government sponsored research. There must naturally be considerable restraint upon the publicity given to the work of public research agencies. It is a well recognized feature of public life that expenditures upon all that can be called publicity is frequently suspect and so must always be watched with unusual care. For this reason, but more particularly because of the natural reticence of scientists and engineers at work on their own without the catalytic influence of an allied sales force, government sponsored research in Canada is not well known, even within the Dominion itself. There may be, for example, some who see this paper to whom the name of the *National Research Council* is new. This lack of publicity is not an unmixed blessing. To many, it is not even a disadvantage. Far better, so is it widely thought, to let public recognition come slowly based only upon real technical achievement and upon contributions to the public service.

And on this note, a halt must be made. Many things are missing from this brief review, including mention of some of the questions raised by the Society's Program and Papers Committee. These have had to be deliberately avoided lest any hint of invidious comparison were to be suspected by even a single reader, comparisons in this setting being odorous indeed. Government sponsored research in Canada has been described as research paid for out of public funds, subject to final control by the Parliament of Canada, always conducted in close contact with relevant industrial research and University work. It has as its ultimate objective some improvement in the utilization of natural resources and in standards and equipment for the physical basis of the well being and real progress of the lives of all Canadians, upon which the country ultimately depends.