

# Relation of Scientific Research to Industry

**Chief of Advisory Council, Dr. Macallum, Outlines Need for Industrial Research, Benefits Which Industry Derives and Outline of Plans Proposed for Development.**

The following interesting and illuminative summary of the work of the Canadian Council for Scientific and Industrial Research appears in The Toronto Globe's annual financial survey issued on January 2nd. Dr. A. B. Macallum, the administrative chairman of the Council, reviews the situation in Canada in regard to the application of science to industry as follows:—

"Re-construction and development" in Canada in the new era of international girding for supremacy in the arts of peace means to the Canadian Honorary Advisory Council for Scientific and Industrial Research much in so far as "development" is concerned, but little in regard to "re-construction." Re-construction postulates the building up again of what existed before; and up to the outbreak of war there was constructed in Canada no national organization for research work. The glowing path of Canada's opportunity for industrial development runs wide and far, but the Council's research path has to be blazed through a comparatively unexplored forest. It is almost entirely new ground to be covered.

Where Germany and, though perhaps in lesser degree, the United States had builded before the war great organizations for industrial research founded on wide-visions realization of the commercial value and necessity of applying science to industry, in Canada, as in Great Britain, state encouragement and individual enterprise had, until the war started, been content in the main with a laissez-faire policy. Germany had her trained technologists and research workers by the thousands in every field of industry, and through the organized application of science to industry, was winning her trade victories in every foreign mart.

In the United States, which early took a leaf from Germany's book, the great universities like Harvard, Yale, Chicago, Columbia, and Cornell had staffs and equipments in pure and applied science, which kept pace or almost kept pace with the demand from great American industrial establishments for trained scientific investigators, chemists, electrical engineers, metallurgists, etc., to solve industrial research problems. The annual budget of the Massachusetts Institute of Technology, for instance, exceeded before the war, and still exceeds, the total of the annual expenditures of all the Faculties of Applied Science in Canada. There are some two thousand research laboratories in connection with large industrial concerns in the United States, and each of more than fifty individual firms expend annually sums ranging from \$25,000 to \$500,000 for research.

In Canada in a score of years less than twenty students have received the advanced (Ph.D.) degree in science from the University of Toronto and fewer still from McGill. Not two per cent. of Canadian firms have research laboratories, and only about ten per cent. have routine laboratories, chiefly for the testing of materials. If Canadian industries were to seek for a supply of trained technical men capable of applying the most advanced scientific knowledge to industrial processes sufficient to meet even their most ordinary needs, the number of adequately trained men available would not be sufficient to satisfy five per cent. of the demand.

That, briefly put, is the situation with regard to the needs in Canada for equipment and men for research work. That is the situation which has confronted the Research Council since its creation in December, 1916. And that has been, and is, the crux of all the problems of scientific and industrial research in Canada, handicapping the carrying out of the large research programme planned for the past year and for the coming year, jeopardizing Canada's position in the international rivalry for export trade and demanding prompt remedy if the full measure of our opportunity is to be grasped. In resources of capital and ma-

terials, in all the natural advantages for industrial supremacy we are in an enviable position as compared with our trade competitors. But in regard to the vital question of scientific organization of our industrial processes of finding new uses and, hence, new markets for the raw materials and the by-product of manufacture, and of keeping pace with the advances made in other countries through research, we have as yet hardly touched the fringe of opportunity.

Confronted with this situation and with a slowly awakening public and individual realization of its portent, the main task of the Council this past year has been, while carrying on the immediate needs of research work with the means at hand, to pave the way for meeting adequately the urgent needs of the future. The goal has been a supply of trained men for research work, adequate equipment and facilities for research and the enlistment of industrial organization in co-operative effort to solve common problems, the solution of which lies in the application of science to industry. The great forward step taken has been to promote the establishment of a Central Research Institute at Ottawa, combining the functions of the Bureau of Standards at Washington and of the Mellon Institute at Pittsburg.

The proposal for such an Institute, submitted to the Government in November last, was the result of many months' careful investigation by the Council. In view of the situation above outlined, the argument advanced in support of it is so obvious as to need no restatement here. There has been a prompt and appreciative response to the proposal by the Government and by all the public interests concerned. There is good reason to believe that the Institute will be established without any unnecessary delay. It will involve an expenditure of \$500,000 for a four-storey building, having initial provision for fifty laboratory rooms, and with plans so drawn as to provide for expansion as the needs develop. The cost of the scientific equipment is estimated at \$100,000, and the cost of maintenance, salaries, etc., at about \$100,000 per annum for the first few years.

The establishment of the Institute is the necessary first step towards placing industrial research work in Canada upon an adequate and permanent basis and towards enabling the Dominion to keep abreast of similar progressive methods in the United States, Great Britain, Japan, France, Australia, and our other trade competitors. It will, doubtless, be followed by the organization of trade guilds or associations for research in each branch of industry, formed to pool resources in solving common problems and to take advantage of the laboratory equipment and opportunity offered, under the Council's proposals, by the Government-maintained Institute.

A further necessary step will be the working out of the Council's plans for more adequate provision by the universities for the training of qualified scientific workers. In the more generous investment of state funds for this purpose, starting, say, with Toronto, McGill, and L'Ecole Polytechnique in Montreal, lies the hope of securing for the ensuing years of the world's strenuous and pitiless trade warfare the nation's leaders in scientific and industrial research.

Apart from these crucial phases of the work and aims of the Research Council, space permits of only passing reference to some of the many research problems already undertaken.

As a result of the Council's initiative, governmental action was taken in June last to secure federal co-operation with the governments of Saskatchewan and Manitoba in establishing a demonstration plant in the Souris coal areas of Southern Saskatchewan, to prove the commercial feasibility of carbonizing and briquetting the Western lignites for heating, in domestic furnaces. This year will see a plant established with an outlay of \$400,000 and an annual output of 30,000 tons of coal equal to the Pennsylvania anthracite and marketed in Regina or Moose Jaw at, at least, two