

each had one major university with graduate facilities. They conferred 281 doctorates in course, distributed by fields as follows: biological sciences, including medical and agricultural sciences, 83; engineering and applied science, 13; humanities, 45; physical sciences, 110; and social sciences, 30. Subject matter covered in these and reports of other research conducted by university professors and reported in professional journals is encyclopaedic and reflects specialization and variety. Outstanding research in different fields has become associated with various universities, for example: nuclear research and geophysics in McGill, Queen's, McMaster and Saskatchewan; medical research in such institutions as the Connaught Laboratories and the Montreal Neurological Institute; agricultural research in the western universities; and fisheries research in British Columbia.

Outside financial support for university research comes primarily from four sources: Departments of the Federal Government including the National Research Council and Defence Research Board which provide grants for approved and contracted government-sponsored research; industry which supports both basic and applied research; private foundations which provide grants for approved research, sometimes in selected fields; and provincial governments.

Subsection 5.—Industrial Research

Industrial research in Canada is changing very rapidly. In the past, industry in general was largely unaware of the value of research to its own development and to that of the country, partly because many Canadian companies were subsidiaries of companies in the United Kingdom and the United States and partly because small companies found it impossible to finance their own research. The problem was accentuated by the vast size of the country, the absence of concentration of similar industries and the proximity to the relatively large research facilities of the United States.

However, the emergence of Canada as a highly industrialized society, its entrance into multitudinous fields of production, the rapid growth of many large nation-wide industries, the serving of a discriminating domestic market and the meeting of competition from abroad have had the effect of making Canadian manufacturing establishments research conscious and many of the larger ones now possess competent research organizations. The fields covered by some of these industries are outlined in the 1956 Year Book at pp. 386-389. The research work of the Canadian Pulp and Paper Association, an independent corporation combining efforts of government, university and industry in the expanding field of pulp and paper research, is described in the Forestry Chapter of this volume.

Industrial Research-Development Expenditures in Canada, 1957.—A survey was conducted in 1958 of some 2,800 of the larger industrial firms in Canada in an attempt to measure the extent of the research program being undertaken and to obtain an indication of its direction. From this survey, information was secured on the cost of research programs carried out by Canadian companies in 1957—both direct expenditures and cost of purchasing research-development results from affiliates or from other companies or organizations located in Canada and in foreign countries. Data were also secured on the principal fields in which the research was carried out and on the number of research personnel employed. The magnitude of the research-development costs in 1957 and the increase planned for 1958 give an indication of the size of the program and the direction in which business is searching for new products, for new and more efficient processes and for improvements to existing products and techniques.

The research-development program was reported by industry as totalling \$149,000,000 in 1957 and was estimated at close to \$161,000,000 in 1958. Of the total expenditure in 1957, the major part—amounting to \$125,000,000—was conducted within the companies reporting, an additional \$20,000,000 was spent for research-development done outside Canada, mainly in the United States, and the remaining \$4,000,000 was spent for research done by other companies or organizations in Canada.