

## ADVANCES IN INDUSTRIAL RESEARCH

**APPLICATION OF SCIENCE:** Industrial interest in research in Canada has been greatly stimulated through the contributions and activities of the National Research Council at Ottawa. Since the inception of the Council many Canadian industries have established and are now operating well equipped laboratories, whose workers make full use of the National Research Council's facilities and staff in planning and directing research along their own specialized lines. That there is need for still greater expansion, both in Government-sponsored research and by private enterprise if Canada is to maintain its rightful place among the manufacturing countries of the world, was stressed in a recent address by Dr. C. J. Mackenzie, President of the Council, when he suggested that at least one per cent of the national income could be used to advantage in the prosecution of research. Half of this sum might be spent by Governments, but at least an equal amount should be invested by industry in the application of science to the processing of Canada's raw materials.

Progress is being made and the outlook is encouraging. The Chairman of the Committee of the Privy Council on Scientific and Industrial Research, Mr. C. D. Howe, stated recently that Canada is now making upwards of 200 products that had never been made in this Dominion prior to World War II. He pointed out that there are few manufactured products that cannot be produced as cheaply in Canada as anywhere in the world, assuming an adequate world market.

### EXTENSION OF FACILITIES

This new interest in the possibilities of applying science to industrial processes has brought many problems to the National Research Council. To cope with the expanding programme, facilities have had to be extended. Staff now number upwards of 2,300 persons. Laboratories include the main building in Ottawa, extensive laboratories for aeronautical, hydraulic and building research on the Montreal Road near Ottawa, radar laboratories outside the city and at Scarborough, a Flight Research Station at Amprior and the great Atomic Energy Project at Chalk River. A Prairie Regional Laboratory is located at Saskatoon and a Maritime Regional Laboratory has been authorized and is soon to be constructed at Halifax. Moreover, hundreds of projects financed by the Council are being carried on in co-operation with the universities and other research institutions where personnel are available for the conduct of specialized research on approved subjects.

In February, 1947, the National Research Council became responsible for the full direction of the Atomic Energy Project at Chalk River. Here a thousand skilled workers, half of them scientists and many with world reputations in nuclear research, are working at top speed to produce radioactive materials for

countless uses in medical and industrial research and in the search for the newer knowledge which is fundamental to scientific progress. Already practical results have been achieved. Papers presented at a conference on nuclear chemistry held at McMaster University were published in December 1947. These disclosed as much as possible of the chemistry of the actinide series of elements and of the techniques employed in atomic energy operations, using radioactive isotopes in research, particularly in biology and chemistry. There is also a growing application of electronics to Geiger counters and similar detectors of radiation. The Atomic Energy Project is now in a position to supply radioactive isotopes produced in the NRX reactor at Chalk River.

### IMPORTANT DISCOVERY MADE

This great new tool offers to scientists many advantages in the study of plant and animal physiology and in medical applications in the treatment of human and animal diseases. An important discovery was made during the year by Dr. J. W. T. Spinks now at the University of Saskatchewan but formerly on the staff of the Atomic Energy Project, when he found that phosphate fertilizer added to the soil at seeding accounts for 80 per cent of the phosphate taken up by wheat plants in the early stages of growth. He also showed that plants fertilized at seeding take up later a higher percentage of plant foods from the surrounding soil than do unfertilized other plants grown in the same soil. These results were obtained by using radioactive phosphorus which served as a tracer and could be photographed merely by bringing the plant in contact with a photographic plate. Hundreds of similar new discoveries must be expected to follow the use of radioactive materials.

An important service to industry is being rendered by the Council through its Technical Information Service. This organization was established in the Department of Reconstruction and Supply as a means of bringing to the attention of Canadian industry the important scientific advances that have been made in manufacturing processes and the uses of new materials. The smaller industries in particular have found TIS of great value. This work, now carried on under the National Research Council, and without charge to the inquirer, has been increasing very noticeably in recent months. One of the encouraging factors in the increase is that many requests about new problems are coming from people who have used this service in past months and have found that the answers given by TIS were of considerable help to them.

In food chemistry much of interest to industry has been done. Work is continuing on refrigerated storage of meats, processing of liquid and dried eggs, and dairy products. It has also been found that the baking properties of sugar-egg powders improve as the nozzle size

is reduced within practical limits. Considerable progress has been made on the German Fritz continuous butter machine with a view to its adaptation to Canadian requirements. Dried whey has been tested as a component in sponge cakes, with hopeful results in the baking trade.

New freezing mixtures have been assessed for use in railway refrigerator cars. Two test shipments of frozen fish, made from Vancouver to eastern Canada, using the newer mixtures showed good results.

### FERMENTATION STUDIES EXTENDED

Fermentation studies, which earlier produced butanediol from low grade wheat and surplus crops for use as antifreeze and as a source material for numerous organic chemicals, have been extended. Progress has been made in the fermentation of beet molasses for the production of glycerol. Papers of a glassine or parchment type have been made from several of the cereal straws. A flash-drying unit for processing gluten is currently yielding a product of high quality.

In radar and electronics substantial contributions have been made. In harbour control, the original installation was made at the Naval Signal Station located at Camperdown, N.S., overlooking the entrance of Halifax Harbour. Since then a nine-inch display with accurate ranging facilities has been added. The design of a second antenna has been completed. Procedures are being worked out for the use of shore-based radar in the identification and guidance of incoming ships that are not equipped with radar. Merchant marine radar equipment provides assistance to navigation in restricted waters and serves to give anti-collision warnings. A small low-cost ship-borne radar set has been designed for the use of merchant shipping. Trials during the past season show that blind navigation of the entrances of Toronto harbour and identification of every wharf within the harbour, is possible. Great interest was shown by Lake navigators in the specially fitted motor vessel "Radel" during its operations in Lake Ontario off the Scarboro Field Station last summer. Numerous demonstrations of the usefulness of radar were arranged for the benefit of ship owners and navigators.

A direct-reading electronic instrument designed to locate hot joints on power lines has been given extensive field tests that have demonstrated its practical value. Comparison has been made of the pulse method and the resonance method used to locate faults in electric power cables.

Magnetometer surveys were carried out during the latter part of the year in co-operation with the Department of Mines and Resources and with the assistance of the Royal Canadian Air Force. The magnetometer, trailed by a cable behind an Anson aircraft, records the changes in the earth's magnetic field as the aircraft passes over the land to be surveyed. The results, automatically recorded in the aircraft,

provide the data for accurate topographic maps and indicate the location of mineralized areas. A recording radar altimeter has been developed that will greatly expedite contouring in the preparation of topographical maps, and hence will be a valuable aid in surveying.

Co-operation with Canadian railways has been continued in establishing an experimental chain of radio stations between Montreal and Windsor operating on the 10-centimetre band.

A new type of electron accelerator known as the microtron, which will be suitable for basic research in nuclear physics, is under development.

A five-million volt Van de Graaff generator is being constructed for the Atomic Energy Project and a smaller unit, capable of generating 500,000 to 1,000,000 volts is nearing completion for the Division of Chemistry.

A high-speed motion-picture camera capable of operating at a rate of 200,000 frames per second has been designed and built. With such a tool, exact information can be secured on the details of industrial processes and operations that have heretofore been too fast for the human eye to see and analyze.

Instruments now under development to make use of sound echoes as a drill-hole exploring device in geophysical prospecting, appear promising and will be given full field trials.

### ARCHITECTURAL ACOUSTICS

Architectural acoustics studies include a series of commercial sound absorption tests. Work on acoustic filters for use in the so-called "an-echoic" or echo-free chamber, has been completed. This chamber, about eight feet in each dimension, has special sound-absorbing material in all surfaces and will be used to house instruments and equipment during tests of their sound-producing qualities.

A new rod thermostat is being developed for use in railway refrigerator cars. Sensitivity of 1.3 degrees Fahr. has been secured under semi-operating conditions but further work is required before it can be adapted to commercial use.

Following the radiant panel heating investigations carried out last winter in the two experimental houses built for this project, a summer programme of panel cooling was undertaken and continued throughout July and August. Observations were made on the formation of condensation on the ceiling surface and a survey conducted to determine the temperature distribution across the ceiling. Records were kept of the relative humidity inside and outside the building during the test runs. This project is designed to provide fundamental data on the very practical problem of house heating and ventilation.

Lubrication problems are of prime importance in industry. One of the applications in transport that is of first-class economic interest is the lubrication of railway-car journal bearings. The problem is a rather difficult one in that a single lubricant must be found that can be used the year round in all temperatures. Another requirement is that the