Metallurgy, Physics, Biology. These divisions conduct short term and long term investigations—the short term to provide the basic information required to design and operate the first Canadian power reactors. A wide variety of possible reactor systems make it necessary to conduct extensive investigations, both mathematical and experimental, to determine which are likely to be the most economic and efficient. The longer term work, though mainly the responsibility of physicists and biologists, also involves the chemistry of substances which have become important (or have come into existence) only since the development of atomic energy.

The Reactor Research and Development Division is engaged in experiments and calculations required for the design of nuclear reactors for atomic power stations. Control systems for such plants and for the Chalk River reactors are being studied. The ZEEP reactor has been in constant use in determining the reactive efficiency and other characteristics of various fuel element arrangements. Many fuel samples have been tested in the NRX reactor under conditions simulating those which will exist in power plants. These experiments are providing essential information on the behaviour and suitability of different physical forms of the fuel, or different kinds of cladding to prevent corrosion of the fuel, and of heat transfer characteristics.

The Chemistry and Metallurgy Division includes a number of research groups which are making a co-ordinated attack on the problems of the preparation and processing of reactor fuel. The division develops fuel elements for the NRX and NRU reactors and for power reactors. Much of the work is being done in collaboration with the Department of Mines and Technical Surveys.

In the Physics Division work has continued on the study of nuclear structure, using the experimental facilities of the NRX reactor and the particle accelerators, such as the 3,000,000 electron volt Van de Graaff Generator. To investigate atomic disintegrations produced by very energetic protons an apparatus has been assembled in a mobile laboratory and located at the Inter-University High Altitude Laboratory at Echo Lake, Colorado, U.S.A., where the proton component of cosmic rays is some ten times as frequent as at sea level.

The activities of the Biology Division include the control of radiation hazards, the development of decontamination methods, the study of uses of radioactive isotopes in biological research, and the investigation of the effects of radiation on living organisms.

Canada pioneered in the production of radioactive isotopes and the Chalk River project now produces a wide variety of isotopes for use in industry, agriculture and medicine. The high flux of NRX enabled AECL to produce relatively large quantities of Cobalt-60, with a high specific activity, for use in cancer therapy units. The combined production of NRX and NRU will be required to satisfy the demand from many countries for Canadian units.

The marketing of radioactive isotopes and associated equipment is handled by the Commercial Products Division of AECL with headquarters in Ottawa and about 1,200 shipments of various products were made during 1955. Cobalt-60 Beam Therapy Units have been installed in hospitals and other treatment centres in Canada, the United States, the United Kingdom, Switzerland, France, Italy and Brazil.

Section 3.—Other Scientific and Industrial Research Facilities

Aside from the work of the National Research Council and Atomic Energy of Canada Limited, Canadian research is carried on by various federal agencies, provincial organizations, universities and industries. Several provinces in Canada have established Provincial Research Councils to stimulate and support research on problems having special provincial significance. The universities of course form an extremely important part of the Canadian pattern of research. Much of their work is along fundamental lines but practical problems are not neglected, especially those of regional interest.