

## RESEARCH AND DEVELOPMENT

Research and development are carried out at Chalk River by four divisions: Reactor Research and Development, Chemistry and Metallurgy, Physics, and Biology.

The Reactor Research and Development Division is engaged in experiments and calculations required for the design of nuclear reactors for power stations. The ZEEP reactor is used to study various types and arrangements of fuel for power reactors. A large number of fuel samples have been tested in the NRX reactor under conditions simulating those of possible designs for future power plants. These experiments, carried out in collaboration with other divisions and in some cases with the United States Atomic Energy Commission contractors and with the United Kingdom Atomic Energy Establishment, are providing essential information on the behaviour and suitability of various physical forms of fuel, of different kinds of sheathing to protect against corrosion, and of heat transfer characteristics. Other experiments are leading to methods which make it possible to extract more energy from the fuel.

The Chemistry and Metallurgy Division is working on problems associated with the preparation and the processing of reactor fuel. Fuel elements are being developed for the NRX and NRU reactors and for power reactors. The special equipment and services of the Mines Branch of the Department of Mines and Technical Surveys are used in this program. The disposal of radioactive wastes is being studied and various methods are being tested.

The Physics Division uses the experimental facilities of the NRX reactor and the particle accelerators to study the structure of atoms. The 3,000,000 volt Van de Graaf Generator is used to discover and measure specific properties of various atomic nuclei. To investigate atomic disintegrations produced by high energy protons, a mobile laboratory has been sent from Chalk River to the Inter-University High Altitude Laboratory at Echo Lake in Colorado. There the proton component of cosmic rays is some ten times as great as at sea level.

In the Biology Branch radioactive isotopes are used for such studies as the movements of phosphorus in lakes into organisms and vegetation, the activities of destructive forest insects, and the travel of nutrient solutions in trees. The branch studies the genetic and other effects produced by radiation in living organisms.

### RADIOACTIVE ISOTOPES

As mentioned, Canada pioneered in the production of radioactive isotopes of high specific activity, particularly cobalt-60 for use in cancer treatment units. More than 100 different isotopes are produced for use in medicine, agriculture and industry and are distributed to many countries.