experiments using mono-energetic neutrons as bombarding particles were carried out. Analyses of position of different nuclei in chemical compounds were investigated using neutron spectrometers.

New methods of separating plutonium and certain valuable isotopes from the mixture of fission products have been developed by the research chemistry and operations groups, which indicate from such laboratory scale experiments that they will prove very efficient in plant operations. Methods of fabricating fuel rods enriched with plutonium have been worked out and employed in the reactor to provide excess neutrons for irradiation of materials used to produce isotopes. The new mass spectrograph with which isotopic composition of natural and reactor-produced elements can be determined has given excellent results since it commenced operations during the year. Investigations on the chemical and physical properties of irradiated elements, their radiations and methods of decay have been investigated, as well as X-ray analyses of irradiated materials. This fundamental information accumulated by the physics, chemistry and metallurgical research branches will be of special value in the design of future power reactors.

The plutonium and uranium-233 (from irradiated thorium) separation plants continued operating successfully. The new plant for separating the depleted uranium from the fission products has proved a very efficient process.

Fundamental investigations into changes produced in living cells have been carried out by the Biology Branch. Mutations have been observed in such fast-growing materials as moulds. By using carbon dioxide labelled with the radioactive isotope carbon-14, and by employing various types of radiations, experiments have been directed towards solving the still unknown way in which radiation damages cells and causes lethal effects. The presence of zinc in certain parts of organs has also been detected by the use of isotopes.

Other investigations that have proved very successful have been performed in co-operation with the Department of Agriculture and the Forestry Branch on the uptake of nutriment, motion of sap and the behaviour of insects. Methods of measuring radioactive materials in air and minute quantities in human excreta have been developed. Tests of various filters, gas masks and methods of decontamination have occupied the Radiation Hazards Control Branch. The Electronics Branch has devised special instruments for measuring high activity by remote control detectors.

Engineers, physicists and other scientists have co-operated with the staff of the consulting engineers responsible for the design of the NRU reactor.

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.

For many years, raw materials were the basis of Canada's export trade; Government departments concerned with natural resources therefore became involved in research and large and powerful research organizations were established by the Departments of Agriculture, Fisheries, Mines and Technical Surveys, and Resources and Development. When secondary industry also became important, the Government established the National Research Council, operating under a committee of the Privy Council, to link science with industry for the best economic results.