

magnetometer surveys for geological purposes were continued by the Geological Survey of Canada. The maps that have been prepared from the surveys for many parts of the country have proven to be very valuable in mineral exploration. Research into the magnetic disturbances caused by external influences was continued by several universities and the Defence Research Board. A finding of particular interest was the simultaneous occurrence of aurorae, and associated magnetic disturbance, near the north and south magnetic poles. This resulted from special observations in Northern Canada and in Antarctica.

In the field of upper atmospheric physics, the launching of the *Alouette*, mentioned on p. 58, was of great significance and important also were the re-openings of the Prince Albert Radar Laboratory and the Churchill rocket launching facility. Both of these had been damaged by fire in 1961. A number of groups in Canada, including the National Research Board, Defence Research Board and several universities, are proceeding with the development of instruments to be used in rockets which will be launched from Churchill. Canadian universities, such as the University of Saskatchewan, have taken advantage of their position in the zone of most frequent auroral displays to specialize in the study of this phenomenon.

The study of the oceans bordering Canada is carried on by the new Marine Services Branch, Department of Mines and Technical Surveys, the Fisheries Research Board, the Defence Research Board, and by university groups such as the Institute of Oceanography at the University of British Columbia and Dalhousie University. The Bedford Institute of Oceanography, under the Marine Services Branch, was opened in October 1962. It will be an important centre for oceanographic work, with docking facilities for 10 ships and large laboratory space. Canadian oceanographic ships continued to extend their operations northward, and the *John A. Macdonald* of the Canadian Coast Guard reached a point only 500 miles from the north geographic pole.

The interest of Canadian groups in determining the ages of rocks by radioactive methods continued to expand. Because so many of the rocks exposed in Canada are of Precambrian age and carry no fossils, physical methods for determining the ages have become very important in the geological subdivision of the country. These methods are based on the precise measurement of the quantity in the rocks of certain elements formed by radioactive decay. Instruments suitable for this work are now in operation at the Geological Survey and at the following universities: Toronto, British Columbia, Alberta, St. Francis Xavier, McMaster and Carleton.

The increasing diversity of geophysics in Canada, both in the general study of the earth, oceans and atmosphere, and in geophysical exploration, has meant a continued demand for students with degrees in the subject. Nearly all Canadian universities now offer undergraduate training in some branch of geophysics and it will be apparent from the preceding discussions that research in geophysics is also being carried on at most of them. This research is largely supported by a system of grants awarded by the National Research Council and the Defence Research Board, with some support provided by industry and other agencies.

Section 2.—Astronomy

The modern era of astronomy in Canada may be said to have begun in 1905 with the completion of the Dominion Observatory at Ottawa, the national observatory of Canada. Prior to that time, an astronomical observatory established in 1851 at Fredericton, N.B., was used for a short time to determine the longitude of that centre and for general astronomical purposes; it has been rehabilitated as a historic monument. Other small observatories were established, one at Quebec City in 1854 and one at Kingston in 1875. Astronomical instruments were to be associated with the Magnetic Observatory built by the British Government at Toronto in 1839 but there is no record of their being set up until 1881. A small observatory established at McGill University in 1879 was used for many years for time observations.