

the flow of water through soils and rocks. Canada has a great number of glaciers, the study of which is becoming increasingly important. Glaciers are an important source of water for many rivers of Western Canada and, in addition, their fluctuations provide a useful record of climatic variations. During 1961, field studies in no less than 15 areas of the Arctic and western mountains were made by expeditions from the Department of Mines and Technical Surveys, the Department of Northern Affairs and National Resources, the Defence Research Board, Arctic Institutes and university groups. The measurements made in the field included ice thickness determinations by geophysical methods, ice flow measurements and local meteorology. A complete inventory of Canadian glaciers is being prepared by the Geographical Branch, Department of Mines and Technical Surveys.

The study of the earth's magnetism has been important to navigators for many years but recently the subject has been greatly enlarged to include investigations on the cause of the magnetic field, the magnetic properties of rocks, and the effect of magnetic forces on the electrically charged particles in the upper atmosphere. In 1961 the Dominion Observatory made observations by aircraft along 45,000 miles of line over central Canada to provide information for magnetic charts and established new observatories for recording magnetic changes at Alert and Mould Bay in the Northwest Territories to supplement the work of previously established observatories at Agincourt, Ont., Meanook, Alta., Victoria, B.C., and Baker Lake and Resolute, N.W.T. The Geological Survey made airborne magnetometer surveys over many parts of the country to produce detailed maps of the magnetic field, which are of use in the study of geological structures and the location of mineral deposits. Surveys were conducted in the Yukon and Northwest Territories and, in co-operation with provincial governments concerned, in British Columbia, Ontario and Saskatchewan; 91 map sheets were issued during the year. Similar airborne surveys were conducted by the mining industry.

The study of the magnetic properties of rocks is important in studying the history of the earth's magnetism, which throws light on such fascinating possibilities as wandering of the earth's poles and moving of the continents. Measurements of this type were continued during 1961 at the Geological Survey and the Universities of Toronto, Alberta and Western Ontario.

Studies on the magnetic and electric properties of the earth's upper atmosphere have benefited in recent years by improved facilities, such as rockets, to carry instruments aloft and by new techniques that can be used from the ground. Canada is in a favourable position for such research because the belt of disturbances that produce the northern lights or aurora crosses the country. Such studies have a very important practical application to the problem of radio communication during periods of magnetic storms. The Institute of Upper Atmospheric Physics at the University of Saskatchewan is particularly involved, as are the University of Western Ontario and several laboratories of the Defence Research Board and the National Research Council. (See also Chapter VIII, Part III, Section 3 which relates to Space Research in Canada.)

Studies of very small, rapid pulsations of the earth's magnetism produced by electric currents in the high atmosphere can provide further information on this region. These pulsations are being studied by the Pacific Naval Laboratory of the Defence Research Board and by the Universities of British Columbia and Alberta.

Canada is bounded on three sides by major oceans, in which the motions of water have an important bearing on fisheries, on ice conditions and shipping and on climate. Indicative of the growing importance of oceanography was the formation during 1961 of the Marine Sciences Branch of the Department of Mines and Technical Surveys, which will operate a modern laboratory for oceanography at Bedford, N.S. The Branch will co-operate with Dalhousie University in the Atlantic, and with the Institute of Oceanography, University of British Columbia, in the Pacific. Oceanographic measurements are made on cruises by specially equipped ships and include the determination of bottom topography by electronic depth sounders, ocean currents, temperature and salinity of