

## PART V.—GEOPHYSICS AND ASTRONOMY

### Section 1.—Geophysics

Geophysics began with the observations made by early navigators of the weather, ocean tides and the lodestone. These studies gradually developed into modern meteorology, physical oceanography and geomagnetism. To them were added other physical studies of the earth so that geophysics now includes also seismology—the study of earthquakes; hydrology—the study of waters in rivers, lakes, glaciers and underground (but not in the oceans); volcanology—the study of volcanoes and the earth's heat; tectonophysics—the study of the forces that build mountains and slowly cause changes in level of land and sea; the study of the earth's gravity; and several related studies such as the determination of the ages of ancient rocks and minerals from their content of radioactive elements. In addition, magnetic, electrical, gravitational, seismic and radioactive methods of geophysical prospecting are used to direct drilling in almost all the searches going on in Canada for oil and gas. Both airborne and ground devices are widely used by mining companies to prospect for metals.

The Dominion Observatory and the Geological Survey at Ottawa and the Physics Department of the University of Toronto are carrying out major programs of geophysical research. Several other universities across the country and various provincial governments are also doing geophysical work while the major oil companies as well as many other prospecting establishments have developed geophysical techniques as their most effective approach to the problem of finding oil fields and mineral deposits. A detailed study of the operations of the Geological Survey is given at pp. 13-19 of this volume.

### 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 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 them being set up until 1881. A small observatory established at McGill University in 1879 was used for many years for time observations.

Today the science of astrophysics is carried on mainly by three Canadian institutions: the Dominion Observatory at Ottawa, Ont., the Dominion Astrophysical Observatory at Victoria, B.C., both of which are administered by the Department of Mines and Technical Surveys, and the David Dunlap Observatory associated with the University of Toronto. Of the two government institutions, the Dominion Observatory at Ottawa specializes mainly in the astronomy of position, in solar physics, in meteoric astronomy and in various branches of geophysical work, while the major effort in astrophysics is concentrated at the Dominion Astrophysical Observatory at Victoria. A new observatory for the study of radio astronomy is being erected at White Lake near Penticton, B.C., and will be jointly operated by the Dominion Observatory and the Dominion Astrophysical Observatory. The David Dunlap Observatory, founded in 1935, is equipped with very fine astrophysical instruments of a kind similar to those in use at Victoria. It performs not only the functions of a privately financed and administered research institution but is also the nucleus of the Department of Astronomy at Toronto University. In addition to the work of these three major institutions and a number of smaller observatories, investigations in the field of meteoric astronomy and radio astronomy are conducted by the National Research Council. Research in the field of space is covered in the Education and Research Chapter, Part III, Section 3.