navigators these subjects had in common a need for precise measurement and thus came to be studied by physicists. 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 which build mountains and slowly cause changes of level of land and sea; the study of the earth's gravity; and several minor studies such as the determination of the ages of ancient rocks and minerals from their content of radioactive elements.

Furthermore during the past thirty years it has been realized that many of the methods first developed for studying the earth as a whole can be used to seek deposits of petroleum and useful minerals. Thus there are now magnetic, electrical, gravitational, seismic and radioactive methods of geophysical prospecting and these 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.

It may at first sight seem surprising that hidden deposits of minerals and petroleum can be found by investigations carried out above them on the surface of the ground and even more surprising that anything can be discovered about a place so remote and unapproachable as the interior of the earth. A moment's reflection will suggest that in physics the study of remote objects has become commonplace. Astronomers speak every day about galaxies which are unimaginably distant from earth and about conditions in the interior of inconceivably hot and dense stars. So also nuclear physicists discuss the behaviour of the interior of atoms while newspapers freely discuss such things as electrons, neutrons and isotopes which are only physical concepts to explain indirect observations about things much too small ever to be seen. In comparison with these wonders the interior of the earth is almost prosaic. The centre is no farther from Western Canada than is Ireland (4,000 miles), the temperature there is probably about that of an electric arc (4,500°C.) and the pressure there (3,600,000 atmospheres) is only ten times as great as that already obtained in laboratories.

Thus geophysics is the name given to all those studies, by physical means, of the whole earth including its solid part, its waters and its atmosphere and it includes, as a very important aspect, methods of geophysical prospecting. The examinations of surface rocks, minerals and ores where they are exposed on land remains the field of geology. It is obvious that there should be close co-operation between studies so intimately related as geology and geophysics. Geological methods are more direct, they are often cheaper, but they are limited in scope to the land surface only, whereas geophysics embraces the study of all the earth from its centre to its outermost atmosphere.

This article however deals only with phenomena on and beneath the earth's solid surface. Atmospheric phenomena such as the aurora, the ionosphere and the weather as well as physical oceanography are excluded for reasons of simplification. 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 and the major oil companies as well as numerous geophysical prospecting concerns have developed geophysical techniques as their most effective approach to the problem of finding oil fields and mineral deposits.

The Dominion Observatory

Terrestrial Magnetism.—Studies of the earth's magnetism have been carried on by the Dominion Observatory at Ottawa since its founding in 1905. For many years the main effort was in the field of magnetic mapping and this is still a major effort of the Observatory. In order to construct accurate magnetic maps of Canada, observations of the direction and strength of the magnetic field at ground level have been made at 1,500 stations distributed as uniformly as possible over the whole country and observations at certain of these locations are repeated every few years in order to detect the slow