Dominion Observatory studies of gravity are aimed at achieving a clear understanding of the major variations over the surface of Canada as a whole. In order to do this the following types of observations have been carried out:—

(1) Using pendulum equipment, gravity has been observed at a series of primary base stations suitably located across the country. These bases have all been connected to the national base at Ottawa and it, in turn, has been compared with the international standard at Potsdam, Germany. The system of pendulum bases has been extended beyond the borders of Canada to include 20 stations located from Mexico City across the United States and Canada to Fairbanks, Alaska. Similar bases in Canada have been occupied by United States scientists.

(2) Using the primary bases for purposes of calibration and as points of departure, a system of 100 secondary bases has been set up from Newfoundland to British Columbia and extending well into the Arctic and Subarctic regions of Canada. The values of gravity of these secondary bases are of high accuracy, comparable to the primary bases, and their purpose is to ensure that regional gravity surveys in all provinces and in the Northwest Territories are on a uniform system.

(3) Utilizing the primary and secondary bases, a series of regional surveys has been carried out with the aid of gravimeters and a substantial proportion of the land area of the country has been covered. In southern Canada the regional surveys have been carried out by automobile, gravimeter observations being made every eight miles. In northern Canadian Shield areas where lakes are numerous, light aircraft have been used for transportation. The actual observations of gravity are made on the shores of the lakes and the stations are on the average about 20 miles apart. The total number of observations made up to the end of 1954 was 11,244. Observations have been extended to all provinces of Canada and as far north as Great Bear Lake in the west and Baffin Island in the east. The observations are being used as bases for commercial geophysical surveys (especially in the Prairie Provinces), for studies of isostasy and geodesy, for the investigation of the roots of ancient mountain ranges and for general studies of the character of the earth's crust in different parts of Canada.

(4) Detailed surveys aimed at discovering or outlining geological features of anomalous density and moderate size are frequently carried out in limited areas. Such features include ore-bodies, salt deposits, lava flows, geological fault lines, igneous intrusions and ancient meteor craters. Though the Observatory does not itself carry out geophysical prospecting, members of its geophysical staff have spent a good deal of time and energy on the theory and practice of gravity methods as an aid in the search for economic minerals.

Seismology.—For the purpose of recording earthquakes occurring in Canada and in other parts of the world the Observatory maintains eleven seismograph stations located at Halifax, N.S., Seven Falls, Que., Shawinigan Falls, Que., Ottawa, Ont., Kirkland Lake, Ont., Saskatoon, Sask., Banff, Alta., Victoria, B.C., Horseshoe Bay, B.C., Alberni, B.C. and Resolute, N.W.T. The records from these stations are used partly to delineate areas of unusual earthquake hazard and special three-station networks for this purpose are maintained on the Pacific Coast and in the Rocky Mountains. An equally important function of this chain of stations is, in co-operation with other countries, to provide data for the study of the earth's crust and its interior structure. Especially important to this work is the station at Resolute in the Arctic whose location far from any other installation makes it a particularly valuable unit in the world seismographic network.

Major Canadian emphasis in earthquake research is based on a study of seismological records in Canada and other countries to determine the character of the earth movements which cause earthquakes. Though some earthquakes have their origin at the earth's surface, the majority occur at depths of tens to hundreds of miles so that only secondary effects are directly observed. Methods have been devised for deriving the depth and direction of the true earth motions by a graphical analysis of initial shocks recorded by seismograph stations throughout the world on the occasion of a major earthquake. The results are being applied to investigations of the origins of mountains and of other related features such as island arcs and ocean deeps which are found in the vicinity of active earthquake belts.

In addition to the study of earthquakes, the methods of explosion seismology are being used to study the depth and structure of the earth's crust and of various irregular geological structures found within it. For this purpose radio methods are used to transmit the impulses from seismic detectors to a central recorder so that arrays of seismographs as much as