

*The Research Group.*—This Group contains most of the units of the old Department of Mines and Technical Surveys—the Mines Branch, the Geological Survey of Canada, the Surveys and Mapping Branch, the Observatories Branch and the Geographical Branch.

The *Mines Branch* is a large laboratory and pilot-plant complex carrying out applied and basic research to discover new and better methods of ensuring mine safety, extracting and refining ores and other minerals, and using metals and minerals in industry and defence. Gratifying results have been achieved in the extraction of metals from ores and in the refining of low-grade crude oil, in the automation of grinding circuits and cyanide-leaching processes in gold mills and in the leaching of ground or crushed uranium ores by bacteria. In pyrometallurgy—the extraction of metals by heat—applied research is concentrated principally on the combination of shaft and electric furnaces for smelting iron ore. In petroleum refining, research concerns hydrogenation, catalytic cracking, and catalyst development. This work is highly significant because of the opening-up of unconventional sources such as the Athabasca tar sands and the co-called Colorado oil shales, whose economic importance had been recognized by the Mines Branch for many years. A close tie-in with producers is maintained in mineral processing in which the emphasis is on the concentration of metallic ores and on the processing and improvement of industrial minerals. In the field of mineral sciences, the physical, chemical, crystallographic and magnetic studies being undertaken on sulphide minerals are of fundamental interest. In physical metallurgy, experiments on new alloy combinations continue to yield valuable practical benefits for Canadian industry.

The *Geological Survey of Canada* sends about 100 parties into the field each year to collect scientific information and to make observations on the distribution, structure, metamorphism, palaeontology, physical properties and economic deposits of the nation's rocks and surficial deposits. The Survey does not follow up promising mineral or metal occurrences with detailed exploration; this is left to the multitude of private development and mining companies. Its job is to provide geological maps and basic information by which prospectors, exploration companies and others can chart their course (see also pp. 32-33).

Stratigraphic and structural studies are being carried out in most provinces; recently they have included Operation Selwyn in the Yukon, which so far has examined 20,000 sq. miles of the northern Cordillera, and Operation Bow-Athabasca in the southern Rockies. Both these were helicopter-supported projects. Stratigraphic studies continue in various parts of the Arctic islands, and field investigation of the bituminous rocks of Melville Island has been supplemented by sulphur-isotope studies on hydrocarbons. These rocks contain the first known bituminous deposits in the Arctic, where the oil industry has carried out considerable exploratory work in the past few years. As a guide to possible future oil exploration, geophysical studies have been made on the eastern continental margin. An aeromagnetic survey of the Labrador Continental Shelf and a seismic investigation of the Gulf of St. Lawrence will provide information on the thickness of the sedimentary rocks, and some information can be expected on the nature of possible sedimentary basins. Other recent geophysical work included seismic investigations of the western Rocky Mountains and of bedrock configuration beneath overburden in British Columbia and Saskatchewan and in the uranium-producing area of Elliot Lake in Ontario. Aeromagnetic surveys in co-operation with provincial governments have continued, mostly by contract. Field geochemical and biogeochemical techniques, in which mineral deposits are traced through the analysis of minute quantities of minerals in rivers, the soil, and vegetation, continue to be used and developed by the Geological Survey. Two projects using these methods were recently completed in the Bathurst-Jacquet River area of New Brunswick, and around Cobalt, Ont.

A great deal of fundamental geophysical work of interest to prospectors is being carried out by several divisions of the *Observatories Branch*. Its airborne geomagnetic surveys, which have ranged all over Canada and across the Atlantic to Scandinavia, have become famous. There is also a permanent network of geomagnetic observatories, supplemented by temporary stations, of which about 25 are occupied in a field season, to determine secular