

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 are being 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. An example of work that has resulted in direct economic benefit has been the development of a process to produce metallurgical coke from western Canadian coal, making it possible to undertake a long-term contract to export coke to Japan. 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 so-called Colorado oil shales, whose economic importance has 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 Mines Branch is assisted in its work by the National Advisory Committee on Mining and Metallurgical Research, comprising senior executives and researchers from industry, government and universities.

The Geological Survey of Canada maps and studies the geology of Canada. It is the major organization engaged in this work in Canada and its studies extend to all provinces and territories. Its activities are designed to support two programs of the federal Department of Energy, Mines and Resources, the Mineral and Energy Resource Program and the Earth Science Program. A principal aim of the former is to ascertain the mineral and energy resource potential available to Canada and thus the Survey expends considerable effort in such fields as estimating the potential abundance and probable distribution of mineral and fuel resources. This is done by providing the necessary systematic geological framework, by defining those settings favourable to the occurrence of the various types of mineral commodities and fuels and by comparing these by appraising foreign mineral and fuel resources and by other studies. The Earth Science Program includes activities designed to assist in effective use and conservation of resources and in the management and preservation of man's environment throughout Canada. To assist in this, the Geological Survey provides geologically based information on land resources and terrain performance which is derived from geological, geomorphic, geophysical, geotechnical and related studies of earth and rock materials, land forms and associated dynamic processes.

In support of these activities, the Survey each year sends about 100 parties into various parts of Canada. The results of its studies are published in memoirs, bulletins, papers, maps and numerous scientific technical journals. Headquarters is in Ottawa but there are several regional offices of which the Institute of Sedimentary and Petroleum Geology in Calgary and the Atlantic Geosciences Centre at Dartmouth are the largest.

The Atlantic Geosciences Centre is located in the Bedford Institute at Dartmouth, NS. Its geologists and geophysicists study and investigate the deep structure of the continental shelves and the floors of the open ocean. The importance of this work can be seen in the light of the rapidly increasing interest in the potential mineral resources of continental shelves and of the world ocean. EMR scientists also study material from off-shore wells drilled by industry. Information gained from wells, when integrated with that from marine geological and geophysical surveys, provides the geological framework from which (a) the oil and gas potential may be estimated and (b) geological conditions evaluated to permit the regulation and supervision necessary to attain orderly and safe exploration of off-shore fuel resources. Because of the surge in exploration for petroleum in eastern Canada's sedimentary basins and the Gulf of St. Lawrence, EMR's geological and geophysical research is of great interest and value to the petroleum industry.

The Earth Physics Branch carries out much geophysical work of interest to the mineral industry. It studies, collects and publishes, in the form of maps and charts, information on the geomagnetic field in Canada. Most of the information published is obtained from airborne