

The *Mines Branch* carries out a continuing program of applied and basic research to discover new and better methods of mining, extraction and refining, and new uses for minerals. Its skills, technical knowledge and specialized equipment are at the service of the Canadian mineral industry, government agencies and research organizations. Today the Canadian mineral industry is faced with greatly increased competition in world markets, mainly because of technological advances and higher production in other countries. Added to this is the trend in Canada toward the recovery of complex ores and the consequent need of increased research to enable the maximum economic extraction of metals. This changing situation is reflected in Mines Branch activities which, while still including short-term research to solve immediate problems, are nevertheless being pointed more and more in the direction of long-term research in the interests of future technological advances. This trend is seen, for instance, in the work on flotation for the extraction of metal values, highly disseminated throughout the ore. The usual great variety of pilot runs on ores from all parts of the country are being carried out but, in addition, a series of studies based on modern concepts of this electro-chemical phenomenon is under way.

In hydrometallurgy, a thorough study is being made of bacterial leaching, an economic method of producing uranium, to determine the factors controlling bacterial action and seek maximum recovery by this method. Work on sulphide minerals, which form a large part of Canada's metal resources, further illustrates the trend toward basic research to improve knowledge to allow higher recoveries of metal values. Branch physicists, mineralogists, chemists and spectro-chemists have combined forces in a comprehensive study of the structure of these minerals.

Branch scientists have developed a process for recovering vanadium from fly ash produced in a Canadian oil refinery from the burning of residues resulting from the refining of Venezuelan crude oil. The product of this new process contains over 90 p.c. vanadium pentoxide and is suitable for the manufacture of ferro-vanadium, the form of vanadium for which there is the most market. No vanadium is produced in Canada.

In projects designed to find new uses for metals, interesting results have been obtained. It has been found, for instance, that the presence of as little as one ten-millionth of an inch thickness of gold on ultra high strength steel, prior to cadmium plating, eliminates potential static fatigue damage.

The Branch also works to improve products for marketing. For instance, a research program was undertaken in 1957 jointly with the zinc industry to obtain a more fundamental understanding of the galvanizing process. This has led to better control and an improved product which, in turn, means an improved domestic and export market for Canadian galvanized wares and Canadian zinc.

In fuels research, much attention is being devoted to the development of processes to beneficiate Canada's large resources of heavy crude oils and bitumens to supply the need when the better grade oils are less abundant. Branch scientists, for instance, have constructed and are testing a combined liquid-and-vapour-phase pilot plant, operating at pressures up to 10,000 psi. The plant will be used to process heavy crude oils to finished products and will serve as a cost indicator and as a training ground for mechanical and chemical engineers.

The research activities of the Branch have also been geared to meet the need for increased knowledge in ground and rock mechanics. Indeed, so important has research in this field become that the Branch has opened, at Elliot Lake in northern Ontario, a major centre of mining research to serve as a central source of information for the Canadian mineral industry.

The major activities of the *Observatories Branch* in its two main units—the Dominion Observatory at Ottawa, Ont., and the Dominion Astrophysical Observatory at Victoria, B.C.—are in the field of astronomical and related research, and these activities are covered in Chapter VIII, pp. 405–406. The geophysical work of the Dominion Observatory, which has a definite relation to the locating of mineral deposits, is covered in the same Chapter, pp. 404–405.