Surficial Deposits

The continental glaciation of most of Canada has removed weathered bedrock and residual soils and has almost certainly removed some types of ores such as pre-Pleistocene placer gold deposits, laterites, and upper portions of metallic and manganiferous ore deposits, which had formerly been enriched under stable near-surface conditions. Material deposited includes dominantly clastic detritus such as tills, esker gravels, outwash gravels and sands, or rock flour deposited in lakes or shallow seas in the form of multiple layers of varved clay or massive clay beds. Maps showing the surface distribution of these materials are published by federal agencies and reflect some physiographic features and present and potential land use.

Much of Canada's bedrock surface and ore deposits are covered by such glacially derived surficial deposits. Gravel, sands and clays are extensively used in industrial regions and for earth dam construction, and coarse materials are used for road-building. Other beds or ancient river channels comprising gravels and coarse sands constitute important sources of groundwater. The nature and mechanical properties of glacial deposits must be well known for foundation design of large buildings, for dam design and for other engineering projects. Orebodies now covered by glacial material contributed blocks or grains of ore to the detritus during glaciation. Such blocks or heavy mineral grains can be found and in some cases traced back to their point of origin if the direction(s) of glacial transport can be deduced and if the history of transport is not too complex. Groundwaters circulating through ore and overlying surficial material may transfer metals in solution and enrich the nearby surface soil or stream sediments. Because so much of Canada's bedrock area is screened by surficial deposits, geochemical surveys to detect surface geochemical anomalies have been the initial clue to the discovery of some of its ore deposits. Other anomalies are known to be derived from non-economic mineralization or, where the path followed by groundwater from ore to surface is complex, the source of some surface anomalies remains unknown. Federal and some provincial geologists conduct regional geochemical surveys and supporting research, and mineral exploration companies make extensive and more detailed use of the geochemical prospecting methods.

Geophysics in Canada

Canadian scientists have played a major role in the development and application of airborne and ground geophysical instruments and techniques to probe below the surface of the land, the lakes and continental shelves. Regional surveys of variations in the earth's magnetic field are conducted with the use of aircraft by federal and joint federal-provincial agencies and results are published as aeromagnetic maps. Federal scientists have probed the Palæozoic beds and the surface of their buried basement in Hudson Bay and parts of the continental shelf by seismic methods; they make accurate measurements of the force of gravity at a network of Canadian stations, and record earth tremors and calculate their points of origin. Oil companies commonly conduct seismic and geological studies over large areas as the principal means of selecting promising drill sites. Mineral exploration companies normally select a district which they consider geologically favourable, carry out combined airborne electromagnetic and magnetometer surveys and then survey anomalous localities on the ground with more detailed electromagnetic, magnetic and/or gravity surveys. After geological examination and geochemical studies, these combined data allow selection of initial drill sites where drilling still seems warranted.

Aeromagnetic surveys measure variations in the earth's magnetic field caused by near-surface differences in the magnetic properties of bedrock and to a lesser extent by deeper bedrock features. These surveys have been vigorously conducted and have yielded