

An overview of Labrador geology and metallogeny

Derek H.C. Wilton

Department of Earth Sciences, Memorial University of Newfoundland, St. John's, Newfoundland, A1B 3X5

Labrador geology spans the geological time scale from earliest Archean (ca. 3.6 Ga) to the Tertiary; however, most of the terrestrial landmass is Precambrian (Archean to late Proterozoic). In the most fundamental tectonic subdivision, Labrador consists of the Archean Nain and Superior Structural provinces, the 2.1-1.8 Ga Churchill Province (Trans-Hudson Orogen) that separates the two Archean provinces in central Labrador, the Makkovik Province (ca. 2.0-1.8 Ga) that borders the southern edge of the Nain Province, and the northeast trending Grenville Province which truncates all of the earlier structural provinces. The Grenville Province experienced terminal deformation between 1.1 and 0.95 Ga. The Nain, Churchill and Grenville provinces were intruded by large bimodal anorthosite-granite massifs between 1.45 and 1.15 Ga. Granitoid rocks of the Trans-Labrador batholith (ca. 1.65 Ga) were intruded in the northeast-trending belt within what was to become the Grenville Province. Much of the crust to the south of the batholith was formed during the recently recognized Labradorian Orogeny between 1.7 and 1.63 Ga. This crust was subsequently reworked during the Grenvillian Orogeny. Following the Grenvillian Orogeny, southern Labrador was affected by crustal rifting (Lake Melville rift system) and basaltic dike intrusion (Long Range dykes), representing the distal effects of the opening of the Iapetus Ocean ca. 0.6 Ga. Cambro-Ordovician rocks along the Straits of Belle Isle form part of the western platform of this orogen. Mesozoic rocks are represented by Cretaceous talus deposits preserved within small grabens in western Labrador and scattered basaltic to lamprophyric (and Kimberlitic?) dikes and diatremes of Jurassic-Tertiary age found along the Labrador coast.

Archean mineralization is represented by Ni, minor PGE, and asbestos showings within the Florence Lake greenstone belt located in the southern part of the Nain Province. Aside from these occurrences, the mineral potential of other greenstone belts

is basically unknown. The northernmost exposures of the Nain Province contain a series of metamorphosed, layered, Archean anorthosite complexes that may be equivalent to the chromitiferous Fiskenaesset Complex of West Greenland. Gold mineralization has been reported from high-grade gneisses in the Superior Province in western Labrador-Quebec.

Proterozoic mineralization is represented by the iron deposits of western Labrador that occur within the Schefferville area of the Labrador Trough (Churchill Province). The Labrador Trough also contains Cu-Ni mineralization in interlayered mafic volcanic and turbiditic rocks. Ultramafic sills, intruded into this sequence in adjacent parts of Quebec, host Ni-PGE mineralization. The Lower Proterozoic Ramah Group of northern Labrador contains a stratiform pyrite horizon that may have potential for sedex deposits. The Makkovik Province contains the Proterozoic Kiuts and Michelin uranium deposits along with occurrences, ranging from indications to prospects, of massive sulphides, base-precious metal veins, uranium, molybdenite and REE. The Trans-Labrador batholith is associated with the molybdenite occurrences and some of the uranium occurrences. Minor showings of base metals occur within the anorthosite massifs and associated layered gabbroic intrusions. These mafic plutonic rocks also have a relatively uninvestigated potential for PGE and Ti mineralization. In the Nain area, anorthosite is quarried as a source of labradorite. Proterozoic peralkaline intrusive suites contain rare-metal (including REE, Y, Zr, Be and Nb) deposits. The Grenville Province contains the world-class metamorphosed iron deposits of the Labrador City-Wabush area. In the same area there are also dolomite, graphite and silica deposits. Except for local pyritiferous horizons in pelitic gneiss, the remainder of the Grenville Province is not well endowed with mineralization. The diamond potential of the Mesozoic-Tertiary lamprophyres is unknown.