

**The Mesoproterozoic Nain Plutonic Suite in eastern Canada,
and the setting of the Voisey's Bay Ni-Cu-Co sulphide deposit**

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In 1993, a world-class magmatic nickel-copper-cobalt massive sulphide deposit, containing probably in excess of 150 million tonnes, was discovered near Voisey's Bay, Labrador. The mineralization is hosted by rocks of the Nain Plutonic Suite (NPS), a 1350 Ma to 1290 Ma assemblage of coalesced mafic and silicic plutons emplaced across an 1860 Ma collisional suture between the Archean Nain Province and the Paleoproterozoic Churchill Province. The NPS covers 20,000 square km and encompasses a diverse group of rocks of which the main "families" are anorthosite, troctolite, diorite and granite. These rocks represent a significant magmatic contribution to a tectonically quiescent crust, probably generated in an intracontinental extensional zone above a mantle plume.

The Voisey's Bay deposit sits within a massive troctolite, the Reid Brook intrusion, interpreted to be the oldest pluton

of this type within the NPS. The Voisey's Bay mineralization is disposed as intercumulus concentrations and as massive sulphide (pyrrhotite, pentlandite, and chalcopyrite) zones in several settings, including a steeply-dipping dyke, a bowl-shaped "ovoid", and a bifurcating lens ("Eastern Deeps") at the base of the intrusion. The Ni-Cu-Co mineralization represents gravitational accumulation and concentration of a sulphide liquid in the plutonic environment, coeval with formation of the Reid Brook intrusion. The sulphide liquid is interpreted to have been an integral part of the silicate magma at the time the Reid Brook intrusion was emplaced. The formation of the sulphide liquid is interpreted to be a result of contamination of the metal-laden Reid Brook magma by crustal-derived sulphur from underlying metasedimentary rocks.