

The role of geochemistry in metallogeny: examples from Newfoundland, Australia, and Nunavut

George A. Jenner

*Department of Earth Sciences, Memorial University of Newfoundland, St. John's, NF A1B 3X5
<gjenner@sparky2.esd.mun.ca>*

In the broadest context, metallogeny and metallogenic studies serve to try and establish the relationship between the geological history of an area and its mineral deposits. Geochemistry plays an important role in metallogenic studies, addressing such issues as defining the tectonic environment of formation of volcanic and plutonic rocks, identifying more prospective horizons in a given stratigraphy, establishing correlations between units and defining a chemo-stratigraphy, identifying the source of fluids, and the age of mineralization and host rocks.

Regional scale lithochemical studies of Cambro-Ordovician volcanic rocks in the Dunnage Zone of central Newfoundland have been used to identify tectonic environments in which volcanogenic massive sulphide (VMS) deposits formed. These studies were crucial to the production of the 1:500,000 "Metallogeny of the Vestiges of Iapetus, Island of Newfoundland" map, which serves as a first-order guide to VMS explorationists. More focussed lithochemical studies can be used to assess the potential of relatively unexplored terranes in the vicinity of a particular

mining camp, for example the Buchans area.

As part of a major study on the structure and mineralization of Western Tasmania (host to the Roseberry and Mt. Lyell deposits, amongst others), a variety of geochemical techniques were used. These included standard lithochemical studies of volcanic and sedimentary rocks, microprobe analyses of pyrite samples, stable isotope analyses of fault zones, and detrital grain studies (including U–Pb dating of detrital zircons). The goal of these studies was to test an established tectonic model, and help separate out the effects of late Cambrian and Devonian deformation, which mask the short-lived middle Cambrian extensional event associated with VMS deposit formation.

Geochemical studies of host rocks and mineralized occurrences in Archean greenstone belts in the western Churchill Province, Nunavut have been an important component of the metallogenic investigations. As recently acknowledged by industry, these studies have played an important role in the recent staking of 30,000 ha of land, effectively quadrupling the company's exploration area.