
Preliminary geochronological, geochemical, and isotopic studies of auriferous systems in the Botwood Basin and environs, central Newfoundland

JACQUELINE M. O' DRISCOLL
AND DEREK H.C. WILTON

*Department of Earth Sciences, Memorial University of
Newfoundland, St. John's NL A1A 3X5.*

Gold exploration within the Botwood basin began in the late 1980s and subsequently several styles of mineralization were recognized in the region including low-sulphidation epithermal and orogenic (or mesothermal) lode types. More recently, the presence of possible Carlin and intrusion-related styles has been postulated. In fact, the suggestion of, and evidence for, sedimentary-hosted, Carlin-type gold occurrences in the basin created a staking rush in central Newfoundland during 2002. With the recognition of the basin as a possible host to a wide variety of gold occurrence types, it has become essential to fully understand the geological history of this area and the inter-relationships of the occurrence types. The purpose of this project is to study and compare 20 gold occurrences from within the basin and surrounding lithologies. A key question to be answered is whether regional intrusive suites (granitic to gabbroic) had anything to do with the ore-forming systems, acting as heat sources driving ore fluids, or just as rheologically contrasting host lithologies.

Preliminary conclusions from this study include the following: (1) Geochronological data indicate a common ca. 430 Ma age for granite and gabbro plutonism in the Botwood basin. Zircon inheritance in the granitoids suggests that they were

generated through crustal anatexis of lower crustal material by mantle-derived gabbroic melts. Different gabbroic intrusive suites in the basin are defined by whole-rock geochemistry. (2) There are wide ranges in sulphur isotope ratios for sulphide mineral separates from different occurrences and the dominant control appears to be a lithological source of the sulphur, e.g. occurrences within deep marine sedimentary lithologies are negative in terms of $\delta^{34}\text{S}(\text{‰})$, occurrences in proximity to intrusive suites are around 0‰, and occurrences in which S was derived from igneous rocks have ratios that are slightly to moderately positive in terms of $\delta^{34}\text{S}(\text{‰})$. (3) Trace element compositions of pyrite suggest that different auriferous deposit types have recognizable signatures and that pyrite from the Mustang and Bowater prospects resembles Carlin-type pyrite, pyrite from the Bruce Pond Epithermal Prospect resembles that from low-sulphidation epithermal types of occurrences and pyrite from orogenic lode gold occurrences are not notably enriched in a trace metal contents.