PETROGENETIC STUDIES OF THE BURNTHILL GRANITE AND RELATED Sn-W MINERAL DEPOSITS, CENTRAL NEW BRUNSWICK

H.E. MacLellan
Department of Natural Resources and Energy
P.O. Box 6000, Fredericton, New Brunswick, E3B 5H1
and
R.P. Taylor
Department of Geology, Carleton University
Ottawa, Ontario, K1S 5B6

The Burnthill Granite is the largest in a cluster of five post-tectonic Middle Devonian plutons located within the Miramichi Highlands of central New Brunswick. Recent work has confirmed that the Burnthill Granite is a multiphase, high silica granitic pluton emplaced at shallow crustal levels. The two main phases are a coarse-grained subporphyritic granite in the north and a medium-grained equigranular granite forming two lobes in the south. The northern contacts of the equigranular granite with the subporphyritic granite are gradational, but the southern contacts are sharp. A fine-grained facies of the equigranular granite similarly has both gradational and sharp contacts with the medium-grained equigranular granite. These contact features between three phases with very similar chemistries suggest that all have crystallized from a single, zoned magma chamber that has undergone a complex cooling history involving localized remobilization of the magma.

Alkali feldspars from the coarse-grained subporphyritic granite contain abundant perthitic lamellae and no development of microcline twinning. As grain size decreases, from north to south, the proportion of perthitic lamellae in the alkali feldspars decreases, and microcline twinning is more frequently developed. These are strong indicators that the temperatures of crystallization decreased from north to south.

The close association between the equigranular granites and mineral occurrences leads to the conclusion that collection of fluids in the south

resulted in late crystallization of the magma in that area. Field relations are consistent with the interpretation that the mineral deposits were formed from fluorine-rich magmatic fluids. The fluids were originally concentrated near the roof zone of the magma chamber, which has been subsequently tilted toward the south. Brittle fracture of the cooling granite allowed escape of the fluids along fractures, leading to the development of several mineralized occurrences. The character of each deposit is controlled by the following interdependent factors: 1) the type of fracturing (i.e., joints, faults, stockworks); 2) the thermal regime at the time of fracturing; 3) the location of the hydrothermal system with respect to the granite contact; and 4) the availability and composition of the fluids.