New insights into the generation, emplacement, and magmatic evolution of the South Mountain Batholith, Nova Scotia

M.A. MacDonald, M.C. Corey, L.J. Ham, R.J. Horne and A.K. Chatterjee
Nova Scotia Department of Natural Resources, P.O. Box 698, Halifax, Nova Scotia B3J 2T9, Canada

The South Mountain Batholith of southwestern Nova Scotia is a composite, peraluminous batholith ranging in composition from biotite granodiorite to muscovite ± topaz leucogranite. Recent geological mapping has provided new insights into the evolution of the batholith. Granitic rocks have been assigned to thirteen discrete plutons that can be grouped into early (Phase 1) plutons comprising mostly granodiorite and monzogranite and late (Phase 2) plutons comprising mostly leucomonzogranite and leucogranite. Despite a systematic sequence of emplacement for the rocks of these plutons, an evaluation of published geochronological data indicates that the entire batholith was emplaced and crystallized during a very short time interval (<5 million years) at ca. 370 Ma. Various structural features, including the shape and distribution of plutons and the orientation of primary features (e.g., megacryst alignment, joints, veins), indicate that the batholith was subject to regional stresses associated with the Acadian Orogeny during, and following, its emplacement and crystallization.

The various rock types within the plutons have broadly similar compositions; however, detailed petrographic and geochemical studies indicate unique features that possibly reflect compositional variations within the protolith. Similarly, the style of mineralization within the sundry plutons is interpreted to reflect a combination of protolith composition and differences in the physio-chemical conditions that prevailed during crystallization of individual plutons.

A review of recent petrogenetic studies of granulite gneiss and mafic intrusions in the eastern Meguma Terrane provides a mechanism for generation of the large volume of granitic magma required for the South Mountain Batholith. This mechanism involves the melting of upper crustal rocks, possibly of the Avalon Terrane, which were subducted to lower crustal P-T conditions beneath the Meguma Terrane during continent/continent collision related to the Acadian Orogeny. The presence of mantle-derived mafic intrusions suggests that underplating by mantle magma may have contributed to crustal melting.