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# HIGH-GRADE METAMORPHISM

## PREFACE

A Mineralogical Association of Canada symposium entitled "Advances in the Study of High-Grade Metamorphism" was held at the University of Calgary in May, 1981. Following the meeting, many of the participants took a three-day field trip to study metamorphic rocks in the Canadian Cordillera. This trip was led by Ed Ghent, Phil Simony and Rob Raeside of the University of Calgary.

Subsequently, I, as convener of the meeting, was asked to act as the guest editor of a special issue of *The Canadian Mineralogist* on papers from the symposium. Nine papers on high-grade metamorphism were accepted for this special issue. The papers reflect the wide range of topics currently being studied in the field of high-grade metamorphism.

The topics of geothermometry and geobarometry of high-grade metamorphic rocks are treated in papers by Martignole & Nantel and by Ghent, Knitter, Raeside & Stout. Hollister uses P–T estimates from mineral equilibria and fluid inclusions in combination with radiometric age data to infer a rapid rate of uplift (2 mm/year) for Eocene granulites from British Columbia.

Crawford & Marks describe a terrane in southeastern Pennsylvania in which there were two superposed episodes of metamorphism, the earlier high T/P and the later high P/T; they relate this pattern of evolution to crustal thickening due to emplacement of successive thrust-sheets.

Several papers deal with metamorphic processes, and they reflect various approaches to related problems. Pigage uses results of electron-microprobe analyses in combination with linear regression techniques to outline the probable sillimanite-forming reactions in pelites from Azure Lake, British Columbia. Foster uses a local equilibrium, irreversible thermodynamic model to predict variations in sillimanite segregation textures as a function of matrix composition. In a pair of papers, Loomis & Nimick and Loomis describe the growth of chemically zoned garnets. Loomis & Nimick set up a thermodynamic model for Mg, Fe and Mn end-member garnets and coexisting phases. They use this model to simulate the growth of chemically zoned garnet. In the second paper, Loomis calculates growth models of garnet in the assemblage garnet–kyanite–chlorite–muscovite–quartz–$H_2O$ using several different reaction-models. Tracy and Dietsch illustrate high-grade retrograde reactions involving growth of secondary biotite and breakdown of cordierite to garnet, sillimanite and quartz. They use Fe–Mg profiles in the minerals to set constraints on metamorphic cooling rates and diffusion coefficients.


I thank Louis Cabri for his infinite patience in the production of this special issue. The authors are thanked for adhering to the deadlines and for submitting an excellent set of papers. In addition to the authors of this special issue, most of whom acted as referees, I thank George Fisher, Ray Joesten, John Allen, Jeff Grambling, John Ferry and Frank Spear for reviewing the papers. I thank the Geological Survey of Canada for financial assistance in the publication of this special issue.



Edward Ghent, *guest editor*