Pegmatites. David London. 2008. The Canadian Mineralogist, Special Publication **10**, 347 pp. CDN$125.00 ($100.00 to members of MAC), hardbound, ISBN 978–0–921294–47–4.

This is a wonderful book, full of information and thoughts about pegmatites, superbly presented by the Mineralogical Association of Canada. David London visited a pegmatite on his first undergraduate field trip and was "hooked from that point on". This book is a product of a very productive scientific career focused largely on the study of these intriguing rocks. It is written for a large and diverse audience and draws on a large base; for example, there are 859 references. There are some new topics in this book; the thermal modeling and rheological aspects that are discussed are not a part of London's past work and probably have not been presented anywhere by anyone. Their discussion would be unexpected by those who are familiar with London's past work.

The book is presented in two parts. Part 1 deals with the geology of pegmatites, the historical views, their classification, and mineralogical and chemical compositions. This includes many color photographs of pegmatites and their constituent minerals. It will be of great interest to those who are interested in pegmatites and their minerals as collectible items. It is also basic to understanding the origins of pegmatites as documented in detail in part 2, where advanced laboratory studies relating to these rocks are considered. Many of the laboratory observations have been contributed over the years by London himself. The complete book will interest any petrologist with broad interests in the evolution of rocks. It is immediately relevant to those who study the more felsic igneous rocks, for which some pegmatites are the ultimate evolutionary product. The mineral collector and the mineralogist will see that it discusses mineral occurrences that are "dramatic, complex and beautiful", and scientifically challenging. For the geochemist, it documents the final stages in the most extreme enrichments of many, or perhaps any, elements once widely dispersed at very low abundances in a solar nebula, and then in the primitive Earth. Pegmatites are the source of many important industrial minerals and rare elements with advanced high-technology applications, so this book will be of immense interest to many economic and industrial geologists.

Pegmatitic textures can be found in rocks of all compositions, but granitic pegmatites are by far the most common. These have bulk compositions of minimum-temperature melt, and it is fitting that this book has been published in the 50^{th} anniversary year of the publication by Tuttle and Bowen of the study that documented the importance of such compositions. The common pegmatites do not show conspicuous enrichment in rare elements, but are important as a source of quartz and feldspar for industrial purposes.

For the rare-element pegmatites, London adopts the subdivision of Černý into the LCT and NYF groups of pegmatites, named from enrichments in Li–Cs–Ta and Nb–Y–F, respectively. The more abundant LCT group are strongly peraluminous, and we agree with London that these probably arose from metasedimentary sources. Are these the S-type pegmatites that represent a compositional stage beyond that of the sometimes large bodies of highly fractionated two-mica granite? The LCT group are distinguished by high P contents; London suggests that initially, these result from high P contents of the sedimentary protoliths combined with the solubility of P in peraluminous melts. From our studies of highly evolved S-type granites, we suggest that the second factor is dominant. London notes that enrichment in NYF elements is characteristic of granites that are normally labeled of A-type. It is also, in our experience, characteristic of very strongly fractionated I-type granites. Since compositionally A-type granites are a subgroup of the I-type granites, we suggest that perhaps the NYF group represents the I-type pegmatites.

Ideas about pegmatite origins have been dominated for many years by the Jahns–Burnham model. London pays tribute to that model, stating that "There is no equal for a model that has stood for half a century with no further explanation, inquiry, or alternative needed for most geoscientists". According to that model, the point at which a granitic magma becomes H_2O-saturated marks the transition from granite to pegmatite. Potassium partitions into the vapor, from whence K-rich silicates precipitate. London considers that except for the very rare occurrence of miarolitic cavities, pegmatites do not contain evidence of an aqueous vapor phase until they reach the end of their crystallization. Experimental data also show that there is little fractionation of alkalis between melt and vapor, a fundamental requirement of the Jahns–Burnham model.

Drawing on diverse lines of evidence, London proposes an alternative model based on constitutional zone-refining to account for the textural features and the distribution of minerals within pegmatites. In this process, a flux-rich boundary layer of melt moves at the front of the advancing front of solid crystals. The fluxes H_2O, B, P and F facilitate the diffusion of Al and Si, which would otherwise be very difficult to achieve and which is necessary for the growth of large crystals. Crystallization occurs under conditions of strong undercooling relative to the liquidus. In granitic pegmatites, the boundary between granitic compositions rich in rare minerals marks the transition from crystallization of the bulk melt through the flux-rich boundary layer to crystallization of the flux-rich medium itself.

David London is to be congratulated on producing this very fine volume. He emphasizes that much research remains to be done before we fully understand the origin of pegmatites. However, we can be certain that his ideas as presented in this volume will feature prominently in any "final" resolution of the questions posed by these fascinating rocks.

Bruce Chappell
School of Earth and Environmental Sciences
University of Wollongong
Wollongong, NSW 2522, Australia

Allan White
School of Earth Sciences
University of Melbourne
Melbourne, Victoria 3010, Australia