

## PEGMATITES\*

Pegmatites are remarkable rocks, and this is a remarkable book. Almost everything one could wish to know about pegmatites, their characteristics and their origin is contained in its pages. Thus, it provides readers from a very wide range of backgrounds and interests with an entry-level, a catch-up, or a state-of-the-art review about these fascinating rocks. It would also look good on a coffee table, with its large format and beautiful photographic illustrations.

David London, of the University of Oklahoma, has written a tour de force – a reflective analysis based on his over 30 years of experience working with pegmatites. The book combines and explains in depth field observations, mineralogy, geochemistry, experimental petrology and silicate science in the context of pegmatite science. Using this integrated approach and on the basis of substantial arguments, London proposes a new model for the formation of pegmatites, challenging the well-established Jahns and Burnham model. Hence the book is much more than a textbook; it is provocative and intends to stimulate future work on pegmatites.

The first half of the book is a primer on pegmatites, in which their field occurrence and mineralogy are described. The minerals in pegmatites are beautifully illustrated with the author's photographs of his mineral specimens. There are 24 full pages of photographs of minerals (three of feldspars alone), almost 10% of the book. For each mineral group, there is a useful systematic presentation of their occurrence, properties and uses.

The second half of the book covers the origin of pegmatites. It reviews the extensive experimental work that relates to pegmatite genesis, and it challenges the 50-year-old Jahns and Burnham model, which states that pegmatites form from an exsolved aqueous phase derived once late-stage granitic melts become water saturated. Instead, pegmatitic textures are proposed to originate from the very rapid crystallization, between 350 and 450°C, of late-stage melts enriched in fluxes and incompatible elements. The evidence to support this hypothesis (including the origin of graphic quartz–feldspar intergrowths through magmatic crystallization from highly viscous melts) is carefully and thoroughly discussed. Again challenging accepted wisdom, according to which large crystals grow slowly, the author presents strong evidence from many sources to demonstrate that pegmatite intrusions crystallize in days to a few years, even pegmatites with crystals tens of metres in length.

David London's authority to reflect upon pegmatites comes from his career at the forefront of research into the phenomena that characterize volatile-enriched granitic melts. Based on fundamental principles of mineral equilibria and melt–vapour–mineral interactions, his thesis takes shape in a logical and structured way. The discussion of how theories concerning the origin of pegmatites have developed is interwoven with the human dimension, addressing the characteristics and human failings (as well as the strengths) of influential individuals. Readers with an interest in the history of science will find these aspects of the book most rewarding.

When starting to review this book, I began at the back. Here, 800 references, mostly from peer-reviewed journals, are listed in 38 pages. At the front of the book, the author notes that he has included only reference to papers that he has actually read. Returning to the back, one of the most interesting chapters concerns what we know and don't know about pegmatites. London is keen to recruit disciples to the pegmatite faith, and in this chapter he highlights some of the key research that still needs to be done.

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The book is easy to pick up and read on a selective basis. Each chapter starts with a short summary, which helps to make the book more easily accessible. Readers can embed themselves in the book with ease and, as long as they read the summaries, they can skip chapters that they consider low priority. The quality of the illustrations is one of the book's strengths, as is the provision of a CD-ROM that contains not only the figures (for teaching, research, outreach, etc.), but also a pdf of the chapters of the original Mineralogical Association of Canada Short Course Handbook on Granitic Pegmatites, edited by Peter Černý and published in 1982.

The reader is drawn into the book. The photographs in the first half are seductive, and the second half exercises the reader intellectually through its use of phase diagrams, discussion of the kinetics of crystal growth, thermal modeling, etc. The wide range of techniques discussed in the context of pegmatite evolution makes this book ideal for teaching petrogenesis. The textures that are described are easily visible in the photographs (and can be scrutinised in more detail using the CD-ROM). Concepts that many students find difficult, such as phase diagrams, are explained clearly. By using this book, a student will become familiar with a range of transferable interpretative skills that can be used in the investigation of many igneous rock types. The pedagogic value of pegmatites for teaching and engagement is an important aspect of the book.

What is there to criticize? A number of minor points arise. The description of pegmatites in rocks that are not granitic is very limited, despite a substantial literature. The coverage of the book very much focuses on North American examples, and this means that the 'known knowns' section of the last chapter, which identifies pegmatites that are well studied, omits work on pegmatites in Europe and descriptions that are written in languages other than English. Also, it is disappointing that the book lacks an index (but it is so clearly structured that this is not a major problem). Perhaps the most irritating deficiency of the book is the way in which captions for the photographs of the mineral specimens overflow from one page to the next. It is hard to link the photograph with the caption in some cases.

The criticisms are minor and do not detract from the value of the book for anyone interested, in whatever way, in pegmatites. It is a 'must-buy' book for any igneous petrologist, challenging as it does much accepted wisdom in that field of geoscience.

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