

BOOK REVIEW

Book Review: *Essentials of Igneous and Metamorphic Petrology*. B. Ronald Frost and Carol D. Frost (2013) Cambridge University Press, U.K. ISBN: 9781107696297, 314 pages.

Essentials of Igneous and Metamorphic Petrology, which is easy to recommend, is presented in a concise and compelling manner. The book is about 300 pages and is subdivided into eighteen chapters that convey the fundamental principles that govern the mineralogy of igneous and metamorphic rocks. The authors, B. Ronald Frost and Carol D. Frost, each have a strong track record in these fields. The target audience is introductory-level geoscience students. Students in particular will benefit from both authors' decades of experience teaching the subject matter to undergraduates. Their experience has been condensed in this book.

The first part of the book (ten of the eighteen chapters) introduce igneous petrology, while the remaining eight chapters provide an introduction to metamorphic petrology. Both topics are developed independently, allowing the reader to focus on each subject area separately. The general format of the chapters is uniform throughout the book. Each chapter provides a clear and accessible introduction to a specific topic, which is subdivided into a number of sections, and close with a summary of the material in the chapter. At the end of each chapter, there are exercises, which apply the concepts that were introduced in the chapter, and should prove useful for both students and teachers. Further reading is also suggested in most chapters, and very detailed references (including chapter or page ranges) will allow the reader to follow up on particular subjects and topics. Moreover, all figures, photos and photomicrographs, and geological maps are available in color online with additional resources for teachers, which is an excellent source for lecture material.

The igneous and the metamorphic petrology parts of the book have a similar basic organization: the first chapter gives an overview of the scope of the topic, including terminology, classification schemes, textures and structures (in the case of igneous rocks), and types of metamorphism, identification of protoliths, determination of metamorphic conditions, and textures (for metamorphic rocks). The subsequent chapter in each case introduces phase diagrams and chemographic projections, respectively, as an important tool for understanding the evolution of melts and igneous crystallization, and the relative *P-T* stability and effects of bulk composition on mineral assemblages in metamorphic rocks.

The igneous petrology is developed in subsequent chapters by introducing more general aspects of the topic (silicate melts and magmas, chemistry of igneous rocks, basalts, and mantle

structure). In further chapters focus turns to rock types that are expected in different tectonic environments (oceanic and convergent margin magmatism, intracontinental volcanism and plutonism, and the interpretation of granitic rocks).

Subsequent topics in metamorphic petrology section deal with the metamorphic facies, geothermobarometry, and a short review of thermodynamics. The focus moves on to the metamorphism of particular rock composition types (mafic rocks, peridotitic rocks, pelites, and calcareous rocks). This structure is ideal for readers who want to refresh their knowledge of, or become acquainted with, certain tectonic environments or rock types.

Throughout the text, additional information is given in "application boxes," providing interesting asides or supplementary information. For instance, box themes may inform the reader about novel or innovative research that altered our understanding of tectonic processes (ocean drilling, discovery of ultrahigh-pressure terrains) or show the reader links to genesis of ore deposits of certain rock types or processes (e.g., ore deposits in oceanic crust, layered mafic intrusions, alkaline plutons, granites, and hydrothermal ore deposits).

The appendix is also a useful supplement, especially for students. It reviews the mineral chemistry and abundance of minerals found in igneous and metamorphic rocks. The concise discussion of the appearance of these minerals in hand specimen and thin section will be particularly valuable for beginning students.

The book achieves the authors' aim of providing an accessible introduction to modern petrology, and does an especially good job of introducing phase diagrams as an essential tool for understanding the basic processes governing magmatic and metamorphic rocks. I personally enjoyed the modular concept of the book that allows the reader to focus on selected rock types or tectonic environments. Because the later chapters deal with more advanced themes beyond that are beyond an introductory level, I can envision graduate students finding this book an excellent reference. I expect to frequently consult this book myself for the preparation of classes given to undergraduates. Overall, I can highly recommend this book as a well-organized presentation of the essentials of igneous and metamorphic petrology and their application in an up-to-date mix of modern geochemistry and plate tectonics.

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