Mineralogical Magazine (2021), **85**, 827
doi:10.1180/mgm.2021.49

CAMBRIDGE UNIVERSITY PRESS

Book Review

An Introduction to Metamorphic Petrology, Second Edition

Yardley B.W.D. and Warren C. Cambridge University Press. Pp. 344, ISBN 9781108456487

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Bruce Yardley's 'An Introduction to Metamorphic Petrology' (published by Longman Scientific and Technical) has been a go-to textbook for both teachers and students for some three decades. The aim of this book was that it should be "comprehensible to the student who has little knowledge of thermodynamics" and should introduce "some of the known facts and currently fashionable hypotheses"; two facets, that this original book achieved remarkably well. The Second Edition, published by Cambridge University Press in 2021, and co-authored by both Bruce Yardley and Clare Warren, provides the first update since 1989.

The First Edition comprised some 248 pages in total, split into seven chapters, with an additional appendix on phase diagram formulation. The Second Edition rises to 333 pages, split into ten chapters, with three appendices. The first set of chapters follows the same pattern in the updated edition, beginning with 'The Concept of Metamorphism', then introducing the concept of chemical equilibrium, perhaps one of the most important facets of metamorphic petrology along with one that can sometimes be underappreciated. Determination of pressure and temperature was only a section of the equilibrium chapter in the original edition; however, in the update, it has been given its own chapter. This move reflects the fact that quantitative estimation of pressure and temperature conditions of metamorphic rocks has probably become the most common tool applied within metamorphic geology in the last 30 years. This is largely thanks to the dedicated development of readily accessible software tools and the chemical activity ratios that they require, meaning thermodynamic modelling and creating of compositional petrogenetic grids and 'pseudosections' can be achieved with relative ease. As such, a description of the key principles behind these tools is much warranted.

The next three chapters, as with the first edition, describe metamorphism of three lithological associations: pelitic rocks, basic igneous rocks and limestones. This was succeeded in the original by a large chapter on 'Textures and Processes'. In the update, this has been expanded into three separate chapters, covering 'Mineral Growth and Textures', 'Linking to Deformation' and the 'Duration of Metamorphism'. Again, the expansion of these chapters is dictated by significant advances and research efforts in these areas, particularly our knowledge of the links between metamorphism and deformation, and within the advances of estimating the timing and duration of metamorphism. The latter has benefited from the proliferation of laboratories capable of *in situ* dating methods in the last two decades. The final chapter is dedicated to linking metamorphism and tectonics. For those interested in the minutiae of mineral equilibria, these links are often deemed 'the arm-wavy' bit, for others, they are where the utility of metamorphism teaches us about how the Earth works as a whole. Either way, this summary, although short (it could easily form a book or two by itself), provides a nice synopsis and end to the book.

A key addition to this book, and one that I'm sure teachers and lecturers will appreciate and utilise, is a set of exercises at the end of each chapter. These cover basics such as terminology introduced in the chapter, and more involved tasks such as basic mathematic calculations relevant to the concepts introduced. Another welcome addition is colour. The illustrations are well chosen and well crafted (and include some beautiful photographs); this is an important component of the book, as these illustrations are critical for conveying complex processes, and for those that are visual learners such as myself, if it is true that a picture can truly convey a thousand words.

So does the book achieve its goals? I would predict a unanimous show of hands here. Metamorphic petrology comprises a number of complex processes, including principles of chemistry and physics, and is therefore 'inaccessible' or even 'scary' to some students. However, this textbook provides just the right level of information to understand these processes in enough detail, and equally important, to understand why these processes are important for the subject as a whole. Throughout, the real-world examples of metamorphic processes have been extensively updated, something that cannot have been easy with 30 years of literature to choose from! Overall, the authors have done a tremendous job in crafting a classic, into what I predict will also become an as popular and well-revered textbook.