

## BOOK REVIEWS

EMELEUS, C. H. & BELL, B. R. 2005. *British Regional Geology: the Palaeogene Volcanic Districts of Scotland*, 4th ed. x + 214 pp. + map in folder. Keyworth: British Geological Survey. Price £18.00 (paperback). ISBN 0 85272 519 1.  
doi:10.1017/S0016756806213050

This, the long-overdue fourth edition of this book, has been completely rewritten by two of the most knowledgeable petrologists currently working on the British Tertiary Igneous Province: Henry Emeleus (Durham) and Brian Bell (Glasgow). Given the undoubted petrological pedigree of the two authors it is no surprise that this publication is first class and is suitable for use by a wide variety of people ranging from undergraduates, school teachers, researchers, lecturers, field trip leaders, civil engineers to enthusiastic amateur geologists.

The book is written in clear and lucid style and is lavishly illustrated with numerous colour maps, tables, diagrams and stratigraphic columns, all of which are ideal for teaching purposes. A significant number of well chosen clear photographs and some photomicrographs also illustrate the most salient geological features of the area. A useful A3 fold-out colour map of the Scottish Palaeogene igneous province is also contained in the back pocket of the book. The book has also benefited from contributions by Dave Stephenson from the BGS (Edinburgh).

Chapter 1 presents an informative overview of the geology of western Scotland and the Hebrides and places the Scottish Palaeogene province in its wider context as part of the North Atlantic Tertiary Igneous Province. The next three chapters focus on the geology and structure of the pre-Tertiary rocks onto, and through, which the Palaeogene volcanic rocks and intrusions were emplaced. A sound understanding of the nature of these basement rocks and sediments is important in the elucidation both of the siting of the Palaeogene volcanic complexes and their petrogenesis, particularly crustal contamination of the magmas. Chapter 5 reviews the regional setting, ages and igneous stratigraphy of the Scottish Palaeogene rocks, and the point is made that the igneous activity in the province may have occurred in several discrete pulses over a period of three million years, around 60.5–57.5 Ma.

The next three chapters provide an extensive summary of the field characteristics and basic petrography of the lavas (including interbedded sediments), dykes, plugs and sills of the province and this is followed in Chapter 9 by an excellent synthesis of the field relations and petrography of the intrusions in each of the province's central complexes. The following chapter consists of a (slightly too) brief summary of the vast wealth of elemental and isotopic data which have been gathered on these Hebridean Tertiary igneous rocks over the past ~ 40 years and highlights how these data have been used to elucidate mantle sources and melting processes as well as magmatic processes such as crustal contamination, fractional crystallization and magma mixing. Given that much of our increased knowledge of the Scottish Palaeogene igneous province over the last 50 years has resulted from such geochemical research it is slightly disappointing that this chapter is not a little more

detailed. Chapter 11 discusses the structure of the lava fields and the structural effects of central complex emplacement on the country rocks. This chapter also highlights the importance of several major faults which cross-cut the province, namely the Camasunary and Skerryvore Fault and the Great Glen Fault; strangely, the Highland Boundary Fault which cross-cuts Arran is not discussed in this section.

Chapter 12, a short account of the late Palaeogene to early Neogene history, is followed by a detailed chapter on the Quaternary geology of the region. As would be expected this chapter is principally concerned with the several glacial episodes which have affected the region during the Quaternary period. The final chapter of the book briefly reviews the somewhat limited economic geology of the region; however, this review is none the less useful in that it highlights historically important economic deposits and small scale deposits as well as large scale quarrying.

In summary, this book at £18 represents excellent value for money. It brings up to date the Tertiary Hebridean igneous story for a wide variety of users. It deserves to be bought by many individuals and libraries and I am confident it will remain one of the standard general references for Hebridean Tertiary geology for many years to come. This book clearly shows that, despite many years of research, much of it going back to the very dawn of geology as a science, there is still much work to be done on the Hebridean Palaeogene igneous rocks. Lets hope we don't have to wait another 45 years for the fifth edition!

Andrew C. Kerr

POTTER, P. E., MAYNARD, J. B. & DEPETRIS, P. J. 2005. *Mud & Mudstones. Introduction and Overview*. xi + 298 pp. Berlin, Heidelberg, New York: Springer-Verlag. Price Euros 79.95 (+ VAT at local rate), SFr 135.50, £61.50, US \$89.95 (hard covers). ISBN 3 540 22157 3.  
doi:10.1017/S0016756806223057

The book *Mud and Mudstones* is a fairly comprehensive outline and assessment of fine-grained argillaceous rocks and sediments. The authors have aimed it at a broad audience including undergraduate geology and engineering students, but in particular for those professionals who require an introduction to this important and diverse aspect of the geological sciences.

The book is subdivided into nine chapters, a set of appendices and a glossary of terms useful to the study of muddy sediments and rocks, for the non-specialist. Included within each chapter is text within specific boxes, which have been used to expand on the background of technical details, to avoid sidetracking within the main body of the text. For the more knowledgeable reader this helps avoid some unnecessary detail, while for those new to the subject it acquaints the reader, while maintaining the continuity of the chapter. The book benefits from the inclusion of a significant number of examples cited from published literature, together with a section at the end of each chapter entitled 'Digging Deeper' and containing further sources of reference. These features should enable the interested reader to pursue particular topics of interest with greater ease.

Chapter 1 provides a short overview of the subject matter, and within chapters 2 through 6 the authors detail the production of mud and silt, its transport and deposition, the role of oxygen, the depositional systems in which muddy sediments are commonly found and the physical and chemical changes which occur in mudrocks during burial. Chapter 7 examines methods for characterizing sediment sources, using petrographic and in particular geochemical methods of analysis. Chapter 8 looks at how the geology of muddy depositional basins can be used to characterize the mudstones themselves and provide an insight into the nature of a basin, and its wider geological context. Finally, within Chapter 9 the economic importance of mudrocks and an outline of their engineering characteristics are described. The appendices are helpful as they provide short descriptions of different methodologies and useful background for readers with little knowledge of the subject.

In considering the scope of the book, it is perhaps likely that some topics will be considered in slightly less detail than others. For example, cyclical deposition within mudrocks can be certainly be recognized on lunar tidal scales through to Milankovitch frequencies, as described by the authors. In addition, there is now a sizeable literature on image-based annual- through decadal-scale records of lamina deposition, which provide a useful insight into and archive of past climate variability. The content on this subject could perhaps have been greater than it is, given the present interest in climate studies.

In summary the book is written in a style that is easy to read and provides for rapid cross-referencing of subjects/ topics of interest to the reader. The authors have attempted to provide a useful summary of the important aspects of fine-grained argillaceous rocks, and they have achieved this.

Richard B. Pearce

AVSETH, P., MUKERJI, T. & MAVKO, G. 2005. *Quantitative Seismic Interpretation. Applying Rock Physics to Reduce Interpretation Risk*. xv + 359 pp. Cambridge, New York, Melbourne: Cambridge University Press. Price £90.00, US \$140.00 (hard covers). ISBN 0 521 81601 7. doi:10.1017/S0016756806233053

This book describes one methodology for interpretation of prestack seismic reflection data amplitudes to yield a probabilistic distribution of lithology and pore fluid information in the subsurface. The authors state that one of their principal aims is to 'improve interaction between geologically and geophysically inclined seismic interpreters'. In this respect I think the book succeeds admirably. It is relatively easy to read and is complete with over 60 colour plates, 300 references and an index. The text and figures are of excellent quality and there is only a handful of typographic errors. Pitfalls and major summary points within the text are highlighted. Graduate students who work with seismic data will find that the book provides an excellent overview of rock physics and interpretation technologies that are becoming more commonly used within the oil industry. Teachers of geophysics will be able to bolster their lecture notes by summarizing this interpretation methodology in their lectures and the online data examples provided could easily be incorporated into practical sessions.

In this book the case histories and text evangelize a workflow which can help both to reduce and to quantify interpretation risk even when there is significant overlap in acoustic impedances between different rock types. While the book is well referenced the authors could perhaps have

explained alternative potential methodologies in more detail. There are some references to new and upcoming seismic analysis techniques in Chapter 4 but a case history in 4D seismic analysis and expanded discussion on attenuation and anisotropy studies would have been beneficial.

The first two chapters are a description of the field of rock physics which attempts mathematically and empirically to parameterize rocks such that the variations of lithology, porosity and saturation can be related to seismically derived  $P$  and  $S$  velocity and density. Lithology and fluid substitutions are stressed. In the third chapter statistical rock physics is used to try and quantify uncertainty. This is the hardest chapter to follow but the basic principles are well illustrated by the applications at the end of the chapter and the case histories in Chapter 5. Chapter 4 is a welcome overview of the myriad of methods for extracting quantitative information from prestack seismic amplitudes. Seismic modelling, offset dependent amplitude analysis and acoustic and elastic impedance inversion are the principal techniques covered. A section on seismic processing is outdated but an excellent overview of interpreting AVO crossplots is included. One powerful application of the probabilistic technique is to determine the value of additional data (such as elastic impedance) in classification of key facies types from seismic data. Chapter 5 is a summary of successful case histories from West Africa and the North Sea that have been used as examples throughout the book. Chapter 6 provides workflows which recommend various stages to be applied to exploration and development of oilfields.

Reading the entire book from cover to cover is a rewarding experience and gives the reader a new understanding of the breadth and scope of this field – and how it may be used to benefit the interpretation of seismic data.

Rob Hardy

WEISHAMPEL, D. B., DODSON, P. & OSMÓLSKA, H. 2004. *The Dinosauria*, 2nd ed. xviii + 861 pp. Berkeley, Los Angeles, London: University of California Press. Price £62.00 (hard covers). ISBN 0 520 24209 2. doi:10.1017/S001675680624305X

Several changes have been made since the first edition of *The Dinosauria* (Weishampel, Dodson & Osmolska, 1990). The front cover is graced by a group of indisputably bird-like creatures. This is in contrast to the particularly reptilian cover stars of the latter publication and reflects the editors' updated perception of a bird–dinosaur relationship as the 'logical sequel of phylogenetic systematics' – a methodology that is emphatically endorsed in the new book. Other changes are the addition of a numerical cladistic analysis to each of the taxonomic chapters and some changes in authorship (the number of authors has almost doubled from 23 to 43) and chapter topics, precipitated by the clarification of theropod taxonomy and the inclusion of a new chapter on biogeography.

In Section One, some 23 taxonomic chapters summarize what is known about each group of dinosaurs seriously and effectively. The level of group considered and attention to detail for each varies wildly with nine chapters spanning 183 pages of Theropoda (giving *Herrerasaurus* and *Eoraptor* the benefit of the doubt as non-theropods for this calculation) inadequately counterbalanced by two chapters sharing 90 pages of Sauropodomorpha. Ornithischia seem similarly short-changed with ten chapters over 188 pages. But then perhaps more has become known about the ever-popular carnivorous dinosaurs. The standardized format of