BOOK REVIEWS

FAURE, G. & MENSING, T. M. 2011. *The Transantarctic Mountains: Rocks, Ice, Meteorites and Water*. xxvi + 804pp. Springer. Price £153.00, US$229.00 (HB). ISBN 978 1 40208 406 5.
doi:10.1017/S001675681100032X

The Transantarctic Mountains: Rocks, Ice, Meteorites and Water has an ambitiously broad subject matter that has been aimed at an equally wide audience, ranging from active researchers to those who visit Antarctica 'to be inspired by its natural beauty'. For those unfamiliar with Antarctica the authors have provided a fairly broad introduction to the historical exploration of Antarctica, the continent, international treaties, environmental conditions and even cold related injuries. This historical perspective continues at the start of each chapter or new geographical area with a synopsis of post-heroic era scientific exploration, where we learn historical details such as the skimobile used on the 1976/77 international expedition to the Shackleton Range was named 'Buran'. Such information certainly fulfils the authors stated aim of making the book more readable, something that has also been achieved by the provision of numerous appendices that explain scientific analytical techniques and methodology in an accessible manner.

The principal subject of the book, the geology of the Transantarctic Mountains, is well structured being logically split into rocks pre and post the Kukri unconformity and also into geographical regions that form self contained chapters, with meteorites and a useful section on glaciation dealt with separately. The text is well illustrated throughout with detailed location and geological maps, plus reproduced analytical data. Scientifically, the authors stated aims are three-fold: to summarise the relevant facts about the major rock units, present the proposed hypotheses, and aid the identification of areas and geological problems that require additional work. The authors largely deliver on these aims and provide an excellent synopsis of the stratigraphy and lithologies of the Transantarctic Mountains. However, the structural geology of the Transantarctic Mountains, particularly of the basement rocks, is only covered by fairly generalised statements. The authors provide abundant appendices of geochemical and geochronological data for each chapter, however the utility of these are highly variable. Perhaps it is inevitable with a book of such broad scope and scale that some published work has been omitted, but some of the more recent literature is not cited.

Faure & Mensing have produced a hugely ambitious book covering a range of scientific disciplines, and although written in an accessible manner, the subject matter will largely self-select its readership with Antarctic geoscientists (researchers and students) being the main beneficiaries. Regardless of some omissions, *The Transantarctic Mountains: Rocks, Ice, Meteorites and Water* represents a valuable reference text for the stratigraphy and geological history of this remote region, and I would consider it an important resource for anyone wishing to plan a field campaign to this mountain range, as so much local and regional detail is included. This book will be valuable addition to any Antarctic research centre's library, but given the increased prominence of Antarctic science it should also find a place in the Earth Science section of most university libraries.

Mike Curtis
British Antarctic Survey

MCKILLUP, S. & DARBY DYAR, M. 2010. *Geostatistics Explained: An Introductory Guide for Earth Scientists*. xvi + 396 pp. Cambridge University Press. Price £50.00, US$90.00 (HB); £30.00, US$39.99 (PB). ISBN 978 0 52176 322 6 (HB); 978 0 52174 656 4 (PB).
doi:10.1017/S0016756811000355

I very nearly didn't review this book. I'm not really qualified to comment on a book with this title but, as it happens, the book isn't about geostatistics! Instead, it is about the slightly different topic of statistical methods in Earth Sciences where I do have some background (I teach this to undergraduates). That brings me to a second reason why I nearly turned down the review; who needs another 'stats for geologists' book when we already have the excellent *Statistics and Data Analysis in Geology* (Davis, 2002)?

McKillup & Darby Dyar tackle this second objection head-on in the book's Preface where they specifically mention the Davis book and explain that their aim was to produce something a bit less daunting (my words not theirs). The result is a book that won't tell you how to produce much statistics from scratch but which will help you understand the results of computer statistical packages and which will help you decide which analyses to choose. If this is what you need then the book succeeds extremely well.

Some readers may be irritated by my pedantic insistence that this book is about statistics in geology rather than geostatistics. The term 'geostatistics' did indeed originally mean what you might expect but, over the last 30 years, it has come to refer specifically to spatial statistical methods (e.g. interpolation) and has become a very specialized subject. *Geostatistics Explained* barely touches on geostatistics in this narrower sense and therefore has a potentially very misleading title. The reason for this *faux-pas* becomes apparent once the author's biographies are examined. Steve McKillup is a biologist who has previously published a statistics textbook for life scientists. He clearly decided that there was scope to do something similar in geology and turned for help to Melinda Darby Dyar who, like me, is an earth scientist who happens to teach and use statistical methods. Hence, neither author is a geological-stats specialist and they overlooked the problem with the book title. Nevertheless, between them, they have come up with a charming text which succeeds very well in achieving their aims.

What the book does is to provide a friendly introduction to the standard statistical tools from univariate and bivariate methods, for both parametric and non-parametric cases, through to multivariate methods, time series and simple spatial statistics. The first five chapters are a gentle introduction to scientific methodology with the next four providing a grounding in statistical inference. The book then has fourteen chapters giving succinct introductions to the most commonly used statistical methods. I particular enjoyed the explanation of multi-dimensional scaling (MDS) since I've never used this approach and came to it with the eyes of a student trying to grasp a new concept. I'm pretty sure I picked up the main ideas without a struggle and this has to be a good sign!

In summary, reading this book will stop students, researchers and working geologists from using statistics packages as 'black boxes'. There's now no excuse for not having a basic grasp of what you're doing, why you're doing

it and how to interpret (but not over-interpret) the results. However, those using statistical procedures more intensively might want something a bit meatier and, in that market, Davis' book is still the best bet.

Dave Waltham
Royal Holloway
University of London

Reference

DAVIS, J. C. 2002. *Statistics and Data Analysis in Geology*, 3rd edition. Wiley. 656 pp.

FLETCHER, C. 2010. *Physical Geology: The Science of Earth*. xxv + 679 pp. Wiley. Price £39.99, €48.00, US$131.95 (PB) US$84.95 (binder ready); US$79.50 (e-book). ISBN 978 0 47122 037 4.
doi:10.1017/S0016756811000379

Fletcher's textbook (on what is essentially North American geology, or geology plus physical geography/geomorphology in Europe and especially the UK and Ireland) is 679 pages long, very well organized, well illustrated and comprehensive in its coverage.

On the opening page of the Preface, Fletcher asks the reader: 'Why publish another Physical Geology text?', a question I asked myself on beginning this review. To test the three reasons Fletcher gives, I compared his work to four of the standard (North American) books in this class. Fletcher states that his book is organized around two-page sections (for ease of reading), which it is. This is innovative and a positive step. Critics may say that some geological concepts cannot be reduced so dramatically, yet Fletcher does this effectively, which will keep the student's attention. Students do have short attention spans in these days of moving images and instantaneous web access, making reading daunting, so Fletcher is to be applauded. None of the competitors deploy this method. Fletcher also uses Bloom's Taxonomy to develop extensive, critical and comprehensive exercises for each chapter. The competitor texts do all use 'revision questions', many of which are rather an afterthought to the chapters. In Fletcher's book, they are a key element. Finally, Fletcher discusses relevant and controversial issues such as peak oil and natural hazards. Many of the competitor texts do consider such things, but not as comprehensively. Fletcher considers 'global warming', as opposed to climate change, possibly a mistake in my personal view.

Neither Fletcher nor his competitors from the US market cater well for non-North American or even non-US geology students. In this regard, Fletcher has closed his market even further than his rivals, with a chapter on US geology. This is no criticism — US students need to know about their geological heritage, as do my students here in Belfast, so we teach them this, but not many of them want to learn about, see any relevance for, nor have much interest in the geology of another country. His book will be popular in the US I am sure. However, this mix of global and also country-specific outlook is reflected in the content of the book (and its competitors), being about geology and physical geography, making for a mixed bag of information, some of which is relevant to A level and geology/geography undergraduates in many countries outside of the US, some of which isn't.

In short, the factual content of Fletcher's well-written, well-illustrated book is about the same as the other comparator texts on the market. What makes it different is the layout and the exercises, for which Fletcher is commended.

Alistair Ruffell
Queen's University, Belfast

ARCHIBALD, J. D. 2011. *Extinction and Radiation: How the Fall of Dinosaurs Led to the Rise of Mammals*. xii + 108 pp. Johns Hopkins University Press. Price £39.00, US$65.00 (HB). ISBN 978 0 8018 98905 1.
doi:10.1017/S0016756811000690

The extinction of the dinosaurs is an iconic event in Earth history that attracts continued attention from scientists and the public. Just when everyone thought that the case was closed and a giant meteorite implicated, as expressed in a 'manifesto' statement last year in *Science* (Schulte *et al.* 2010), signed by 41 distinguished authors, it turns out that everything is not so clear, as explained by Archibald et al. (2010), signed by an equally distinguished list of 29 authors. David Archibald's book reflects this somewhat cautious stance. He has lived through the brouhaha about the KT impact, and has been a constant commentator over the past thirty years, drawing evidence from his own field of vertebrate palaeontology, and especially from the small mammals that lived during the last days of the dinosaurs. In a previous book (Archibald, 1996), the vertebrate palaeontological case was put, and here it is brought up to date.

This is a slim volume of six chapters, which review, respectively, what is known of the last 10 million years of the dinosaurs, the Cretaceous mammals, the origin of modern mammalian groups, the records of different groups through the KT boundary, possible causes of diversity decline in latest Cretaceous time, and finally the current position on dinosaurian extinction and especially the radiation of the mammals.

Archibald's case rests strongly on his oft-argued case that dinosaurs, and other vertebrate groups such as turtles and mammals, were declining in abundance and diversity through the last 5 m of sediments of the Hell Creek Formation, representing the last 100,000 years of the Cretaceous. Whether this is a global pattern or not is widely debated. His other forte has been the Late Cretaceous mammals, and especially those that are close to modern mammalian clades. Archibald outlines the debates between palaeontologists studying sometimes incomplete remains and experts on modern mammals. He has witnessed, and been instrumental in, major revisions in methods; palaeontologists are now much more critical about assigning fossils to modern clades.

As noted at the start, opinion is divided on whether the KT impact was the sole cause of mass extinction, or a contributor. The evidence for the impact is clear, and the story of how the evidence was assembled is a fascinating story of science in action. But, as Archibald says, nobody addresses the question of just how the physical crisis caused the exact patterns of extinction that we see in the rocks. Most physical killing models arising from impact would be so devastating that all life should have succumbed, and yet it did not. Further, the Deccan traps were erupting through this interval, and geologists cannot ignore them while at the same time arguing that other basalt traps caused mass extinction at the end of the Permian and at the end of the Triassic (through global warming, acid rain, and ocean stagnation).

This is a learned essay, written clearly and attractively for students and the public, but supported by substantial