separate chapters dealing with different relevant field-sites, time periods or glacial processes. While this structure is a little unconventional, it works for the interested reader because the themes have been chosen carefully and the index is comprehensive, allowing references to field sites or landscape features to be found rapidly. That said, it is not the simplest format for a student or field-trip leader to navigate quickly.

Glacial Geology and Geomorphology: The Landscapes of Ireland is not a textbook considering glacial geology and geomorphology, and nor is it a field guide considering the landscapes of Ireland: it is an authoritative integration of the two. The book is produced to a very high standard, evidenced by good-quality paper and printing (including many, high-quality colour photographs and diagrams). The text is written to an expert standard, is richly illustrated, and always interesting. If one is seeking a comprehensive, research-level summary of the ways in which advancing and receding ice masses have contributed to the current surface geology of Ireland then this is now their essential text.

Bryn Hybbard

JOLLEY, S. J., BARR, D., WALSH, J. J. & KNIPE, R. J. (eds) 2007. *Structurally Complex Reservoirs*. Geological Society Special Publication no. 292. vii + 488 pp. London, Bath: Geological Society of London. Price £85.00, US $170.00; GSL members' price £42.50, US $85.00; AAPG/SEPM/GSA/RAS/EFG/PESGB members' price £51.00, US $102.00 (hard covers). ISBN 9781 86239 241 0.
doi:10.1017/S0016756809006141

The ultimate aim of modelling a hydrocarbon reservoir is to predict rates and volumes to maximize economic recovery. The basis of this must be a 3D representation of storage/transmissivity as governed by sedimentary architecture/facies and the baffles/conduits induced by faults/fractures which compartmentalize this volume. Where the reservoir is structurally complex the upscaling of reservoir properties to allow geologically realistic and computationally tractable simulations of flow behaviour is particularly difficult, even with current processing power. The business need to tackle this problem is driving major growth in research and was the rationale for a Burlington House conference in early 2006. This book, produced in commendably short time, is the result. It is aimed at the interface between structural geology and reservoir engineering, an objective which arguably might have been more explicit in the title, and manages to combine practical realities of industrial experience with cutting-edge academic research in a very well balanced fashion.

Content comprises 25 papers, the first of which doubles as a comprehensive editorial introduction. The mapping of complex structures *per se* is not treated, it being sensibly assumed that the basis of all realistic modelling should be a robust interpretation of 3D seismic to the limits of resolution. Hence the focus is on the modelling of what may or must plausibly exist below this resolution, and a paper on the challenges and opportunities of landslide reservoirs uses modern analogues to address this problem. Sub-seismic fracture prediction is approached from both geomechanical stress modelling and seismic anisotropy, the latter with discussion of the potential to invert damage parameters from seismic anisotropy and including a paper of major importance on the work flow for quantification of anisotropy in terms of that induced by fracturing and that inherent to the sediment fabric. The thorny topic of fracture prediction by the use of bed curvature receives an elegant critical testing.

Many papers tackle various aspects of fault seal evaluation, notable among which is a use of percolation theory in the analysis of connectivity in faulted turbidites and a fine case study from the West Sole gas fields. The computational problems of managing, and updating, complex volumes receive limited attention, but seven papers deal with flow simulation and production history matching. They include fascinating statistical demonstration of the correlation of far-field pressure responses to depletion/injection which suggests the stress state in some reservoirs to lie on the verge of failure – if so with important implications for directionality of flow in response to dynamically induced changes in poroperm. Also evident is renewed focus on the multi-phase flow properties of faults, a topic conceptually simple but computationally complex.

The book has a full index and makes generous use of colour illustrations. It can be strongly recommended to industry professionals for whom it is splendid value, particularly at the discounted prices. Moreover several papers including the editorial introduction, the treatment of faults in production simulation models and the modelling of fractured reservoirs will be valuable supplementary reading for course work in petroleum geology.

David James

PELLANT, C. & PELLANT, H. 2007. *Fossils. A Photographic Field Guide*. 144 pp. London, Cape Town, Sydney, Auckland: New Holland Publishers. Price £14.99 (hard covers). ISBN 9781 84537 336 8.
doi:10.1017/S0016756809006153

Including over 200 photographs that represent all of the major groups of macrofossils, *Fossils: A Photographic Field Guide* is an attractive little volume. Including sections on fossil plants, corals and sponges, echinoderms, brachiopods, arthopods and graptolites (included in the same section for some reason), molluscs, vertebrates, and trace fossils, the book looks at individual genera, depicting them in crisp, attractive photographs. Introductory sections discuss the general anatomy and mode of life of the groups, and simple diagrams depict the key anatomical components. Brief descriptions accompany the photos and provide information on size, occurrence and mode of life. Some of the pieces of text accompanying the vertebrates are rather long compared to those that exist on the other fossils.

Fossils: A Photographic Field Guide cannot really pretend to be as indispensable as a field guide as it is simply not comprehensive enough, but it would at least allow a novice to narrow down the identification of any given fossil to a major group. Designed for general readers, it will appeal to anyone interested in geological history or fossil collecting and could prove to be a useful introduction for undergraduate students or for anyone looking for a basic guide to the diversity and wonder of fossilized life.

Darren Naish

SPEAK, P. 2008. *Deb. Geographer, Scientist, Antarctic Explorer. A Biography of Frank Debenham*. xiv + 128 pp. Cambridge: Polar Publishing. Price £12.99 (paperback). ISBN 9780 9548003 1 4.
doi:10.1017/S0016756809006177

Frank Debenham was an Australian-born geologist and geographer, whose career ranged from participation in Scott's

last expedition in 1912 to founding and directing the Scott Polar Research Institute in 1920 and seeing through its transformation and relocation to a new building in 1934. Peter Speak's well researched biography is a fascinating memorial of a bygone age in science and exploration. Whilst it is very much a Cambridge story, since Debenham's professional career started in Cambridge in 1913 and officially finished there with his formal retirement in 1949 and finally with his death in 1956, it does also provide some fascinating insights into Antarctic exploration and the birth pangs of a new discipline in an ancient university.

Debenham's first ordinary degree at the University of Sydney in 1904 was in Classics but after a spell in school teaching he returned to Sydney in 1908 to major in geology and petrology in 1910 with the Welsh-born Tannant William Edgeworth David as professor. David had been with Shackleton's 1907–9 *Nimrod* expedition to Antarctica and when Scott was recruiting for his second Antarctic expedition he asked David to recommend a young geologist. Although Debenham's scientific experience had not extended beyond southeast Australia and included little mountaineering, let alone experience of snow and ice, he was proposed as a likely candidate by David. Interviewed by Scott in a Sydney hotel, Debenham was immediately offered a place on the expedition and was one of the youngest in the scientific party.

At Scott's suggestion, Debenham and some others at least got some brief experience of snow and ice in New Zealand in November 1910. The following month they were 'en route' and crossing the Antarctic circle in *Terra Nova*, making land on January 4th 1911. Debenham's task in Antarctica, the geological re-examination of the Royal Society Range, begun by David on the *Nimrod* expedition, included collecting geological specimens and some plane-table surveying which was to become a feature of his later academic career. Debenham was never likely to have been part of Scott's small party that made the ill-fated assault on the South Pole. By January 1913 it was all over with Debenham and the other survivors on their way home. But home for Debenham was no longer Australia: his immediate task was to write up the geological results of the expedition and that was to take place in Cambridge.

After the luck of being in the right place at the right time that led to his Antarctic experience, Debenham's future trajectory, like that so many young men of the time, took him into active service and the lottery of the First World War. Luck was still on his side and despite being blown up in Salonika in 1916, he survived but did not return to the front lines. From here on it was less luck and more personal determination that drove him. There were still Antarctic reports to be completed and he found a 'home' alongside hoards of unsorted rocks and fossils in the attic rooms of the Sedgwick Museum in Cambridge, loaned by Professor Marr. This was where the Scott Polar Research Institute was effectively born and remained until the University sanctioned a move in 1927 to a permanent home in Lensfield House. Meanwhile in 1919 Debenham joined the Geography Department, first as a lecturer, then reader and finally became the first Professor. So he saw the transformation of that department and indeed the discipline from the first fully-accepted honours degree in 1919. It had taken 31 years for Geography to be formally recognized from when the University had first appointed Francis Henry Hill Guillemard as a lecturer in Geography in 1888.

Peter Speak's biography gives glimpses of many different aspects of Debenham's remarkable career and the important changes that took place in the wider academic environment following the First World War.

Douglas Palmer

LOYDELL, D. K. 2007. *Graptolites from the Upper Ordovician and Lower Silurian of Jordan*. Special Papers in Palaeontology no. 78. 66 pp. London: The Palaeontological Association. Price £42.00 (paperback). ISBN 9781 4051 7978 2.
doi:10.1017/S0016756809006220

Palaeontology has gone from strength to strength in recent years. The astonishing – and astonishingly well-preserved – caches of fossils that have come to light are providing remarkable new insights into the course of evolution, while reconstruction of the Earth's past climate – a crucial context and prerequisite to understanding present climate – is underpinned and constrained by fossil evidence. This kind of work, however, depends utterly on maintaining and improving the systematic knowledge of 'normal' fossil assemblages: and this kind of work, being time-consuming and unlikely to attract headlines (or large grants), is increasingly hard to do in these demanding and impatient times. Hence it is welcome to see this major study of graptolites from around the Ordovician–Silurian boundary of Jordan.

It seems at first an unlikely subject to devote so much care and attention to. The graptolites had been hit hard by the end-Ordovician extinction associated with the brief but intense glacial phase of that time, and the general view (that I also used to hold) is of low-diversity faunas of bland and unremarkable normalograptid graptolites, largely resistant to detailed examination. Not so: by the kind of patient and careful study on which he has made his reputation, David Loydell has recognized 42 taxa in this apparently unpromising stuff, three of them new. It gives an altogether different picture of the diversity in this interval – and there are almost certainly more species out there, for there are still unsampled intervals in the stratigraphy. The study is made additionally useful because it acts as a bridge between two major graptolite provinces: the familiar graptolites of the European successions, and the endemic taxa of north Africa, previously biostratigraphically enigmatic.

Following relatively brief sections on the geology and biostratigraphy, the bulk of the work is of systematic taxonomic descriptions, concisely written and effectively illustrated, mostly by simple line drawings (the flattened but thankfully untectonized graptolites are not especially photogenic). There are the kind of surprises here that often turn up when type specimens of long-established and time-worn taxa are re-examined: Charles Lapworth's species *normalis*, for instance, formerly known as a *Climacograptus* and now the genotype of *Normalograptus*, is in reality a third larger in breadth than has been thought for a century. And there are nitpicks, too, of course, the taxonomic assignations that one might individually frown at (the wonderfully biform graptolites here assigned to *Neodiplograptus*, a genus that I have looked at askance ever since its genotype species, *magnus*, turned out to have thecae that are as uniform as you please).

No matter: this is a reference work that will continue to be well-thumbed by graptolite workers long after more fashionable scientific papers have faded into obscurity. Ironically, the data within it will be of use both to those extracting petroleum from the ground (the early Silurian transgressive 'anoxic' mudrocks are a major oil source rock) and to those pondering the possible effects of this contemporary global experiment (the marked latest Ordovician post-glacial transgression represents one of the most spectacular ice-sheet collapses of all time). A fine demonstration, then, of the diverse uses to be made of the humble graptolite.

Jan Zalasiewicz