their role in earth surface evolution; glacier composition, mechanics and dynamics; practice of glaciology.

The claim made for the book is that it is an authoritative and comprehensive reference work on contemporary issues in glaciology. It is certainly authoritative, with many of the world's leading figures in glaciology having provided contributions, but there are also plenty of welcome short articles by early career researchers who offer stimulating new insights into traditional and still sometimes unresolved problems. These articles are supported by a consolidated reference list running to 57 pages, comprising around 2000 entries. The book addresses many of the key issues facing glaciologists, ranging from process studies (including techniques), to how real data inform numerical modelling approaches in understanding glacier and ice sheet behaviour. Some controversial topics are covered by contributions from opposing standpoints. Perhaps the most personalized example is the subglacial flood hypothesis of Shaw and co-workers that is rather scathingly dismissed by Benn & Evans, but vigorously defended by Shaw himself. Issues such as this demonstrate that glaciological research continues to be healthy and vigorous, and reinforce the point that gathering of facts and data in the field remain vital to resolving complex physical questions.

Whether the book will be seen as comprehensive depends on one's perspective. For the geologist, key issues relate to the imprint of glaciers on the terrain and the stratigraphic record, in particular how modern processes can be used to interpret ancient glacial sedimentary sequences. Whereas many landscape features are covered in this volume, the coverage of such topics as glacial sedimentology and glaciotectonics is scanty. So for the geologist to translate understanding of the behaviour of glaciers, which *is* well covered, into an understanding of the geological record, the reader must turn to other volumes, such as David Evans's edited book entitled *Glacial Landsystems* (Evans, 2003).

Glacier Science and Environmental Change is a well illustrated volume, with good clear line drawings throughout. In contrast, the numerous black-and-white photographs are mostly of a disappointing flat appearance, and many are reproduced at little more than thumbnail size. The idea of leading major sections of the book and the individual contributions with photographs is a good one but, frustratingly, these images have no captions. The middle of the book contains much better reproduced plates, including coloured diagrams, such as ice sheet reconstructions, and colour photographs, but it is a shame they are divorced from the papers to which they refer. Presumably this approach is a cost-saving measure of the publishers.

The editor's target readership for this book includes advanced undergraduates, postgraduate students and professionals. Glaciologists (if not geologists) will be well served by this book, but the hefty price tag of £125 is likely to restrict purchasers mainly to libraries. Overall, this is a worthy volume that should be widely consulted, especially by professional glaciologists and geomorphologists. However, it is not flawless, and many geologists will find that it does not serve their needs as well as other glacier texts.

Michael J. Hambrey

Reference

EVANS, D. J. A. (ed.) 2003. *Glacial Landsystems*. London: Arnold.

FRANCIS, J. E., PIRRIE, D. & CRAME, J. A. (eds) 2006. *Cretaceous–Tertiary High-Latitude Palaeoenvironments. James Ross Basin, Antarctica*. Geological Society Special Publication no. 258. v + 206 pp. London, Bath: Geological Society of London. Price £75.00, US $135.00; GSL members' price £37.50, US $68.00; AAPG/SEPM/GSA/RAS/EFG/PESGB members' price £45.00, US $81.00 (hard covers). ISBN 1 86239 197 1. doi:10.1017/S0016756807003640

The Cretaceous and Paleogene periods have long been recognized as globally warm 'greenhouse' episodes in Earth history, and have consequently been used as analogues for future global warming. The polar regions are considered to be most sensitive to climate fluctuations and therefore research efforts in these areas are attracting interest from a wide audience. The recent increase in the British government's interest in climate change issues and the global debate on the subject means that this Geological Society Special Publication is extremely timely.

The editors' introduction provides an historical background to the exploration of the James Ross Basin and outlines the 13 papers included in the volume, seven on the Cretaceous and six on the Paleogene. The first two papers (Crame *et al*. and Whitham *et al*.) set the scene for the Cretaceous interval, presenting work on the sedimentary sequence and providing a framework for the following papers on the radiation and extinction of floras and faunas. This is a critical sequence for regional stratigraphic correlation and these papers provide thorough reports covering the sedimentology, tectonics, and volcanism of the fault-bounded basin margin. This work is supported by partial strontium isotope data that clarify some key biostratigraphic problems.

Two contributors investigate the macrofloral evidence for climate change and vegetation diversity from the Late Cretaceous to the Cenozoic. Hayes *et al*. concentrate on angiosperm leaf floras whilst Poole & Cantrill focus on the fossil wood record. Hayes *et al*. applied a range of quantitative (e.g. CLAMP analyses) and qualitative (NLR) techniques to the flora to deduce palaeoclimatic conditions during the Cretaceous. Poole & Cantrill concentrate on the evolution of biotas and the development of Southern Hemisphere biogeography. These studies provide a wealth of information on the composition and biodiversity of the vegetation that grew on the emergent volcanic arc and a record of the past climates.

The remaining three Cretaceous papers have a palaeontological theme. The first (Kriwet *et al*.) investigates the palaeogeographical and palaecological implications of Antarctic fish diversity. The second paper (Martin) puts marine lizards into a wider context with their last occurrence coinciding with the K–T boundary. The last of these papers (Martin & Crame) addresses the palaeobiological significance of vertebrate fossils.

The first of the Paleogene papers (Marenssi) investigates the James Ross Basin in a global context by describing erosional surfaces that coincide with sea-level lowstands. The majority of the Paleogene papers focus on Eocene palaeontology discussing mammals (Goin *et al*. and Bond *et al*.), penguins (Tambussi *et al*.) and the climatic significance of the terrestrial vertebrate fauna (Case). I would have liked to have seen photographs to complement the detailed sketches of the holotype described in Bond *et al*. These papers show the crucial biogeographic importance of Antarctica presenting a new genus, species and biozone. Case *et al*.

include palaeontological evidence for the initiation of cooling during the late middle Eocene.

The final paper (Hambrey & Smellie) presents evidence for the response of Antarctica to global climate and sea level change with the development of the Antarctic Ice Sheet during the Neogene.

As would be expected from the Geological Society Publishing House, this is a high quality, well structured production in hardback format. The clear descriptions and varied techniques described in this book make it a useful resource for undergraduate students approaching palaeoenvironmental or palaeoclimate studies for the first time. Specialists will use the book as a reference in stratigraphic correlation studies across the whole of the Southern Hemisphere, including proposed offshore drilling programmes (e.g. ANDRILL), and for comparison with Northern Hemisphere sections. It provides evidence for climatic conditions on Antarctica that can be used by climatologists and palaeoclimatologists in varied climate change studies. The book will also be a valuable resource for palaeobotanists and palaeontologists, providing a comparison to other key Cretaceous–Paleogene outcrops in the Southern Hemisphere, thus allowing radiations and extinctions to be tracked across the region.

In summary this book will be an important addition to any library that has researchers in Earth Sciences and will be of additional interest to colleagues from many other disciplines.

Melise Harland

SARMIENTO, J. L. & GRUBER, N. 2006. *Ocean Biogeochemical Dynamics*. xiii + 503 pp. Princeton, Woodstock: Princeton University Press. Price £48.95 (hard covers). 0 691 01707 7.
doi:10.1017/S0016756807003755

The authors of *Ocean Biogeochemical Dynamics* aim to provide a theoretical framework for the study of biogeochemical processes in the oceans. They set out an overview of the distribution of major and trace chemicals in the oceans and provide a review of ocean circulation. They adopt a hypothesis-driven approach to tackle some of the key issues, including air–sea exchange, organic matter production and its export to deep water, remineralization and ultimately burial in sediments. They then use the tools developed in earlier chapters to tackle the cycles of carbon, silicon and calcium carbonate and finally discuss the issue of CO_2 and climate.

Those expecting a cosy, qualitative view of the oceans should look elsewhere. This is a seriously quantitative effort! The authors make no apologies; the material is designed for those with a good grounding in maths and physics rather than chemistry and biology. The authors structure the chapters by first identifying the important questions, then examining available data and developing thought experiments and models and ultimately setting up hypotheses or paradigms to be tested. I found this approach to be stimulating and thought provoking. It is an excellent means of getting the message across and in instructing students how problems should be tackled, particularly in ocean biogeochemistry when there are often few data. For example, in the chapter on production, Sarmiento & Gruber develop their arguments regarding the efficiency of the biological pump in the different oceanic biomes by using a combination of observations and modelling. They explain the link between nutrient recycling efficiency and surface nutrient concentration in terms of consumption by phytoplankton, iron supply, light limitation and temperature. They suggest that even in the iron-limited Southern Ocean the system behaves like a large phytoplankton-dominated region, with potentially high export efficiency, rather than a picoplankton-dominated biome with low export efficiency. Why then does experimental addition of iron to surface waters of the Southern Ocean produce only a modest reduction in nutrient concentration? Primarily, the authors argue, because of light limitation. In developing this argument, the authors unravel the literature and provide their own insight to clarify a potentially tricky problem.

In the final chapter, Sarmiento & Gruber discuss the carbon cycle, CO_2 and climate. They identify the Southern Ocean as key in best explaining the variations in atmospheric CO_2 associated with glacial–interglacial cycles. They describe a synthesis hypothesis which links cooling with changes in productivity in the Southern Ocean, which in turn leads to a change in the distribution of nutrients and dissolved inorganic carbon even at low latitude. Ultimately the carbonate compensation depth shoals, leading to drawdown of atmospheric CO_2. Their hypothesis is compelling; their book will stimulate a new generation of oceanographers to prove them right, or wrong! I will certainly be recommending this excellent volume to my students and will no doubt be using it myself very frequently.

George Wolff

SHA JINGENG, WANG YONGDONG, & TURNER, S. (eds) 2006. *Marine and Non-Marine Jurassic: Boundary Events and Correlation* (Proceedings of the International Symposium on the Jurassic Boundary Events and the First Annual Symposium of the International Geoscience Program IGCP 506: Marine and Non-marine Jurassic). Special Issue of *Progress in Natural Science*, Volume **16**. vi + 322 pp. Beijing: Science in China Press; Abingdon: Taylor & Francis. Price £32.77 (incl. p&p; paperback). ISSN 1002-0071.
doi:10.1017/S0016756807003664

I suspect that many institutions will lack the wherewithal for a subscription to *Progress in Natural Science*. However, librarians (and individual scientists) may wish to purchase this special issue, available on its own at a reasonable price, for the wealth of information on Jurassic stratigraphy, environments and biotas that it contains.

There are three 'general' papers: a preface to the issue and outline of IGCP 506 (Sha *et al.*); a review of Jurassic chronostratigraphic units (Morton); and a synopsis of new and existing isotopic data from Jurassic (and Cretaceous) cephalopods, interpreted largely in terms of global climate change (Zakharov *et al.*). Of the remaining 27 studies, 23 have a locus in south and east Asia (India, Thailand, Vietnam, Japan, far-eastern Russia and China, with fully 16 papers devoted to the last country). The results are usually interpreted within a larger geographic context so there is a good deal to interest Jurassic workers based elsewhere. British Jurassic researchers, familiar only with non-marine facies from the mid- and uppermost parts of the system, will be fascinated by the descriptions of non-marine sediments and biotas from other horizons; for example in Xinjiang province, NW China, there is a thick and almost complete Jurassic sequence entirely in non-marine facies (Shi *et al.*). Fully 11 papers, however, deal with mid-Jurassic non-marine environments and biotas, greatly enlarging existing knowledge of this interval. Fossil preservation is generally very good, and sometimes exceptional, allowing determination of the internal structure (Wang *et al.*; Zhang *et al.*), organic geochemistry (Sun *et al.*), and stomatal