

that he is dismissive of a number of other contributors to this discipline. This recurrent whiff of the *ex cathedra* has the rather odd effect of making Mayr sound as a lonely voice, and one seldom gets the impression of biology being a buzzing, chatting, and engaging community of souls. Also, rather strangely there are very few examples of all the various wonders of biology and the marvels of evolutionary adaptation: even within the group of which Mayr was an acknowledged authority, the birds, such examples as the kiwi, hoatzin, swift and crow all have terrific stories to tell, but the woodenness of delivery leaves at least this reader feeling flat.

What of the autonomy of biology? This too is a curious gambit, and seems to this reviewer to point to incoherence. To be sure biology is a great deal more than the sum of its physical and chemical parts, and hence the recurrent lure of vitalism. That won't work, but simply for Mayr to claim autonomy is hardly sufficient if one wants to explain the evolution of such complex and integrated systems. Moreover, it is difficult to square such autonomy with the likelihood that there are deeper principles constraining what is and is not possible in biology, and however dimly somehow one senses that these must link to the other sciences.

It would be a mistake to think this book is without some value, and Mayr serves well to articulate existing pieties (such as humans being an evolutionary fluke with all the implications this has for the SETI programme) as well as providing crisp analyses as to the different types of teleology, but behind this one senses a mind that is straying into areas beyond his philosophical competence. He thus lauds the philosopher Quine in his claim that 'Darwin's greatest philosophical achievement [consisted] in having refuted Aristotle's final cause' (p. 91). Such a view is, of course, echoed by Dawkins (of whom Mayr is particularly dismissive) and Dennett, but I for one suspect that the complaint by Darwin's colleague, John Herschel, of evolution by natural selection being 'the law of the higgledy-piggledy' (p. 92), still retains a real force. Moreover, this reviewer would not be quite so ready as some to dismiss Aristotle and indeed some straws in the wind suggest that the origins of biological form, the template for its existence, may not be as nebulous as Mayr appears to think. Herschel's remarks suggest that even at the time of Darwin both he, and indeed the neglected Sedgwick, had actually put their finger on exactly why biology cannot, *contra* Mayr, be autonomous.

Simon Conway Morris

LOPES, R. 2005. *The Volcano Adventure Guide*. x + 352 pp. Cambridge, New York, Melbourne: Cambridge University Press. Price £30.00, US \$50.00 (hard covers). ISBN 0 521 55453 5.
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My initial impression on opening *The Volcano Adventure Guide* was that it could be just the gift for someone you want to 'bump off'. What could be a more original method of dispatching of an unloved one than to send them a book about planning a trip to an active volcano? However, Rosaly Lopes does clarify the risks of visiting volcanoes along with the essential measures for safe geo-tourism, so this turns out not to be a tome to file alongside the poisoner's handbook on the bookshelf. But Lopes' lively book is more than a travel guide: in her personalized Cook's Tour of the world's volcanoes, she delves into the science of volcanology and reviews some of the most famous eruptions in history and prehistory.

Actually, many millions of people *do* sightsee on volcanoes each year. The Hawaii Volcanoes National Park alone received nearly 1.5 million recreational visitors in 2007. And this is not a new phenomenon: Hawaii opened its doors as

a National Park in 1916, and, long before that, Europe's well-heeled dilettante and literati crowd flocked to Naples to admire (besides the magnificent citadels and Bourbon lifestyle) smoking Vesuvius across the bay. So, actually there is real sense in publishing a guidebook dedicated to volcano travellers.

Given the numbers involved in volcano tourism, it is unsurprising that a few are killed in the process now and then. Some of the fatalities result from the stress of hiking up to the summit, thin air at high altitude, and other effects of exertion in mountainous terrain. But there are infrequent incidents in which tourists become victims of volcanic activity: through being caught in unexpected blasts of lava bombs, or poisoned by fumarolic gases, or burnt by scalding mud. There was a close call in 2001 when Masaya volcano in Nicaragua erupted, showering a couple of hundred people in the car park at the crater's edge with hot rocks ejected from the vent. Several were struck by bombs but none seriously injured. Lopes evaluates these and other risks in the first part of her book (which also introduces the global distribution of volcanoes and essential background into eruption characteristics and causes) and provides checklists for preparing for a safe volcano trip. In case the worst should happen, she lists a set of rules on the course of action to follow when caught in an eruption, though it would be best to have read these beforehand.

The second part of the book consists of a set of chapters organized by region: Hawaii, continental USA, Italy, Greece, Iceland, Costa Rica and the West Indies. In all, there are entries for 42 volcanoes, describing their histories and notable features, along with practical information for visiting them. Of course, this is by no means an exhaustive list (there is no coverage for instance of the volcanoes of Japan, some of which are extraordinarily popular with local tourists) but it does give the volcano enthusiast (or armchair traveller) plenty to consider in planning (or imagining) a sulphurous vacation. Although the book refers to itself as a 'guide', it is not one of the more portable varieties. However, with its hardback covers, it would make a good seat for the volcano traveller, protecting against the often sharp edges of scoriaceous lava, and the large format suits well the overall presentation of text and abundant colour figures and maps.

Lopes is best known in the volcanological community for her research on planetary volcanism; perhaps her next *Adventure Guide* will be an 'extraterrestrial edition' aimed at future generations of space tourists . . . or people you *really* don't like.

Clive Oppenheimer

MARTILL, D. M., BECHLY, G. & LOVERIDGE, R. F. (eds) 2007. *The Crato Fossil Beds of Brazil. Window into an Ancient World*. xvi + 625 pp. Cambridge, New York, Melbourne: Cambridge University Press. Price £80.00, US \$150.00 (hard covers). ISBN 9780 521 85867 0.
doi:10.1017/S0016756808005657

The spectacular cover of *The Crato Fossil Beds of Brazil* is adorned with a photo of the magnificent fossil cicada (strictly speaking a palaeontinid cicadomorph) *Baecocossus* cf. *fortunatus*, described by F. Menon and S. W. Heads in 2005. Preservation here is so good that even the detailed colour patterning on its outstretched wings is still evident. The editors of this *Window into an Ancient World* (along with the publishers Cambridge University Press) are to be congratulated on producing such an attractive and useful work which will, no doubt, join OUP's Messel book, the Smithsonian's book on Florissant, etc., on our library shelves for decades to come.

Written by an international cast of 33 authors, this big book has 21 chapters, grouped into five parts, beginning with a general introduction to the Crato Formation Konservat Lagerstätte (in six chapters) and then runs through the invertebrate fauna (11 chapters with the insects being further divided into another 21 sections), the vertebrates (seven chapters), flora (two chapters) and finally miscellaneous bits and pieces; each chapter and section has its own bibliography. A glance through the references shows that for such a big book, that must have taken some time to put together, the individual authors have managed to be pretty well up to date with references to work published as recently as 2005 and 2006. Finally, there is a very useful species list and systematic index but no general index.

For palaeontologists, no matter what your specialization, this is a book to enjoy at your leisure even if it is just for the innumerable excellent illustrations which include 32 colour plates and countless drawings of the marvellous diversity of arthropods, especially the insects (over 100 species). As Günter Bechly points out, the early Cretaceous (probably late Aptian) age Crato Formation limestones and their fossils preserve an unusual mix and diversity of terrestrial and aquatic taxa. Furthermore, they record a time 'when plant/insect co-evolution was in its early stages' and since both plants and insects are particularly well preserved here, the biota is of particular interest over and above the obvious attributes of diversity and quality of preservation. However, the most frequent groups are 'Orthoptera, Blattaria, Hemiptera and Ephemeroptera... which together represent more than 80% of the fossil arthropod material based on a study of 3651 fossil arthropod(s)...'.

As with many historically famous fossils from platy limestones, most of the fossils from the Crato Formation have been found by stone workers in the course of splitting the rock for commercial purposes. The fossils are put aside for sale through a network of dealers and eventually the best reach an international market. Without such commerce most would never be found. However, the entire Chapada Araripe region has now come under protective environmental legislation and is in the process of becoming Brazil's first Geopark which will protect a number of internationally significant localities and provide educational facilities. Hopefully this will ensure a good balance between necessary commercial activity and protection of scientifically important sites.

Douglas Palmer

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MILLER III, W. (ed.) 2007. *Trace Fossils. Concepts, Problems, Prospects*. xxiv + 611 pp. Amsterdam, Boston, Heidelberg, London: Elsevier. Price £110.00, US \$185.00, Euros 155 (hard covers). ISBN 9780 444 52949 7.
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Ichnology is a rapidly expanding field that is finding applications in many different fields, from the search for early life on Earth, to petroleum geology, sedimentology, evolutionary palaeobiology, archaeology and zoology among others. This

interesting compilation of papers comes in a number of different formats from historical geology to review articles and original contributions. The editor has organized these into three sections: 'Historical Background', 'Concepts and connections to the earth and biological sciences' and 'Advances, fresh approaches and new directions'.

The 'Historical background' section hides a review of the ichnofacies model of Seilacher by MacEachern *et al.*, which provides for the first time very welcome definitions of new terminology that has been used in ichnofacies papers for the last 10 years or so.

For the non-expert, there is an excellent section on the preservation of trace fossils and the terms used to describe them in the 'Concepts and connections to the earth and biological sciences' section. The review of ichnology and sequence stratigraphy, also by MacEachern *et al.*, while effectively the same as that published by the same group of authors in 2004, is also worthwhile for someone new to ichnology. The same could be said for several of the papers which appear in very similar form in McIlroy (2004).

Highlights from the last sections of 'Concepts and connections to the earth and biological sciences' and in 'Advances, fresh approaches and new directions' include Miller & White's state-of-the-art review of lake ichnofacies, which involves integration of lake processes and trophic webs in a manner that is likely greatly to improve the understanding of the ichnology of such systems. Also in the same section is an excellent review of the biomechanics of burrowing by Jumars *et al.* that links sediment properties with burrowing mechanisms that, for me, helps to explain a lot of what I have found puzzling in trace fossils for many years.

In summary the volume is excellent in its scope, though its claim to be state-of-the-art is somewhat let down by the authors borrowing heavily on their earlier 2004 papers. I suspect that the book was a long time in press as many of the papers do not cite works after 2004. The reprographics in the volume are excellent, I would certainly recommend it as a library reference text to support other reading for students, and specialist ichnologists will find many little treasures of knowledge in the volume.

Duncan McIlroy

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This relatively slim Special Publication covers a broad topic in rock deformation: why some deformation is distributed through large rock volumes and other deformation is localized in narrow zones. The focus of the 12 collected papers is on the upper crust. Deformation here is classically envisaged as 'brittle' rather than 'ductile', though the volume shows that this view is over-simplified. There are few definitive answers in this collection to problems of upper crustal deformation, but some stimulating papers that better define some good questions to ask.