

BOOK REVIEWS

New periodical

Dewey, J. F., Tapponnier, P. E. & Burchfiel, B. C. (editors). *Tectonics*. Published bimonthly by the American Geophysical Union and the European Geophysical Society. (contact AGU for subscription information)

The first issue of *Tectonics*, which appeared in February 1982, contains a statement of editorial policy. The journal seeks papers on the 'structure, origin and evolution of the lithosphere with particular emphasis on the continents'. Its theme is the 'mechanical and thermal evolution of the lithospheric crust and mantle and the way this is reflected in cratons, basins, and mountains . . .'. The statement goes on to list a range of topics including the origin, secular evolution and growth of the crust; modelling and neotectonic studies of the continental lithosphere; rifts and basins; convergent zones; and ' . . . regional, analytical, synthetic and integrative tectonics . . .'. The editors clearly intend to cover one of the most exciting and rapidly growing areas of geology: the development of rigorous predictive models of behaviour of the crust and lithosphere on a scale one step down from that of plate tectonics. Papers on these topics have been dispersed among a range of geological and geophysical journals, and *Tectonics* will perform a useful function if it gathers them together and brings them to the attention of a wider geological audience. Hence the journal fills an identifiable niche; but what of the other occupants? The most obvious competitor is *Tectonophysics*, and there are areas of overlap with the *Journal of Structural Geology*, and with several geophysical and petrological journals.

Papers in the first issue cover the plate-tectonic evolution of Antarctica, models of a lithosphere containing density heterogeneities, measurements of strain and palaeostress in a subduction complex, crustal seismicity in the light of rock-mechanics data, and geometry and subsidence history of pull-apart basins. The mix is different from *Tectonophysics*, but sufficiently similar that the new journal will need to compete on other grounds as well. This the editors clearly intend: they aim for a review time of one month, and a (1982) price of U.S. \$20 for AGU and EGS members. I also hope that *Tectonics* will develop a more clearly defined scope and a more coherent editorial policy than *Tectonophysics*.

The new journal is reproduced from camera-ready copy produced by authors. The quality of the final product is uniform and good, though there is a higher incidence of error than in most typeset journals that go through a proof stage. Line-drawings are generally well produced, though there is the usual problem of stipple tones clotting or fading due to reduction. Photographs have suffered from the fairly poor-quality paper used—comparable in surface texture to *Nature*, and worse than the majority of geological journals, including *Tectonophysics* and *Journal of Structural Geology*.

Three questions, arising out of the stated aims of the journal, occur to me.

(1) Will it be able to maintain a clear sense of direction in a subject that has its roots in every aspect of the earth sciences, and which is also susceptible to speculation and fashion?

(2) How will the rapid-review policy affect the quality of the published papers? At least one of the more specialist papers in the first issue seems to me to be in need of more critical treatment. If the journal is aiming for rapid publication of controversial and topical papers (like *Geology*), will they make space for critical discussions, as *Geology* does?

(3) How will *Tectonics* approach research in structural geology? It is ironic that I was asked to write this review at a meeting of the Tectonic Studies Group, now the principal forum for structural geologists in western Europe; yet scarcely one in ten of the presentations at that meeting would be explicitly covered by the stated scope of the journal. Observational and analytical structural geology traditionally provided much of the data-base for tectonics.

Since the advent of plate tectonics, with its firm base in geophysics, there has been an increasing communication gap between the practitioners of large-scale tectonics and those of structural geology, particularly in the U.K. I hope that *Tectonics* will try to bridge this gap.

I think that a journal like *Tectonics* is needed; I wish the editors success, and I hope the journal survives in the present icy economic climate.

J. P. Platt

Plate tectonics

Condie, K. C. 1982. *Plate Tectonics and Crustal Evolution* (Second Edition). Pergamon Press, Oxford. 310 pp. Coloured Tectonic Map of the World. Price: hardcover £32.50, paperback £13.10.

Teachers of courses in tectonics, and earth scientists who require a quick update in areas of tectonics outside their own expertise, will welcome this thoroughly revised edition of Kent Condie's popular text *Tectonics and Crustal Evolution*. It is a measure of the pace of research, with the accumulation of new data and the rapid development of ideas in tectonics, that a second edition of Condie's book should have become necessary only six years after the publication of the first. Those familiar with the first edition will know that the text is aimed at advanced undergraduate and post-graduate students of the Earth Sciences who are taking courses in Tectonics.

In the first five chapters the author outlines the scope of his subject and its methodology, giving a résumé of present knowledge of the Earth-Moon system and the nature of the Earth's core, mantle and crust. Chapters 4 and 5 give a detailed account of techniques which have been used to explore the crust and on the basis of composition and structural characteristics, the author identifies ten types of crustal province. While the early chapters provide a wealth of factual information, and are useful for reference, they are difficult to read as the author does not make clear where all this data is leading us. Each aspect is dealt with as though it represented a separate and unrelated body of factual information. It is only in Chapter 6 'Sea-floor Spreading' that the main theme of the book becomes apparent and the text becomes considerably more readable. In Chapter 7 'Magmatic Associations', the author is clearly in his own area of expertise and provides an excellent summary of current thinking on the origin of magmas and their relationships to different tectonic environments, on the basis of geochemical data. The following chapter (8) 'Continental Drift and Plate Tectonics', includes a useful section on the relationships between tectonic environments and the occurrence of economic deposits of minerals and hydrocarbon accumulations.

Chapter 9 outlines movements of the continents during the Phanerozoic using the palaeomagnetic compilations of Scotese *et al.* (1979) and continues with brief descriptions of Phanerozoic mobile belts, including the Appalachian-Caledonian, Hercynian, Cordilleran and Alpine systems, in terms of plate tectonics. Inevitably, given the scope of the book, the treatment of this important aspect is somewhat superficial and fuller descriptions of their structural evolution, and discussion of the mechanisms by which they were formed would have been welcome. In particular, in his account of the North American Cordilleran system, the author deals cursorily with the concept of 'suspect terranes' (Coney *et al.* 1980); terranes allochthonous to the North American craton, accreted to the continental margin from the Pacific side since Triassic times. From his account, it is clear that the author has not assimilated the full significance of this new paradigm, which provides an explanation for the many anomalous features which result from the application of simple plate-tectonic models to the interpretation of ancient mobile belts, and gives new meaning to long-held concepts such as the 'orogenic cycle'. In any future revision this theme will surely be more fully developed.

For the final chapters of his book the author considers the evolution of the continental crust through time, and in particular its origin the Precambrian, with the development of the oceans and the atmosphere, and the associated origin and evolution of life. Chapter 10 is particularly valuable and thought-provoking, bringing together and expanding sections, which were scattered through the earlier edition, to form a new chapter on the Precambrian crust. An excellent summary is given of the Archaean provinces and Proterozoic rock associations, but

perhaps the author comes down too heavily against the operation of plate tectonics at these early stages in Earth history. The evidence here, particularly from palaeomagnetic data, is not yet sufficiently conclusive for plate mechanisms to be dismissed as a factor in the accumulation of the early crust. Again the concept of allochthonous terranes, with the possibility of large-scale transcurrent faulting, both during and after accretion, provides further degrees of freedom in the interpretation of the early mobile belts. Archaean orogenic belts will need to be reexamined in the light of this new model.

Each chapter is followed by a list of statements summarising its contents and a list of suggestions for further reading. A detailed reference list is given at the end of the book, followed by a comprehensive index. The text is profusely illustrated with line drawings throughout and the volume includes a large, coloured tectonic map of the world, suitable for the lecture room.

In spite of its comprehensive coverage and its excellent presentation, the main impression left after reading Condie's book is one of disappointment. The author fails to convey the sense of excitement which motivates most research workers as the developing concept of plate tectonics, with its many variations on a few simple themes, provides more and more convincing models to explain the complexity of orogenic belts, and permits the formulation of more coherent theories of crustal evolution. The author's view of plate tectonics, derived from a geochemical, rather than a structural or deformational standpoint, appears to be essentially static. Plate tectonics is a dynamic process describing events which are in progress at the present day. Potentially, from the evidence which it provides of the present interactions of crustal plates, we can deduce the processes by which one crustal type is altered into another, and can extrapolate these processes backwards through time to account for the present composition and structure of the whole of the Earth's crust.

Despite these reservations Condie's book clearly fulfills a need, and the success of the first edition has encouraged the publishers to improve the presentation of the second edition. No longer is it presented as camera-ready copy; line drawings are placed at appropriate positions in the text, rather than gathered together at the end of each chapter, and the author has been encouraged to carry out a thorough revision of his text with the introduction of much new material and updating of his references. Comprehensive coverage, attractive presentation and moderate price will surely commend this book to all students of the Earth Sciences.

A. J. Barber
N. Breen

REFERENCES

- Coney, P. J., Jones, D. L. & Monger, W. H. 1980. Cordilleran suspect terranes. *Nature, Lond.* **288**, 329–333.
Scotese, C. R., Kambach, R. K., Barton, C., van der Voo, R. & Ziegler, A. M. 1979. Palaeozoic base maps. *J. Geol.* **87**, 217–277.

Geophysics, then and now

Bates, C. C., Gaskell, T. F. & Rice, R. B. 1982. *Geophysics in the Affairs of Man*—A personalised history of exploration geophysics and its allied sciences of seismology and oceanography. Pergamon Press, Oxford. 492 pp. Price: hardcover £30.00; softcover £12.30.

When I first picked up this book my initial impression was that I would be bored by page twenty and would have little inclination to read on through the next 400 pages. The book has a dull look about it. The cover is dull and the pages are cluttered with footnotes and quotations, all in very small print. The illustrations are mainly grouped into six sets of postage-stamp size photographs distributed at intervals throughout the book, unreferenced to the text, of generally poor quality and often of doubtful relevance. For example, in the group of illustrations between pages 286 and 287, the pages of photographs are not numbered, a diagram showing the evolution of sensors for underwater warfare was obviously prepared for publication at two to three times the size printed here and is for the most part quite illegible. Also in terms of relevance to the text (in the same group of photographs), who is Linda Benedict, Junior Surveyor on Seismic Party 1741 of Geophysical Service, Inc. and what is the happy snap of her at work outside Evanston doing on the same page as passport portraits of John Slaughter (Director, NSF), Manik Talwani (Second Director, Lamont-Doherty) and Bettye Athanasiou (Life Member SEG)?

However, despite its many shortcomings in presentation, much of this book makes interesting and entertaining reading. It contains a wealth of information concerning events which have happened within the lifetimes of the authors. Much of what they write must be in part based on first-hand experience and familiarity with the circumstances of events as well as the people involved. This account of the birth and development of modern geophysics during the past few decades is admittedly personalised but much of its merit derives from the way in which the authors succeed in telling their story as from the view-point of an insider, someone directly involved in the events that occurred.

The book commences with a very brief description of how the science and technology of geophysics developed from earliest recorded knowledge until the end of the First World War. The inter-war years are seen as 'geophysics coming of age'. Then follows a chapter on how many well-known and eminent geophysicists spent the war years. Interesting though this chapter is, there is little evidence for much advancement in conventional geophysics during this period; seismology and oceanography were given more attention. Immediately post-war, exploration geophysics became again a field of active research and renewed application in the search for hydrocarbons and minerals. Over the same period, the foundations were laid for major international cooperation in such enterprises as the International Geophysical Year (1 July 1957 to 31 December 1958). The 1960s are seen as a period of significant interplay between science and government and of course the beginnings of revolution with development of plate-tectonic theory. The final historical chapter covers the 1970s and early 1980s, a period of boom in exploration geophysics following great technical advances in seismic exploration technology. At the same time, however, there were complex economic and political changes occurring with environmentalism on the one hand and OPEC on the other, radically influencing both governmental and corporate policy in resource exploitation.

The broad history having been covered, the authors then give a well-documented account of geophysics as a business with a detailed analysis of the pattern of growth of many of the major contracting companies so well known today to the practicing geophysicist. Finally, and again in a very personalised way, the realm of geophysics is given added perspective by introducing the views of a number of eminent contributors, either as short statements of actions in their careers which had given greatest personal satisfaction, or as a series of *vignettes*, such as that by W. Harry Mayne: 'Conception of the Common-Depth-Point (CDP) Method of Seismic Surveying'.

With so much good material within it the book must be judged as a successful enterprise. I know I will use it often for reference and as a source-book. I would have preferred it to be shorter, better illustrated and with less devotion to oceanography, which in my opinion is given more eminence than necessary as an allied science to geophysics. I warmly recommend it to all involved in geophysical research and exploration.

R. McQuillin

Inside information

Bolt, B. A. 1982. *Inside the Earth: Evidence from Earthquakes*. W. H. Freeman & Company, San Francisco. 191 pp., 75 figs. Price: hardcover £16.90; softcover £7.70.

In this book, Bruce Bolt throws light upon not only the obscurities of the Earth's internal form and composition, but also the mysteries of earthquake seismology, which can often appear as impenetrable as the Earth itself. To many, acronyms such as U.E.O. (unidentified earthquake onset) and the codes for seismic arrivals, such as PKiKP (a p-wave refracted through the Earth's outer core, reflected from the surface of the inner core and refracted back to the Earth's surface as a p-wave), serve only to increase the impenetrability of the subject, leaving them with the feeling that as long as there are a core and mantle down there somewhere, that is fine with them and the Earth. It is Bruce Bolt's intention to make the subject plain to readers whether they be students or 'curious laymen'. He has set himself the difficult task of explaining qualitatively, often by analogy, an essentially quantitative science. In this he generally succeeds admirably, but he finds it difficult in early chapters to avoid clumsiness in stepping around certain topics which are dealt with in later chapters or cannot be treated at length where they arise. Certain basic information about seismic theory and excerpts from important papers are presented in 'boxes' aside from the main text, which makes 'hem easy to refer to. Subjects are cross-referenced well, and the figures are clearly drawn and annotated.