

occupy a volume itself, but then so could several topics included in the text.

The subject matter of the two chapters on meteorites and the terrestrial planets is not often covered in igneous and metamorphic petrology texts, and the 30 and 22 page chapters can serve only as a bare introduction to the subjects. As such they are somewhat out of place beside the more detailed treatment given to other topics.

As one may expect from a knowledge of the research contributions of each of the authors, the chapters dealing with metamorphic rocks lean heavily on model reactions that have determined experimentally, or deduced from theoretical analysis. A great many reactions are listed and illustrated in various graphical presentations, but the end result may be somewhat confusing for a student because there is only very limited discussion of the possible pitfalls involved in applying such reactions to real mineral assemblages. Classification of igneous rocks is dealt with in purely chemical terms, and this may be justified by the treatment in subsequent chapters. A student should be encouraged to relate to rocks by reference to the Streckiesen or an alternative mineralogical classification. The book presents as facts a number of concepts that others may consider controversial, but it achieves a broad coverage of igneous and metamorphic processes in a manner that will stimulate the top students to further investigation. I would have great difficulty using this book as a text because of the mixed level of introductory petrology and more advanced chemistry. However, it could play a useful role in a supplementary reading list for undergraduate courses.

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Concepts and Methods of Biostratigraphy

Edited by Erle G. Kauffman
and Joseph E. Hazel
Dowden, Hutchinson and Ross, Inc.,
658 p., 1977.
\$35.00

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Almost two centuries ago, William Smith made known his momentous dual discovery that formations are arranged in a regular order and that each is characterized by its own peculiar fossils; since then, however, the literature has remained devoid of a comprehensive account of the concepts and methods governing the application of fossils in stratigraphy, over and above the rather cursory treatment included in textbooks on paleontology, stratigraphy and earth history. In this setting, the publication of a book which, in the words of the editors, was "conceived to at least partially fill this void", must rank as something of a landmark in the annals of biostratigraphy irrespective of the merits (or defects) of the work itself.

Some 30 or so invited contributors, two-thirds located in the United States, authored the 25 papers of which the book is comprised. These are grouped into four major sections, each consisting of six papers, covering: 1) conceptual aspects of biostratigraphy, 2) biostratigraphic methods, and the biostratigraphic utility of selected groups of 3) mobile, and 4) essentially sessile organisms. In addition, an introductory paper by J. M. Hancock outlines the historical development of classification and correlation in terms of the personalities involved, from William Smith and his contemporaries in the early nineteenth century to the influential Hollis Hedberg of more recent date.

The first two papers in the conceptual section (N. Eldredge and S. J. Gould; P. C. Sylvester-Bradley) discuss the relative merits of different evolutionary models and their applications in biostratigraphy. In this same section, biological and ecological factors which contribute

to the attributes of the 'good zonal fossil', such as wide geographic distribution and rapid rate of evolution, are explored in the contributions of J. B. C. Jackson, R. S. Scheltema, E. G. Kauffman, and J. W. Valentine.

The section on biostratigraphic methods includes two papers which approach the issue of correlation from the mathematical standpoint, one by F. X. Miller reviewing graphic correlation methods and the other by J. E. Hazel on multivariate analytical techniques. A further three papers describe the establishment of biostratigraphic schemes in selected geographic areas over restricted time intervals: the Cenozoic of the Gulf Coast (C. W. Poag), the Central European Neogene (F. F. Steininger), and the Maastrichtian of northwest Europe (F. Surlyk and T. Birkelund). The sixth contribution in this section, by J. A. Van Couvering and W. A. Berggren, seeks to integrate Neogene biostratigraphy with the paleomagnetic and radiometric time scales formulated for the same period.

The final two sections of the book consist of papers devoted to the biostratigraphic utility of selected fossil groups, ranging from consideration of such classics as the ammonites (W. J. Kennedy and W. A. Cobban) and graptolites (W. B. N. Berry) to more unlikely contenders such as the gastropods (N. F. Sohl), a group not usually in the forefront of biostratigraphic endeavour. Other contributions in these two sections deal with conodonts (F. H. T. Rhodes and R. L. Austin), foraminifera (B. Mamet; R. C. Douglass), trilobites (M. E. Taylor), corals (W. J. Sando), brachiopods (J. B. Waterhouse), and echinoids (G. Ernst and E. Seibertz), while a token indication that biostratigraphy is not the sole preserve of the invertebrates is provided by the inclusion of one paper each on spores and pollen (J. A. Doyle) and vertebrates (D. E. Savage).

Inevitably, in a compilation involving so many authors, individual contributions vary widely in approach, content and quality, even within the confines of a single major section; contrast, for example, the generalized overview of ammonite biostratigraphy presented by W. J. Kennedy and W. A. Cobban with the detailed treatment accorded to the fusulinid foraminifera by R. C. Douglass.

At the same time, the restricted geographical distribution of the majority of the contributors has conveyed a predominantly North Atlantic bias to the text. It should be borne in mind, however, that such is the scope of the topic encompassed by the title of the book that it would be impossible to give complete and uniform coverage within the confines of a single set of covers and, at least, the editors have achieved their aim of *partially* filling the void!

The book suffers from a number of technical defects which reflects careless proof-reading and lax editorship. Thus, the text is beset with numerous typographical errors while several text figures have the lettering inverted. Such defects might be excusable if they betokened rapid publication. That such is not the case, however, is clearly evidenced by a perusal of the lengthy bibliography comprising more than 1500 citations, the most recent of which pre-date Hedberg's 1976 International Stratigraphic Guide by at least two years. For this reason, the book was already something of a 'period piece' at the date of publication. It tells us nothing new, but it does fulfil the valuable role of bringing together a wealth of information widely scattered through the literature. It is a useful reference, but not a fount of new ideas.

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Stromatolites: Developments in Sedimentology 20

Edited by M. R. Walter
*Elsevier Scientific Publishing Co.,
790 p., 1976.
\$99.95*

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A few years ago, I was present at a seminar given by M. A. Semikhatov on the advances in Russian thinking on the use of stromatolites in biostratigraphy. I was intrigued to discover that the Russians, the leaders in this field, were becoming more and more sensitive to the influence of physical or environmental factors on Precambrian stromatolite morphology, rather than considering them purely organic structures, while from my own experience with modern stromatolites I knew that researchers working with modern forms were recognizing increasingly the biological controls of morphology. This "depolarization" and the growing interdisciplinary approach to the study of stromatolites is documented convincingly in this book edited by Malcolm Walter.

Walter and Elsevier have produced a comprehensive but very expensive compilation of 43 papers by 42 contributors which touches on nearly all aspects of stromatolite morphology, biology, sedimentology and biostratigraphy. It is destined to become the standard source book for stromatophiles, even though most will not be able to afford its excessively high price.

The papers or chapters in the book are categorized by topic into 12 groups; the more significant of these groups, with the number of papers in each in parenthesis, are: Methodology and Systematics (5), Abiogenic Stromatolite-like Structures (3), Biology of Stromatolites (5), Fabric and Microstructure (2), Morphogenesis (4), Biostratigraphy (3), Recent Models (8), Basin Analysis (9), and Mineralization Associated with Stromatolites (2). As with any compilation of this size, the quality of papers, and

the value of the contribution of individual papers to the volume as a whole, are variable. Many of the papers are brief, some disappointingly so, and some cover topics published elsewhere. The overall quality of the book, however, is very good, and illustrations are plentiful and generally of good quality. Walter is to be congratulated for what must have been a long and demanding job of editing.

The book will be most valuable for the collections of papers on biology of stromatolites, on abiogenic stromatolite-like structures, on morphogenesis, and on recent models. At first sight, an obvious gap is the absence of a paper by Brian Logan or his research group on the Shark Bay stromatolites, yet this deficiency is covered by papers by Hoffman and by Playford and Cockbain, and also by papers by Logan's group in AAPG Memoir 22. Geologists aware of some of the controversies over interpretations of some carbonate provinces in Western Australia may find the summary of the history of discovery and research on the Shark Bay stromatolites given by Playford and Cockbain in the Introduction to their paper of interest.

To some extent, the study of stromatolites and their environmental interpretations have been over-influenced by the unique occurrence of the stromatolites of Shark Bay, and their concentration in the present intertidal environment. The "bandwagon" effect so common in geology (and other sciences?) has placed too much emphasis on stromatolites as diagnostic of restricted intertidal environments, and not enough on the environmental and biological (plus evolutionary) principles involved. The papers by Playford and Cockbain, and by Hoffman document the occurrence of subtidal (sublittoral) stromatolites in Shark Bay, and should be read carefully. The pitfalls of unqualified uniformitarianism are many and varied.

I have not read every word in every paper in this book, but it is essential reading for anyone working with stromatolites, for even many specialists in the field probably do not have the broad overview of all aspects of the topics covered by the book. It is disturbing to conclude that useful as this book will be, its price puts it beyond the grasp of the student, the average geologist, and indeed many smaller university libraries.

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