

REVIEWS

J.F. KIRKALDY 1971: *The study of fossils*. Revised edition. London: Hutchinson Educational. 116 pp., 58 text-figs. £0.90.

F.A. MIDDLEMISS 1971: *A guide to invertebrate fossils*. Revised edition. London: Hutchinson Educational. 128 pp., 27 text-figs. £1.05.

RHONA M. BLACK 1970: *The elements of palaeontology*. Cambridge: University Press. 339 pp., 201 text-figs. Paperback, £2.25 (also available in cloth).

D.M. RAUP and S.M. STANLEY 1971: *Principles of paleontology*. San Francisco: Freeman. 388 pp., many illus. (numbered by chapter). £4.80.

For many decades, the palaeontologist has been ill served by textbooks: publishers have been reluctant to sponsor new works and outdated or unsuitable works have run through edition after edition, simply because no more palatable alternatives were available. At long last, the situation is changing. This is partly the result of a growing public interest in the general field of geology, but a much bigger initial factor has been the demonstration by Pergamon Press and Elsevier that there is always a reading public for scientific texts, however esoteric the subject, and that, if the price were scaled correctly, the publisher could scarcely fail to profit.

A second phase has now begun with the publication of series of inexpensive works, restricted in length and illustrated by line drawings rather than photographs. These series are aimed partly at students, partly at scientists who wish to learn something of a field outside their own specialism, partly at an amateur readership. The price is pitched generally lower than £2.00, to encourage purchase on the spur of the moment by the casual bookshop browser. The first two works here reviewed, and two more specialised books treated in the review which follows, exemplify this newer trend. The result of these two phases of publishing activity is that at long last the palaeontologist (professional or amateur, specialist or student) can find on the booksellers' shelves something designed to suit his particular needs - a happy reversal of his earlier position.

Kirkaldy's book, originally published in 1963 and now fully revised, is intended to introduce fossils to the biologist; however, it is equally suitable as a first text on palaeontology for schools or Adult Education courses or as a stimulus to a casual interest in the subject. The author's style is relaxed and lucid, refreshingly free from ambiguities of meaning and multi-claused sentences: the illustrations integrate well with the text. The presentation is straightforward and sensible. After two chapters sketching in the geological background, the nature of fossils and their mode of preservation is summarised and a brief account is given of the succession of life through time, representatives of most major fossil groups being figured. It is good to see the inclusion of a brief treatment of micropalaeontology and palynology, though the author should remember that the latter topic covers a variety of other groups (chitinozoa, dinoflagellates, acritarchs, etc.) as well as spores and pollen. The treatment of trace fossils is unduly brief, in view of their importance, and a section on the collecting of fossils might have been helpful: but limitations on space probably precluded such additions.

A few errors may be noted. "Scolecodont" is mis-spelled in the caption to Fig.11: and Fig.11H seems to be a Tintinnid, not a radiolarian. Dr. Machin's illustrations are so economical in shading and detail as to be occasionally misleading; for example, the dentition in *Glycimeris* (Fig.36B) is shown wrongly. On p.30 it is stated that "in a few cases, complete carcasses of mammoths have been found": the number of authenticated finds in fact approaches 30! The dismissal of d'Orbigny as a "catastrophist" (p.67) oversimplifies his attitude. These points are all minor: in general, Prof. Kirkaldy has admirably fulfilled his aims.

Less satisfactory is the companion volume by Middlemiss, in which more is attempted and less attained. To review the whole field of invertebrate palaeontology in a mere 128 pages,

including illustrations, must clearly involve a great deal of selection and the author merits a great deal of sympathy in his attempt: even so, the virtual omission of the stromatoporoids and the complete omission of any treatment of such important groups as the blastoids, archaeocyathids and especially the ostracods is hard to excuse. The statement of page 51 that the brachiopods are "the largest and in many ways the most important of all the major groups of fossil animals" is downright astonishing! On page 18, the hystrichospheres are distinguished from, and stated to be of greater geological importance than, the dinoflagellates: however, it has been known for ten years now that the true hystrichospheres are in fact cysts of dinoflagellates and that the latter are of great stratigraphical importance in Mesozoic and later rocks, as are earlier forms once called "hystrichospheres", now designated acritarchs, in the Palaeozoic and late Pre-Cambrian. In the review of the arthropods (pp.101-103) the existence of such other fossil groups as the phyllocarids, brachiopods, and ostracods is not even mentioned: the implication (p.102) that king-crabs have no fossil history is presumably inadvertent.

The illustrations are attractively presented, but do not repay close study: their captioning also requires a drastic overhaul. To illustrate this, let us consider the illustrations of the bivalves (Figs.14 to 17). The outline of *Arctica islandica* (Fig.14) is incorrect. The *Nucula* illustrated in Fig.15 is not recognisably *N. similis* and the resilifer cannot be seen in this illustration or that of *Ostraea edulis*. The two illustrations of *Trigonia* (Fig.16) both appear to represent broken specimens (why?) and their generic assignation is questionable: the excellently drawn "*Pteria*" is in fact an *Oxytoma*. In Fig.16, the *Arca* is excellently drawn whereas the *Carbonicola* is scarcely recognisable as such and the supposed "*Pholas*" is actually *Barnea candida*.

The text is clearly written and laid out: essential terminology is summarised; the reviews of the geologic range and importance of the groups are useful. However, I feel that the systematic errors will need to be eliminated and the illustrations revised before this work can be considered a satisfactory reference for the amateur geologists, school and first-year students for whom it was written.

No comparable major criticisms can be levelled at Rhona Black's *Elements of Palaeontology*, which treats at a more extended length with an even wider field. The illustrations are consistently of high quality - figures crisply drawn and clearly labelled, photographs excellently taken and reproduced very well, including four fine colour photographs. I noted no systematic errors in captions or text. However, there are a few faults in presentation: chapter 16 "Microfossils" is misleadingly titled, since it effectively deals only with foraminifera and conodonts, reference to other groups of microfossils being scattered through several other chapters. (Incidentally, there is no mention of the fossil dinoflagellate cysts, despite their stratigraphic importance). Trace fossils again receive too little attention. The author clearly saw no need to deviate from the tried and tested layout adopted in so many earlier works: originality of approach is perhaps difficult to attain in a systematic survey such as this. She has produced, in consequence, a worthy and useful work, precisely in the main stream of palaeontological texts for University and College students and enthusiastic amateurs, all of whom will find it a useful acquisition.

In complete contrast is Raup and Stanley's *Principles of paleontology*, whose authors have perceived the need for a complete rethinking of the method of textbook writing for palaeontologists to incorporate the wealth of new approaches now opening to the student of fossils. Their cover, an analog-computer simulation of the shell form of a gastropod, sets the tone for one of the most refreshing and stimulating palaeontological texts yet written.

The work is designed for use as a basic text in University teaching, though all palaeontologists of whatever level of attainment are likely to find something of value. It is divided into two parts: "Description and classification of fossils" and "The uses of paleontologic data". Early in the work, the scale of the problem facing the palaeontologist is made clear: given that there are around 4,500,000 living species, it is possible to calculate that there must have been around 982,000,000 species in existence in the 600 million years since the beginning of the Cambrian and, whilst many of these are of course not capable of fossilisation, it has been computed that, there have been at least 10,000,000 species of preservable, marine organisms alone.... No wonder palaeontology is often considered a science of names; no wonder so many students plump for the softer options of petrology, geophysics, etcetera.....

Having stated the problem, the authors detail the approaches adopted - the description of single specimens and of fossil populations; the characters used in identifying species; the methods of assessing ontogenetic variation and variation within populations, as a consequence of environmental controls and evolution (acting separately or together); the methods of taxonomy, the science of classification. Then, having explained how the data is assembled and classified they proceed to show how it is used, in assessing adaptation and functional morphology, in determining past environments, in demonstrating the course of evolution, in the relative and (to a restricted extent) in the absolute dating of rocks, in determining the degree of rock deformation during earth movements, and as an index to the composition of past seas.

Their deduction that the occurrence of vertebrate footprints in rocks from which no fossil bones have been recovered means that "tracks could be preserved but not skeletons" (p.6) is unjustified. A single living animal can produce, during its life, many thousands of tracks and there is a greater probability that some of these tracks should be preserved than that the single skeleton should survive. Their claim (pp.39-40) that the word "small" is meaningful in taxonomic descriptions is slightly overstated: despite their defence, such terms remain inexact in absence of further quantification, even when applied within restricted groups. A much greater fault - and a familiar one in texts produced by palaeozoologists - is that they make no mention, in the section on taxonomy, of the *International Code of Botanical Nomenclature* and seem unaware of its provisions, profoundly different in some respects from the *zoological Code* and much more adjusted to the needs of the palaeontologist.

They do not attempt the task which Rhona Black set herself, of describing the major groups of fossils, outlining their history and summarizing the morphological terminology applied to each. Indeed, these two books complement one another and together provide an epitome of the science of palaeontology as it is at present.

William A.S. Sarjeant.

J.S. RYLAND 1970: *Bryozoans*. London: Hutchinson University Library. 175 pp., 21 text-figs. £0.70.

M.J.S. RUDWICK 1970: *Living and fossil Brachiopods*. London; Hutchinson University Library. 199 pp., 99 text-figs. £0.80.

These two works form part of an attractively produced, and very moderately priced, series of textbooks, intended for biologists but in some instances of equal interest to palaeontologists. The series is edited by Professor A.J. Cain, of the University of Liverpool. The bindings are all attractive, the type-face pleasant to read, and the illustrations uniformly clear and well-labelled.

The first of the books, written by a zoologist, will only appeal to palaeontologists with a strong interest in living forms. Two chapters only (6 and 7) are of specific geological interest. The author adopts the current view, still disputed by many specialists, that the Entoprocta are unrelated to the bryozoans. In chapter 4, he gives an interesting account of the ecology of the Gymnolaemata and, on p.67, lists the bathymetric distribution of colonial forms in present marine environments: unfortunately, very little is said about the palaeoecology of fossil bryozoa, despite the considerable amount of work done on this topic. (Some of the major works are listed, however). Some terms are defined inadequately (e.g. "reteparine", p.67: "lunulitiform", p.68): some references are incompletely cited: but in general, the text is explicit and most points are dealt with clearly. This book must be welcomed as the first inexpensive text on a group strangely neglected in geology courses, despite their wide distribution and stratigraphical importance; at the same time, its palaeontological shortcomings must be lamented.

Since the number of living genera of brachiopods is insignificant in comparison to their fossil representation, it is entirely proper that the second work should be written by a palaeontologist. Professor Rudwick acknowledges, in his introduction, his indebtedness to the *Treatise of Invertebrate Palaeontology*, Part H, *Brachiopoda*, a work to which he himself contributed. This indeed was epochal in the study of this group, since it brought the first semblance of order into a prevailing situation of taxonomic chaos and also stimulated research on living forms by such palaeontologists as Alwyn Williams of Belfast and Albert J. Rowell, then of the University of

Nottingham. It is greatly to the credit of Professor Rudwick that he has written a thoughtful and original work on the brachiopods, instead of merely producing a potted extract from the *Treatise*. In particular, he has developed interestingly a number of themes concerning physiology and ecology - the senses of brachiopods, the ways in which they protect themselves, the modifications of the structure of the lophophore through time and the feeding habits to which these correspond, the relation of the brachiopod to its substrate - which well demonstrate how the palaeontologist can help the zoologist, and vice versa. This is an admirable work and can be recommended without qualification: it is to be hoped that similar works on other groups will follow in this series.

Leslie A. Riley and William A.S. Sarjeant.

J. CHALLINOR 1971: *The history of British geology. A bibliographical study*. Newton Abbot, Devon: David and Charles. 224 pp. £3.50.

Distinguished historians of geology are fairly rare birds; bibliographers are almost equally uncommon elements of the geological fauna and even more rarely distinguished. One of the very few who can claim to be distinguished both as geological historian and bibliographer is Mr. John Challinor, now in what is proving a very active retirement from the Senior Lectureship in Geology in the University of Wales, Aberystwyth. His publications include a series of bibliographies of Staffordshire geology, the familiar and useful *Dictionary of Geology*, and historical works: some of local Midlands interest, such as "Dr. Plot and Staffordshire geology" and "From Whitehurst's 'Inquiry' to Farey's 'Derbyshire': a chapter in the history of English geology" (*Transactions of the North Staffordshire Field Club*, 1944-45 and 1946-47), some of national interest, such as "The progress of British geology during the early part of the 19th Century" (*Annals of Science*, vol.26, 1970). It is an honour to our Society that he should be one of its Honorary Members.

The book here reviewed is clearly destined to become a basic tool for future geological historians. Pride of place is given to a chronological listing of primary literature. This begins with the earliest recorded observation on British stratigraphy, by John Leland (c.1538) and includes George Owen's manuscript account (1603) of the outcrop of the Carboniferous Limestone in South Wales. The familiar roster of papers by the "giants of geology", from Hutton through to Lyell, are all included: whilst the author concentrates on works of specifically British interest, he also lists some that were seminal in geological thinking without being directly relevant, e.g. Darwin's *Origin of Species* (1859). As he progresses through the later nineteenth century towards the present (the latest items included date from 1969), the author has had to decide what should be included from among an increasing flood of literature. His choice inevitably cannot include all works which any particular reader personally considers important (for my own part, I regret the omission of Arkell's "Standard of the European Jurassic", *Bull. Geol. Soc. Amer.* 1945, one of the most important of all contributions to stratigraphical thinking). The increasing emphasis on books in the period from 1955 onwards is surely undesirable, since books tend increasingly to lag far behind research and now rarely contain any truly original work. However, it is unfair to extend such criticisms. Many scientific historians seem to consider the minimum "safe distance" to be about a century of scientific development - their excuse, the need to attain "true perspective"; their real reason, I suspect, a desire to avoid controversy or the danger of making a false judgement. Mr. Challinor is to be congratulated for venturing so far beyond this boundary; his doing so may instil a greater courage of opinion into future geological historians....

Following the bibliography, there is an extremely interesting discussion of the major themes treated, in which the original authors are directly quoted wherever appropriate. Supplementary references (papers commenting on, or enlarging themes treated in, the papers in the main list, plus historical or bibliographical works) are also listed. Here again, there is (inevitably?) some element of selection: A bibliography of works on the history of geology, currently being prepared by my wife and myself, may ultimately supplement this.

The binding and dust-wrapper are attractively designed, the type-face readable, the price rather high but not impossibly so. Strongly recommended.

William A.S. Sarjeant.