BOOK REVIEWS

ANDERTON, R., BRIDGES, P.H., LEEDER, M.R. and SELLWOOD, B.W.
A dynamic stratigraphy of the British Isles; a study in crustal evolution
Allen & Unwin, 1979, 301 pp., illustrated text-figs., soft back - £7.95

The title of this book suggests that stratigraphy and geological history are to be combined, with the British Isles as the centre of the arena. Previous books on these subjects (Rayner, D.H. and Bennison & Wright) were written before plate tectonics, as a method of crustal evolution, could be included, so that the text reviewed here must be a considerable advance on previous texts.

The content of the book and its arrangement also differs from previous texts in that there is much new information, and the restrictive straight-jacket System descriptions is overthrown for a more logical tectonic framework. Thus the book commences with early crustal formation on a global scale and later the British Isles includes at least the adjacent sea areas. The early Iapetus Ocean dominates the account of the late Pre-Cambrian and Lower Palaeozoic and later the British Isles is considered as a margin of the European Continent. Contents are completed with 'the Present' and a look into the future.

The book is well illustrated and much of the detail of the evidence (the boring aspect for many undergraduates) is presented in text-figs. and tables, many reminiscent of those in the Special Report Series of the Geological Society of London - 'A correlation of the....rocks of the British Isles.' Some of these reports had not been written when 'A dynamic stratigraphy...' was prepared so that there is a certain amount of imbalance in the detail correlation of some areas at certain times. Some of the tables and figs. (p.95) contain a surfeit of information not easily comprehended even by a specialist. Many figures are cluttered by dense symbols masking lettering (13.13 - I had to mention that one). The text contains many esoteric terms, making it difficult for the average reader, but it is stated that a minimum first year geology University course is necessary, but which University? Are other institutions of higher education or the membership of parochial geological societies thereby excluded?

The book follows the unfortunate modern trend (in my view) of starting with generalisations and conclusions, presenting much of the evidence in the tables and figs., or routing the reader to a bibliography which itself is only the start of the search. Arguments and hypotheses are presented with the minimum of evidence. There should be more reference to fossil evidence still the major basis for correlation and for palaeoecology. The sedimentology is excellent but the palaeontology leaves much to be desired. What has happened to the Jurassic zones? How are systems and stages defined?

Palaeogeography is illustrated in many maps and diagrams but the overall impression is a bit disjointed in that the overall picture of successive geographies is not presented on a standardised map. It is suggested that maps similar to those of Wills, brought up to date, could appear at the end of each section or chapter.

The text is presented in a two column format which assists reading and allows the page width to be increased a little. It has been well proof read and considering that there are four authors, the text is remarkably uniform in style.

This is a book to be recommended certainly to University undergraduates and also to others interested in the evolution of the British Isles area, with help from other bibliographical sources.

F.M. Taylor

BURNS, T.L., & SPIEGEL, H.J., *Earth in Crisis*, C.V. Mosby Co., 1980, St. Louis and London, 2nd Ed., 549 pp., illustrated text-figs. and half-tone plates. Hard covers £11.75.

'Earth in Crisis' is intended for 'freshmen and sophomore general education students', that is, first and second year American university students, and indeed it does have the flavour of a subsidiary subject textbook, covering a bewildering amount of material but often in a rather sporadic and superficial manner. Geology, oceanography, meteorology and astronomy are treated in four separate sections, the first and last of these forming the major part of the book. Of all four, I felt that the astronomy section was the most successful, although I should hastily state that the geology part is the only one on which I can comment with any but the most elementary knowledge of the subject.

The geology section comprises a disappointingly potted account, slick and easy to read, but lacking in imagination in the more exciting areas of the subject. It begins with chapters on minerals and rocks, containing some appallingly poor photographs of rock specimens although the effect is somewhat alleviated by some spectacular plates of large-scale features. Igneous and surface processes are dealt with, followed by a depressingly brief account of fossils and the geological record. The chapter on 'Diastrophism' fails to generate any excitement or feeling of discovery - it should be compared (very unfavourably) to the, admittedly wider scale, book by P.J. Wyllie - 'The Way the Earth Works'. The final chapter on U.S. National Parks is of limited value only, to British students. Certain irregularities and omissions are apparent - to cite one, for example, some attention is paid to James Hutton and the Vulcanists, but no mention at all is made of Werner and his Neptunean school.

It is the authors' desire that the oft neglected 'social, economic and environmental considerations' be comprehended along with the physical phenomena, and their attempts to include these in the text come as a welcome change from the rather narrow approach of many mineralogy texts.

Questions and activities for the student at the end of each chapter are intended to 'involve thought...instead of memorisation', and to this end some are naturally more successful than others. I always feel that such additions command more student attention when interspersed with the text rather than being at the end of a chapter or section - although there is always the danger that such a highly thought provoking question/activity could seduce the hitherto engrossed student from his reading!

Finally, the Prologue should prove a stimulant to all jaded Freshmen. It should be read with a heavy mid-west accent, preferably with the theme music from '2001: a space Odyssey' playing in the background. We journey into the book 'from some remote part of the universe at the speed of light with the freedom of a god'! Disregarding our by now infinite mass, we approach the solar system, with planets which 'have no light of their own and reflect only that which their giant master sends them', including 'an incredibly beautiful ringed sphere called Saturn' and 'a breathtakingly beautiful blue planet' - Earth.

Who would miss it?

Edwina Cosgrove

L.B. HALSTEAD, 1975. *The evolution and ecology of the Dinosaurs.* Illustrated by Giovanni Caselli. London; Peter Lowe/Eurobook. 116 p. £2.75.

L.B. HALSTEAD, 1979. *The evolution of the Mammals.* With 8 double-page illustrations by Sergio and many other illustrations. London: Peter Lowe/Eurobook. 116 p. £4.50.

These two works form part of a planned series which will explore the life of the past in brief form with ample colour illustration: a third, *The evolution of Early Man* by Bernard Wood, is also to be published shortly. The page size is large, 21 x 27 cm ($8\frac{1}{4}$ x $10\frac{1}{2}$ inches) and the use of colour illustration lavish; both books are extremely attractive to handle and to read. Though apparently designed primarily for a juvenile market, they must not be dismissed merely as 'children's books"; they provide admirable epitomes of available information on the groups with which they treat and can be read with profit by anyone wishing to expand their knowledge of fossil vertebrates.

The earlier of the two works appeared at a time when a rethinking of traditional attitudes to dinosaurs (a 'dinosaur renaissance", some have called it) was just gathering momentum. For too long, dinosaurs have been dismissed as brainless automata, living long lives at a slow pace, as if the 78 r.p.m. speed of life of mammals were being replayed at 16 r.p.m.! The idea was, from the outset, absurd; after all, the dinosaurs not only ousted the paramammals from dominance in the terrestrial environment, but also managed to retain dominance for over 100 million years--an achievement inconceivable for such 'automata"!

With this century-old misconception now properly discarded, the dinosaurs can now be seen as they were; as a group whose lengthy evolutionary success was merited both by their physiological design and by their capabilities for relatively advanced social behaviour. As we now know from the evidence of fossil footprints, herbivorous dinosaurs travelled in mixed-age herds which may even have been 'structured", with the younger, more vulnerable animals at the centre; and some, at least, of the carnivorous dinosaurs hunted in packs. The evidence for herd and pack behaviour comes also from skeletons; the *Iguanodon* herd from Bernissart in Belgium; the coelurosaur (*Coelophysis*) pack from Ghost Ranch, New Mexico; and herds of mixed-age ceratopsians recently discovered in the Alberta Badlands by Dr. Philip Currie of Alberta Provincial Museum. There is evidence that, like their relatives the crocodiles, dinosaurs guarded their nests; certainly a Mongolian ceratopsian nest with eggs had a slain coelurosaur (properly named *Oviraptor*!) beside it. Moreover, a nest with abandoned eggshells, recently found in the Cretaceous Two Medicine Formation of Montana, had 18 baby hadrosaurs in it. Their skeletons suggest they were at least 1 - 2 weeks past hatching and their continuing association with the nest strongly suggests they were being tended by adults! This is behaviour far in advance of that of which the generality of living reptiles are capable.

On the question of dinosaur warmbloodedness, Dr. Halstead's views need to be stressed;

> 'Dinosaurs were not warm blooded in the same way that birds and mammals are. [The latter] keep their internal temperature steady by burning up their food quickly--a high metabolic rate--and insulating their bodies with fur and feathers while dinosaurs relied on their large size.
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> Dinosaurs were simply too big to have a high metabolic rate. They would have had to burn up such vast quantities of food that they would have had to eat for more than 24 hours a day to keep going--and this is obviously an impossibility. [However] As an animal grows larger, it takes longer to warm up or cool down. When it reaches a certain size the process is so slow that it is almost unnoticeable. The temperature inside the animal's body stays the same all the time and we say that it is warm blooded.

> Both types of warm-blooded animals must have a network of veins and arteries to carry the blood to the various parts of the body. With such a large body bulk, the dinosaurs had to be particularly efficient at this and under the microscope it is possible to see a whole pattern of very fine blood vessels in a dinosaur bone. Their blood supply to the bone was in fact better than a man's."

This work is not altogether up-to-date, naturally enough in a field in which advances are coming so fast. Thus it was sent to press too early to discuss Hopson's theory that the skull enlargements and horns of hadrosaurs were used in part in fighting, in part as display and loudspeaker devices; nor could mention be made of the recent discoveries of truly giant sauropds in Utah which almost dwarf *Apatosaurus* and *Brachiosaurus*--so recent indeed that no formal names have been attached, only the nickname 'Supersaurus" to a form that may have been around 35 metres (110 feet) long and "Ultrasaurus" to a *Brachiosaurus*-like creature not quite so long, but yet more massive.

I noted just a few errors. On p. 13, *Paleoparadoxia*, stated to be a sea cow, is in fact a desmostylid. On p. 17, the Swanage reptile track is misinterpreted, this was not a single bipedal dinosaur with a broad trackway 'taking small steps", but two dinosaurs travelling fast, side by side, and taking long strides. The Stonesfield discovery of *Megalosaurus* occurred, not in 1822, but prior to 1818. It is unfair, however, to charge Halstead with error in his theory concerning the different environments of juvenile and adult hadrosaurs (p. 96) since, at the time he wrote, little was known of the abundant hadrosaur tracks, both adult and juvenile, in the same late Lower Cretaceous environment in the Peace River Canyon, British Columbia; and indeed his theory may be applicable, for all I know, to later hadrosaur genera!

I am puzzled as to how Halstead can accept a transition between the gliding reptile *Podopteryx*, with its small flying membrane between its limbs (specifically between humerus and femur and attached to its flanks) and much larger one between hind limbs and tail (see figure, p. 48), and the pterodactyls, with the flying membrane sustained by an elongate digit of the hand, extending to the flank but *not in any way involving* the hind limb. (Reconstructions showing the membrane attaching to the hind limb are incorrect; there is no fossil evidence for such attachment). Such a transition seems to me in the highest degree unlikely; surely an independent ancestry for the pterodactyls is more probable?

Nevertheless, this account of dinosaur evolution, and of the ecology of Mesozoic times, remains an accurate enough summary of modern views even now, five years after its first publication.

The evolution of the Mammals is of especial interest in being the only general book on such a topic to be written since Scott's *A history of land mammals in the Western Hemisphere* (1913); and it is only regrettable that his book is not so lengthy and detailed as was Scott's. (May one hope it will be the prelude to a more extended treatment?) Very much of its contents will thus be unfamiliar to most readers. As in the first book, the overall approach is chronological, the faunas of each geological period being successively examined. This approach perhaps worked rather better with the dinosaurs, for the Mesozoic periods were longer and the groups involved were fewer and more uniform in character. With the briefer periods of the Cainozoic it becomes harder to use this approach, especially when following the stories of a much greater diversity of animal groups. Occasionally the result is misleading: the pronghorns, for example, are mentioned only on p.75 and the text would leave an uninformed reader with the impression that they are entirely extinct. (In fact one genus, *Antilocapra*, not only survives but is relatively common in the prairies of the northern U.S.A. and Canada). Sometimes indeed the chronological straitjacket has caused the author such difficulties that it has almost been shrugged off (as, for example, in treating the horses, pp. 60-61); but in general Dr. Halstead has managed to tell a clear enough story within this self-imposed restriction.

Once or twice, a knowledge is assumed that most readers simply will not have; when bandicoots are said to be like African elephant-shrews, for example (p. 14), will the comparison really help many readers? A few misprints have survived uncorrected: the name of the carnivorous

marsupial *Thylacoleo* is twice mis-spelled (p. 101), as is that of the mustelids (p. 81). Some statements seem to me hard to justify. Are human beings truly the most widespread animals (p. 15)? Surely mice and rats are not only more numerous, but also survive in many places--small islands, in particular--where humans do not? Were the baluchitheres truly the *largest* land mammals (p. 43)? Maybe they were the tallest; but what price the much more massive hornless rhinoceros *Paraceratherium*? The dismissal of the problematic astrapotheres as "adapted to a hippopotamus-like life" (p. 55) is in my view a misleading over-simplification, and I would certainly challenge the statement on p.12 that "Animals without secondary palates use their teeth mainly to prevent food from escaping from their mouth"!

From his comment on p. 66 that large peccaries died out 10,000 years ago, it is evident that Dr. Halstead was not aware of the remarkable discovery in 1975 of a large species hitherto known only from fossil bones in the Pleistocene, *Catagonus wagneri*, not only live and well but even relatively abundant in western Paraquay--the first new, large land animal to be discovered since since the okapi! Halstead's failure to mention the calcichordates in his discussion of vertebrate origins (p. 21) may simply indicate non-acceptance of Jefferies' theories on the critical evolutionary significance of those organisms. In contrast, his citation of *Petrolacosaurus* as a progenitor of dinosaurs and birds presumably predate the recent work showing this genus to be, not a diapsid reptile, but an early araeoscelid with a euryapsid skull.

The artists who illustrated these books deserve great credit, for they have added greatly not only to their decorative quality, but also to the ease with which the scientific information may be comprehended. The illustrations by Giovanni Caselli to the first book are not always successful--his *Thrinaxodon* (p. 25), for example looks wooden and his *Lystrosaurus* (p. 28) look peculiar--but many others are extremely vivid and memorable, for example his swimming brontosaurs (pp. 56-57) and his battling pachycephalosaurs (pp. 88-89). It is less clear who is responsible for the illustrations in the second book. "Sergio" is credited only with the eight very splendid double-page illustrations, but there are many other excellent and spirited colour depictions (that of *Glyptodon*, p. 55, perhaps the finest), either by "Sergio" or some other artist; perhaps the author's wife, Jennifer Middleton Halstead, an accomplished biological artist, deserves the credit for them?

All in all, these extremely attractive books can be recommended, not only for purchase by civic, school and university libraries, but also by anyone who is interested in the history of life on earth and wishes to know more about it. Such books are a pleasure to own and to look at, as well as to read; and, despite my few carpings above, reflect credit alike on publisher, artists and author.

William A.S. Sarjeant