reviews

Extended view of evolution

A. Hallam

Evolution and Extinction Rate Controls. (Developments in Palaeontology and Stratigraphy, vol. 1.) By Arthur J. Boucot. Pp. xv+425. (Elsevier Scientific: Amsterdam, Oxford and New York, 1975.) Dfl. 110; $42.50.

FOR many years Professor Boucot has been both an indefatigable collector of Silurian and Devonian brachiopods over the whole world, and an equally energetic taxonomist. The vast amount of information he has compiled is summarised in this book which also includes a valuable survey of the important work on Palaeozoic marine invertebrate communities undertaken during the last decade by palaeontologists on both sides of the Atlantic.

It is anything, however, but a straightforward descriptive review. Right from the preface and introductory chapter Boucot plunges into his principal theme, which is basically simple: as is well exemplified by his brachiopods (though that principle is clearly thought to be of more general validity) evolution was most rapid when potentially interbreeding populations were small in size. Although other controls on rates of evolution are conceded they are dismissed as of relatively minor importance. In the course of his argument, by marshalling a wide array of facts, Boucot launches penetrating criticisms against hypotheses conflicting with his own, such as the Bretsky–Lorenz hypothesis which postulates an inverse relationship between rate of evolution and broad environmental tolerance (and genetic variability); and weaknesses in the widely accepted stability–time hypothesis of Sanders are also pointed out.

What then are we to make of Boucot's own hypothesis? Although it seems reasonable biologically, one is faced directly with the shortcoming of the method used to assess the population size of a given taxon, which is to estimate the area of distribution. It is not obvious to me that there should be such a simple correlation. Again, Boucot argues that cosmopolitan taxa evolved more slowly than provincial taxa because they had larger populations. Why could not that reflect simply the greater tolerance of the cosmopolitans, which were able to survive the minor environmental vicissitudes that evidently proved too rigorous for the provincials? When Boucot generalises he is forced to indulge in special pleading. Consider, for instance, the following highly dubious and unsupported statement on page 114: "The Mesozoic ammonoids . . . exploded into a tremendous development of both taxa and individuals during several post-Palaeozoic intervals that are consistent with the concept of population size being inversely related to rate of evolution." Mammals evidently evolved faster than invertebrates because their populations were smaller. Is there any evidence whatsoever that large mammals, with smaller populations, evolved faster than small ones? In my opinion the fossil evidence can more plausibly be held to support quite another view: that particular groups of animals, whether mammals, ammonites, bivalves or brachiopods, had characteristic rates of evolution regardless of the size of individuals, which usually correlates inversely with population size. Stanley's view that mammals evolved faster than bivalves because they competed more intensively seems much more reasonable.

In spite of his extensive discussion of biogeography Boucot holds a curiously agnostic position on plate tectonics, which is evidently regarded as being too speculative to warrant more than the most passing mention. I agree with his view that plate tectonics fails to explain many features of Silurian–Devonian provinciality. Why should the early Devonian faunas exhibit more provincialism, for instance, than those of the late Silurian, although the continental configurations had not changed significantly in the interim? It seems reprehensible, on the other hand, that Boucot neglects to consider a Gondwanaland configuration in his discussion of the Malvinokaffric Realm, which he bases on distinctive faunas occurring only in New Zealand, South Africa and southern South America.

A final comment on this interesting and provocative work concerns the rambling and verbose style of prose. If he had organised his material better and avoided the numerous repetitions he could have condensed his book into about half the length, thereby bringing the cost down to a level within the reach of individuals as opposed to institutions. □

Intelligence book

Bernard Meltzer

Artificial Intelligence. (Academic Press Series in Cognition and Perception.) By Earl B. Hunt. Pp. xii+468. (Academic: New York and London, January 1975.) $29.00; £13.90.

THIS introduction to artificial intelligence deals with a wider range of topics than is customary in such texts—computability, pattern recognition, heuristic problem solving, automatic theorem proving, computer perception and comprehension of natural language. A newcomer who wants to know, for example, what an augmented transition network for the analysis of language is, or what inference by resolution means, would get some idea from this book.

But, alas, much of the exposition is neither clear nor correct. Explanations using *non-sequiturs* are particularly depressing, and inadequate diagrams obscure rather than illuminate them. The account of the work of Guzman, Clowes, Huffman on the perception of line diagrams of polyhedral solids, and the treatment of picture interpretation generally, is particularly poor—perhaps not so surprisingly: 24 pages are devoted to computer perception, whereas 161 consider 'classical' pattern recognition, the relevance of which to artificial intelligence is much smaller.

The treatment of theorem proving is marked by a confusion between the propositional and quantificational calculus, and little account is given of the important work on mathematical reasoning outside the resolution framework. The notions of analogy and model are confused with each other. Besides such obfuscations, the author is given to producing, out of the blue, large general judgments with little justification. □