dling them. In my opinion, this success is mixed. O'Donald certainly is to be complimented on writing the first comprehensive book dealing with an ecological genetic investigation of a bird population. His large data base collected over several years and in two locations has allowed him to write many scientific papers. Now that the population study is terminated it is fitting that it be brought together into a single volume. Often, theories and concepts developed early in a study have to be rejected as more data accumulate, and O'Donald critically appraises and frequently rejects hypotheses he himself had proposed earlier. He is often as critical of his own work as he is of that of others.

O'Donald states in the concluding section of the book that to a population geneticist the most important question is: Is the polymorphism "protected"? To oversimplify his argument, he finds that the non-melanic form gains a selective advantage in that it reaches reproductive maturity at a younger age than the melanic form. Since the two morphs have no detectable differences in annual survival or longevity, this should give a fitness advantage to the non-melanic form. Selection at another stage of the life cycle favors the melanic form. Newly mated melanic males nest earlier and produce more fledglings than the non-melanic forms. These are the only obvious differences in the measured components of fitness, and O'Donald builds them into various models to see if they can account for the "protection" of the polymorphism. In general they cannot, and additional mechanisms such as nonrandom mating, heterozygote advantage, and gene flow must be invoked. One is left with the feeling that there are too many explanations available, and perhaps this will often be the case in real-world populations.

One criticism I have of this book relates to O'Donald's interpretation of the enhanced fecundity of the melanic forms. He concludes that this is an example of sexual selection with females choosing melanic males preferentially and thereby nesting earlier in the season with higher reproductive success. O'Donald admits that he has no direct evidence of female choice or sexual selection and must rely on indirect approaches. He implies that some quality of the melanic males makes them more attractive, perhaps through some pleiotropic relationship between melanism and hormone levels. A simpler alternative would be that breeding melanics are on average more successful simply because they are on average older. This follows from the fact that pale morphs nest at an earlier age than non-melanics yet have similar annual adult survival rates. Nowhere in the book does O'Donald address this plausible explanation. Whenever age is investigated, it is in terms of years of breeding experience, not actual age.

A second, but minor, negative comment relates to O'Donald's superficial treatment of the North American segment of the species. This is particularly evident in his range maps, which are grossly inaccurate for the New World.

Overall, I found this a stimulating and provocative book. To those evolutionary ecologists who have not previously looked at populations from a geneticist's viewpoint it will be particularly valuable.

FRED COOKE

Department of Biology,
Queen's University,
Kingston, Ontario K7L 3N6, Canada

Marine Communities

Biotic Interactions in Recent and Fossil Benthic Communities. MICHAEL J. S. TEVESZ and PETER L. MCCALL, Eds. Plenum, New York, 1983. xviii, 837 pp., illus. $95. Topics in Geobiology, vol. 3.

Biotic interactions are in. Witness the number of books on coevolution published recently. The present book clearly documents that paleontologists (contrary to the title, the perspective is purely paleontologic) actively participate in the trend. The editors and the authors can take pride in this endeavor.

Underlying the contributions in this volume is recognition of the obvious but too rarely cited phenomenon that a wide variety of biotic interactions occur in modern benthic communities and play a part in controlling the composition and distribution of the communities. It is obvious also that such interactions occurred and played a role in the geologic past, but it is something else to identify effects of any interaction in a particular fossil assemblage. Paleontologic data are static, showing patterns, not processes. Fortunately, there are many independent lines of evidence that may be used in deciphering the interplay of biotic and abiotic factors that gave rise to the patterns. In their contribution to this book Kidwell and Jablonski lucidly discuss paleoecologic and stratigraphic criteria for identifying the operation of taphonomic feedback, or the effects of accumulating dead shells on the distribution of benthic organisms. There is also functional morphology, that unsung hero of any paleontologic inference; and often traces of biotic interactions are left directly on the skeletons of benthic organisms. That much more than merely anecdotal evidence can be derived from the fossil record is best demonstrated by the research of Jennifer Kitchell and her collaborators on shell-drilling gastropods and their prey. For some reason this topic has been left out of the book, but a review by Kitchell of biotic interactions in siliceous phytoplankton is included. This paper exemplifies the potential and also the limitations of paleontologic inference about directed biotic interactions.

The importance of paleontology with respect to biotic interactions does not, however, rest on particular kinds of research such as are represented in this book. Rather, it rests on the unique accessibility to paleontologists of the evolutionary time scale. It is the time scale that is claimed to separate microevolution from macroevolution and to allow for distinction between short-term biotic interactions and community evolution. On the macroevolutionary scale, individual species, lineages, and even clades are no longer of particular interest. It is functional groups, or guilds, that are of concern. Consequently, community evolution is defined by reference to patterns of relative significance of various guilds. The widely but ambiguously used, and often misused, concept of community may thus regain its significance. It no longer refers to a superorganism consisting of strongly integrated species controlled largely by directed interactions, but rather to an association of guilds in which weak, diffuse interactions play a predominant role. Community ecologic organization may still come to be recognized as a, perhaps the, controlling factor in the evolution of species, but this is no longer an assumption.

This shift in conceptual framework is made explicit by Thayer. His bulldozing hypothesis (that the rate of sediment bioturbation by deposit feeders and predators has considerably increased through geologic time, thus contributing to the decline of immobile benthos living on soft substrates) is well supported by a variety of lines of biologic and paleontologic evidence; additional sedimentologic evidence is provided by Larson and Rhoads. A similar approach is taken by Vermeij with respect to durophagous predation.

The concluding part of the book is even more ambitious, for the aim is to put forth new (macro)evolutionary prin-

ciples. Sepkoski and Sheehan argue that (i) factor analysis of the family diversity within classes of marine metazoans decomposes the Phanerozoic biota into three "evolutionary faunas"; (ii) good fit of predicted curve to the empirical pattern implies that each fauna diversified according to its own logistic equation and displaced the one that dominated previously; (iii) this displacement is due to major differences in species packing or degree of ecospace utilization; (iv) cluster analysis of the facies distribution of Cambro-Ordovician communities identifies clusters, equivalent to the evolutionary faunas, that first appear onshore, later expand offshore, and persist there longer than onshore; (v) this pattern implies that evolutionary novelties generally arise onshore, owing either to better adaptedness of nearshore taxa that permits them to invade offshore communities or to closer coadaptation that permits them to outcompete offshore communities. A similar conclusion is reached by Jablonski and Bottjer, who demonstrate that Late Cretaceous onshore communities resembled modern ones, whereas the contemporary offshore communities included some sessile epifaunal suspension feeders very much as in the Paleozoic but not in the Recent. Jablonski and Bottjer's explanation emphasizes ecology and population structure of nearshore taxa as promoting evolutionary novelty. Finally, Bambach argues that the difference in diversity between communities representative of Sepkoski's evolutionary faunas is due to an increase in number of guilds instead of in species packing.

Attractive as these arguments are, they are strongly disputable. Factor analysis of nonstandardized diversity data (without giving equal weight to all taxa) does not distinguish cohesive evolutionary units, because it focuses on the few most diverse taxa; it does not show that, say, sclerosponges shared an evolutionary pattern with articulate brachiopods, or calcareous sponges with bivalves. Good fit of a model to an empirical curve cannot prove the validity of the model, especially if there is no independent estimate of the parameters; assumptions of the model and alternative models must also be tested. There is no evidence that, say, Cambrian trilobites were less specialized than Late Paleozoic brachiopods or nautiloids; if, however, the increase in diversity is due to the utilization of an ever wider variety of resources, there is no reason for displacement of one evolutionary fauna by another. The distributional pattern of Cambro-Ordovician communities is far from obvious, and their equivalence to the evolutionary faunas is questionable (the fauna decomposes into four rather than three primary clusters; there are significant discrepancies between the results of cluster and companion factor analyses; and there is a question whether typically Paleozoic linguloid-mollusk communities are modern or Cambrian). That pattern is irrelevant to the question where evolutionary novelties first appear, unless novelty is identified with a specific array of guilds (taxa characteristic of particular faunas appear earlier than the equivalent community clusters; the appearance of other taxa is neglected as a novelty). The snag with Jablonski and Bottjer's argument is that though their community pattern may tell us something about delayed extinction in offshore environments it tells us nothing about accelerated evolution of new body plans onshore. There is also no doubt that Thayer's bulldozers and Vermeij's durophagous predators flourished in Late Cretaceous offshore habitats. Bambach's data demonstrate that the number of guilds identified among modern bivalves and gastropods is larger than the number identified in Cambrian trilobites or Paleozoic graptolites, conodontophorids, or nautiloids, but this may merely reflect different levels of our understanding of their biology.

All this criticism does not imply that the hypotheses concerning community evolution proposed by Sepkoski and Sheehan, Bambach, and Jablonski and Bottjer are false. They may well be right, even though, I suspect, for wrong reasons. However, before one can argue persuasively for closely coadapted evolutionary faunas and their constituent communities that directly interfered as integrated entities, some better evidence needs to be presented.

Nevertheless, one can hardly imagine future research on community evolution that would ignore these thought-provoking contributions.

ANTONI HOFFMAN
Lamont-Doherty Geological Observatory,
Palisades, New York 10964

Books Received

Academic Science, Higher Education, and the Federal Government, 1950–1983. John T. Wilson. University of Chicago Press, Chicago, 1983, x, 116 pp. $10; paper, $3.50.

Advances in Applied Mechanics. Vol. 23. John W. Hutchinson and Theodore Y. Wu, Eds. Academic Press, New York, 1983. x, 453 pp., illus. $75.

Advances in Carbohydrate Chemistry and Biochemistry. Vol. 41. R. Stuart Tipson and Derek Horton, Eds. Academic Press, New York, 1983. xii, 406 pp., illus. $56.

Advances in Enzymology and Related Areas of Molecular Biology. Vol. 55. Alton Meister, Ed. Interscience (Wiley), New York, 1983. vi, 570 pp., illus. $55.

Coastal Oceanography. Herman G. Gade, Anton Edwards, and Harald Svendsen, Eds. Plenum, New York, 1983. x, 582 pp., illus. $79.50. NATO Conference Series IV, vol. 11. From an institute, Oslo, Norway, June 1982.

Cognitive Therapy with Couples and Groups. Arthur Freeman, Ed. Plenum, New York, 1983. xiv, 343 pp. $35.

Comprehensive Treatise of Electrochemistry. Vol. 7, Kinetics and Mechanisms of Electrode Processes. Brian E. Conway *et al.*, Eds. Plenum, New York, 1983. xviii, 788 pp., illus. $95.

Computational Aspects of VLSI. Jeffrey D. Ullman. Computer Science Press, Rockville, Md., 1984. x, 495 pp., illus. $32.95.

Computational Methods in Bifurcation Theory and Dissipative Structures. M. Kubiček and M. Marek. Springer-Verlag, New York, 1983. xii, 243 pp., illus. $42. Springer Series in Computational Physics.

Computer Images. State of the Art. Joseph Deken. Stewart, Tabori and Chang, New York, 1983. 200 pp. $25; paper, $16.95.

The Computerization of Newspaper Organizations. The Impact of Technology on Organizational Structuring. Nancy M. Carter and John B. Cullen. University Press of America, Lanham, Md., 1983. vi, 139 pp. $21; paper, $9.25.

Contemporary Nephrology. Vol. 2. Saulo Klahr and Shaul G. Massry, Eds. Plenum, New York, 1983. xxvi, 793 pp., illus. $75.

Control and Analysis in Iron and Steelmaking. R. V. Williams. Butterworth, Boston, 1983. viii, 288 pp., illus. $59.95.

Control Processes in Fish Physiology. J. C. Rankin, T. J. Pitcher, and R. T. Duggan, Eds. Wiley-Interscience, New York, 1983. xii, 298 pp., illus. $39.95. From a symposium, Bangor, United Kingdom, Sept. 1981.

Cryocoolers. Part 1, Fundamentals. Graham Walker. Plenum, New York, 1983. xxvi, 365 pp., illus. $49.50. The International Cryogenics Monograph Series.

Curiosity and Exploration. Theories and Results. Hans-Georg Voss and Heidi Keller. Academic Press, New York, 1983. xii, 209 pp. $29.50. Translated from the German edition (1976).

Experimental Bacterial and Parasitic Infections. Gerald Keusch and Torkel Wadström, Eds. Elsevier, New York, 1983. xx, 497 pp., illus. $78. From a workshop, Stockholm, June 1982.

Experimental Manipulation of Gene Expression. Masayori Inouye, Ed. Academic Press, New York, 1983, xiv, 315 pp., illus. $39.50. Based on a symposium, Stony Brook, N.Y., May 1982.

Farm Appraisal and Valuation. William G. Murray *et al.* 6th ed. Iowa State University Press, Ames, 1983. viii, 304 pp., illus. $22.95.

Faulkenstein's Theories Are Loose on Earth. Dezmon A. Faulkenstein. Vantage, New York, 1983. xxvi, 117 pp. $7.95.

Finite Elements. An Introduction for Engineers. R. K. Livesley. Cambridge University Press, New York, 1983. x, 199 pp., illus. $29.95; paper, $13.95.

First Course in Linear Algebra. P. B. Bhattacharya, S. K. Jain, and S. R. Nagpaul. Halsted (Wiley), New York, 1983. xii, 280 pp. $19.95.

Fish Biomechanics. Paul W. Webb and Daniel Weihs, Eds. Praeger, New York, 1983. xvi, 398 pp., illus. $42.95.

Fish Neurobiology. R. Glenn Northcutt and Roger E. Davis, Eds. University of Michigan Press, Ann Arbor, 1983. Two volumes. Vol. 1, Brain Stem and Sense Organs. viii, 414 pp., illus. $45. Vol. 2, Higher Brain Areas and Functions. viii, 375 pp., illus. $45. From a symposium, 1977.

Forecasting with Univariate Box-Jenkins Models. Concepts and Cases. Alan Pankratz. Wiley, New York, 1983. xiv, 562 pp. $34.95. Wiley Series in Probability and Mathematical Statistics.

International Encyclopedia of Psychiatry, Psychology, Psychoanalysis, and Neurology. Progress Volume 1. Benjamin Wolman, Ed. Aesculapius Publishers, New York, 1983. xxxiv, 509 pp. $89.

Introduction to Material and Energy Balances. G. V. Reklaitis, with Daniel R. Schneider. Wiley, New York, 1983. xvi, 683 pp., illus. $33.95.

An Introduction to Stability Theory. Anand Pillay. Clarendon (Oxford University Press), New York, 1983. xiv, 146 pp. $29.95. Oxford Logic Guides, 8.

Inventions. The Patented Works of R. Buckminster Fuller. St. Martin, New York, 1983. xxxiv, 316 pp., illus. $40.

Iodinated Density Gradient Media. A Practical Approach. D. Rickwood, Ed. IRL Press, Washington, D.C., 1983. xii, 242 pp., illus. Paper, $17.

Ionization Potentials. Some Variations, Implications and Applications. L. H. Ahrens. Pergamon, New York, 1983. xii, 104 pp., illus. Paper, $29.50.

Is God a Creationist? The Religious Case Against

(Continued on page 312)