Book Reviews

Broader Themes in Paleoecology

Structure and Classification of Paleocommunities. Papers from a symposium, Miami Beach, Fla., 1974. ROBERT W. SCOTT and RONALD R. WEST, Eds. Dowden, Hutchinson and Ross, Stroudsburg, Pa., 1976 (distributor, Halsted [Wiley], New York). xii, 292 pp., illus. $25.

From an evolutionary point of view, the disadvantage of studying present-day communities of plants and animals is that they represent only a single slice in time: although evolutionary relationships can be inferred, the characteristic time scale for actual evolutionary change is far longer than human lives, not to mention tenure decisions. One important aspect of the study of the fossil remains of past communities is, therefore, that they can exhibit the dynamical workings of evolutionary processes. One can glimpse the movie, albeit jerkily and fuzzily, as opposed to examining the last frame with a hand lens.

Earlier paleoecology was primarily a tool for refining stratigraphic analysis, with consequential practical applications (such as petroleum location). Rocks of the same age can record different environments, and those fossils which are restricted to environments rather than time planes can be a misleading guide to the temporal organization of strata. An appreciation of the autecology of fossilized species can help unravel these complications. More recent paleoecological studies have addressed broader themes. In a pioneering paper, Bretsky and Lorenz (*1*) argued that Paleozoic nearshore communities are typically less diverse, but geologically more persistent, than offshore communities, and that this accords with current ecological notions about stability and diversity. Valentine (*2*) has integrated contemporary ecological theory with paleoecological data to give an account of the evolution of the marine biosphere (*3*). The book under review is a mixture of the old and the new.

The chief difficulty in using paleontology as a time machine to study past communities is the differential preservation of different taxa. Even for organisms that are not soft-bodied, some shells (for example) fossilize better than others. Many of the papers address this problem, at the community level. The techniques used include statistical cluster analyses and a new classification in terms of feeding habit and substrate niche diagrams (Scott). Broadly, they suggest that qualitative community attributes such as species presence-absence data (and thence species richness) or taxonomic composition are likely to be more reliably indicated by the fossil record than are quantities such as diversity or trophic structure.

Two interesting papers deal with communities of ostracods, one set from the late Paleozoic (Brondos and Kaesler) and the other from the Pleistocene (Lister). The species in these guilds of filter-feeding zooplankton fossilize similarly, presenting relatively few problems of differential preservability. Lister shows the community patterns of species relative abundance (as measured by diversity indices, equitability, or just number of species) change in a regular and predictable way with time. The changes seem to be governed by climatic conditions. A beautiful figure (p. 202) shows the correlation between a diversity index (the Brillouin index) and the curve of marine paleotemperatures for this 700,000-year sweep.

In a similar vein, Scott (pp. 46–51) uses his feeding habit-substrate niche methods to analyze the changes in community structure from stable, predictable environments (carbonate shelf below normal wave base) to unstable, unpredictable environments (carbonate sands within the zone of wave action). The "coincidence between facies patterns, petrographic trends, diversity patterns and community feeding habit-substrate niche structure supports the conclusion that environmental stability and predictability, among other factors, influence the complexity of community structure."

One of the prevailing sins in contemporary ecology is a tendency to extravagant generalization, based on particular taxa or particular situations. Paleoecologists are apparently not immune to this temptation. "Of all aquatic communities, freshwater communities are the simplest, least diversified, and support the lowest number of organisms" (p. 84). What about Lake Baikal? "Environments having stable and relatively low amounts of resources sustain the most diverse, highly specialized communities" (p. 41). Does this include tropical rain forests? Such overly simple generalizations are the exuberance of a young and growing subject. I think that as the subject matures a more complex—but still manageable—theoretical framework will emerge. This book is a step toward that happy day.

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References and Notes

1. P. W. Bretsky and D. M. Lorenz, *Proc. North Am. Paleontol. Conv.* (Part E), 522 (1970).
2. J. W. Valentine, *Evolutionary Paleoecology of the Marine Biosphere* (Prentice-Hall, Englewood Cliffs, N.J., 1973).
3. For other recent reviews bearing on the reciprocal interactions between paleontology and theoretical ecology, see S. J. Gould, in *Theoretical Ecology: Principles and Applications*, R. M. May, Ed. (Saunders, Philadelphia, 1976), chapter 12, and E. C. Pielou, *Ecological Diversity* (Wiley, New York, 1975), chapter 8.

Pollen and Spore Evolution

The Evolutionary Significance of the Exine. Papers from a symposium, London, Sept. 1974. I. K. FERGUSON and J. MULLER, Eds. Published for the Linnean Society of London by Academic Press, New York, 1976. xii, 592 pp., illus. $71. Linnean Society Symposium Series, No. 1.

This book includes 23 papers presented at a symposium organized by Ferguson and Muller on the implications of the structure of the exine—the resistant, fossilizable wall of spores and pollen grains—for plant evolution. Although two-thirds of the book consists of papers that exemplify the conventional emphasis on comparative morphology of spores and pollen of modern plants, "pollen types" and "trends," and their relation to the established taxonomy of particular groups, the effects of recent advances are evident throughout. Most strikingly, all the taxonomic papers illustrate how electron microscopy has become an indispensable part of modern palynological studies. Developmental research on patterns of deposition of exine material (discussed most specifically by Rowley, Dickinson, Meyer and Yaroshevskaya, Denizot, and Lugardon) has also had significant impact on evolutionary dis-