

that they may provide a means for high time resolution of strata. Sorting out their types, causes, and applications is an ambitious agenda. The contributors to the volume do not always succeed, but their efforts and results are important. Though some of the analyses seem unduly concerned with local details, an understanding of the significance of a bio-event rests on the compilation of such details. Still unresolved in many cases is the geographic extent of a particular bio-event. While many of the bio-events discussed in this book are undoubtedly global in their expression, others may reflect only local or basin-wide phenomena. How to distinguish the global signal from the local noise?

Only Kauffman's extensive review of event stratigraphy in the Western Interior Cretaceous of North America explicitly addresses the issue of distinguishing local, regional, and global bio-events. Even when the principles are clearly articulated, the practice is less than straightforward. The extent to which variations in species abundance, episodes of mass mortality, immigrations, and even extinctions are synchronous over vast areas should be proven rather than assumed. Individual stratigraphic sections are often full of bio-events of all sorts.

Boucot's essay expresses his skepticism of the approach to bio-events that uses compilations of stratigraphic ranges. Not only are they prone to errors of all sorts, he argues that compilations and analyses of the Sepkoski-Raup variety obscure the real signal—that of extinction and evolution within communities. Boucot calls paleontologists back to the trenches: back to document precise range limits and back to decipher the environmental and ecological context of the fossils. Indeed, this is what most of the contributors to this volume are doing. But such work is not going on in a theoretical vacuum—it is done to test the hypotheses that emerge from the more analytical and theoretical approaches.

Sepkoski provides a lucid review of the periodicity issue and answers some of the major criticisms elicited by his and Raup's earlier contributions. Working now with genera instead of families, Sepkoski's analyses continue to reveal a 26-million-year periodicity in extinction events since the mid-Permian but fail to detect a periodic signal in the Paleozoic. The periodicity hypothesis continues to resist refutation.

Fossils do not provide the only means to detect perturbations in the biosphere. Holser, Margaritz, and Wright review the variations in sulfur, carbon, and strontium isotopes through the Phanerozoic. I suspect that the potential of such geochemical work for the understanding of bio-events has yet

to be fully realized. On the global scale, issues of temporal resolution, diagenesis, and local fractionation need to be worked out. At the local level, geochemical anomalies in the vicinity of bio-events need to be evaluated in the context of fluctuations higher and lower in the section. It's not just the fossils that are subject to vagaries of preservation, collection, and age determination.

In a largely theoretical contribution, Wilde and Berry present a model in which changes in deep-ocean circulation can be produced by climatic changes. As a cause for marine bio-events, the model is plausible but as yet largely untested.

The 35 short reports are organized stratigraphically, starting with the Precambrian and ending with the Tertiary. Most report on particular sections or particular bio-events. Their cumulative effect is impressive. It seems that no corner of the globe and no time is free of bio-events of one sort or another. The extinction events of the Late Devonian and the Cretaceous-Tertiary receive the most attention. Though geographic coverage is extensive, it is not global, being based with few exceptions on studies in Eurasia. Extinctions of marine invertebrates and protists are the bio-events most commonly discussed in this section of the book. Sea level lowering, climatic change, and bolide impact are the three most popular explanations for the biotic changes recorded in the rocks.

Many of the short papers are well-documented, succinct case studies. For example, Farsan presents evidence from stratigraphic sections in Iran and Afghanistan that suggests that the Late Devonian extinctions were protracted rather than sudden events. McGhee and others fail to find evidence for any geochemical anomalies at the Late Devonian extinction event in Germany. Whatley presents an impressive compilation of patterns of ostracod species diversity, origination, and extinction through the Mesozoic. Wiedmann documents the gradual decline of macroinvertebrates at the Cretaceous-Tertiary section at Zumaya, Spain, and argues for multiple causes for the end-Cretaceous extinctions.

Some of the short papers are brief progress reports, providing neither data nor scientific perspective. They have some value in fostering scientific communication but are likely to be quickly superseded.

The volume was produced from camera-ready copy. The production and editorial quality are satisfactory, but an index would have been a welcome addition.

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Some Other Books of Interest

Schrödinger. Centenary Celebration of a Polymath. C. W. KILMISTER, Ed. Cambridge University Press, New York, 1987. x, 253 pp. \$54.50. From a conference, London, March–April 1987.

Erwin Schrödinger was born in 1887, and to celebrate the centennial of the event representatives of the various scientific fields that Schrödinger, in the editor's words, had made his own were invited to survey his contributions to their fields and his influence on their own work. This collection of 19 papers ranging in length from four to 25 pages and of varying degrees of breadth and technicality is the result. The contributors include Jon Dorling, J. S. Bell, Chen Ning Yang, W. E. Thirring, Martin Karplus, Kenichi Fukui, A. D. Buckingham, J. T. Lewis, James McConnell, O. Hittmair, S. W. Hawking, A. Salam, T. W. B. Kibble, and M. J. Seaton. Among the more biographically oriented contributions are a brief introduction by the editor, a chapter by Ludwig Boltzmann's grandson Dieter Flamm on Boltzmann's influence on Schrödinger, and an account by William McCrea of the Dublin Institute of Advanced Studies and Schrödinger's tenure there. In two final papers, Linus Pauling and M. F. Perutz assess Schrödinger's contributions to molecular biology, both giving negative evaluations of his famous book *What Is Life?*—K.L.

Methods in Computational Chemistry. Vol. 1, Electron Correlation in Atoms and Molecules. STEPHEN WILSON, Ed. Plenum, New York, 1987. xviii, 363 pp., illus. \$65.

"With the increasing use of computational techniques in chemistry, there is an obvious need to provide specialist reviews of methods and algorithms so as to enable the effective exploitation of the computing power available," writes Stephen Wilson in the preface to this initial volume of *Methods in Computational Chemistry*. The series is intended to fill that need. "Each volume," Wilson continues, "will cover a particular area of research . . . and will provide a broad-ranging yet detailed analysis of contemporary theories, algorithms, and computational techniques." It is hoped that the series will be useful to those engaged in developing computational methods, to chemists, atomic and molecular physicists, biochemists, and molecular biologists wishing to use such methods, and to graduate students needing an introduction to the field. This initial volume is devoted to the problem of describing electron correlation effects in atoms and molecules, "the accurate calculation [of which] from first principles

has long been recognized to be one of the central problems of quantum chemistry." It contains four papers. The first, by Karol Jankowski (116 pp.), is intended to provide a short review of the methods that have been used in studies of electron correlation effects in atoms, with special attention to methods that might be also applied in the study of molecular systems and to atomic correlation effects of special interest with respect to the theory of molecular electronic structure. In the second (133 pp.) electron correlation in molecules is discussed by Miroslav Urban *et al.* In the two remaining chapters Wilson discusses methods for devising efficient four-index transformation schemes for two-electron integrals and B. H. Wells reviews the use of Green's function Monte Carlo methods in the solution of the molecular electronic Schrödinger equation. The volume includes author and subject indexes.

—K.L.

Environmental Radon. C. RICHARD COTHERN and JAMES E. SMITH, JR., Eds. Plenum, New York, 1987. xiv, 363 pp., illus. \$55. Environmental Science Research, vol. 35.

This volume is intended to "bring the reader to a level at which he can easily understand the current literature" on the effects of radon in the environment. It presupposes as background, according to the editors, only "some basic university-level chemistry and physics." The volume opens with a chapter outlining the physical properties of radon and the relevant units of measure, followed by an account of uses of radon from the 16th century to the present. Measurement methods and sources of the element are then surveyed. The next four chapters take up effects on humans—routes of exposure, dosimetry, health effects, and "mitigation" (building modifications that can reduce indoor exposure). A final chapter discusses risk assessment and policy issues. The book concludes with a glossary, appendixes giving equations for radioactive decay and conversion factors, reference lists for the individual chapters, a general reading list, and an index.—K.L.

Books Received

Climate and Plant Distribution. F. I. Woodward. Cambridge University Press, New York, 1987. xii, 174 pp., illus. \$39.50; paper, \$14.95. Cambridge Studies in Ecology.

Emergency Responses to Chemical Accidents. Planning and Coordinating Solutions. James T. O'Reilly. McGraw-Hill, New York, 1987. vi, 387 pp., \$39.50.

Optical Metrology. Kjell J. Gåsvik. Wiley, New York, 1987. xii, 231 pp., illus. \$49.95.

Peptide Hormone Receptors. M. Y. Kalimi and J. R. Hubbard, Eds. De Gruyter, Hawthorne, NY, 1987. viii, 720 pp., illus. DM 310.

Sex and Scientific Inquiry. Sandra Harding and Jean F. O'Barr, Eds. University of Chicago Press, Chicago, IL, 1987. viii, 317 pp. Paper, \$10.95.



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