vertical thermal structure of the tropical oceans, more vigorous circulation, partitioning of pelagic biotas biogeographically, and increased ocean productivity. East-west biogeographic differences are also recorded during the Miocene, and these changes are attributed to tectonic restriction of the Indonesian and Middle American seaways. The profound oceanic thermal changes during the Miocene, brought on by the development of permanent polar ice sheets, also had major impact on the terrestrial environment, but this is not intended to be a part of the book.

This book is important to marine geologists and paleontologists of all sorts, including those dealing exclusively with shallow-water, near-shore situations, and to people interested in terrestrial and climatic history as well because of the close linkage between the oceans and climate. Its 23 authors and the editor have provided more knowledge about the oceans than is available for any other time except the Quaternary.

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Interplanetary Dust

Properties and Interactions of Interplanetary Dust. R. H. GIESE and P. LAMY, Eds. Reidel, Dordrecht, 1985 (U.S. distributor, Kluwer, Hingham, MA). xxvi, 444 pp., illus. $64. Astrophysics and Space Science Library, vol. 119. From a colloquium, Marseille, July 1984.

This collection of 80 papers presents a rather up-to-date account of knowledge of and research on interplanetary dust. Following the format of the colloquium from which it derives, the volume contains seven sections: on observations of zodiacal light and the F-corona; space and related ground experiments on interplanetary dust; laboratory studies of interplanetary dust collections; experimental and theoretical studies of grain optics; relationships of interplanetary dust to comets and meteoroids; dust-plasma interactions; and dynamics of interplanetary dust. The term "dust" is restricted to very small particles excluding meteors.

All but two of the sections start with invited reviews that summarize the state of their field and provide useful reference sources. Although not labeled as such, Leinert's paper on the dynamics and spatial distribution of dust has many features of a brief review. Weinberg's review of zodiacal light observations and the contributed papers that follow it present a very up-to-date account of this, the oldest phase of interplanetary dust research. Included are brief accounts of balloon-borne infrared measurements and IRAS (Infrared Astronomical Satellite) observations.

In his review of laboratory investigations of optical properties, Zerull briefly describes the theoretical aspect of the problem and then outlines the experimental procedures for studying scattering by individual particles. These include microwave analogue studies, laser and electrostatic levitation, and the use of fine threads for particles sufficiently large compared to thread diameter. The analogue technique, now most vigorously pursued at the Ruhr University at Bochum Laboratory, where Zerull is located, receives the most emphasis. Because particles are scaled up to centimeter dimensions this procedure also permits the composition, structure, and shape of a particle to be readily fabricated. It also requires a large laboratory for carrying out the measurements.

Dust-plasma interactions have received less attention but can have significant effects. These are described by Fahr and Ripken for the heliosphere. Other areas of current interest are planetary rings, particularly for Saturn, and cometary dust tails.

Brownlee's chapter on the collection of interplanetary dust is disappointing in view of his extensive and exciting contribution to the field. About a third of the chapter is an account of Hemenway's early work. The report from the McDonnell Center for Space Sciences by Fahey *et al.* together with Brownlee's review provides a good summary of analytical work on individual particles. As techniques improve and skills in applying them are developed, the study of individual particles will become a major approach to research on interplanetary dust.

Missing from the book is discussion of experimental investigations of the formation and properties of grains condensed from cosmic-type gas mixtures. Study of properties of such grains and their thermal metamorphosis and hydration effects is an important complement to the analysis of interplanetary grains.

An interesting and often valuable feature of symposium proceedings is a report of the discussions that followed presentation of the papers. In this volume only a small fraction of the papers are followed by such reports.

This book on the whole is valuable for finding out where research on interplanetary dust is heading and what its present status is. It is a source of references to work through 1984 but does not stand on its own because of the brevity of the papers.

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Some Other Books of Interest

Advances in Plant Nutrition. Vol. 1. P. B. TINKER and ANDRÉ LÄUCHLI, Eds. Praeger (Greenwood), Westport, CT, 1986. xviii, 301 pp., illus. $40.95.

Because of the success with which fertilizers have been used, the editors of this new series note in their introduction, the study of plant nutrition has come to seem stagnant. However, in view of "signs that the subject may once again be entering a period of excitement and rapid development," they have judged it "an appropriate time to launch a series [that will] bring out comprehensive reviews on topics of current interest within the discipline as a whole." Both fundamental science and practical application will be included, and especially, it is hoped, work that joins the two. The inaugural volume contains accounts of six topics: the efficiency of nitrogen fertilizers in cereals as related to climate (Craswell and Godwin); breeding for nutritional characteristics in cereals, especially as related to trace elements (Graham); nutrient uptake rates as related to inorganic tissue components (Glass and Siddiqi); the functions of calcium (Hanson); the role of adenosine triphosphatases in nutrient absorption (Leonard); and the potential use of nuclear magnetic resonance in the study of plant nutrition (Loughman and Ratcliffe). As is intended for future volumes, the present volume includes an "Editorial" describing promising research trends on other topics in the field.

—K.L.

Some Mathematical Questions in Biology: Muscle Physiology. American Mathematical Society, Providence, RI, 1986. x, 234 pp., illus. Paper, $35. Lectures on Mathematics in the Life Sciences, vol. 16. From a symposium, Detroit, MI, May 1983.

Some Mathematical Questions in Biology: DNA Sequence Analysis. American Mathematical Society, Providence, RI, 1986. x, 124 pp., illus. Paper, $28. Lectures on Mathematics in the Life Sciences, vol. 17. From a symposium, New York, May 1984.

A symposium entitled "Some Mathematical Questions in Biology" is an annual feature of the AAAS meetings. These volumes represent proceedings of two of the most recent in the series.

The volume on muscle physiology contains papers on the molecular mechanism of muscle contraction by H. E. Huxley, the role of ATP hydrolysis in muscle contraction by E. Eisenberg, a model of the contractile process based on component studies by M. B. Propp, a mathematical method for deter-

mination of cross-bridge properties from macroscopic experiments by H. M. Lacker and C. S. Peskin, cardiac contraction as observed at the level of the sarcomere by J. W. Krueger and K. Tsujioka, and electrical field problems in muscle by R. S. Eisenberg.

In the volume on DNA sequence analysis there are five papers: an enumeration of unresolved problems in sequence analysis by W. M. Fitch, a report on a computer program for pattern recognition by P. H. Sellers, an analysis of probability distributions for sequence comparisons by M. S. Waterman, a consideration (subtitled "The continuing need for interaction between biologists and mathematicians") of some probabilistic and statistical problems by S. Tavaré, and a discussion of the prediction of RNA folding by M. Zuker.—K.L.

Ecdysone. From Metabolism to Regulation of Gene Expression. MARY BOWNES, Ed. Pergamon, New York, 1986. vi, 291 pp., illus. $58.30. From a workshop, Edinburgh, March 1985. Published also as *Insect Biochemistry*, vol. 16, no. 1.

This volume marks the decennial of a series of semiannual workshops on ecdysone initiated at the 1975 international conference on invertebrate hormones held at Lille, France. The workshops, "planned initially on a modest European basis," have grown steadily, the participants at the 1985 workshop numbering over 100, about a third of them from the United States. In an introductory chapter Jules Hoffmann assesses progress in the field over the past ten years. Noting the importance of methodological advances to its development, he identifies and discusses in turn four principal areas of progress: the biosynthesis and metabolism of ecdysone, its mode of action at the cellular and the molecular level, its involvement in the regulation of reproduction and embryogenesis, and the phylogenetic distribution of ecdysteroids. There follow 37 papers reporting or reviewing studies in these and related areas. The next ecdysone workshop is to be held in Marburg, West Germany, in 1987.—K.L.

Books Received

***Ab Initio* Molecular Orbital Theory**. Warren J. Hehre *et al.* Wiley-Interscience, New York, 1986. xx, 548 pp., illus. $79.95.

Abortion, Medicine, and the Law. J. Douglas Butler and David F. Walbert, Eds. 3rd ed. Facts on File, New York, 1986. xvi, 795 pp., illus. $40.

Active Tectonics. Geophysics Study Committee, National Research Council. National Academy Press, Washington, DC, 1986. xiv, 266 pp., illus. $26.95. Studies in Geophysics.

Advances in Gene Technology. Molecular Biology of the Endocrine System. David Puett *et al.*, Eds. Cambridge University Press, New York, 1986. xxvi, 402 pp., illus. $49.50. ICSU Short Reports, vol. 4. From a symposium, Miami, Feb. 1986.

Advances in Renal Physiology. Christopher J. Lote, Ed. Liss, New York, 1986. xiv, 334 pp., illus. $59.50.

Aerogels. J. Fricke, Ed. Springer-Verlag, New York, 1986. viii, 205 pp., illus. $39. Springer Proceedings in Physics, vol. 6. From a symposium, Würzburg, FRG, Sept. 1985.

Bioreduction in the Activation of Drugs. P. Alexander, J. Gielen, and A. C. Sartorelli, Eds. Pergamon, New York, 1986. vi, 122 pp., illus. $52. From a symposium, Oxford, England, July 1985. First published as *Biochemical Pharmacology*, vol. 35, no. 1.

Brain Theory. Günther Palm and Ad Aertsen, Eds. Springer-Verlag, New York, 1986. xii, 257 pp., illus. $42. From a meeting, Trieste, Italy, Oct. 1984.

Cadmium. E. C. Foulkes, Ed. Springer-Verlag, New York, 1986. xiv, 400 pp., illus. $196. Handbook of Experimental Pharmacology, vol. 80.

Catalog of Teratogenic Agents. Thomas H. Shepard. 5th ed. Johns Hopkins University Press, Baltimore, 1986. xxvi, 710 pp. $45.

Cell Biology. B. King, Ed. Allen and Unwin, Boston, 1986. xiv, 265 pp., illus. $45; paper, $17.95. Modern Views in Biology.

Central Plains Prehistory. Holocene Environments and Culture Change in the Republican River Basin. Waldo R. Wedel. University of Nebraska Press, Lincoln, 1986. xviii, 280 pp., illus. $34.50.

Chemistry of Multiphase Atmospheric Systems. Wolfgang Jaeschke, Ed. Springer-Verlag, New York, 1986. xvi, 773 pp., illus. $110. NATO Advanced Sciences Institutes Series G, vol. 6. From an institute, Corfu, Greece, Sept. 1983.

Detectors for Particle Radiation. Konrad Kleinknecht. Cambridge University Press, New York, 1986. viii, 206 pp., illus. $44.50.

Development as Action in Context. Problem Behavior and Normal Youth Development. R. K. Silbereisen, K. Eyferth, and G. Rudinger, Eds. Springer-Verlag, New York, 1986. x, 322 pp., illus. $56. From a conference, Berlin, May 1983.

Development, Genetics, and Psychology. Robert Plomin. Erlbaum, Hillsdale, NJ, 1986. x, 372 pp., illus. $39.95.

Developmental Biology. William F. Loomis. Macmillan, New York, and Collier Macmillan, London, 1986. x, 405 pp., illus. $33.

Excited States and Reactive Intermediates. Photochemistry, Photophysics, and Electrochemistry. A. B. P. Lever, Ed. American Chemical Society, Washington, DC, 1986. xii, 276 pp., illus. $56.95. ACS Symposium Series, 307. Based on a symposium, Toronto, June 1985.

Excitonic Processes in Solids. M. Ueta *et al.*, Springer-Verlag, New York, 1986. xii, 530 pp., illus. $75. Springer Series in Solid-State Sciences, 60.

Executing Temporal Logic Problems. B. C. Moszkowski. Cambridge University Press, New York, 1986. xiv, 125 pp., illus. Paper, $14.95.

Experimental Hematology Today–1985. S. J. Baum, D. H. Pluznik, and L. A. Rozenszajn, Eds. Springer-Verlag, New York, 1986. xvi, 143 pp., illus. $39. From a meeting, Jerusalem, July 1985.

Expert Systems 85. Martin Merry, Ed. Cambridge University Press, New York, 1985. x, 344 pp., illus. $39.50. The British Computer Society Workshop Series. From a conference, Warwick, England, Dec. 1985.

Fabry-Perot Interferometers. G. Hernandez. Cambridge University Press, New York, 1986. xvi, 343 pp., illus. $69.50. Cambridge Studies in Modern Optics, 3.

Farm Women. Work, Farm, and Family in the United States. Rachel Ann Rosenfeld. University of North Carolina Press, Chapel Hill, 1986. xiv, 354 pp., illus. $26. Institute for Research in Social Science Monograph Series.

Fatigue Crack Growth. 30 Years of Progress. R. A. Smith, Ed. Pergamon, New York, 1986. xii, 146 pp., illus. $35. From a conference, Cambridge England, Sept. 1984.

Field Theory, Quantum Gravity and Strings. H. J. de Vega and N. Sanchéz, Eds. Springer-Verlag, New York, 1986. vi, 381 pp., illus. Paper, $26.80. Lecture Notes in Physics, 246. From a seminar series, Meudon and Paris, 1984–1985.

Fishes. A Field and Laboratory Manual on Their Structure, Identification, and Natural History. Gregor M. Cailliet, Milton S. Love, and Alfred W. Ebeling. Wadsworth, Belmont, CA, 1986. viii, 194 pp., illus. Paper, $16.25.

Fluid-Rock Interactions during Metamorphism. John V. Walther and Bernard J. Wood, Eds. Springer-Verlag, New York, 1986. x, 218 pp., illus. $44. Advances in Physical Geochemistry, vol. 5.

Glucocorticoid Hormone. Mechanisms of Action. Yukiya Sakamoto and Fumihide Isohashi, Eds. Japan Scientific Societies Press, Tokyo, and Springer-Verlag, New York, 1986. viii, 199 pp., illus. $32.

Handbook of Physiology. Section 3, The Respiratory System. Vol. 2, Control of Breathing. Alfred P. Fishman *et al.*, Eds. 2nd ed. American Physiological Society, Bethesda, MD, 1986 (distributor, Williams and Wilkins, Baltimore). 2 vols. xxiv, 909 pp., illus., + index. $245.

Handbook of Physiology. Section 3, The Respiratory System. Vol. 3, Mechanics of Breathing. Alfred P. Fishman *et al.*, Eds. 2nd ed. American Physiological Society, Bethesda, MD, 1986 (distributor, Williams and Wilkins, Baltimore). 2 vols. xxiv, 784 pp., illus., + index. $245.

Handbook of Plant Cell Culture. Vol. 4, Techniques and Applications. David A. Evans, William R. Sharp, and Philip V. Ammirato, Eds. Macmillan, New York, and Collier Macmillan, London, 1986. xvi, 698 pp., illus. $57.

Handbook of the Birds of Europe, the Middle East and North Africa. The Birds of the Western Palearctic. Vol. 4, Terns to Woodpeckers. Stanley Cramp *et al.*, Eds. Oxford University Press, New York, 1985. x, 960 pp., illus. $98.

Haploids of Higher Plants in Vitro. Hu Han and Yang Hongyuan, Eds. China Academic Publisers, Beijing, and Springer-Verlag, New York, 1986. xii, 211 pp., illus. $108.

Hazardous Waste Management. Gaynor W. Dawson and Basil W. Mercer. Wiley-Interscience, New York, 1986. xii, 532 pp., illus. $65.

Hazardous Waste Management. Reducing the Risk. Council on Economic Priorities. Benjamin A. Goldman, James A. Hulme, and Cameron Johnson, project directors. Island Press, Washington, DC, 1986. xx, 314 pp., illus. $64.95; paper, $34.95.

Hazards. Technology and Fairness. National Academy of Engineering. National Academy Press, Washington, DC, 1986. x, 225 pp., illus. Paper, $22.50. Series on Technology and Social Priorities. From a symposium, Washington, DC, June 1985.

Knowledge of Language. Its Nature, Origin, and Use. Noam Chomsky. Praeger, New York, 1986. xxxii, 307 pp. $29.95; paper, $9.95. Convergence.

Laboratory Exercises in Microbiology. Jaime S. Colomé *et al.* West, St. Paul, MN, 1986. x, 283 pp., illus. + plates, appendixes, exercises report, index. Paper, $17.95.

Laboratory Outlines in Biology-IV. Peter Abramoff and Robert G. Thompson. Freeman, New York, 1986. x, 529 pp., illus. Paper, $17.95.

Land Evaluation. Donald A. Davidson, Ed. Van Nostrand Reinhold, New York, 1986. xviii, 373 pp., illus. $44.95. A Hutchinson Ross Publication. Van Nostrand Reinhold Soil Science Series.

Legged Robots That Balance. Marc H. Raibert. MIT Press, Cambridge, MA, 1986. xvi, 233 pp., illus. $30. The MIT Press Series in Artificial Intelligence.

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Motivational Systems. Frederick Toates. Cambridge University Press, New York, 1986. xii, 188 pp., illus. $37.50; paper, $11.95. Problems in the Behavioural Sciences, 4.

Multiple Criteria Optimization. Theory, Computation, and Application. Ralph E. Steuer. Wiley, New York, 1986. xxii, 546 pp., illus. $39.95. Wiley Series in Probability and Mathematical Statistics.

Nations at Risk. The Impact of the Computer Revolution. Edward Yourdon. Yourdon, New York, 1986. viii, 616 pp., illus. $19.95.

New Directions for Agriculture and Agricultural Research. Neglected Dimensions and Emerging Alternatives. Kenneth A. Dahlberg, Ed. Rowman and Allanheld, Totowa, NJ, 1986. xii, 436 pp., illus. $45; paper, $18.95.

New Evidence for the Pleistocene Peopling of the Americas. Alan Lyle Bryan, Ed. Center for the Study of Early Man, University of Maine, Orono, 1986. x, 368 pp., illus. Paper, $32. Peopling of the Americas Symposia Series. From a congress, Mexico City, Oct. 1981.

Otters. Ecology and Conservation. C. F. Mason and S. M. Macdonald. Cambridge University Press, New York, 1986. viii, 236 pp., illus. $34.50.

Our Modern Medicines. Their Origins and Impact. F. J. Bandelin. Woodbine, Hankinson, ND, 1986. xii, 228 pp., illus. Paper, $13.95.

Parasitology. William C. Marquardt and Richard S. Demaree, Jr., Macmillan, New York, and Collier Macmillan, London, 1986. xii, 636 pp., illus. $29.50.