

Peruvian anchoveta fishery. In 1970 world production of fish meal peaked at over 5 million metric tons (mmt), with Peru producing over 40 percent of the world total. In 1972, Peru's production fell by half and in 1973 by half again. Despite this large drop in Peruvian production, world fish meal production averaged 4.43 mmt during the period 1973–77, compared with an average 4.38 mmt during 1965–69. During the 1970's, Japan and the U.S.S.R. nearly offset the decline in Peruvian production and became the world's leading producers of fish meal. Vondruska correctly observes that El Niño was but one of several factors contributing to the doubling of fish meal prices in 1973 following the 1972 El Niño event. He cites the drop of fish meal prices in mid-1977, following the El Niño event of 1976, as another case where developments in world markets for all high-protein meals determine price behavior. While Vondruska provides interesting data and insights, his chapter falls short on at least two counts. First, for his analyses of price behavior, he relies on U.S. prices of menhaden meal instead of Peruvian fish meal. Since he states he had Peruvian meal prices for 1964–78, presentation of these data in the discussion of the El Niño events of 1965, 1969, 1972, and 1976 would make his results more credible. Also, one is tempted to draw some conclusions that Vondruska ought to have drawn. For example, it appears that the demand for Peruvian fish meal is highly elastic (that is, changes in Peruvian production do not affect price very much) and is significantly subject to the vicissitude of international events. This leads to another important implication, namely that the uncertainties of the market may rank in empirical significance with the uncertainties of resource availability, and both have implications for inventory-holding policy as well as harvesting policy. One wishes for more explicit recognition of such implications.

The chapter by Linn A. Hammergren, a political scientist, is an excellent description and analysis of fishing policy under three governments in Peru. The quality of the writing is clearly above that of the other chapters in the book, making it accessible to all readers. This chapter represents an insightful application of public administration theory to explain political and bureaucratic decision-making regarding fisheries. Hammergren convincingly argues that "Peruvian fishing policies from 1958 to 1978 . . . have been less responsive to El Niño or to any other industry-specific condition than they have been to the

more general political and economic situation." And "the crux of the problem has been the persisting fragmentation of policymaking in the sector, which has meant that decisions have frequently worked to contradictory ends, and that such apparently critical issues as resource management have been virtually ignored." In my experience, the conclusions apply equally to most coastal states around the world. Appropriate resource management will not become a reality anywhere until the many problems inherent in existing bureaucratic and political decision-making processes are solved.

By the late 1960's, the Peruvian anchoveta fishery had become seriously over-capitalized, an inherent tendency of all open-access (or common-property) fisheries. Part 3 also includes a reprint of an old but excellent analysis of the over-capitalization problem in the anchoveta fishery, the Instituto del Mar del Perú's Panel of Experts' Report. The analysis is practical, to the point, and accessible to the non-expert, giving careful and clearly reasoned estimates of the substantial gains realizable by reducing processing and harvesting capacity. The report represents a standard of analysis and exposition that we all should strive for when communicating with fisheries administrators.

Two other papers in part 3 are of marginal worth. In one, César Caviedes presents an imperfect economic analysis of events in Chilean fisheries before and after the 1972–73 El Niño. In another, Matthias Tomczak views the Peruvian fisheries situation in the context of the struggle for independence from imperialism. The reader who fails to read these two papers will not miss much.

In part 4, Colin Ramage concludes that successful forecasts of El Niño phenomena are not likely in the near future. Despite this conclusion, Glantz polled 60 experts on what ought to and could have been done if the 1972–73 El Niño were perfectly forecast. The responses to this hypothetical problem reveal the crucial issues behind the stock collapse problem. Several important research topics leap off the pages of Glantz's summary of the responses.

In sum, I strongly recommend this volume to those interested in fisheries management. Though it has a number of shortcomings, the dedicated reader will add significantly to his or her appreciation of an important class of resource management problems.

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## The Inner Solar System

**Earthlike Planets.** Surfaces of Mercury, Venus, Earth, Moon, Mars. BRUCE MURRAY, MICHAEL C. MALIN, and RONALD GREELEY. Freeman, San Francisco, 1981. xvi, 388 pp., illus., + plates. Cloth, \$24.95; paper, \$14.95.

*Earthlike Planets* is meant to serve as a supplementary textbook in college astronomy and geology courses, as a primary textbook in introductory courses in planetary geology, and as a vehicle that allows the educated layperson access to some of the more important results from the planetary exploration program. The book begins with an overview of the earthlike or terrestrial planets that includes examples of how our ideas of planetary origin and evolution have changed over the past decade as a result of exploring the moons and planets. In the next couple of chapters the kinds of physical and chemical processes that shape the surfaces of the terrestrial planets are discussed. The following three chapters highlight the more important scientific results obtained from exploration of the earth's moon, Mercury, and Mars. The last chapter deals with comparative planetology—lessons to be learned about the origin and evolution of the solar system, including the earth, from examination and comparison of the geological records of the earthlike planets.

The book is generally well organized, well written, and remarkably free of typographical errors, the reproduction of figures is excellent, and, most important, the level and nature of the science discussed are generally superb. The book provides a rare insight into a new and growing field. Technical jargon is kept to a minimum. There is an appendix that lists background information and ways of acquiring the lunar and planetary images that are figures in the text. The utility of such an appendix will be clear to anyone who has ever tried to probe the NASA data-management bureaucracy in an attempt to obtain image data. In the last chapter, the interweaving of scientific results with arguments about what future planetary missions to undertake proves to be a powerful method of illustrating the need for future planetary exploration. Because they have been involved in planning such missions, the authors have been able to provide special insight into the possibilities and probabilities for future exploration.

I see two problems with the book. First, several hypotheses are presented as if they are well established in planetary geology, although the field is so new

and has grown so quickly that there are, in fact, very few well-established hypotheses. As an example, the reader might well come away with the impression that most researchers agree that release of volatiles from the Martian interior was triggered by a period of early heavy impact bombardment of the Martian surface. It is not clear by any means that a period of heavy bombardment would deposit enough energy to initiate such a triggering. Second, the book suffers somewhat from a lack of discussion of the physical and chemical connections between the evolution of planetary interiors and surfaces. For instance, lunar mascons (mare volcanic fill), the lithospheric loading that they induce, and their probable relationship to the formation of graben and mare ridges are only briefly mentioned. A more extensive geophysical discussion of the Tharsis plateau on Mars, which dominates the low-order terms of the global gravity field, might also have been appropriate.

Despite these problems, the book provides the best introductory discussion to date of comparative planetology. I believe it will serve as the standard introductory textbook for some time to come. I plan to adopt the book for use in my introductory course on the solar system, and I am encouraging my colleagues to purchase copies for their personal libraries.

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## Auditory Mechanisms

**Comparative Studies of Hearing in Vertebrates.** Papers from a workshop, Honolulu, Nov. 1978. ARTHUR N. POPPER and RICHARD R. FAY, Eds. Springer-Verlag, New York, 1980. xiv, 458 pp., illus. \$39.80. *Proceedings in Life Sciences.*

This volume consists of 16 chapters whose subjects range from underwater sound localization to mammalian auditory cortices. The book is divided into sections dealing respectively with fishes, amphibians, reptiles, birds, and mammals. Throughout, major attention is directed toward the auditory periphery, but there are also two chapters dealing exclusively with the central auditory system. In the insightful final chapter T. H. Bullock discusses the important questions that still need to be examined.

The basic structure and physiology of the auditory system are well reviewed for all the groups but mammals, but there is so much material on the mammalian auditory periphery that a review would require a full volume in itself. Sound localization and psychoacoustics are beautifully discussed for all the groups but amphibians and reptiles, as befits the state of our knowledge on these topics. Most of the chapters not only discuss their authors' contributions but include excellent reviews of other pertinent literature as well. For both authors and readers, one of the joys of such a book is the opportunity, not available in refereed journals, for speculation. Eight of this book's chapters contain what I would call responsible speculation, clearly labeled as such, consistent with factual data, and often suggesting new research approaches to unanswered problems.

Some chapters contain particularly interesting points of view and have the data to back them up. Stebbins (chapter 15) discusses the evolution of mammalian hearing using a wide spectrum of data from paleontology, comparative anatomy, ecology, and psychoacoustics. His inclusion of behavioral data in a nonteleological manner is provocative and refreshing.

Lombard (chapter 4), using a synergistic blend of comparative anatomy, paleontology, and embryology, presents a cogent argument for the evolutionary independence of the amphibian auditory system. He finds that only the middle ear cavity and Eustachian tube have a similar ancestry in present-day amphibians and other vertebrates. In the following chapter, Capranica and Moffat convincingly ascribe functional nonlinearities in the ears of toads to the hair-cell-tectorial-membrane relationship; both the nonlinearities and their structural bases are remarkably similar to those of mammals.

One of the high points of the volume is Knudsen's (chapter 10) description of auditory localization in birds—particularly owls. The logic, ingenuity, and ability to ask the right questions exhibited in this series of experiments by a handful of researchers provides a standard toward which most of us only strive.

The most obviously neglected topic is echolocation; it could be argued, however, that reviews on this topic are already plentiful. The index is disappointing and typographical errors are more numerous than one would hope, but I found few factual errors.

This book is of obvious value to all who are interested in the evolutionary aspects of vertebrate audition. I believe

it should be of special importance to those who know only the "standard" auditory research animals—cats, guinea pigs, monkeys, and humans—for it demonstrates the awesome diversity that has evolved in auditory structure, physiology, and behavior.

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## Books Received

**Adrenergic Activators and Inhibitors.** Part 2. L. Szekeres, Ed. Springer-Verlag, New York, 1981. xxii, 938 pp., illus. \$224.20. *Handbook of Experimental Pharmacology*, vol. 54/II.

**Advances in Enzymology and Related Areas of Molecular Biology.** Vol. 52. Alton Meister, Ed. Interscience (Wiley), New York, 1981. viii, 408 pp., illus. \$32.50.

**Advances in Organic Geochemistry 1979.** Proceedings of a meeting, Newcastle-upon-Tyne, Sept. 1979. A. G. Douglas and J. R. Maxwell, Eds. Pergamon, New York, 1980. xviii, 784 pp., illus. \$160. *International Series in Earth Sciences*, vol. 36. Also published as vol. 12 of journal *Physics and Chemistry of the Earth*.

**Air Pollution and Forests.** Interactions between Air Contaminants and Forest Ecosystems. William H. Smith. Springer-Verlag, New York, 1981. xvi, 382 pp., illus. \$29.80.

**Albert Einstein, the Human Side.** New Glimpses from His Archives. Helen Dukas and Banesh Hoffmann, Eds. Princeton University Press, Princeton, N.J., 1981. viii, 168 pp. Paper, \$3.95. Reprint of the 1979 edition.

**American Sublime.** Landscape and Scenery of the Lower Hudson Valley. Raymond J. O'Brien. Columbia University Press, New York, 1981. xiv, 354 pp., illus. \$19.95.

**Annual Review of Pharmacology and Toxicology.** Vol. 21. Robert George, Ronald Okun, and Arthur K. Cho, Eds. Annual Reviews, Palo Alto, Calif., 1981. xii, 670 pp., illus. \$20.

**Anodic Protection.** Theory and Practice in the Prevention of Corrosion. Olen L. Riggs, Jr., and Carl E. Locke. Plenum, New York, 1981. xiv, 284 pp., illus. \$39.50.

**Antibiotics.** Vol. 4, Biosynthesis. John W. Corcoran, Ed. Springer-Verlag, New York, 1981. xii, 382 pp., illus. \$97.

**Black Children/White Children.** Competence, Socialization, and Social Structure. Zena Smith Blau. Free Press (Macmillan), New York, and Collier Macmillan, London, 1981. xx, 284 pp. \$19.95.

**Bottom-Interacting Ocean Acoustics.** Proceedings of a conference, La Spezia, Italy, June 1980. William A. Kuperman and Finn B. Jensen, Eds. Plenum, New York, 1980. xii, 718 pp., illus. \$75. *NATO Conference Series IV*, vol. 5.

**Brewing Science.** Vol. 2. J. R. A. Pollock, Ed. Academic Press, New York, 1981. xxii, 666 pp., illus. \$98.50. *Food Science and Technology*.

**Cancer Chemo- and Immunopharmacology.** Papers from a meeting, 1979. G. Mathe and F. M. Muggia, Eds. Springer-Verlag, New York, 1980. Two volumes. Vol. 1, Chemopharmacology. xiv, 316 pp., illus. \$66. Vol. 2, Immunopharmacology, Relations, and General Problems. xii, 262 pp., illus. \$52. *Recent Results in Cancer Research*, 74 and 75.

**Cardiovascular Psychophysiology.** A Perspective. Paul A. Obrist. Plenum, New York, 1981. x, 236 pp., illus. \$22.50.

**Cerebral Vascular Disease 3.** Proceedings of a conference, Salzburg, Sept. 1980. J. S. Meyer, H. Lechner, M. Reivich, E. O. Ott, and Ar. Aranibar, Eds. Excerpta Medica, Amsterdam, 1981 (U.S. distributor, Elsevier North-Holland, New York). xii, 352 pp., illus. \$62.25.

**Changing Views of the Physical World, 1954-1979.** Papers from a symposium, Canberra, Mar. 1979. G. K. White, Ed. Australian Academy of Science, Canberra, 1980. x, 142 pp., illus. Paper, A\$7.50. *Silver Jubilee Symposium Volume 2*.

**Control and Dynamic Systems.** Advances in Theory and Applications. Vol. 17. C. T. Leondes, Ed.

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