courage the present generation to return to these old problems with the new, powerful techniques of modern biological research. But despite Hamburger's efforts to reformulate and clarify the major concepts of experimental embryology, I am left with the impression that the molecular-cellular-developmental biologist will feel that the time is not yet right for an all-out assault on embryonic induction.

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Volcanic Rocks

Mantle Xenoliths. PETER H. NIXON, Ed. Wiley-Interscience, New York, 1987. xviii, 844 pp., illus., + plates. $215.

The mantle comprises most of the earth's volume and mass. It is the source region of almost all the earth's volcanic activity, and its convection provides the driving energy for plate motions on the earth's surface. However, our knowledge of the mantle is limited by its remoteness. Some aspects of mantle composition can be inferred from the chemistry of volcanic rocks formed by partial melting within the mantle, but this does not tell us about the variety of rock types present, their mineralogy, or their interrelationships. The only samples of mantle rock to which we have access are alpine peridotites (fragments of uppermost mantle emplaced in the crust tectonically) and mantle xenoliths (inclusions) brought rapidly to the surface by volcanic eruptions.

Mantle Xenoliths is an ambitious attempt to summarize our current knowledge of mantle petrology and the processes that control its structure and evolution. The book is divided into two main parts. The first presents descriptions of xenolith localities grouped by regions, and the second consists of topical studies related to xenoliths. The latter include reviews of specific suites or occurrences, summaries of particular techniques useful in mantle petrology and the data derived from them, and papers that review what has been learned about mantle processes by the application of these methods to different xenolith assemblages.

Part 1 is the first comprehensive summary of all xenolith localities that have been studied to date. Nixon has brought together 26 papers that summarize existing (and in some cases previously unpublished) data on each major xenolith province. Most of the chapters in this section are well written and informative, although some areas for which extensive data exist (for example, the western United States) are not as well covered as others. Some other areas, such as Greenland and South America, either lack important xenolith localities or have not been studied in detail; these papers (Scott-Smith; Meyer and Svisero) are necessarily brief. The chapters on xenoliths from Italy (Morten), central France (Downes), eastern China (Cao and Zhu), southern Africa (Nixon), India (Ganguly and Bhattacharya), and eastern Australia (O'Reilly and Griffin) stand out as excellent contributions. Also of particular interest to mantle petrologists are the papers that deal with mantle xenoliths from areas underlain by oceanic crust, such as Hawaii (Sen) and the Ontong Java plateau (Nixon and Neal). These chapters provide insight into the differences between suboceanic mantle and that underlying continental crust.

Part 2 is largely a review of previously published ideas. Many of the 24 papers in this section offer useful syntheses of current thinking on topics in mantle petrology such as pressure-temperature calculations on mantle phase assemblages (Finnerty and Boyd), magnetic properties of the mantle (Wasilewski), megacrysts in kimberlites and basalts (Schulze), the redox state of the mantle (Arculus and Delano), and diamonds (Harris; Meyer). Other papers deal with more specific topics, such as textural evidence for the formation of garnet lherzolite from harzburgite by exsolution (Cox, Smith, and Beswetherick), the size and distribution of asthenospheric diapirs beneath central France (Nicolas, Lucazeau, and Bayer), and compositional heterogeneities in a high-temperature lherzolite nodule (Smith and Boyd).

A major theme in part 2 is mantle metasomatism: the enrichment of refractory mantle lithologies in volatile-rich phases and in other components required to form basaltic magmas. This topic is central to current debates about the origin of magma and the evolution of the mantle. Important questions addressed in these papers deal with the scale of metasomatic processes and the timing of enrichments relative to volcanic activity: Is metasomatism regional in extent or confined to magma-saturated wallrock in zones adjacent to volcanic conduits? Does metasomatism precede volcanic activity and provide the additional components necessary to form magma, or does it result from the localized intrusions of magma derived from deeper in the mantle? These questions are addressed by Wyllie ("Metasomatism and fluid generation in mantle xenoliths"), who presents experimental data to show that a separate volatile phase cannot exist at depths between 120 and 260 kilometers because volatiles in this region will be dissolved in a melt phase. Above 120 kilometers, however, regional metasomatism may occur when volatiles exsolve from the crystallizing melts.

Chapters by Dawson on MARID suite xenoliths, Lloyd and others on regional K-metasomatism in east Africa, O'Reilly on volatile-rich xenoliths from east Australia, and Haggerty on metasomatic titanate minerals deal with the question of metasomatism directly by examining xenolith suites that exhibit textural or mineralogical evidence for metasomatic enrichment. These studies reach conflicting conclusions on whether or not the metasomatism is regional or local in extent; this reflects the general lack of agreement by petrologists on this topic. Dawson argues forcefully that the textural characteristics of MARID suite xenoliths require that they form by the crystallization of magma in dikes and veins. Rare composite xenoliths show that these veins intrude peridotite and have metasomatically enriched their wallrock by the infiltration of volatile-rich magma. In contrast, Lloyd and his group suggest that enriched xenoliths from east Africa were formed by metasomatism on a regional scale, based on the presence of relict strained olivines in pyroxene-rich xenoliths. They conclude that this enriched mantle then melted to form the host lavas, which are characterized by extreme LIL (large ion lithophile) and LREE (light rare earth element) enrichments.

These contrasting conclusions can be reconciled, however. O'Reilly compares xenolith suites from alkaline volcanic fields in east Australia with the isotopic composition of the host lavas and finds that lavas enriched in the heavy isotopes of strontium and neodymium are also characterized by modal enrichment of the xenolith suite. She notes that although these xenoliths are heterogeneous on a scale of centimeters, their mantle source region would be homogeneous at the larger scale (kilometers) sampled by melting events. More work of this nature is needed.

This book includes features that will be appreciated by both casual readers and experienced petrologists: a glossary for sorting out esoteric rock names, jargon, and the plethora of "types" and "groups" that plague mantle petrology; a compendium of every known xenolith locality, grouped by region, with data on lithic assemblages, age of emplacement, and host rock types; and, perhaps most useful of all, 72 pages of combined references. In addition, the lavish color plates throughout the volume illustrate clearly minerals and textures that are indistinguishable in black-and-white photographs.

This book is not designed for the reader with a passing interest in earth science. It will appeal most to students who desire a

comprehensive introduction to mantle petrology and processes and to petrologists and geochemists who work on mantle-derived rocks or magmas. Although *Mantle Xenoliths* does have shortcomings (for example, the coverage of eclogite xenoliths is weak, and there is virtually no discussion of alpine-type peridotite massifs), it will undoubtedly prove a valuable resource to anyone who works on mantle-derived rocks. It brings together in one volume a vast array of data and ideas on mantle xenoliths and will serve as a springboard for future research on these fascinating rocks.

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Books Received

The Acetylator Genes and Drug Response. Wendell W. Weber. Oxford University Press, New York, 1987. xiv, 248 pp., illus. $49.95.

Advances in Cognitive Science. Steps Toward Convergence. Manfred Kochen and Harold M. Hastings, Eds. Westview, Boulder, CO, 1988. xiv, 283 pp., illus. Paper, $45; to AAAS members, $36. AAAS Selected Symposia Series, vol. 104. Based on symposia, Los Angeles, CA, May 1985.

Analysis of Vertebrate Structure. Milton Hildebrand. 3rd ed. Wiley, New York, 1988. xviii, 701 pp., illus. $42.50.

Animal Cell Technology. Principles and Products. M. Butler. Open University Press, Milton Keynes, U.K., and Taylor and Francis, Philadelphia, 1987. xii, 180 pp., illus. Paper, $22. The Biotechnology Series.

Application of Biotechnology. Environmental and Policy Issues. John R. Fowle III, Ed. Westview, Boulder, CO, 1987. xii, 242 pp. Paper, $25; to AAAS members, $20. AAAS Selected Symposia Series, vol. 106. From a meeting, 1985.

Chemical Triggering. Reactions of Potential Utility in Industrial Processes. Gebran J. Sabongi. Plenum, New York, 1987. xii, 284 pp., illus. $55. Topics in Applied Chemistry.

Complex Mixtures. Methods for In Vivo Toxicity Testing. National Research Council. National Academy Press, Washington, DC, 1988. xii, 227 pp., illus. $35.

Decision Making in Criminal Justice. Toward the Rational Exercise of Discretion. Michael R. Gottfredson and Don M. Gottfredson. 2nd ed. Plenum, New York, 1987. xvi, 308 pp., illus. $35. Law, Society, and Policy, vol. 3.

Design and Analysis of Algorithms for Stochastic Integer Programming. L. Stougie. Centrum voor Wiskunde en Informatica, Amsterdam, 1987. vi, 92 pp., illus. Paper, Dfl. 14.10. CWI Tract 37.

The Destroyers. The Underside of Human Nature. James Kern Feibleman. Lang, New York, 1987. viii, 187 pp. $26. American University Studies, Series 11, vol. 17.

Humans as Self-Constructing Living Systems. Putting the Framework to Work. Martin E. Ford and Donald H. Ford, Eds. Erlbaum, Hillsdale, NJ, 1987. xiv, 409 pp., illus. $49.95; paper, $24.95.

Hypervelocity Impact. Charles E. Anderson, Jr., Ed. Pergamon, Elmsford, NY, 1987. xii, 759 pp., illus. $115. *International Journal of Impact Engineering*, vol. 5. From a symposium, San Antonio, TX, Oct. 1986.

Kalman Filtering with Real-Time Applications. C. K. Chui and G. Chen. Springer-Verlag, New York, 1987. xvi, 191 pp., illus. $39.50. Springer Series in Information Sciences, vol. 17.

The Law of the Land. Two Hundred Years of American Farmland Policy. John Opie. University of Nebraska Press, Lincoln, NE, 1987. xxii, 231 pp., illus. $25.95.

Management of Toxic Materials in an International Setting. A Case Study of Cadmium in the North Sea. Lies Dekker, Blair T. Bower, and Rob Koudstaal. Balkema, Accord, MA, 1987. viii, 116 pp., illus. $38.50. Coastal Water Series, no. 2.

The Mediterranean Was a Desert. A Voyage of the Glomar Challenger. Kenneth J. Hsü. Princeton University Press, Princeton, NJ, 1987. xvi, 197 pp., illus. Paper, $8.95. Reprint, 1983 ed.

Membrane Transport Processes in Organized Systems. Thomas E. Andreoli *et al.*, Eds. Plenum Medical, New York, 1987. xvi, 392 pp., illus. Paper, $29.50. Reprinted from *Physiology of Membrane Disorders*, 1986.

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

Mixtures and Mineral Reactions. J. Ganguly and S. K. Saxena. Springer-Verlag, New York, 1987. xii, 291 pp., illus. $59. Minerals and Rocks, vol. 19.

Modern Elementary Particle Physics. Gordon Kane. Addison-Wesley, Redwood City, CA, 1988. xx, 344 pp., illus. $39.95.

Modern Mathematical Statistics. Edward J. Dudewicz and Satya N. Mishra. Wiley, New York, 1988. xx, 838 pp., illus. $44.80. Wiley Series in Probability and Mathematical Statistics.

Monsoon Meteorology. C.-P. Chang and T. N. Krishnamurti, Eds. Clarendon (Oxford University Press), New York, 1987. x, 544 pp., illus. $85. Oxford Monographs on Geology and Geophysics, no. 7.

Naturalized Birds of the World. Christopher Lever. Longman Scientific, Harlow, U.K., and Wiley, New York, 1987. xx, 615 pp., illus. $197.

The Niche in Competition and Evolution. Wallace Arthur. Wiley-Interscience, New York, 1987. xiv, 175 pp., illus. $45.95.

Polymer Science in the Next Decade. Trends, Opportunities, Promises. Otto Vogl and Edmund H. Immergut, Eds. Wiley, New York, 1987. x, 284 pp., illus. + plates. $100. From a symposium, New York, May 1985.

Principles of Genetic Toxicology. David Brusick. 2nd ed. Plenum, New York, 1987. xviii, 284 pp., illus. $35.

Proceedings of the International Symposium on the Impact of Oxygen on the Productivity of Non-Ferrous Metallurgical Processes. (Winnipeg, Manitoba, Aug. 1987.) Vol. 2, Proceedings of the Metallurgical Society of the Canadian Institute of Mining and Metallurgy. George Kachaniwsky and Chris Newman, Eds. Pergamon, Elmsford, NY, 1987. viii, 283 pp., illus. $56.

Processing of Environmental Information in Vertebrates. Milton H. Stetson, Ed. Springer-Verlag, New York, 1987. xii, 261 pp., illus. $79. Proceedings in Life Sciences.

Public Policy and Agricultural Technology. Adversity Despite Achievement. Don F. Hadwiger and William P. Browne, Eds. St. Martin's, New York, 1987. x, 126 pp. $37.50. Policy Studies Organization Series.

Sample Pretreatment and Separation. Richard Anderson. Published for Analytical Chemistry by Open Learning by Wiley, New York, 1987. xxxvi, 632 pp., illus. Paper, $37.95.

Science and Technology Education and Future Human Needs. J. L. Lewis and P. J. Kelly, Eds. Published for the ICSU Press by Pergamon, Elmsford, NY, 1987. xii, 185 pp., illus. $28; paper, $16. Science and Technology Education and Future Human Needs, vol. 1. Based on a conference, Bangalore, India, 1985.

A Sharp Lookout. Selected Nature Essays of John Burroughs. Frank Bergon, Ed. Smithsonian Institution Press, Washington, DC, 1987. 606 pp., illus. $39.95; paper, $19.95.

Signal Transduction and Protein Phosphorylation. L. M. G. Heilmeyer, Ed. Plenum, New York, 1987. x, 400 pp., illus. $75. x NATO Advanced Science Institutes Series A, vol. 135. From a school, Spetsai, Greece, Sept. 1986.

Sociobiological Perspectives on Human Development. Kevin B. MacDonald, Ed. Springer-Verlag, New York, 1988. xvi, 405 pp., illus. $43.

The Symbiotic Universe. Life and Mind in the Cosmos. George Greenstein. Morrow, New York, 1988. 271 pp., illus. $18.95.

Synthetic Aperture Radar. J. Patrick Fitch. Springer-Verlag, New York, 1988. viii, 170 pp., illus. $36.

The Teaching of Practical Statistics. C. W. Anderson and R. M. Loynes. Wiley, New York, 1987. xii, 199 pp. $52.95. Wiley Series in Probability and Mathematical Statistics.

Tropical Forest and Its Environment. K. A. Longman and J. Jenik. 2nd ed. Longman Scientific, Harlow, U.K., and Wiley, New York, 1987. xii, 347 pp., illus. $49.95. Tropical Ecology Series.

Works and Lives. The Anthropologist as Author. Clifford Geertz. Stanford University Press, Stanford, CA, 1988. x, 157 pp. $19.95.