quarian, and internalist, looking at the intricacies of technological development without linking those changes to any broader social circumstances. With the founding of *Technology and Culture* under the energetic editorship of Melvin Kranzberg, historians were given a forum to explore the topic with new care and rigor.

To show what the journal has accomplished, Staudenmaier begins with a little counting and classifying. He clusters the 272 articles according to the time period, geographical location, variety of technology, and methodological style with which they deal. From there he identifies the issues most prominent in the array. As one might expect, the topic of leading concern has been that of "emerging technology," how new inventions and innovations arise when they do. Another important theme involves the distinctive character of technological knowledge. By and large, historians have rejected the notion that technology is merely "applied science." "Technological knowledge is unique," Staudenmaier writes, "because its design concepts are radically incomplete when they remain on the abstract level. By their very nature they must be continually restructured by the demands of available materials, which are themselves governed by further constraints of cost and time pressure and the abilities of available personnel" (p. 104).

During the 1960's, the book argues, there eventually emerged a rough consensus about the most fruitful method for studying technology's past. "Contextual history" (p. 13) takes what is best from detailed, internalist studies of technological design and combines them with research into significant economic, social, and cultural influences upon technological change. Indeed, the fact that the periodical was named *Technology and Culture* rather than, for instance, "History of Technology," reveals this intention to examine technology within a broad range of contexts. As reflected in this journal and in other publications as well, the contextual approach—in its various manifestations—is now the one historians generally prefer.

Though Staudenmaier praises the advances his colleagues have made, he is also aware of some shortcomings. The journal has not paid much attention to such topics as the worker's role in technological change, non-Western contributions, cultural conflicts involved in technology transfer, criticisms of capitalism, and women's perspectives. In some cases these oversights are obviously crucial ones, as for example in the "nearly complete avoidance of the question of labor-management tension in the journal" (p. 177). This leads Staudenmaier to wonder openly whether the attempt to overcome "Whig history" and "progress talk" has been successful. Have the historians merely buried this threadbare ideology in a more subtle array of concepts and methods?

Staudenmaier has a talent for dissecting complicated issues—gnarly disputes about technological determinism, for example—and occasionally suggests possible strategies for resolving them. Along the way he summarizes a wide range of empirical findings about specific devices, techniques, and systems. For humanists, engineers, and scientists interested in the relationship of technology to broader currents of social thought, this book will be a useful and enduring resource.

Despite the book's many strengths, I found myself wishing Staudenmaier had found a way to reveal his own views more directly, rather than continually filter them through the writings of others. In the introduction he comments that he was first attracted to the study of technology by observing the powerful and often destructive effects the coming of modern technics has had upon the American Indians. Although he seems troubled by what technology has done in "reweaving the human fabric," he never tackles that issue directly. It is one thing to make great strides developing the intellectual apparatus of an academic subdiscipline, quite another to confront the social, political, and spiritual challenges posed by the presence of technology in our world.

LANGDON WINNER
*Department of Science and Technology Studies, Rensselaer Polytechnic Institute, Troy, NY 12180*

## Crustal Geochemistry

**Archaean Geochemistry.** The Origin and Evolution of the Archaean Continental Crust. A. KRÖNER, G. N. HANSON, and A. M. GOODWIN, Eds. Springer-Verlag, New York, 1984. x, 286 pp., illus. $30.50. Final Report of IGCP Project no. 92.

**The Continental Crust.** Its Composition and Evolution. An Examination of the Geochemical Record Preserved in Sedimentary Rocks. STUART ROSS TAYLOR and SCOTT M. MCLENNAN. Blackwell Scientific, Palo Alto, CA, 1985. xvi, 312 pp., illus. Paper, $23. Geoscience Texts.

In the last decade there has been considerable progress in understanding the early geochemical evolution of Earth's crust-mantle system. These two books are excellent summaries of the current state of knowledge about this system. *Archaean Geochemistry* was prepared as the final report of an International Geological Correlation Programme project. It is a collection of papers by several authors and covers many aspects of the geochemistry of the crust-mantle system during Archean times, from the formation of Earth to about 2500 million years ago. *The Continental Crust* is a summary by Taylor and McLennan of their views of continental crustal evolution and of their extensive studies of the geochemistry of ancient sedimentary rocks. These books complement one another, and either one, or both, would be valuable to geoscientists interested in recent developments in this branch of geochemistry; the books would also be good references for a graduate-level seminar on the geochemical evolution of the crust-mantle system.

The papers in *Archaean Geochemistry* cover a wide spectrum. The book begins with a paper by Wänke and co-workers that deals with mantle geochemistry and with the authors' model of the accretion history and bulk composition of Earth. The model the authors favor postulates an inhomogeneous accretion from two basic components, and thus it is a variant of current common ideas. I like their general approach, although I was disappointed that they did not clearly identify their two components or give their composition in tabular form; presumably interested readers will have to obtain that information from previous papers. A second paper, by Sun, is also primarily concerned with mantle geochemistry, but more from the viewpoint of interpretation of data from Archean mafic and ultra-mafic rocks. Sun concludes that core-mantle fractionation was complete by 3.8 billion years ago and that much of the crust-mantle fractionation observed today had also occurred by then; he also concludes that there were significant heterogeneities present in the Archean mantle.

Two of the chapters deal with the genesis of Archean greenstone belts. One (Groves and Batt) concludes that greenstones in Australia were ensialic whereas the other (Smith *et al.*) concludes from oxygen isotope data that greenstones in South Africa were ensimatic. Although two different greenstone belts are involved, these papers clearly indicate that the important question of what geologic setting leads to formation of Archean greenstone belts is far from resolved and that different types of data, or different examples, lead to different conclusions.

Several papers of more local interest deal with the geochemistry of igneous or metamorphic rocks in the Archean. Two of these (Hansen *et al.*; Condie and Allen) are of particular interest because they deal with the granulitic rocks of southern India, including a particularly well-documented transition from amphibolite facies to granulite facies.

These papers present models of the formation of these rocks that should be considered in studies of other granulite terranes. Three of the remaining papers are particularly interesting, since they present geochronologic data from two regions for which little detail has been published recently: Archean crustal rocks in the U.S.S.R. and in China. All three papers are based on modern techniques of geochronology, and one (Bibikova) argues against the existence of very ancient rocks (greater than 3.6 billion years old) previously reported from parts of these regions.

Although McLennan and Taylor have a paper in *Archaean Geochemistry* that summarizes their model of the composition of the Archean crust, their book is a much more comprehensive treatment of crustal geochemistry. They begin with a revised model of the composition of the current upper continental crust, in which they survey all the available data bearing on the abundances of major elements, trace elements, and minor elements in the upper continental crust. This leads to a composition model that is based on the least uncertainties, from which they extend their discussions to less accessible parts of the crust. They then present their arguments concerning the composition of the total continental crust, taking into account heat-flow data and the age structure of the crust: Archean crust is different from younger crust, and bulk crustal composition models depend on inferred growth histories of the crust. Taylor and McLennan conclude that 75 percent of the present crust was formed in the Archean and 25 percent was formed more recently. Their estimate about the composition of the lower crust is dependent on their estimates about the upper and total crusts, since it is arrived at by subtracting one from the other.

Following the presentation of their models, Taylor and McLennan discuss several major questions that can be addressed with their data, including those concerning the uniformity of crustal composition with time, the provenance and tectonic significance of greywackes, the Archean crust, the Archean-Proterozoic transition, the growth rate of the crust, and crust-mantle relationships (including composition of oceanic crust). They also present a general model of the origin and evolution of continental crust from the Archean to the present, with particular emphasis on the differences between crustal processes that took place during the Archean and those that took place during Proterozoic and later times. They finish the book with a chapter on compositions of crusts from other planetary bodies, including the moon.

I was particularly impressed with the extensive quantity of data that has been compiled in this book and that is used to develop the crustal models. As the authors point out in several instances, the determination of a representative bulk composition for the continental crust or any significant part of it is very difficult and highly dependent on the model being used. Many readers of this book will probably want to quarrel with one fine point or another, but I believe that most general models of crustal compositions differ little in detail if they have been properly constrained with trace element, radiogenic isotope, and geophysical data. This book clearly presents the most comprehensive discussion of the subject to date, and I expect that it will be a classic reference for years to come. It is all the more useful as a potential textbook because it brings many aspects of geochemistry to bear on the subject, thus providing excellent starting points for many discussions of whole-Earth geochemistry.

W. R. VAN SCHMUS
*Department of Geology, University of Kansas, Lawrence 66045*

## Reprints of Books Previously Reviewed

**Alexander Fleming**. The Man and the Myth. Gwyn Macfarlane. Oxford University Press, New York, 1985. Paper, $9.95. *Reviewed* **225**, 1140 (1984).

**The Carnivores**. R. F. Ewer. Comstock (Cornell University Press), Ithaca, NY, 1985. $42.50; paper, $17.95. *Reviewed* **181**, 433 (1973).

**Glimpsing an Invisible Universe**. The Emergence of X-Ray Astronomy. Richard F. Hirsh. Cambridge University Press, New York, 1985. Paper, $17.95. *Reviewed* **225**, 1015 (1984).

## Books Received

**Eukaryotic Transcription**. The Role of *cis*- and *trans*-acting Elements in Initiation. Yakov Gluzman, Ed. Cold Spring Harbor Laboratory, Cold Spring Harbor, NY, 1985. x, 200 pp., illus. Paper, $30. Current Communications in Molecular Biology. From a symposium, Cold Spring Harbor, NY, March 1985.

**Experimental Assessments and Clinical Applications of Conditioned Food Aversions**. Norman S. Braveman and Paul Bronstein, Eds. New York Academy of Sciences, New York, 1985. xii, 441 pp., illus. Paper, $100. Annals of the New York Academy of Sciences, vol. 443. From a conference, New York, April 1984.

**The Experimental Basis for Absorbed-Dose Calculations in Medical Uses of Radionucleotides**. Recommendations. National Council on Radiation Protection and Measurements, Bethesda, MD, 1985. vi, 109 pp., illus. Paper, $13. NCRP Report No. 83.

**Extracellular Matrix**. Structure and Function. A. Hari Reddi, Ed. Liss, New York, 1985. xxii, 435 pp., illus. $96. UCLA Symposia on Molecular and Cellular Biology, New Series, vol. 25. From a symposium, Keystone, CO, April 1984.

**An Introduction to Human Ecology Research on Agricultural Systems in Southeast Asia**. A. Terry Rambo and Percy E. Sajise, Eds. xviii, University of the Philippines, Los Baños, 1984 (distributor, Environment and Policy Institute, East-West Center, Honolulu) xviii, 327 pp., illus. $30; paper, $15.

**Ion- and Molecule-Selective Electrodes in Biological Systems**. Jenö Havas. Springer-Verlag, New York, and Akadémiai Kiadó, Budapest, 1985. 238 pp., illus. $34.50. Translation.

**Ion Measurements in Physiology and Medicine**. M. Kessler, D. K. Harrison, and J. Höper, Eds. Springer-Verlag, New York, 1985. xvi, 336 pp., illus. Paper, $48.10. From a symposium, Burg Rabenstein, Switzerland, 1983.

**The Island of South Georgia**. Robert Headland. Cambridge University Press, New York, 1984. xvi, 293 pp., illus. $39.50.

**Japan's Science Edge**. How the Cult of Anti-Science Thought in America Limits U.S. Scientific and Technological Progress. Shigeru Kimura. Wilson Center, Washington, DC, and University Press of America, Lanham, MD, 1985. 164 pp., illus. $20.75; paper, $8.20.

**Language Intervention with Young Children**. Marc E. Fey. College-Hill, San Diego, 1985. xii, 358 pp. $24.95.

**Larval Forms and Other Zoological Verses**. Walter Garstang. University of Chicago Press, Chicago, 1985. xvi, 98 pp., illus. Paper, $5.95. Augmented reprint, 1951 edition.

**Laser Spectroscopy VII**. T. W. Hänsch and Y. R. Shen, Eds. Springer-Verlag, New York, 1985. xv, 419 pp., illus. $29.50. Springer Series in Optical Sciences, vol. 49.

**The Mystery of Comets**. Fred L. Whipple, assisted by Daniel W. E. Green, Smithsonian Institution Press, Washington, DC, 1985. xii, 276 pp., illus., + plates. $24.95; paper, $12.50.

**Nature and Technology**. Bioeconomics. John G. Strange. Graphics Communications Center, Appleton, WI, 1985. vi, 153 pp. $12.50.

**The Nature of Selection**. Evolutionary Theory in Philosophical Focus. Elliott Sober. MIT Press, Cambridge, MA, 1985. xii, 383 pp., illus. Paper, $12.50. Reprint, 1984 edition.

**Perspectives on Minority Influence**. Serge Moscovici, Gabriel Mugny, and Eddy Van Avermaet, Eds. Cambridge University Press, New York, and Editions de la Maison des Sciences de l'Homme, Paris, 1985. xiv, 260 pp. $49.50. European Studies in Social Psychology. From a conference, Barcelona, Sept. 1980.

**Philosophy and Spacetime Physics**. Lawrence Sklar. University of California Press, Berkeley, 1985. xii, 336 pp. $27.50.

**The Physical Chemistry of Membranes**. An Introduction to the Structure and Dynamics of Biological Membranes. Brian L. Silver. Allen and Unwin, Boston, and Solomon, New York, 1985. 396 pp., illus. $60.

**Rapid Detection and Identification of Infectious Agents**. David T. Kingsbury and Stanley Falkow, Eds. Academic Press, Orlando, FL, 1985. xii, 296 pp., illus. $29.50. From a symposium, Oakland, CA, Oct. 1983.

**Resources and Society**. A Systems Ecology Study of the Island of Gotland. Sweden. James Zuccheto and Ann-Mari Jansson. Springer-Verlag, New York, 1985. x, 246 pp., illus. $69.50. Ecological Studies, vol. 56.

**Restoring the Earth**. How Americans Are Working to Renew Our Damaged Environment. John J. Berger, Knopf, New York, 1985. xii, 241 pp. $16.95.

**Reverse Osmosis/Ultrafiltration Process Principles**. S. Sourirajan and Takeski Matsuura. National Research Council Canada, Ottawa, Ontario, 1985. viii, 1113 pp., illus. Cs125.

**The Rice Economy of Asia**. Randolph Barker and Robert W. Herdt with Beth Rose. Resources for the Future, Washington, DC, 1985 (distributor, Johns Hopkins University Press, Baltimore). xx, 324 pp., illus. $30; paper, $12.

**Ring-Opening Polymerization**. Kinetics, Mechanisms, and Synthesis. James E. McGrath, Ed. American Chemical Society, Washington, DC, 1985. x, 398 pp., illus. $74.95. ACS Symposium Series, 286. From a symposium, St. Louis, April 1984.

**Risk Quantitation and Regulatory Policy**. David G. Hoel, Richard A. Merrill, and Frederica P. Perera, Eds. Cold Spring Harbor Laboratory, Cold Spring Harbor, NY, 1985. xii, 368 pp., illus. $67. Banbury Report 19. From a conference, Cold Spring Harbor, May 1984.

**The Transfer of Spectral Line Radiation**. C. J. Cannon, Cambridge University Press, New York, 1985. xiv, 541 pp. $99.50.

**Transport in Nonstoichiometric Compounds**. George Simkovich and Vladimir S. Stubican, Eds. Plenum, New York, 1985. x, 563 pp., illus. $85. NATO Advanced Science Institutes Series B, vol. 129. From an institute, University Park, PA, June 1984.