discussed not as a structural entity but as a statistical relationship between the several protein complexes of the electron transport chain embedded in the nonrigid lipid matrix. These goals are farsighted and worth remembering but difficult to achieve because pertinent ideas and data are just emerging. In general, the authors address the theme of molecular mechanisms as well as the present literature allows. There is a fairly common consensus among them that the general tenets of the chemiosmotic framework for membrane energy transduction first laid down by Mitchell are now well established but that many of the chemical details are not yet understood.

A paper by Cox and Olsen on the organization of the electron transport chain in the thylakoid membrane is valuable because it is one of few reviews currently available that begins to deal with the issue of protein mobility and, in particular, with the transfer of electrons over large distances from photosystem II to the stromal membranes enriched in photosystem I.

Prince, O'Keefe, and Dutton summarize the data and ideas concerning the pathway and physical-chemical mechanisms of electron transport and proton translocation in the cyclic electron transport pathway of bacterial chromatophores. They discuss models to describe behavior of the components in the ubiquinone-cytochrome c_2 oxidoreductase. As they point out, making such models illustrates very well the difficulty of translating the general ideas of the chemiosmotic hypothesis into specific chemical mechanisms of transmembrane electron transport and proton translocation. A paper by Malkin provides a discussion of some analogous facets of the chloroplast electron transport chain.

Papers by Nelson and by Schlodder *et al.* provide a fine, up-to-date qualitative and quantitative discussion of the transduction of the H^+ electrochemical potential to ATP synthesis. Schlodder *et al.* discuss the problem of coupling and those of reversibility, kinetics, energization, and conformational-chemical changes in admirable detail. These two papers, along with a paper containing information on secondary structure by Sebald and Hoppe in volume 12 of *Current Topics in Bioenergetics*, can provide an up-to-date perspective on molecular details concerning the chloroplast coupling factor. Perhaps because of lack of space, Schlodder *et al.* do not discuss caveats that exist in the literature concerning the use of fluorescence quenching of 9-amino acridine as a probe of the transmembrane pH and the carotenoid band shift as a probe of transmembrane potential. A guide to the literature on this subject can be found in the book in a paper by Baltscheffsky *et al.*

The hope is expressed in the preface that the book could be used by advanced undergraduates and nonspecialists, a goal rarely achieved in multiauthor "topics" volumes. In the opinion of the reviewer, nonspecialists would find it difficult to follow most of the discussion in the book. It is, however, highly recommended for research workers in the fields of photosynthetic energy transduction, oxidative phosphorylation, and bioenergetics. It also can and should be used as a source of material by teachers of graduate courses in photosynthesis and bioenergetics.

W. A. CRAMER
Department of Biological Sciences, Purdue University, West Lafayette, Indiana 47907

Igneous Petrology

Igneous Rocks of the British Isles. D. S. SUTHERLAND, Ed. Wiley-Interscience, New York, 1982. xvi, 646 pp., illus. $132.

Hadrian's Wall is built of (and on) the quartz dolerite of the Great Whin Sill, which occupies 12 different horizons of Carboniferous rocks across northern England; the Giant's Causeway of County Antrim displays the hexagonal cooling columns of the Tertiary Causeway tholeiite basalt; the Ordovician Borrowdale volcanics of the Lake District have been mapped in at least 26 different units; the volcanic centers and dike swarms of the famous Tertiary Province form the enchanted isles of Skye, Mull, Arran, Ardnamurchan, and Rhum in the Hebrides. Igneous rocks such as these account for a substantial portion of the scenery and history, both geologic and human, of the British Isles.

In response to such splendors of nature, British scholars played a central role in the development of modern geology and petrology: Hutton with his uniformitarianism; Nicol with his polarizing prism; Sorby with thin sections of rocks for microscopic study in polarized light; and in this century Holmes with his time scale, Read who hoped to have seen the most rocks, Bailey and the other "Mull authors" with their magma types, Tilley, Wager, Brown, O'Hara and others who elucidated the fractional crystallization and mixing of basic and ultrabasic magmas, and Moorbath and others who applied isotopic analyses toward the resolution of petrologic problems. Amid this wealth of native talent, only a few interlopers stand out as contributors to British petrology: Bowen of Washington for his strenuous and revolutionary application of the principles of phase equilibria to the evolution of Hebridean magmas, and more recently Taylor and Forester of Pasadena for their stable isotope studies of how Hebridean and other magmas interacted with their surroundings.

In short, the igneous rocks of the British Isles have themselves played a major role in the evolution of petrologic thinking, and they continue to do so. Hence the justification for such a descriptive book as this, many years in preparation by 37 authors. The main part of the book is a compressed field guide, arranged in chronological order and by district from the 3-billion-year-old Precambrian remnants to the 60-million-year-old Tertiary Province, all set out insofar as possible in the context of modern plate tectonics. A remarkable appendix describes the rocks petrographically with photomicrographs and drawings to illustrate textures. The hand of a respected and durable civil service, in the form of the Institute of Geological Sciences (IGS), is strongly evident in these descriptions of classic rocks. Chemical analyses and geochronology are given in other appendixes. Geochemistry and magma genesis are only briefly summarized in the main body of the text except in regard to the Tertiary Province, a foremost battleground for the testing of hypotheses on magma types, layered intrusions, magma mixing and unmixing, crustal and mantle melting, and hydrothermal metamorphism. The part of the book on the Tertiary Province contains an overview by G. M. Brown, who is currently director of IGS, and a chapter on magma genesis by R. N. Thompson, a leader among the new generation of warriors.

This is clearly a reference book, but in view of the classic thoroughness with which these important rocks have been studied, it is also inescapably a teaching resource that should be familiar territory to any aspirant in the field of igneous petrology. Old hands will renew acquaintance with the peridotite of The Lizard, the granites of Donegal, and the classic exposures of the Hebrides. They will re-encounter and perhaps better understand the rocks benmoreite and mugearite and learn to recognize the Skye Main Lava Series and the newer magma types such as Fairy Bridge and Preshal

Mohr. (If these names sound like Gaelic or worse to the nonspecialist, it may be said in their defense that they represent things no more outlandish or less tangible than the elementary particles of physics. Whether or not they are more chaotic remains to be seen.) People looking for new ideas or new fields to conquer will find that almost none of the famous controversies on the origins of these rocks have been firmly resolved. There is still plenty to do, as this book helps to show. But a great deal has been done. Hadrian would have liked what underlies and makes up the wall he never saw.

S. A. MORSE
Department of Geology and Geography, University of Massachusetts, Amherst 01003

The Moon

Planetary Science. A Lunar Perspective. STUART ROSS TAYLOR. Lunar and Planetary Institute, Houston, 1982. xx, 482 pp., illus. $39.95.

This is the third book concerning the moon written by Taylor. Each book has sought to provide a synthesis of knowledge at an appropriate point in time: following the historic Apollo 11 mission; following study of samples returned by the last Apollo flight; and, now, during a hiatus in planetary exploration. The author properly takes the view that our understanding of the moon is central to the interpretation of remotely sensed data obtained for other planets and satellites.

The book deals with the geology, geophysics, and geochemistry of the moon. The treatment is generally laudable although, by the author's own admission, it is biased toward geochemistry. The origin of the moon is concluded to be in accord with the double planet hypothesis; the capture hypothesis is dismissed, and the fission hypothesis is ruled out for a number of reasons. This discussion is perhaps the least balanced in the book. The evidence of a magma ocean essentially contemporaneous with accretion is very strong, and the author makes a case for melting of the whole moon. The primary differentiation of the moon into crust, mantle, and core (?) occurred during solidification of the magma ocean. The origin of enigmatic KREEP remains obscure but must also be related to the magma ocean. Petrogenesis of mare basalts is complex but is broadly consistent with the remelting of mafic magma ocean cumulates. All of these events have been obscured to a greater or lesser degree by intense cratering events. The moon has been geologically quiescent for three billion years.

The author points out that in some ways our understanding of the moon exceeds our understanding of earth because of the moon's small size and relatively simple geologic history. However, in practical terms our knowledge of the moon is pathetically inadequate. We lack even a low spatial resolution global geochemical and geophysical map of the moon. We lack photographic images of the lunar poles. We have not sampled the most typical lunar terrain. The possibility of a lunar base has been raised, yet we could not sensibly decide on a site for such a base given our current knowledge of the moon.

Overall, the book presents a scholarly synthesis of lunar science in late 1981. I know of no other book in which this task has been attempted. The book is eminently readable and is largely free of typographical errors. Earth and planetary scientists with even a casual interest in the moon will benefit from reading it.

MICHAEL J. DRAKE
Lunar and Planetary Laboratory, University of Arizona, Tucson 85721

Books Received

Annual Review of Plant Physiology. Vol. 33. Winslow R. Briggs, Paul B. Green, and Russell L. Jones, Eds. Annual Reviews, Palo Alto, Calif., 1982. x, 744 pp., illus. $22.

Anthropometry and Biomechanics. Theory and Application. Proceedings of a symposium, Cambridge, England, July 1980. Ronald Easterby, K. H. E. Kroemer, and Don B. Chaffin, Eds. Plenum, New York, 1982. x, 328 pp., illus. $42.50. NATO Conference Series III, vol. 16.

Antiepileptic Drugs. Dixon M. Woodbury, J. Kiffin Penry, and C. E. Pippenger, Eds. Raven, New York, ed. 2, 1982. xviii, 880 pp., illus. $65.

Application of Electro-Ultrafiltration (EUF) in Agricultural Production. Proceedings of a symposium, Budapest, May 1980. K. Németh, Ed. Nijhoff/Junk, The Hague, 1982 (U.S. distributor, Kluwer Boston, Hingham, Mass.). 138 pp., illus. Paper, $22. Reprinted from *Plant and Soil*, vol. 64, No. 1.

The Application of Mathematics in Industry. Papers from a seminar, Canberra, Australia, Dec. 1980. Robert S. Anderssen and Frank R. de Hoog, Eds. Nijhoff, The Hague, 1982 (U.S. distributor, Kluwer Boston, Hingham, Mass.). xiv, 202 pp., illus. $32.50.

Applications of Modern Dynamics to Celestial Mechanics and Astrodynamics. Proceedings of an institute, Cortina d'Ampezzo, Italy, Aug. 1981. Victor Szebehely, Ed. Reidel, Boston, 1982 (distributor, Kluwer Boston, Hingham, Mass.). xviii, 374 pp., illus. $43.50. NATO Advanced Study Institutes Series C, vol. 82.

Applied Geomorphology. Proceedings of a symposium, Kent, Ohio, Oct. 1980. Richard G. Craig and Jesse L. Craft, Eds. Allen and Unwin, Boston, 1982. x, 254 pp., illus. $30. The "Binghamton" Symposia in Geomorphology: International Series, No. 11.

The Atomic Complex. A Worldwide Political History of Nuclear Energy. Bertrand Goldschmidt. Translation and revision of the French edition (1980). American Nuclear Society, La Grange Park, Ill., 1982. xiv, 480 pp. Cloth, $31; paper $24.

Attention and Arousal. Cognition and Performance. Michael W. Eysenck. Springer-Verlag, New York, 1982. x, 210 pp., illus. $32.

Automatic Control in Desalination and the Oil Industry. Appropriate Applications. Proceedings of a workshop, Tripoli, May 1980. H. El Hares and T. Dali, Eds. Pergamon, New York, 1982. xxii, 210 pp., illus. $45.

Available Energy and Environmental Economics. Robert H. Edgerton. Lexington (Heath), Lexington, Mass., 1982. xxii, 450 pp., illus. $36.95.

Basic Cell Biology. Charlotte J. Avers. Willard Grant Press, Boston, ed. 2, 1982. x, 518 pp., illus. $20.

Bayesian Reliability Analysis. Harry F. Martz and Ray A. Walker. Wiley, New York, 1982. xxii, 746 pp. $44.95. Wiley Series in Probability and Mathematical Statistics.

Behavior Modification in Black Populations. Psycho-social Issues and Empirical Findings. Samuel M. Turner and Russell T. Jones, Eds. Plenum, New York, 1982. xviii, 330 pp. $22.50.

Beyond Cholesterol. Vitamin B_6, Arteriosclerosis, and Your Heart. Edward R. Gruberg and Stephen A. Raymond. St. Martin, New York, 1981. xvi, 190 pp., illus. $10.95.

Biochemical Actions of Hormones. Vol. 9. Gerald Litwack, Ed. Academic Press, New York, 1982. xiv, 362 pp., illus. $42.

Biological/Biomedical Applications of Liquid Chromatography IV. Papers from a symposium, Amsterdam, Apr. 1981. Gerald L. Hawk, Robert F. Hutton, Gordon Johnston, and Chris Mol, Eds. Dekker, New York, 1982. xviii, 368 pp., illus. $55. Chromatographic Science, vol. 20.

The Collection and Preservation of Animal Parasites. Compiled by Mary Hanson Pritchard and Günther O. W. Kruse. Illustrations by Mark Marcuson. University of Nebraska Press, Lincoln, 1982. vi, 142 pp. Spiral bound, $10.95. Technical Bulletin no. 1.

Commodity and Engineering Plastics. Papers from a symposium, Atlanta, Mar. 1981. Norbert Platzer, Ed. Interscience (Wiley), New York, 1982. xvi, 244 pp., illus. Paper, $28. Journal of Applied Polymer Science: Applied Polymer Symposium 36.

Common Plants of the Mid-Atlantic Coast. A Field Guide. Gene M. Silberhorn. Johns Hopkins University Press, Baltimore, 1982. xvi, 256 pp., illus. Cloth, $17.50; paper, $7.95.

Compendium of Barley Diseases. D. E. Mathre, Ed. American Phytopathological Society, St. Paul, Minn. 1982. vi, 78 pp., illus. Paper, $12. The Disease Compendia Series.

Competition for California Water. Alternative Resolutions. Papers from a conference, Asilomar, Calif., Sept. 1981. Ernest A. Engelbert and Ann Foley Scheuring, Eds. University of California Press, Berkeley, 1982. x, 212 pp. Cloth, $27.50; paper, $8.95.

Computer Network Architectures and Protocols. Paul E. Green, Jr., Ed. Plenum, New York, 1982. xviii, 718 pp., illus. $59.50. Applications of Communications Theory.

Computer Science and Technologies, 1982. T. Kitagawa, Ed. OHM, Tokyo, and North-Holland, Amsterdam, 1982 (U.S. distributor, Elsevier North-Holland, New York). iv, 366 pp., illus. $124. Japan Annual Reviews in Electronics, Computers and Telecommunications, vol. 4.

Concepts in Biology. Eldon D. Enger, Andrew H. Gibson, J. Richard Kormelink, Frederick C. Ross, and Rodney J. Smith. Brown, Dubuque, Iowa, ed. 3, 1982. xiv, 500 pp., illus. Paper, $18.95.

Concepts in Pediatric Neurosurgery I. Karger, Basel, 1981. x, 236 pp., illus. $114.

Contact with the Stars. The Search for Extraterrestrial Life. Reinhard Breuer. Freeman, San Francisco, 1982. xii, 292 pp., illus. $28.50.

Contemporary College Algebra. Ignacio Bello and Jack R. Britton. Harper and Row, New York, 1982. x, 384 pp. $20.95.

Contemporary College Algebra and Trigonometry. Jack R. Britton and Ignacio Bello. Harper and Row, New York, 1982. x, 582 pp., illus. $21.50.

Contemporary Topics in Analytical and Clinical Chemistry. Vol. 4. David M. Hercules, Gary M. Hieftje, Lloyd R. Snyder, and Merle A. Evenson, Eds. Plenum, New York, 1982. xiv, 382 pp., illus. $52.50.

Critical Issues in Setting Radiation Dose Limits. Proceedings of a meeting, Washington, D.C., Apr. 1981. National Council on Radiation Protection and Measurements, Bethesda, Md., 1982. vi, 288 pp., illus. Paper, $15. Proceedings of the Annual Meeting, no. 3.

The Cuicatlán Cañada and Monte Albán. A Study of Primary State Formation. Charles S. Spencer. Academic Press, New York, 1982. xx, 330 pp., illus. $39. Studies in Archaeology.

Dental Microbiology. Jerry R. McGhee, Suzanne M. Michalek, and Gail H. Cassell. Harper and Row/Lippincott, Philadelphia, 1982. xx, 914 pp., illus. $32.50.

Design for Independent Living. The Environment and Physically Disabled People. Raymond Lifchez

(Continued on page 863)