

the present book is that it effectively discusses the unique properties and reactions of organic fluorine compounds in terms of modern mechanistic organic chemistry.

Instead of trying to provide a comprehensive treatise, which would require many large volumes, Chambers has selected important and current topics to review so that an organic chemist can quickly obtain the basic information he needs to utilize fluorinated materials in his research. In the early chapters the effects of fluorine substitution (particularly on reaction centers) are clearly explained and methods of introducing fluorine are covered. These chapters are excellent. In the subsequent chapters the mechanistic approach is successfully applied in discussions of displacement reactions and of the synthesis and chemical behavior of various classes of highly fluorinated organic derivatives.

A few typographical errors are apparent even to a casual reader. Also, some references cited in the text appear to have been omitted from the reference lists, and a colleague found that several references he consulted had no relation to material discussed in the text. The index is inadequate, but from personal experience I blame this on the publisher rather than the author.

The book is readable and interesting. It is indispensable for organic fluorine chemists and should be read by most other organic chemists and by graduate students. It should be a valuable reference work in teaching because perfluorinated systems provide examples of limiting cases of certain reaction mechanisms.

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## The Sun

**The Solar Chromosphere.** R. J. BRAY and R. E. LOUGHHEAD. Chapman and Hall, London, 1974 (U.S. distributor, Halsted [Wiley], New York). xx, 384 pp., illus. + plates. \$30. International Astrophysics Series.

Although the authors argue that the energy balance in the solar chromosphere and corona is of wide interest outside of solar physics, the amount of detail in which they present the subject will limit interest in this book to specialists in the field and to students seeking definitions and an overview of

chromospheric physics. Because the book collects material widely scattered through the literature, it certainly has its place in institutional libraries.

Approximately two-thirds of the book is devoted to detailed discussion of the morphology of solar spicules and the fine structure of the solar disk as defined by one observing technique: the use of the narrow-band birefringent filter to record solar structure as seen in the  $H\alpha$  line of neutral hydrogen. Results obtained by spectroscopic observations are hardly touched on. The concentration on the  $H\alpha$  chromosphere results, however, in a much-needed discussion of the many different fine structures observed in the chromosphere. The comparison of measurements obtained by many workers allows one quickly to judge for himself the reliability of empirical results. The influence of instrumental properties on the visibility of solar fine structure embedded in a semitransparent medium is not adequately discussed.

The remainder of the volume is devoted to two major topics: the construction of chromospheric models from continuum observations, and the production of the chromosphere and corona through dissipation of mechanical energy carried by waves in the solar atmosphere. The second is central to an understanding of the origin of the high temperature in the outer solar atmosphere. The chapter presenting the background theory of wave propagation and dissipation has been a useful reference for the reviewer. As the authors point out, the applicability of this theory to the energy balance problem in the chromosphere cannot be established since the requisite wave periods are not observed directly at the present time. Some of the difficulty lies in the choice of atmospheric model and the knowledge of the radiative loss function throughout the solar chromosphere. Our ability to derive reliable atmospheric models and to compute the radiative losses accurately rests squarely on the theory of radiative transfer in nonequilibrium atmospheres, but this large part of chromospheric physics is neither reviewed nor used by the authors.

The authors define chromospheric height regimes in a way that is at variance with the common designations. They define the "low chromosphere" as lying between 0 and 5,000 kilometers, the "middle chromosphere" as between 5,000 and 10,000 kilometers, and the "upper chromosphere" as between

10,000 and 20,000 kilometers. These scales give an erroneous impression of the vertical extent of the chromosphere as defined by structures other than spicules. There is ample observational and theoretical evidence that the depths of formation for the strong chromospheric lines ( $H\alpha$ ,  $CaII$ ,  $H$ , and  $K$ ) lie below 2500 kilometers and that the sharp rise to coronal temperature begins at about the same height. It is this reviewer's belief that the important instabilities and energy dissipation in the solar chromosphere occur at heights below 5000 kilometers. Likewise, much of the fine structure on the disk, in both active and quiet regions, must lie at these relatively low levels; whereas we see the effects of momentum transport and, perhaps, extension of the magnetic field to the higher layers as the solar spicules. This difficulty with the geometrical scale affects the chromospheric models put forward by the authors; the temperature minimum is too broad and the temperature rise into the corona is too slow to fit spectroscopic observations. A more reasonable geometrical picture identifies the "upper photosphere-low chromosphere" as the region between 0 and 1000 kilometers where the medium is approximately homogeneous and in hydrostatic equilibrium. The "middle chromosphere" between 1000 and 4000 kilometers is the inhomogeneous layer where the  $H\alpha$  line begins to become optically thin and also where the rapid rise in coronal temperatures ( $T_e \sim 10^6$  °K) occurs. From 4,000 to 10,000 kilometers we observe spicules and other manifestations of the chromospheric network as the characteristic features of the "upper chromosphere."

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## Marine Sedimentology

**Recent Sedimentary Carbonates. Part 1, Marine Carbonates.** J. D. MILLIMAN. Springer-Verlag, New York, 1974. xvi, 376 pp., illus. \$25.50.

During the past decade, the carbonate minerals, sediments, and rocks have been the subject of an intensive but generally uncoordinated investigation of almost unparalleled extent. They have been studied by oceanographers, chemists, mineralogists, geologists, biologists, physiologists, thermodynam-

cists, and petrologists. The result, not surprisingly, is a voluminous literature of extraordinary diversity. This literature includes far-ranging new discoveries, some of dramatic significance, others important only insofar as they provide a data base for new hypotheses. It lays some old superstitions, but replaces some of these with new ones. It represents, withal, a vast extension of our insights into and understanding of the complexities of the natural occurrences of this seemingly simple group of minerals. Milliman has attacked this literary morass with courage and vigor and produced an exceptional book that goes far beyond his stated objective, "to synthesize our present-day knowledge about calcium carbonate in the marine environment."

The book does provide such a synthesis, one that is concise, readable, accurate, and unusually complete. It is also an illustrated manual for the sedimentary petrographer and a critical, annotated bibliography of approximately 1300 primary references. It serves as an index to the carbonate literature, affording multiple access paths, abundant internal cross-references, and a highly flexible organization.

Milliman has maintained commendable objectivity throughout the book. Although his treatment of certain controversial matters clearly reflects his own interpretations, the discussions and choice of references are evenhanded and balanced. Indeed, Milliman might be criticized (mildly) for being unduly tolerant of some hypotheses that seem best consigned to the dustbin of geological mythology. Beneath the scholarly and impartial narrative, a careful reader will detect the whisper of scientific controversy, the shadow of unfulfilled investigative promise, and occasional bits of whimsy. But these are sidelights in what is first and foremost an encyclopedic synthesis of recent advances in the field.

Milliman does not deal with one major subject of recent study, the physiology of organic calcification, but he treats virtually every other aspect of carbonate deposition and diagenesis in the marine ambient. Some readers may find the opening chapter on carbonate chemistry and mineralogy disappointingly brief, but much of the material that has been omitted here will be found in later sections of the book dealing with the particular subjects to which it is most relevant (diagenesis, cementation, dolomitization).

Carbonate mineralogy is also specifically developed in a book that must stand as a companion volume, F. Lippmann's *Sedimentary Carbonates* (Springer-Verlag, 1973), which is too recent to appear in the bibliography.

It is regrettable that numerous typographical errors have escaped the proofreader's eye, many of them in the bibliographic entries; none of these, however, appears to be of more than irritational significance. The book will prove invaluable to students and investigators in a wide range of fields. It will be, I believe, the definitive source book on marine carbonates in the late 20th century, complementing and extending earlier definitive works by Schmidt and Cayeux.

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## Books Received

**Advances in Neurology.** Vol. 5. Proceedings of the Second Canadian-American Conference on Parkinson's Disease. Fletcher H. McDowell and André Barbeau, Eds. Raven Press, New York, 1974. xvi, 512 pp., illus. \$22.50.

**Almost All About Waves.** John R. Pierce. MIT Press, Cambridge, Mass. 1974. x, 214 pp., illus. \$8.95.

**Annual Review of Pharmacology.** Vol. 14. Henry W. Elliott, Ronald Okun, and Robert George, Eds. Annual Reviews, Palo Alto, Calif., 1974. x, 594 pp., illus. \$12.

**Botany.** Michael Neushul. Hamilton (Wiley), Santa Barbara, Calif., 1974. xvi, 532 pp. illus. + plates. \$13.95.

**Cambrian of the British Isles, Norden, and Spitsbergen.** C. H. Holland, Ed. Wiley-Interscience, New York, 1974. viii, 300 pp., illus. \$29.95.

**Catheter Center.** Martin Hanig. Boxwood Press, Pacific Grove, Calif., 1973. x, 142 pp. Paper, \$2.95.

**The Cerebellum, Epilepsy, and Behavior.** Proceedings of a symposium, Bronx, N.Y., Aug. 1973. Irving S. Cooper, Manuel Riklan, and Ray S. Snider, Eds. Plenum, New York, 1974. xii, 402 pp., illus. \$17.50.

**Chemical Principles in the Laboratory with Qualitative Analysis.** Emil J. Slowinski, Wayne C. Wolsey, and William L. Masterton. Saunders, Philadelphia, 1974. x, 352 pp., illus. Paper, \$6.25. Saunders Golden Series, Teacher's Guide available.

**Chemical Zoology.** Vol. 8, Deuterostomians, Cyclostomes, and Fishes. Marcel Florkin and Bradley T. Scheer, Eds. Academic Press, New York, 1974. xxii, 682 pp., illus. \$57.

**Dye Lasers.** F. P. Schäfer, Ed. Springer-Verlag, New York, 1973. xii, 286 pp., illus. \$25.10. Topics in Applied Physics, vol. 1.

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**Animals and Man.** S. Charles Kendeigh. Prentice-Hall, Englewood Cliffs, N.J., 1974. vi, 474 pp., illus. \$16.95.

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**A Field Guide to Wildflowers of Northeastern and North-central North America.** Roger Tory Peterson and Margaret McKenny. Illustrated by Roger Tory Peterson. Houghton Mifflin, Boston, 1974. xxviii, 420 pp. Paper, \$3.95. Reprint of the 1968 edition. Peterson Field Guide Series, vol. 17.

**Fracture Mechanics of Ceramics.** Proceedings of a symposium, University Park, Pa., July 1973. R. C. Bradt, D. P. H. Hasselman, and F. F. Lange, Eds. Plenum, New York, 1974. Two volumes, illus. Vol. 1, Concepts, Flaw, and Fractography. xiv + pp. 1-444. Vol. 2, Microstructure, Materials, and Applications. xvi + pp. 445-938. Each volume, \$28; the set, \$50.

**Frontiers in Catecholamine Research.** Proceedings of a symposium, Strasbourg, France, May 1973. Earl Usdin and Solomon H. Snyder, Eds. Pergamon, New York, 1973. xvi, 1220 pp., illus. \$50.

**Gambling with Truth.** An Essay on Induction and the Aims of Science. Isaac Levi. MIT Press, Cambridge, Mass., 1974. xiv, 252 pp. Paper, \$3.95. Reprint of the 1967 edition.

**Genetics.** Roger Baldwin. Wiley, New York, 1973. viii, 296 pp., illus. Paper, \$3.95. Wiley Self-teaching Guides.

**Homogeneous Catalysis by Metal Complexes.** Vol. 1, Activation of Small Inorganic Molecules. M. M. Taqui Khan and Arthur E. Martell. Academic Press, New York, 1974. xiv, 422 pp., illus. \$42.

**Hospital Engineering Handbook.** American Hospital Association, Chicago, Ill., 1974. x, 318 pp., illus. \$8.75.

**How to Build and Use Electronic Devices without Frustration, Panic, Mountains of Money, or an Engineering Degree.** Stuart A. Hoenig and F. Leland Payne. Little, Brown, Boston, 1973. xiv, 260 pp., illus. \$9.95.

**The Human Potential.** An Essay on its Cultivation. William T. Couch. Duke University Press, Durham, N.C., 1974. xii, 410 pp. \$9.75.

**Hydrographic History and Relict Fishes of the North-Central Great Basin.** Carl L. Hubbs, Robert Rush Miller, and Laura C. Hubbs. California Academy of Sciences, San Francisco, Calif., 1974. vi, 260 pp., illus. Paper, \$10. Memoirs of the California Academy of Sciences, vol. 7.

**Ice Age Lost.** Gwen Schultz. Anchor/Doubleday, New York, 1974. xviii, 342 pp. + plates. \$10.

**Individual Differences.** Abilities and Motivational Directions. Leona E. Tyler. Appleton-Century-Crofts (Prentice-Hall), New York, 1974. viii, 248 pp., illus. \$6.95. Century Psychology Series.

**Initial Reports of the Deep Sea Drilling Project.** Joint Oceanographic Institutions for Deep Earth Sampling (JOIDES). Vol.