

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-