Reference Source and Textbook

Physics of the Earth's Upper Atmosphere. C. O. Hines, I. Paghis, T. R. Hartz, and J. A. Fejer, Eds. Prentice-Hall, Englewood Cliffs, N.J., 1965. xiv + 434 pp. Illus. $17.35.

According to the preface, the fundamental goal of this book is to provide a broad view of the entire subject of the earth's upper atmosphere, defined here to lie above an altitude of about 60 km. The book involves a total of 13 different contributors, each chapter being the work of one or two experts. The usual deficiencies of such a multiple effort—lack of continuity, variations of style, annoying repetition of basic concepts, and absence of cross-references—have been largely avoided by the editors. The book is consistently well-written and the account flows smoothly from one chapter to another. Each chapter contains selected references, which are invaluable in this field.

Subject matter is divided into two basic parts, roughly equal in length. The first involves the "undisturbed upper atmosphere" and treats such subjects as photon processes (in the case of a quiet sun), ionospheric structure, motions, and fluctuations. The second part describes the "disturbed upper atmosphere." It includes chapters on photon processes (in the case of a disturbed sun), solar cosmic rays and storm plasma outside the atmosphere, polar cap events, ionospheric and magnetic storms, the optical aurora, the radio aurora, and the theory of geomagnetic storms. The various treatments are authoritative and as up-to-date as can be expected.

At this point in the development of upper atmospheric research, no book of reasonable length can do full justice to all the specialized topics involved in this complex subject. This one emphasizes ionization and interactions with particles of solar origin. Especially in the latter case, it is a welcome and much-needed addition to the literature. But it includes very little about the airglow, or about chemical reactions involving neutral constituents, or about the structure and composition of the neutral atmosphere, or about observational techniques and problems. By definition, it includes practically nothing about the atmosphere below 60 km, which the editors assign to the discipline of meteorology.

These omissions do not detract from the value of the volume. I point them out simply to emphasize, somewhat nostalgically, that the library of the scientist interested in the upper atmosphere must now include many books, of which this should certainly be one. The editors and authors are to be congratulated for an excellent and valuable contribution, which will undoubtedly take its place as one of the principal references and graduate texts on the subject.

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Spores and Spore Structure

Spores. Ferns. Microscopic Illusions Analyzed. vol. 1, *Varied Plant Groups Introduce True Ferns Through Spore Tetrad Structures.* Clara S. Hires. Mistaire Laboratories, Millburn, N.J., 1965. xxiv + 548 pp. Illus. $22.50.

Clara Hires discusses the structure of spores and spore tetrads, emphasizing the difficulties encountered in focusing with the microscope and interpreting what is seen. Her concepts of spore structure have been developed with the aid of plastic models. A major portion of the book is devoted to examples of pteridophyte spores and some conifer and angiosperm pollen.

The greatest value of the book lies in the abundant illustrations (about 350 photomicrographs, 100 photographs, and 700 drawings). The photomicrographs are excellent, illustrating quite well many spore features at different focal levels. There also are beautiful photomicrographs of indusia, germinating spores, and sporangia and close-up photographs by Charles Neidorf of fern pinnae.

However, Miss Hires's chief point—indicating errors in focusing the microscope and viewing spores from various angles—is so elementary that it can be viewed as no real problem. Furthermore, any botanist will note readily that the work is permeated with errors and confused ideas. After carefully explaining how to distinguish individual spores from tetrads and monolete from trilete spores, she proceeds to confuse them herself. Illustrations labeled as spore tetrads of *Polypodium* and *Tsuga* are clearly pine and fir pollen grains. Such well-known monolete spores as *Polypodium, Dryopteris,* and *Schizaea* are called trilete. The "distinguishing spirals" in the glands of indusia and paraphyses are merely the plasmolyzed protoplasts. Collapsed *Polypodium* spores are thought by Miss Hires to be naked, bowl-shaped protoplasts. Spore sections would have helped the author in her interpretations.

The text is amateurishly written. It ignores all existing spore terminology and uses instead simpler terms in a very loose manner. Botanical terms in general are used in peculiar and inconsistent ways. All previous work is considered inaccurate because it is not based on "basic spore concepts." Folksy terms, such as "scales like tiny pink roses," hardly lend a scientific aura to the work. No bibliography is included in this volume, but occasional references are cited, such as her zoology notes (1916) and a Mr. Wizard TV program.

The work as a whole is a collection of the author's personal impressions of ferns and spores and not the results of work by a trained morphologist. It is hoped that if the proposed volumes are forthcoming, they will be more accurate botanically.

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New Books

Biological and Medical Sciences

Illustrated Tumor Nomenclature. Published for the International Union Against Cancer by Springer-Verlag, New York, 1965. 331 pp. Illus. $36 (see cover illustration on this issue of *Science*).

Microhemocirculation: Observable Variables and Their Biologic Control. Elio Maggio. Thomas, Springfield, Ill., 1965. 208 pp. Illus. $16.50.

The Molecular Basis of Heredity. A. R. Peacocke and R. B. Drysdale. Butterworth, Washington, D.C., 1965. 188 pp. Illus. $7.25.

The Physiology of Mammals and Other Vertebrates. P. T. Marshall and G. M. Hughes. Cambridge Univ. Press, New York, 1965. 296 pp. Illus. $4.50.

Seiverd's Chemistry for Medical Technologists. Wilma L. White and Sam Frankel. Mosby, St. Louis, ed. 2, 1965. 444 pp. Illus. $10.75.

Size and Cycle: An Essay on the Structure of Biology. John Tyler Bonner. Princeton Univ. Press, Princeton, N.J., 1965. 227 pp. Illus. $7.50.