

Such errors are few and otherwise negligible. On pages 81, 84 and 112 the student is asked to deal with physically impossible concentrations of calcium hydroxide and calcium sulfate; the problems are, however, workable on paper if not in the laboratory. The authors apparently prefer the pre-Debye-Hückel ideas of ionization, devoting three pages to the relation of freezing points to the extent of ionization of salts. Problems are given involving the solubility products of compounds of three and four ions without explanation in the text.

Such criticisms are, for the most part, of secondary importance, since the authors have clearly fulfilled their aims as set forth in an excellent introduction. This book should prove very satisfactory to the student who must learn to work problems alone, as well as for class or "quiz section" use.

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TEXT-BOOKS OF BOTANY

Textbook of Botany. By E. N. TRANSEAU, H. C. SAMPSON and L. H. TIFFANY. xi+812 pp. 424 figs. New York: Harper & Brothers. 1940. \$4.00.

WITH increasing emphasis, in both secondary schools and colleges, on survey courses in general science, frequently just skimming the crests of the waves—with the ever-present danger of merely lifting off the foam—it is consoling to come upon a volume that rides on a deep keel; and certainly this book does.

More than any other recent text, it surveys the whole field of botany; more than any other recent text, it stresses physiology and ecology. There are separate chapters, among the total of fifty-three, on "The Synthesis of Sugar," "Factors Influencing the Rate of Photosynthesis," "Synthesis of Starches," "Synthesis of Fats and Proteins," "Respiration," "Respiration and Plant Development," "Physical Processes Involved in the Movement of Materials in Plants," "Plant Behavior Related to Osmosis," "Transpiration," "Growth, Dormancy, and Germination of Seeds," etc. Similarly, from the ecological standpoint, individual chapters are devoted to "Seasonal Aspects of Plants," "Environment and Leaf Development," "Non-Green Plants," "Under-water Environments" and "The Vegetation of North America." The authors take ample cognizance of recent research in these fields. The illustrations are abundant, clear-cut, effectively reproduced, and many are original.

The evolutionary development of plants does not form the central theme of the second half of the volume, as in most of our texts. This makes it possible for the authors to draw on a wider range of material, and detracts somewhat from the unity of the book. However, it is in keeping with the pedagogical phi-

losophy set forth in the preface. "We have tried to interfere as little as possible with the teacher who prefers to have students observe and discuss phenomena before books are consulted. Nearly every chapter has been written with the assumption that it will not be read by the student until the instructor thinks that the student's own observations should be supplemented by what is written." With more traditional methods of instruction, an eight hundred page volume to be mastered by beginning students would not be conducive to the preservation of undergraduate tranquility. In accordance with the philosophy that these authors have developed, however, a large treatise is a necessity. Those who disagree with this philosophy will prefer to use a shorter book; those who are converted will find this one well written, very inclusive, beautifully illustrated, modern and scientifically accurate.

Fundamentals of Plant Science. By M. ELLEN O'HANLON. xii+488 pp. 268 figs. New York: F. S. Crofts & Co. 1941. \$4.25.

INTENDED as a text-book for a full year's work in general college botany, "Fundamentals of Plant Science" amply does justice to its title. As in most of the standard texts, the first part is devoted to the cell and to the organs of the higher plants; part two, which comprises considerably more than half the volume, deals with the groups in the plant kingdom and with genetics, evolution and botanical history. There is a twenty-five page glossary at the end. The serious student will find much food for thought and very appreciable mental stimulation between these covers.

Any new text-book of general botany must win its spurs, and this one does have its distinctive features. The author is well known for her work on liverworts, and they are accorded effective if necessarily brief treatment. The Bryophyta are subdivided into the Hepaticae, the Musei and the Anthocerotales, thus raising this last group in rank, as suggested by Howe at the turn of the century. Similarly in the Pteridophyta, the lycopods are discussed first, where they really belong, and not last, as in most text-books. Fossil Pteridophyta, as well as fossil gymnosperms, are also given consideration. In view of the importance of the Psilophytales in phylogenetic interpretations, every adequate modern text-book must afford them consideration, and this one does. Similarly, the enterprising student may read and learn here of apogamy and apospory, the embryo sac of the lily and other atypical angiosperms, soilless growth of plants, tree rings, artificial parthenocarpy, hormones, xenia, the Gnetales and numerous topics which many other books fail to mention. The illustrations are largely original.

At the close of each chapter there are "Suggestions for Investigation and Discussion" and "References."

The references, perhaps more than any other characteristic of the book, are outstanding. The author has had the originality and the fortitude to add numerous recent citations, many from current periodicals, to her literature lists, so that students may travel farther afield and may also realize that plant science offers wide opportunities for investigation.

Every book reflects the personality of its author, and this is especially true of the present volume. It is written with verve and with feeling. At times it portrays the author's philosophy, and it may be preferred, because of this, in Catholic institutions. Scientifically it is a thoroughly sound and very creditable work.

The Plant World. By HARRY J. FULLER. xi + 592 pp. 306 figs. New York: Henry Holt and Company. 1941. \$3.25.

"THE PLANT WORLD" is intended especially for students "registered in elementary botany courses principally because of the cultural and general educational value of the subject, rather than because of its usefulness as a prerequisite to a professional botanical career." As such, it fills a definite niche on the library shelf.

The book is divided into four parts. The first is a brief discussion of twenty-five pages dealing with such topics as the history of botany, the importance of the subject, the nature, "explanation" and origin of life, and the differences between animals and plants. In part two, which comprises considerably more than half the volume, the cell is considered, as are the structure and functions of roots, stems, leaves and flowers. The final chapter is devoted to variation, heredity and plant breeding. Then, in part three, the groups of the plant kingdom are rather briefly discussed. The last part is concerned with various aspects of evolution, and the final chapter is on ecology. The appendix contains "A Modern Classification of the Plant Kingdom," prepared by Dr. O. Tippo, and a glossary of some twenty pages.

If the students read and learn the material presented here, they will have a good understanding of the subject, for the author does not pull his punches, even though the book is addressed more specifically to non-professional students. All the main subjects usually

considered in elementary courses are treated adequately, and the more general "cultural" topics, such as evolution, are emphasized. The style is simple, clear and direct. Modern research work is embodied in the discussions, and a definite attempt is made to show the importance to man of many topics such as wood, grafting, plant diseases, plant breeding, etc.

A large number of the illustrations are photographs and photomicrographs; they are well selected and clear, and most of them are new in text-book circles.

"The Plant World" is a readable digest of the thoughts of men who have been pondering this kingdom and of the human application of these thoughts.

Plant Biology. By PAUL WEATHERWAX. vi + 455 pp. 182 figs. Philadelphia: W. B. Saunders Company. 1942. \$3.25.

THIS volume is intended for use in a short course in botany. It is cast largely in the traditional mold. The first part deals with the structure and functions of leaves, roots, stems and reproductive organs. Considerable emphasis is placed on physiology; there are separate chapters, among the total of twenty-seven, on "The Sources of Food," "The Utilization of Food," "Metabolism, Transport, and Food Storage," "Growth" and "Responses to Stimuli." There is a clear chapter on "Heredity."

Somewhat less than half the book is devoted to the groups in the plant kingdom. This treatment is more adequate than that in many larger texts. The author finds opportunity to discuss and illustrate such plants as *Marsilea*, *Salvinia*, *Azolla*, *Isoetes*, *Psilotum*, *Lepidodendron*, *Ginkgo*, *Ephedra* and *Welwitschia*. Individual chapters toward the end of the volume are devoted to "Evolution," "Pollination," "Dormancy and Dispersal" and "Migration, Communities, Succession." There is a twenty-five page glossary. With very few exceptions, the illustrations are from the pen or the lens of the author, and they are clearly and carefully prepared.

"Plant Biology" is a sound book, substantial in its contents, direct in its style. It is the work of a mature scientist who has the ability to present to students the botanical heritage of the past set in the focused light of the present.

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SPECIAL ARTICLES

DENSITY AND SIZE OF INFLUENZA VIRUS A (PR8 STRAIN) IN SOLUTION¹

INFORMATION regarding the density and the size of

¹ This investigation was supported through the Commission on Influenza, Board for the Investigation and Control of Influenza and Other Epidemic Diseases in the

virus particles in solution can be obtained from measurements of rate of sedimentation of the particles

Army, Preventive Medicine Service, Office of the Surgeon General, United States Army, and in part by a grant to Duke University from the Lederle Laboratories, Inc., Pearl River, N. Y.