fraction of mammalian liver. Saponification of beef or hog liver fat in hot alcoholic potash for one hour yielded an orange-colored, non-saponifiable residue, which was tested on patients suffering from functional uterine bleeding. The administration by mouth of an adequate dosage completely controls the menorrhagia or metrorrhagia. Thus far our clinical observations indicate that in young women there is a cumulative effect lasting for months after its administration has been discontinued. Patients in the latter part of menopause who suffer from menorrhagia or metrorrhagia require much larger doses than the former group and show no cumulative effect, requiring treatment with each period. This apparent inverse dosage with the ovarian function suggests that its action is related to the functional activities of the gonads. Curtis[1] also has reported favorable results from the use of liver extract and of our fraction.

While it was known from the work of Dam[2] that liver fat contains the anti-hemorrhagic vitamin K, we did not consider the anti-menorrhagic factor to be related, since it withstands hot saponification. The recently reported observations of Lichtman and Chambers[3] indicate that there is a saponification-stable substance in liver fat which has some of the properties of vitamin K.

We are continuing the fractionation and testing of the anti-menorrhagic factor (produced commercially as "Anti-menorrhagic Factor"—Armour) and have begun experiments to determine the identity or non-identity of the anti-hemorrhagic and anti-menorrhagic factors.

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SCIENTIFIC BOOKS

RECENT BOTANICAL BOOKS

Economic Botany: A Textbook of Useful Plants and Plant Products. By ALBERT F. HILL. vii + 592 pp. 225 figs. McGraw-Hill Book Company, Inc., New York. 1937. $4.00.

THE author states that this book is the "outgrowth of several years' experience in presenting a one-semester course dealing with economic plants." He has expressed an aim to give the student, through a knowledge of industrial, medicinal and edible plants, a broader outlook, greater interests in the world about him and a realization of the importance of plants and plant products to mankind. Nine chapters deal with such industrial plants and plant products as fibers, wood, cork, tanning and dye materials, rubber and other latex products, gums and resins, essential oils, fatty oils and waxes and sugars, starches and cellulose products. Two chapters consider medicinal plants, fumitories and masticatories. Seven chapters discuss the history and nature of food plants, cereals, legumes and nuts, vegetables and fruits, both of temperate and tropical regions. There are two chapters on food adjuncts, including spices and other flavoring materials, beverage plants and beverages. A systematic list of species discussed, a bibliography and an index constitute the appendix. Books of this sort serve a good purpose, and the author has succeeded well in carrying out the aims expressed in the preface.

W. W. ROBBINS
UNIVERSITY OF CALIFORNIA

Herbals, Their Origin and Evolution. A chapter in the history of botany, 1470–1670. By AGNES ARBER. 2nd ed. xxiv + 326 pp. 131 figs. 26 plates. Cambridge University Press, Cambridge. 1938. $7.50.

THE revival of interest in herbs and herb gardens makes unusually timely this revised and enlarged edition of Mrs. Arber's book on herbals. These curious mixtures of descriptive botany, gardening, folk-lore, medicine, wood-engraving and even cookery were so highly prized in families fortunate enough to own one that many have come down in good condition to the present time and formerly could be bought at reasonable prices. Their acquisition by institutions and private collectors has made prices soar, and good copies of the classic herbalists have become impossible except to the very wealthy.

Mrs. Arber's book offers more, however, than could be found in any one collection, since it contains excellent reproductions of the more striking of the drawings and woodcuts from a variety of sources, many inaccessible to the ordinary botanist. While nearly all the text figures and plates of the earlier edition have been retained, a few substitutions have been made, and the number has been increased. Much of the text has been rewritten and expanded. An appendix lists chronologically the more important herbals and botanical works published during the period covered.

Even libraries and individuals owning a number of herbals will find in this book valuable sidelights on the development of descriptive botany in the comparative chapters on the various countries and in the attractive and accurate accounts of the herbalists themselves.

B. F. LUTMAN
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[1] A. H. Curtis, "Textbook of Gynecology," pp. 111, 404. W. B. Saunders Company, 1938.

[2] H. Dam and F. Schonheyder, *Biochem. Jour.*, 30: 897, 1936.

[3] A. L. Lichtman and W. H. Chambers, SCIENCE, 88: 358, 1938.

Introduction to Plant Pathology. By FREDERICK DEFOREST HEALD. xi + 579 pp. 200 figs. McGraw-Hill Book Company, New York and London. 1937. $4.00.

DR. HEALD would be the first to insist that there is little point in a review which is wholly laudatory, or merely descriptive, yet I am unable to write any other sort regarding his latest book. This volume is the work of a master of lucid style with long experience in preparing texts, who is recognized as one of the best teachers of plant pathology in this country.

Diseases caused by parasites still get the largest share of space, a little more than 250 pages. The non-parasitic and virus diseases take up about 150. The sixty pages given to plant disease prevention and control include a number of recently discovered and little known methods, while the fifty introductory pages give material of general and vital interest to students who are not specifically interested in agriculture or, for that matter, in plant pathology, but merely in human affairs. If forced to indicate a change, I would suggest the omission of the section on "Methods," leaving that subject for the more detailed manuals.

Teachers of plant pathology are fortunate to have such a book available, and I suspect there are few of them who do not frequently consult it, even if they do not use it in their classes.

NEIL E. STEVENS
UNIVERSITY OF ILLINOIS

Plant Ecology. By JOHN E. WEAVER and FREDERIC E. CLEMENTS. Second edition. xxii + 601 pp. 271 figs. McGraw-Hill Book Company, New York and London. 1938. $5.00.

THE first edition of this book appeared in 1929. The second revised and enlarged edition appears while the work is still unrivaled in our language. The new edition has 81 more pages, 9 more illustrations and 429 more papers cited in its literature list than the old.

Considerable attention is given to applied ecology, notably conservation. Much new and valuable material is included under the discussion of soil. However, recent advances in the field of atmospheric factors and climatology have received less attention than they deserve. The section on methods of studying vegetation has been augmented somewhat. Without enthusiasm, the frequency-abundance quadrat method is described. Besides other variations of the quadrat, the relict method and pollen analysis also are discussed.

The past decade has seen remarkable advance in the practical use of ecology. In education the condition is less satisfactory. In many of the leading older institutions the subject is not recognized as a discipline nor given attention in introductory biology. Perhaps matters would be helped if such an influential book as this were to approach the difficult problem of vegetation and plant communities in a more tentative spirit. The task of reducing this problem to some order has involved drastic measures which create the impression of a finality that is doubtless far from the thoughts of either author.

PAUL B. SEARS
OBERLIN COLLEGE

Plant Physiology. With reference to the green plant. By EDWIN C. MILLER. Second edition. xxxi + 1201 pp. 39 figs. McGraw-Hill Book Company, New York and London. 1938. $7.50.

ALTHOUGH the chapter headings are the same as in the first edition, much new material has been incorporated. The increase in length is 300 pages, and of these 61 have been added to the chapter on growth; about 20 pages each to the chapters on the cell, loss of water, formation of carbohydrates, nitrogen metabolism, translocation and respiration; less than 10 pages of increase are found in each of the chapters on solutions and membranes, intake of water and solutes, fat metabolism and digestion. The large number of literature references which made the first edition so valuable to teachers, students and those engaged primarily in research work has been doubled in the new edition, so that now approximately 6,500 citations are available. The extraordinary interest in recent years in the subject of growth is shown by the fact that the 250 references that sufficed for the first edition (literature up to 1929–30) have been increased in this edition to approximately 900. New material, or more complete discussions than appeared in the previous edition, will be found on the following topics: cell membrane formation, oxygen supply and root growth, absorption of solutes, minor elements, indications of nutrient deficiencies, drought resistance, autumnal coloration, nitrogen metabolism, latex, cohesion theory of the ascent of sap, translocation (direction, distance, mechanism, tissues involved), respiratory coefficients, composition of air of intercellular spaces, growth-promoting and growth-inhibiting substances, dormancy, ripening, radiation (wave-lengths, x-rays, polarized light), photoperiodism, bioelectric phenomena, effects of various gases and vernalization.

F. E. DENNY
BOYCE THOMPSON INSTITUTE
FOR PLANT RESEARCH

The Structure and Development of the Fungi. By H. C. I. GWYNNE-VAUGHAN and B. BARNES. xvi + 449 pp. 309 figs. Second and revised edition. The University Press, Cambridge. 1937. $5.50.

THE first 48 pages deal with the general characters

of the fungi, such as structure, physiology and relationships to other organisms. This introductory survey is the most interesting and valuable part of the book, bringing to one's attention much important work that has been omitted from other similar books. A brief discussion of the Monads, the possible representatives of the ancestral stock of the fungi, is given. The Myxomycetes and Plasmodiophorales are excluded from the fungi and are unfortunately too briefly discussed.

Then follows a morphological and cytological discussion of the fungi from the Phycomycetes through the Basidiomycetes. The Fungi Imperfecti are dismissed in two pages. The final chapter of twenty pages is on mycological technique, presenting valuable information on the isolation, culturing and staining of fungi. The list of literature includes well over 1,000 titles.

The authors have the knack of saying much in a few words, and it is therefore unfortunate that so many valuable investigations, instead of being summarized, are passed over entirely or merely mentioned. For example, in the preface the authors emphasize the importance of flagellation as a guide to the interrelationships of the Phycomycetes and yet fail to take full advantage of both old and new researches on this very subject.

It must be remembered, however, that the book is addressed to the student rather than to the investigator, and as such a book it will fill an important need in mycology classes.

JOHN N. COUCH
UNIVERSITY OF NORTH CAROLINA

The Structure of Economic Plants. By HERMAN E. HAYWARD. x + 674 pp. 340 figs. The Macmillan Company, New York. 1938. $4.90.

THIS book, "an outgrowth of courses in plant anatomy offered at the University of Chicago since 1927," is most timely and welcome. For a long time those interested in applied botany, research workers and students, have had a need for a work which would assemble the investigations relating to the structure and developmental anatomy of important economic plants. This work may serve to point out that the student may learn fundamental anatomy from a consideration of such plants as onion or radish as well as from a study of little-known and relatively unimportant species.

The book is organized in two parts, the first of four chapters dealing with general plant anatomy, the second with the structure of a selected number of economic plants. Part I, including cells and tissues and their development, the anatomy of the root, the anatomy of the shoot and the anatomy of the flower and fruit, is sufficiently comprehensive to make the book generally useful.

Part II considers the structure and developmental anatomy of *Zea mays, Triticum* spp., *Allium cepa, Cannabis sativa, Beta vulgaris, Raphanus sativus, Medicago sativa, Pisum sativum, Linum usitatissimum, Gossypium* spp., *Apium graveolens, Ipomoea batatus, Solanum tuberosum, Lycopersicum esculentum, Cucurbita* spp. and *Lactuca sativa.* The author states that "the principal criteria determining the selection were the economic importance of the plant, its suitability as a representative of the family to which it belongs, and the intricacy of its anatomical and morphological detail." In addition to the numerous original illustrations, others have been selected from various special studies; nearly all are well-labelled. Citations of the more important literature conclude each chapter. A glossary "defining the terms in the sense in which they are used in this work" is appended. It is gratifying to know that the author contemplates a second volume which will deal more especially with important fruit crops. The present volume is a distinct contribution, meeting a long-felt need in the field of applied botany.

W. W. ROBBINS
UNIVERSITY OF CALIFORNIA

General Plant Physiology. By E. C. BARTON WRIGHT. Foreword by Sir F. Gowland Hopkins. 539 pages, 44 figs. P. Blakiston's Sons and Company, Philadelphia. 1938. $4.50.

THE reviewer considers this book to be one of the better texts in plant physiology. Conservative in the treatment of many topics, the emphasis on the various aspects of plant physiology is well placed, and the student who masters such a presentation will receive sound training upon which to evaluate more controversial work. The chemical aspects of physiology receive the greater attention; the discussions of carbohydrates and fats are especially well done. Preliminary training in organic chemistry is a necessary prerequisite for an understanding of a large part of the material discussed. Effective use is made of curves, diagrams and structural formulae.

There is a tendency to give greater prominence to English contributors to plant physiology, as might be expected, and not every one would agree with the author's judgment that Mason and Maskell's and Mason and Phillis' studies on translocation in the cotton plant "represent . . . one of the most brilliant series of advances that has been made in plant physiology," in spite of the extensive and thorough work involved in those studies. Some will object also to statements that all living things are capable of movement, that metabolism is the main concern of plant physiology, and some will criticize the emphasis placed on the gas exchange in respiration rather than the energy relations. Others will be disappointed to find that vapor pressure receives little attention in the con-

sideration of transpiration. To still others, however, it will be a pleasure to find that osmosis is treated as diffusion through a membrane and that it is not limited to the diffusion of water through a semi-permeable membrane, as some American authors are inclined to treat it. The book is divided into three parts—Part I, "General Physiology of the Cell"; Part II, "Metabolism"; and Part III, "Growth, Reproduction and Irritability." That such a division is not entirely satisfactory is shown by the inclusion of transpiration and ascent of sap in Part I, "General Physiology of the Cell," and transport of solutes in Part II, "Metabolism."

A few criticisms selected from many pages may give an impression that much of the book is regarded unfavorably. Such is not the intent, however, as is indicated by the early portion of this review.

The press work and binding are excellent.

WILLIAM J. ROBBINS
NEW YORK BOTANICAL GARDEN

A Bibliography of Eastern Asiatic Botany. By ELMER D. MERRILL and EGBERT H. WALKER. xlii + 719 pp. Jamaica Plain: Arnold Arboretum. 1938. $12.50.

IN every field, good bibliographies are keys to literature that vastly enhance its usefulness. Perhaps the time may come when the best bibliographies will cover the fields where such works are most needed, but up to the present time most bibliographers have chosen their own fields, and each has recorded the literature of the subjects in which he was most deeply interested.

And so it has happened that this fine bibliography, remarkably complete and accurately compiled, deals with the plant life of eastern Asia, with which both authors have long concerned themselves. It may be said in justification of this undertaking that, unless checked by the present unsettled conditions in that part of the world, our knowledge of the Asiatic flora is entering upon an era of great expansion, and the existence of a record such as this of what has already been done may prevent duplication of effort.

"Eastern Asia," as the term is here used, "comprises China, Japan, Formosa, Korea, Manchuria, Mongolia, Tibet, and eastern and southern Siberia," and works are included relating to the flora of adjacent regions, when these have an important bearing on that of the region mentioned. There are more than 21,000 author-entries, including references to more than 1,200 serials; these have been checked to the original sources whenever possible, and an effort has been made to correct erroneous statements of dates of publication, unless this would involve unwarrantably extensive investigation. The troublesome cases arising from the many authors' names and the titles in Russian, Japanese and Chinese characters have been handled in an eminently satisfactory manner, and there are separate lists of Chinese and Japanese serials and of Chinese and Japanese authors. There are also classified subject-indexes, filling about 125 of the quarto pages. The clerical and typographical errors are remarkably few for a work of this character. In short, the volume is a permanent testimonial to the diligence and scholarship of its authors and will long remain a standard work of bibliographic reference.

JOHN H. BARNHART
NEW YORK BOTANICAL GARDEN

SPECIAL ARTICLES

VITAMIN RESEARCH

A BIOCHEMICAL research program that is receiving attention in the Sterling Chemistry Laboratory at the present time calls for the development of practical methods of synthesizing primary halides of the pyrimidine type, corresponding to the organic structure expressed by formula I. Primary, pyrimidine halides of such constitution are difficult to prepare, and function as necessary intermediates in the synthesis of vitamin principles of the vitamin B_1 type. For example, the recently devised method of synthesizing the anti-neuritic vitamin, *thiamin* (V), is based on the fact that a pyrimidine halide represented by formula III couples