tory and extent of irrigation, characteristics of arid region soils, soil moisture, plant-soil-water relations, evaluating land for irrigation, source and quality of irrigation water, measurement and application of irrigation water, irrigation practices for various crops, drainage reclamation, land evaluation, nutritional problems, and soil management for specific crops.

In this clearly written, well-illustrated book the authors have attempted to cover too much ground for a textbook to be used by students whose major subject is soils. But it should find wide use in vocational schools and as a handbook for those giving technical advice to farmers.

Along with its fine qualities, the book has some shortcomings. The statement is made that modern irrigation practice began in a specific year. In a practice as old and widespread as irrigation, transitions are gradual and take place over wide areas. In the discussion of soil moisture no credit is given to Buckingham for initiating the concept of capillary potential.

The book provides an excellent up-to-date appraisal of the problems associated with the management of irrigated soils, and should therefore find a wide reading public.

M. R. HUBERTY

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Elementary Plant Physiology. Stuart Dunn. Cambridge, Mass.: Addison-Wesley, 1949. 164 pp. $3.50. Laboratory manual to accompany text $1.00.

This "brief text," as the author describes it, is exactly that, and as such stands out in sharp contrast to such standard works as those by Miller and by Meyer and Anderson. (Oddly, there is no reference to the second text throughout Dunn's book.) *Elementary Plant Physiology* is the type of text which schools of applied science, such as agricultural colleges, have needed for some time. The general field of plant physiology is adequately covered for a one-semester or one-quarter course.

One virtue of such a short text is that it allows time for discussion and for the review questions at the end of each chapter, which appear to be excellent quizzes for the student on the material just covered. As the author explains, literature citations and bibliography are intentionally brief; however, considering the brevity of the text, they are probably adequate.

When it comes to judging the actual make-up of the book, one can cite both virtues and what appear to be serious failings. The order of chapters is both logical and continuous (structure, absorption, transpiration and translocation, mineral nutrition, photosynthesis, organic constituents, respiration, and growth and movement). To cite a few examples, in Chapter 3 (absorption) the explanation of osmosis and diffusion are extremely clear, simple, and concise, and good examples are used. On page 28 under methods of measuring osmosis the author points to the errors in interpretation of data obtained by the cryoscopic method. Such cautions in a brief text of this nature are well taken. On the other hand one wonders whether in an elementary text an explanation of Donnan equilibrium is advisable, especially in light of the pros and cons to the theory in present-day literature. In certain instances explanations of phenomena are so brief that their value is questionable (e.g., the discussion of the "Perimeter Law" and the researches of Brown and Escombe, attempted in half a page). There is an excellent diagram of a corn plant and the several loci for detection of absorbed radioactive elements in the plant (p. 60). (It does, however, include a slight error, designating intercellular space as stoma.) Chapter 5 (mineral nutrition) is excellent for its general completeness and clarity of explanation and example. The brief historical reviews of such major topics as solution culture (called water culture here) are good aids to further understanding of the subject, as is Chapter 6, on photosynthesis. One might quarrel with the use of the word *function* in relation to the mere *presence* of mineral elements in plant constituents, in contrast to cases where they do have definite physiological functions (e.g., Fe in chlorophyll synthesis, K in protein synthesis, etc.), but this is general throughout plant physiology texts. Although the chapter on photosynthesis is moderately brief, it seems to cover adequately the cardinal points of pigments, factors, conditions, and mechanism. Because of this brevity, however, certain statements are made without much room for flexibility and exception to the generally accepted rule (and in this unsettled area of plant physiology, there are many). For example, CO_2 is said to be available *only* from the air; no mention is made of CO_2 from respiration or CO_2 pickup as in a reverse Kreb's Cycle. However, a good review is given of recent advances in using isotopes as tracers.

In the opinion of the reviewer, one of the most serious omissions occurs in Chapter 7, on organic constituents of plants (carbohydrates, proteins, fats, enzymes, and miscellaneous compounds, 8 pages!). In general the treatment is what one finds in an organic chemistry or elementary biochemistry text, i.e., merely names, structures, and classification. The author missed a grand opportunity to give to students in the applied fields, who do not normally acquire this material in other courses, much pertinent information on organic compounds and constituents composing plant tissues and organs.

One of the best chapters in the book is the last one, Chapter 9, on growth and movement (21 pages). The examples and explanations are very good and clear. As in most first edition texts, a variety of slight errors will crop up. There is one on page 153, where the author gives the impression that one has to work in darkness in making auxin assays, whereas normal red or orange light is generally used. The diagram in Figs. 8 and 9 is a poor one for demonstrating *Avena* curvature assay (the angle referred to is no angle). The author should consult Went and Thimann's *Photohormones*, p. 31, Fig. 10.

In general, then, the text has much to recommend it and has a definite place in institutions that do not have a major curriculum in plant physiology, as well as in agricultural colleges and other schools of applied science.

A laboratory manual by the author accompanies the text. This 50-page manual follows the text closely from Chapter 3 on. Each of the 49 experiments has many selected journal references and good page references from several texts (Meyer and Anderson are included here).

In general, the experiments are short and not too complex for individual performance.

JAMES H. M. HENDERSON
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Colloid Chemistry of the Silicate Minerals. C. Edmund Marshall. New York: Academic Press, 1949. 195 pp. $5.80.

This is the first of a series of monographs on agronomy prepared under the auspices of the American Society of Agronomy. The volume is restricted, in the main, to evidence obtained from reasonably pure materials, thus enabling the author to lay before the reader an account from the viewpoint of a participant, in which the advances of the last twenty years are especially emphasized.

After a historical outline, the author takes up silicate structures, silicates based on a three-dimensional framework, the colloidal properties of the zeolites and the structures of silicates with planar frameworks, and the structural interpretation of chemical analysis of the clay minerals. This is followed by chapters dealing with the sizes and shapes of clay particles and with the optical properties of clay aggregates and suspensions, adsorption by the clays and its consequences, clay acids and their titration curves, and ionic exchange reactions of the clays. The book is concluded by three chapters on properties: the electrokinetic properties and mechanical properties of clay suspensions, and sols, and the properties of clay aggregates and films. From this outline of the chapter headings it will be seen that the work is restricted to pure materials, relegating to the background diverse and important applications. In admirable fashion the author has clarified the fundamentals rather than describing the technical details of application. The author has succeeded well in his announced purpose and is to be congratulated.

HARRY B. WEISER
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Fifty Years of Plant Physiology. Th. Weevers. Amsterdam, Holland: Scheltema & Holkema's, 1949. 308 pp.

This contribution to the history of plant physiology covers the years 1895–1945, with special emphasis on Dutch investigators and their works. Since many of these are unfamiliar to American physiologists, their inclusion here is one of the chief assets of the volume, although it tends to overbalance the work of plant physiologists of other countries and thus gives a one-sided picture of the development of the science.

In plan the book is modeled so faithfully upon Hugo de Vries' *Textbook of Botany* that it practically forms a sequel to it. However, in the past fifty years the science of plant physiology has expanded and branched out in many directions unimportant or unheard of in the time of de Vries. The result is that the book seems overloaded in such fields as tropisms and other movements, and inadequate in such fundamental aspects of growth as photosynthesis, water relations, and enzymes. Even after a careful perusal of the entire volume, the reader lacks a well-rounded concept of plant physiology in 1945. However, the book is a valuable addition to a physiologist's library for the sake of its bibliography.

RUTH M. ADDOMS
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Water in the Physiology of Plants. A. S. Crafts, H. B. Currier, and C. R. Stocking. Waltham, Mass.: Chronica Botanica; New York: Stechert-Hafner, 1949. 240 pp. $6.00.

Graduate students in biological science are expected to achieve a somewhat detailed knowledge of a restricted field and a reasonable familiarity with the important ideas and techniques of many associated sciences. The tremendous volume of information that keeps pouring forth in countless technical journals makes this task increasingly difficult. It is quite hopeless to expect graduate students, or even more experienced research workers, to keep abreast of this flood of data, theories, and facts without the assistance of specialists whose critical judgment can bring order and sharper focus to the work in their spheres of interest. The rapidly growing number of reviewing journals, monographs, and articles is tangible evidence that this problem is appreciated and that efforts are being made to provide at least a partial solution.

The volume under review is a contribution of this kind. It endeavors to bring together in readable form both the historical and the modern ideas about water and its role in the physiological processes of plants. Any satisfactory comprehension of water movements in living systems must be solidly based upon an understanding of the chemical and physical properties of water as a chemical compound. It is the recognition of this important point that has prompted the authors to focus attention upon water rather than upon the plant or on specific processes in the plant. This approach to an important segment of plant physiology is something of a departure from tradition, but is sound and logical in its recognition of the close dependence of physiology upon the physical sciences.

The authors first discuss water as a chemical compound and review the various theories that have been advanced to account for its many unusual properties in terms of atomic and molecular linkages. This discussion is followed by a similar treatment of aqueous solutions.

Chapter 4 is devoted to a detailed analysis of osmosis in physical systems from the viewpoint of the physical chemist. In Chapter 5 the terminology common in physiological literature is defined and used in reviewing various hypotheses that have been suggested to account for the origin of pressure in osmotic systems. Although this is still a complex and controversial subject, it seems to the reviewer that the discussion does not dispel all of the confusion that has so long surrounded it.

Attention is then directed to the osmotic systems of living cells and tissues. Particular emphasis is given to