

Plant pathology

THE approach of *Fundamentals of Plant-Pest Control*, by D. A. Roberts (Freeman: San Francisco and London; \$17.50; £10.20) is to try to unify all aspects of plant pest control, pointing out common features as much as possible, and culminating in the necessity for the systems approach in order to achieve integrated pest control. This is a theme of much recent thought on the subject and it is evidently right that undergraduates should study and evaluate the approach.

After a general introduction to the plant-pest ecosystem, a series of chapters reviews the structure and functioning of crop plants, followed by the dynamics of plant pest populations and the basic elements of plant pest control. The second main section reviews different types of pests, in the wide sense: microbial pathogens, nematodes, arthropods, weeds and vertebrates. Finally, the systems approach is outlined and the author concludes with his reflexions on pest control in the future.

Desirable though the ultimate objective may be, one is left somewhat dissatisfied with the book as a student text and not altogether convinced by the arguments as they stand. There is an unsatisfactory discrepancy between the potential readership of the book and the background knowledge one would expect of the reader. If it is intended for the naive reader, who has not studied plant pests in the more traditional way, then it is hard to see how he can properly evaluate the whole of the argument or cope with the use of terms like mycoplasma-like organisms or /2-chloro-4-(ethyl-amino)-6-(isopropylamino)-s-triazine/. If, on the other hand, the reader has the background, then why does he have to be given a diagram showing an elementary view of plant structure, be told that organic compounds contain carbon, or study a table setting out among more appropriate things the type of metamorphosis in stoneflies, book-lice and fleas. Such a book must surely aim to refine the understanding of a student with an adequate background, and in this sense more than a third of the text is rather unnecessary.

Leaving this aside, the sections on each type of plant pest are well structured accounts of the application of basic principles to each case. These chapters, contributed by different specialists working consistently to the author's theme, are, with the exposition of population dynamics and the

basic elements of control in the first section, the strongest section of the book. The plant pathology, entomology or weed biology student, in a context where such people are still separate, as is largely the case in the UK, will most profitably read the chapters which do not relate directly to him. The unifying approach cannot, however, always accommodate the real situation altogether. There is ultimately not so much in common between vertebrate pest control and that of nematodes as there is between the latter and plant disease control. The concepts of vertical and horizontal resistance arising from van der Plank's view of plant pathology and applying to races of host-specific pathogens and varieties of their hosts transpose rather superficially to the interactions between plant and insect species. Nevertheless, detailed differences should not submerge the most important fundamental similarities.

The systems approach of the last section is illustrated by the system "undergraduate education in crop-plant-pest control". Why, one wonders, is it not possible to illustrate it by a real plant protection system? The latter only appears in a highly condensed account of computer models such as EPIDEM. One can accept the validity of computer modelling or integrated pest control as such, but this text does not altogether convince one of the real, productive, value of the "higher systems level", or systems approach itself. Undergraduates may profitably

read this text but should keep their feet firmly on the ground and their critical faculties well in trim.

G. N. Agrios' *Plant Pathology* (Academic: New York and London, \$22.95) was in its first edition a textbook one was only too glad to recommend to students. It was invaluable for its thorough and clearly expressed accounts of selected diseases, for its abundant and excellent illustrations and life-cycle diagrams, and for the confidence with which one could advise students to refer to it as a supplement to lecture courses. It had its faults: the introductory chapters on general concepts were rather solid catalogues of information, without much feel for the essentially research orientation of subjects such as biochemical defence mechanisms; the rather limited number of diseases treated was often a problem, especially for the European user.

This new edition triumphantly corrects the latter fault, and is generally revised and brought up to date. The introductory chapters have been somewhat polished and some superfluous material has been removed. There is no doubt that this new edition is even better than the first and it can be thoroughly recommended as an invaluable teaching aid with very few reservations.

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Plant anatomy

THE first edition of *Plant Anatomy* (Part I: Cells and Tissues) by E. G. Cutter, was published in 1969 and contained 168 pages. Now, almost ten years later (Edward Arnold: London; hardback £13.50; paperback £6.75), the 315 pages contain considerably revised and updated information while retaining the essential character of the original volume. Considerable use has been made of both scanning and transmission electron micrographs and, in general, the reproduction of these is quite respectable considering the quality of paper and method of printing. It is good to see such comprehensive revision—to the extent that transfer cells warrant a whole new chapter of their own—but it is a pity to find that some other cell types (for example, endodermis and hypodermis) are relatively very neglected. To some

extent this arises because this book is a companion to the second part (Organs) in which the endodermis, for example, is more fully described. Nevertheless, it is regrettable that while, as written in the review of the first edition (*Nature*, 222, 1100; 1969), "No cell types are omitted . . .", the degree of coverage is so variable.

This is very much a plant anatomy book with a difference: constantly probing and questioning and never very far away from the functions of the cells and tissues being described. Thus, the author is not satisfied simply to classify or to catalogue but attempts to show how the specific structures serve their different roles. Glands, and other cells and tissues, are no longer viewed simply as interesting structural aggregates but also as morphological entities that are uniquely adapted to serve their (described) function. Moreover, mature cells are not assumed to appear *de novo* and Dr Cutter takes pains to stress the subject of differentiation, both in a specific chapter where genetic control, totipotency,

polarity, pattern formation and nuclear-cytoplasmic interactions are briefly reviewed and also at appropriate times in the other chapters. This style leads to a book that is very readable and well suited to elementary students as well as to the more experienced botanists who will undoubtedly benefit from it.

Cell contents and cell walls are despatched briefly but efficiently in consecutive chapters. All the major organelles are reviewed in up-to-date fashion. It is good to see the most recent views on, for example, C_4 chloroplasts and plasmodesmata, although we might have hoped for a more comprehensive assessment of the structure and role of microtubules than the dozen lines allowed for them. Indeed, the whole area of membrane structure and techniques such as freeze-etching is ignored, as is the work on cell wall formation by, for example, Willison and Brown. This is surprising and disappointing in a book that tries to relate structure to function as membranes are of such paramount importance.

It would have been much more useful if the subject coverage in this book had been more evenly distributed. However, taken as a whole, this is an attractive volume that should encourage botanists to think more about how the structure and function of plants are intimately inter-related. Anything that does this is to be welcomed and Dr Cutter has made a notable step in the right direction.

Applied Plant Anatomy (Longman: London and New York, £4.95), by D. F. Cutler, seeks to illustrate the way that a sound knowledge of plant anatomy can be applied to the solution of many important every day problems. It is good, in a textbook of plant anatomy, to see pictures such as that of a papyrus sandal and to read about "wood in archaeology": this does help the subject to come alive. This novel approach leads to a book that is different from most others on elementary plant anatomy and one that is both readable and enjoyable for even the newest student of botany.

The introductory chapter contains brief notes on techniques for both light and electron microscopy. This is followed by chapters on the basic morphology of plants; a good, simple, illustrated glossary; the histology of plant organs; meristems; vascular tissues; adaptive features; flower and fruit; and economic aspects of applied plant anatomy. Each chapter is well illustrated by clear line diagrams and micrographs. The distribution of micrographs is a little uneven and, indeed, there might have been more of them altogether. At the end of each chapter there is a small list of suggested further

reading and, where appropriate, lists indicating where to look to find particular anatomical characters. This is a most valuable addition and covers plants worldwide. The further reading lists are rather too short and often quite dated. Having commented on the usefulness of electron microscopy to the study of plant anatomy, the author then fails to cite a single further reference in this area. Indeed, the four books suggested at the end of chapter one serve as a rather limited coverage of the subject area.

The introductory chapter on techniques is useful but it is a pity that

some of the figures concerning the resolution of microscopes seem to have been muddled: both TEM and SEM resolution are out by a factor of 100! The index is concise and helpful and, indeed, reflects the whole tone of the book, which is to convey a very considerable amount of information in a palatable and easily understandable style.

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Principles of plant nutrition

Principles of Plant Nutrition. By K. Mengel and E. A. Kirkby. Pp. 593. (International Potash Institute: PO Box 41, CH-3048 Worblaufen-Bern, Switzerland, 1978.)

THIS book is broadly based in accordance with the implications of its title and achieves a commendable integration of soil and plant aspects of nutrition. The partnership of geographically separated authors, who are both practically orientated university teachers, provides a background of wide experience and as shown by the principal bibliography (about 1,400 references) an extensive familiarity with the subject.

Chapters 1 to 6 (totalling 290 pages) describe some general principles. Considerable attention is given to plant-soil relationships; nutrient uptake, translocation and storage; nutrient availability in relation to crop needs; general effects of nutrient deficiencies; and methods of nutrient application and correction. A number of major physiological activities—photosynthesis, nitrogen fixation, nitrogen assimilation, water relations, active transport, nutrient absorption—are described in sufficient depth to provide the necessary background for understanding the role of various elements, although respiration seems less adequately considered.

Chapters 11 to 18 deal separately with each of the familiar essential elements—except chlorine, which is reviewed in three pages in a chapter confined to some possibly beneficial or indirectly essential elements: cobalt, silicon and vanadium. Reviews on separate elements cover soil aspects of their availability, their metabolic roles and deficiency and some toxicity effects on growth. These chapters provide a good general idea of the importance of the elements. These and the other chapters are each concluded with a general reading list to supplement

the numerous specific citations in the text.

Chapter 19 concludes the treatise with examples of several toxic or less familiar elements which are discussed in more general terms and it includes several interesting miscellaneous reports. There are a few minor omissions—for example, regarding the production by certain plants of apparently specific citrate and oxalate metal complexes especially with nickel and chromium; the quite extensive work on tungsten relegated here to a few words on page 149 on tungsten inactivation of nitrate reductase by unspecified means; the original, rigorous and model investigations of Brownell on the absolute need for sodium by *Atriplex vesicaria* (though his later discovery of its possibly general importance in C_4 -type photosynthesis plants is nevertheless noted); the differentiation of apparently two types of malate enzyme; the exciting conclusions of Meish *et al.* regarding the essential role of vanadium in green algae, thought to involve the formation of delta aminolaevulinic acid (though this news may have 'broken' as the book went to press); and finally (though possibly again just too late), the further work of Polacco on the need for nickel in urea metabolism since the first report on urease by Dixon *et al.* briefly cited on page 514.

This quite comprehensive and well documented book will be of value to students and lecturers alike in faculties of agricultural science, botany and biological sciences and should also be welcome in the libraries of agricultural institutes, advisory workers and consultants. It is especially commended for its relevance to practical aspects of crop nutrition and for proper appreciation of the general principles on which practice should be based.

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