

BOOK REVIEWS

Inorganic Plant Nutrition: edited by A. LAÜCHLI and R. L. BIELESKI. *Encyclopedia of Plant Physiology, New Series Vol 12A and 12B*, Springer, Berlin, 1983. 870 + xxiii and ix pp. DM 338 (ca £85).

The familiar green volumes of the first edition of the *Encyclopedia* are now 26 years old and look rather 'dog-eared' on the library shelves. It is a justifiable enterprise therefore to re-review the whole of plant physiology in a similar format in the light of the information which has since accumulated and of changes that have occurred in both scientific and social perspectives. Previous volumes in this edition with which I am familiar have been authoritative: so too is this volume although in a slightly different style.

There are 23 articles written by some 37 authors whose names are familiar from the literature. Drs. Läuchli and Bielecki have arranged the articles into five sections which emphasize, in the main, functions rather than individual elements. Section I deals with general aspects of mineral nutrition (Marschner) including the occurrence and cycling of nutrients in the biosphere (Delwiche), transport both at soil-root interfaces (Rovira *et al.*) and in the plant (Lüttge); it deals with competition between nutrients (Robson and Pitman), the diagnosis of deficiencies (Bouma) and techniques of solution culture (Asher and Edwards). Section II is concerned with inorganic nitrogen metabolism. There are three articles on nitrogen fixation, which cover its physiology, biochemistry and genetics (Bothe *et al.*) and summarize the situation for symbiotic (Quispel) and 'free-living' (Dobereiner) systems, and two which described the uptake and metabolism of nitrate in higher (Beevers and Hageman) and lower (Ullrich) plants. The next section deals with the uptake and metabolisms of sulphur (Schiff) and of phosphorous (Bielecki and Furguson).

The other two sections are separately bound in part B. Section IV deals with functional aspects of mineral and inorganic ions on growth (Moorby and Besford), and as components (Sandmann and Böger) or modifiers (Wyn-

Jones and Pollard) of proteins and enzymes. It also discusses the genetic basis of inorganic nutrition (Gerloff and Gabelman). The final section reviews some specific elements that have topical biochemical interest such as calcium (Marmé), boron (Dugger), silicon (Werner and Roth), or which like sodium and potassium, have complex interactions (Flowers and Läuchli) or which are 'unusual' and toxic (Bollard).

This list is surely encyclopedic enough, especially when one recalls that some apparently neglected aspects of, for instance, transport or toxicity, are treated in other volumes of this series. But the style of this volume is encyclopedic in another way. The articles are comparatively short (25 ± 8 pages) and easy to read. They are deliberately not 'comprehensive reviews with exhaustive literature survey', but rather integrated summaries often with a 'personal viewpoint'. Like those in a good general encyclopedia, these articles provide the non-specialist with a view of each topic that is not blurred by an overemphasis on minutiae. There are, however, enough references to keep a would-be-specialist happily occupied.

In the foreword, Epstein helps to put the book into a historical perspective with interesting comparisons of topics that have developed over the last 26 years; the reviewers, with frequent references to ecological or genetical matters emphasize these, and it is for instance striking that mycorrhizas now have the lions share of 33 pages, whereas in the first edition of the *Encyclopedia* they had only four. Both the foreword and the final summary (Bielecki and Läuchli) also emphasize the future prospect. Tomorrow's world, poorer in oil and energy, may rely heavily on crop plants that require only small amounts of mineral fertilizer but use them with great efficiency. How to recognise such plants, and how to manipulate and select their characteristics is a problem that gives an important motive and direction to the work summarized in this volume.

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Biosynthesis and Function of Plant Lipids: edited by W. W. THOMSON, J. B. MUDD and M. GIBBS. American Society of Plant Physiologists, 1983. 268 pp. \$15 (non-members) or \$7.50 (members).

This volume covers the proceedings of the Sixth Annual Symposium on Botany which was held in January 1983 and consists of 15 chapters contributed by the speakers at that symposium. Of course, as with all publications of proceedings the coverage is neither comprehensive nor, in most cases, do the individual articles serve as reviews of the areas. In comparison to the biennial *Developments in*

Plant Biology there are large areas of plant lipid biochemistry which are not mentioned. Nevertheless, the editors have made considerable efforts to connect the articles together and have succeeded very well in making the book a coherent whole rather than a collection of unrelated papers. Some of the chapters are very good indeed and all of them hold at least some interest to workers in the area.

The book begins (perhaps appropriately) with a comprehensive review by Stumpf of recent work on the molecular nature of plant fatty acid synthetase. Although each writer has emphasised their own work, such has been

the contribution of Shimakata and Stumpf's results to this area that the chapter is really a definitive review of the 'state of the art' as it was at the time of the meeting. The paper ends by discussing compartmentation which provides the link with the next chapter on phospholipid metabolism in castor bean subcellular fractions. Next come two chapters on polyunsaturated fatty acid accumulation. This area which used to be controversial is, perhaps, less so now that we know more about individual systems but still retains a lot of interest. Part of the previous disagreements were obviously due to the various experimental systems used and some of these points are highlighted by the writers. The role of polyunsaturated fatty acids in photosynthetic membrane structure and function is discussed nicely by Leech. Although the book is not printed on the highest quality paper, the electron micrographs have been reproduced satisfactorily which is fortunate for this chapter and some succeeding ones. It is interesting to compare the results presented in the chapter with more recently published work.

The blending of biochemical with ultrastructural experiments marks a slight division in the book and several chapters follow concerning the structure of membranes from a more physical point of view. Bishop's contribution sets the scene well by summarizing the functional role of membrane lipids and alluding to the unique properties of some plant membrane constituents. He describes interesting experiments of his own as well as raising many questions about fundamental biophysical aspects. The theme of membranes is continued by a thought provoking paper on lipids in chloroplast thylakoids and followed by presentations on the influence of lectins (or lack of) on membranes, on artificial galactosylglyceride mixtures, on the membrane systems in plant secretory salt glands and of the influence of free radicals on membrane structure

and possible connections with senescence. In several of these chapters the importance of the hexagonal-II phase is stressed and this is clearly a very important area for current research. I found this part of the book particularly interesting because it covered an extremely important yet, until recently, very neglected area of plant biochemistry. One unfortunate feature of my copy of the book was that parts of the chapter on lectins were very poorly reproduced making them rather difficult to read.

From senescence one moves on to developmental systems with a description of carotenogenesis during chromoplast formation and then a chapter on terpenoids and *Euphorbia* latex. The only contribution on 'lower' plants is one on membrane function in yeast lipid synthesis mutants. This was a good review of the area particularly in connection with phospholipid metabolism. I always think it is a pity that so much attention is paid to *Saccharomyces cerevisiae* when many other more interesting (from a lipid stand-point) yeasts are sadly neglected. One has the feeling that so much can be learnt from the study of mutants especially in relatively simple systems. The book ends with a brief description of some commercial aspects of jojoba cultivation. Although this paper seemed almost to be an afterthought, it did serve well to highlight the continued importance of plant lipids in commercial terms.

In summary, therefore, the book contains a lot of new information and represents excellent value for money (particularly to members of the ASPP). Some of the chapters are very good indeed and I positively recommend the volume to all those working on plant lipids.

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