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BOOK REVIEWS

Introduction of Plant Biochemistry: by T. W. GOODWIN and E. I. MERCER. 2nd edn. Pergamon Press, Oxford, 1983, 677pp. £19.50.

Publication of the second edition of this well-known textbook will be warmly welcomed by all concerned in the teaching of plant biochemistry. The first edition, published in 1972, was a widely-used successful text but had long since been left behind by advances in the subject. As the authors remark in their preface to the new edition, the rapidity with which advances have been made in biochemistry during the last decade have been particularly impressive in the field of plant biochemistry.

The second edition, although in the same pellucid style, has been expanded to almost double the size of its predecessor. Despite some minor adjustments to the subject areas and titles of one or two chapters, the topics covered remain essentially the same. The biggest expansions in the second edition have been in the treatment of 'Phytohormones and Related Compounds', 'Respiration' and 'Terpenes and Terpenoids'. Considering the research interests of the authors, it is perhaps not surprising that terpenes and terpenoids should constitute one of the largest chapters, but this does not significantly distort the overall balance of the book. The new substantially expanded chapter on phytohormones presents a welcome survey of this complex field through biochemists' eyes and avoids the pitfall of over-speculation.

Like most people who look critically at a new text, after first considering the range of topics and the style of presentation, I turned to those chapters which cover my own research interests in nitrogen metabolism. I was a little disappointed. Purines and pyrimidines together rate only 8 pages in which there are only half a dozen references specifically to plants. Some inaccuracies have crept in too. Uric acid is not widely distributed in plants, and Streptomycetes and sponges (*sic*) are not the only plants in which pyrimidine nucleosides have been clearly identified. Aside from the topics 'Nucleic Acids' and 'Protein Biosynthesis', which are considered in some depth, nitrogen metabolism is in general underrepresented. I should have like to have seen more on amine and polyamine metabolism, nucleotides, the biochemistry of betaines, and the biosynthesis of heterocyclic amino acids and coenzymes. To some extent these deficiencies are ameliorated by the 48 pages on 'The Alkaloids' but so little is known about alkaloid metabolism, as distinct from alkaloid chemistry, that I cannot help but feel that it would have been more profitable to have used at least some of this space in a wider coverage of the metabolism of nitrogenous compounds. However, to attempt to cover the whole gamut of plant biochemistry in a single text is a formidable task and it is inevitable that with only two authors there are some thin areas and some minor errors. The only way to avoid this problem would be by multi-authorship in which each section is written by a specialist but the price so often paid for this approach is lack of a unified style and of a common philosophy. Both of these ingredients are essential for successful undergraduate texts and they are patently present in this new edition of Goodwin and Mercer. The diagrams and formulae, with which the book is amply provided, are first-class and clearly illustrate the points made in the text. It is a pity that some of the electron micrographs have been badly reproduced and the detail has been obscured. Two appendices have been incorporated into this second edition. One explains in simple terms the intricacies of the Cahn–Ingold–Prelog nomenclature now widely used in specifying absolute configuration at chiral centres. The second appendix covers SI units of biochemical importance.

Despite my criticisms, I shall have no hesitation in adding this text to the list of essential book purchases for my own undergraduate students and would recommend it to all appropriate undergraduates, or postgraduates newly entering plant biochemistry. At what these days has to be considered a modest price for a text of this size and content, it is excellent value.

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Physiological Plant Ecology I and II: edited by O. L. LANGE, P. S. NOBEL, C. B. OSMOND and H. ZIEGLER. Vols. 12A and 12B in the Encyclopedia of Plant Physiology, New Series. Springer-Verlag, Berlin, 1981/2. pp. 625 and 747. DM 239 and 288.

Physiological plant ecology (or ecological plant physiology) is concerned with explaining how plants survive the environmental extremes in physiological or molecular terms. It encompasses plant response to radiation, winds, fire, too much or too little moisture and temperatures ranging from $-90°$ to $250°$. Although the subject has a respectable history dating back to the turn of the century (e.g. Haberlandt, 1884), it has only really emerged as a distinctive subdiscipline within botany in the last thirty years. Several student textbooks, such as those of Larcher (1973, 1980) and Bannister (1976), have appeared in recent years and there have been a number of specialized monographs and symposium proceedings. However, no comprehensive treatise has yet appeared. For this reason, a very generous allowance has been made in this current Encyclopedia series from Springer-Verlag and no less than four volumes have been commissioned to survey this field. The two volumes under present review deal with responses to the physical environment (vol. 12A) and with water relations and carbon assimilation (vol. 12B).

Expectedly, the emphasis is on biophysics and ecology and biochemical processes are generally not considered to any significant extent. Sometimes, the biochemistry has not been studied. However, I was surprised that in some

areas the link up with biochemical information was not given more prominence. For example, in the chapter on plant response to solar ultraviolet radiation, by M. M. Caldwell, the current theory that flavonoids or other phenolics concentrated in the epidermal cells have a role in protecting plants from damage by UV-B radiation was not discussed at any length. Agreed, the experimental evidence is still slim but it deserves consideration. Likewise, there are several chapters on plant response to temperature extremes, but the changes that have been observed repeatedly in fatty acid unsaturation of membrane lipids (see e.g. P. Mazliak, *Progress in Phytochemistry*, Vol. 6, pp. 94–97) were scarcely mentioned.

In other chapters, notably those in volume 12B, biochemical, especially enzymic, studies of adapted plants receive more attention. Thus, R. M. M. Crawford in a well balanced account of physiological responses to plant flooding, discusses in depth the different metabolic responses that have been encountered in anoxic plants. Equally, there is a very satisfying link up between biochemistry, physiology and ecology in the excellent chapter on the functional significance of the different pathways of CO_2 fixation in photosynthesis, which is written by C. B. Osmond, K. Winter and H. Ziegler. In other areas of physiological ecology, the link up with biochemistry has yet to come. There are certainly many interesting and subtle aspects of plant adaptation discussed in these two volumes which deserve biochemical investigation. Heat tolerance is one area of great fascination. How do the enzymes in such plants continue to function without denaturation?

With the publication of these two excellent volumes, we now have available comprehensive, up to date and authoritative accounts of how plants respond to light and temperature, water and wind. The two later volumes will complete the picture, with accounts of ecosystems, mineral recycling, nutritional aspects, symbioses and allelopathic interactions.

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Plant Cell and Tissue Culture—A Laboratory Manual: by J. REINERT and M. M. YEOMAN. Springer-Verlag, Berlin, 1982. 83 pp. $22.00

There are an increasing number of scientists who turn to *in vitro* cultured plant cells for solving a range of problems in different areas of the botanical sciences. Therefore, the teaching of basic principles and methods in plant culture work should be an essential part of the training program of undergraduates and technicians.

Now, another very useful laboratory manual has been produced by two experts in the field of plant tissue culture. This book is a valuable source of practical information and basic techniques covering complete details of material, equipment and technical procedures at the laboratory bench. Fully illustrated instructions, detailed protocols and schedules will help the student in acquiring the experimental techniques quickly and effectively. The topics are grouped into six sections: 1. Aseptic isolation of plant material and studies on growth and cell division, 2. Application of plant cell cultures in bioassays of cytokinins, 3. Morphogenesis *in vitro*, including embryogenesis, shoot and root regeneration, anther culture and the induction of haploid plants, vegetative propagation of orchids, 4. Techniques for the isolation, culture and fusion of protoplasts, 5. Secondary metabolites in tissue cultures and 6. Embryo and organ culture including meristem culture. The section on secondary metabolites in tissue cultures has obviously been chosen to demonstrate the potential use of plant cell cultures for the production of those secondary compounds that are of interest for the biochemists, but it does not really involve a new basic method in cell culture technique. The appendix offers useful information concerning the sterilization procedures, the preparation of different culture media, cell number counting procedures and finally a list of commercial suppliers.

To my own knowledge, the experiments presented in this manual have been performed in the authors' laboratories as part of undergraduate training courses so that reproducibility and accuracy are guaranteed. In accordance with the authors' intention, this manual "should have its place on the laboratory bench in front of the student, open and ready to use". So it will be a valuable guide for those entering plant cell culture work.

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