

## BOOK REVIEWS

**The Biochemistry of Plants** edited by P. K. STUMPF and E. E. CONN, **Volume 13: Methodology** edited by D. D. DAVIES. Academic Press, London, 1987, 294 pp, £41.00.

The rationale for adding this volume to the series is that progress in biochemistry follows advances in methodology. Consequently, the aim is to survey biochemical applications of some recently developed techniques. The first of the six chapters affords a well documented review of immunological techniques. Polyclonal and monoclonal antibodies are discussed together with uses of immunology in the identification of proteins. Studies of enzyme induction and degradation are outlined and brief consideration is given to application of the techniques to compounds of low  $M_r$ .

The use of mutants in studies of plant metabolism is surveyed in the second chapter. Applications considered range from nitrate utilization, gibberellin biosynthesis, and photorespiration, to lipid and amino acid metabolism. Amongst the most recent techniques examined are genetic transformation and transposon mutagenesis. The review, which is well-balanced and stimulating, concludes that although there are numerous existing examples of the use of mutants in plant biochemistry, the field is ripe for further development. A related chapter on the use of plant cell cultures in the study of metabolism examines underlying principles and uses studies of amino acid metabolism and secondary product production to illustrate applications.

The treatment of mass spectrometry and its applications to biochemical and physiological studies provides a comprehensive review of the use of stable isotopes in

such areas as photosynthesis,  $O_2$ -uptake, and N-assimilation. Surprisingly, there is no outline of the principles of mass spectrometry, nor of recent developments in mass spectrometric techniques. Absence of any mention of molecular fragmentation studies and structural elucidation seems bizarre when one considers the major advances made in such fields of plant biochemistry as secondary product biosynthesis, phytohormones, and dolichols. The chapter is wrongly titled and should be 'the applications of stable isotopes' rather than 'applications of mass spectrometry'. In contrast, the chapter on NMR in plant biochemistry gives a concise but clear account of the principles and comprehensively surveys recent developments in *in vivo* NMR ranging from *in vivo*  $^{31}P$  NMR to studies of energy metabolism and of metabolic pathways. The ensuing and final chapter deals with ESR spectroscopy. A clear summary of the salient principles is followed by consideration of applications to photosynthesis, the mitochondrial respiratory chain, and chloroplast development.

Reference in the Preface to chromatographic developments led me to expect some consideration of this field. I was disappointed to find no subsequent mention of gel-filtration, HPLC, FPLC, GC-MS, and affinity chromatography all of which have made a major impact on plant biochemistry in recent years. Despite the omissions, however, this is a useful addition to the series. I suspect it will be bought mainly by library subscribers to the series.

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**Sexuality in Plants and its Hormonal Regulation:** by M. KH. CHAILAKHYAN V. N. KHRIANIN, translated from the Russian by V. Lorocho, Ed. by K. V. Thimann, Springer, Berlin, 1987 pp. XIV + 159. DM 135.

To the best of my knowledge this is the only book trying to summarize information on the sexuality of plants. It deals with the nature and genetic basis of sex in plants, how it is expressed and controlled by environmental factors and hormones, and with the role hormone synthesis in and transport from different plant organs on sex of flowers. Also dealt with are flower formation and the effect of plant development on flower sexuality. The book is divided into nine chapters, the penultimate one giving some hints on the practical use of plant hormones to direct plant sex expression, the last one providing a summary of the authors views on the entire question, of plant sexuality.

The volume brings together a great deal of the Russian literature on this topic, much of which is unknown to those not reading Russian. Certainly this reviewer found a great deal of novel information, including such facts as the difference in size, morphology and hormone content of plants of the same species carrying male or female flowers. The authors carefully distinguish between the problems of dioecious plants and monoecious plants carrying unisexual flowers. High levels of gibberellins seem to lead to the expression of male characteristics, cytokinins to that of female characteristics. Thimann in his foreword stresses the fact that in this work the emphasis is on hormones as organ determinants and not as regulators of cellular activity. Our knowledge of hormone action at the cellular level is limited, but progressing, but our ignorance of their action as organ determinants is dismal.

For the phytochemist this volume should be of considerable interest because it raises so many unsolved problems. For example it appears that there are distinct differences in chemical composition and in changes of enzyme activity with development in female and male plants of the same species. Why should hormones determine sex expression of plants, and at what level do they act? Some early work using immunochemical analysis of hemp indicate higher metabolic rates in female than in male plants of hemp, as a result of differences in gene activation. No doubt many of the early observations, particularly at the biochemical level should be re-exam-

ined using modern techniques, but the effort should be well worthwhile. The editorial remarks of K. V. Thimann add important additional information to this book. I would strongly recommend readers of 'Phytochemistry' to browse through this volume. They will find much information to interest them, and many problems which remain to be tackled, which are of interest to plant chemists.

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**The Growing Plant Cell Wall: Chemical and Metabolic Analysis:** by S. C. FRY, Monographs & Surveys in the Biosciences. Longman, Harlow, U.K., 1988, 333 pp, Paperback £19.50.

When we say a plant cell has grown or has differentiated we are referring to phenomena associated with the cell wall. It is one of the distinctive and diagnostic organelles of the plant kingdom and is tightly coupled to all stages of development. There has always been a thread of cell wall investigation running through plant physiology, but in the past it has been woven by only a few perceptive and tenacious workers, often with a reputation for eccentricity. This situation arose mainly from the sheer complexity of the constitutive chemistry, and the technical difficulties associated with interpretation. Indeed there has even been difficulty in defining what actually may be called a plant cell wall (Lampert, Annual Review of Plant Physiology, 1970). Despite these problems, the lack of input to cell wall experimentation is somewhat perplexing when we consider that any true understanding of, say, the hormonal control of cell extension or of differentiation can only be attained through a clear knowledge of the wall modifications.

With the publication of this book, I hope many more young workers will carry their studies to the level of the organelle most intimately involved. The first impression is that here is a format of an unusual but effective structure whereby the discursive text is heavily inter-

calated with boxed sections giving the technical schedules used in the appropriate study. Thus, we have both a story book and a D. I. Y. manual. I find this helpful and not at all confusing, although I am sure others will disagree.

The nuts and bolts of the book are well put together: the Content is informative, with a separate list of the recipe panels; an excellent reference list, and the index seems to work. There are 11 chapters dealing with the wall components, their chemistry and biosynthesis, the constituent enzymes and the basis of growth through wall loosening. In addition there are peripheral chapters including a review of the techniques of radioactively labelling cell walls and the relatively new field associated with biologically active wall fragments.

Stephen Fry has not set out to write a descriptive or comparative text on the biology of cell walls. He has instead put together a manual to encourage and guide more workers to join him in the elucidation of the multitude of outstanding problems. In this he has succeeded and deserves our appreciation. Those who buy this book will not just read it and then leave it on a bookshelf; it will usually be found lying open on a laboratory bench. Perhaps the publishers should have used a chemically resistant material in its production as this is the only book I know of that gives clear instructions on how to bring about its own destruction.

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**Cell Culture in Phytochemistry**, Volume 4 in the series **Cell Culture and Somatic Cell Genetics of Plants**, edited by F. CONSTABEL and I. K. VASIL. Academic Press, San Diego, 1987, pp. 314, \$59.

In this comprehensive series of books on plant cell culture and biotechnology, phytochemical aspects are being dealt

with in two volumes, the one under review and a second one, yet to be published on phytochemicals in cell cultures. Without having both volumes at hand, it is difficult to evaluate the completeness of the coverage of the topic, but a reading of this first volume indicates that the pair will probably provide a useful up-to-date review of a field, which has not been lacking in recent coverage through