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BOOK REVIEWS

Introduction to Ecological Biochemistry: by J. B. HARBORNE. Academic Press, London, 1977. xii + 244 pp. £7.00.

This is indeed a *tour de force*, well deserving the praise given to it by Miriam Rothschild in her foreword; which is in itself a fascinating account of the way in which the obvious can be overlooked for decades, and then hit the scientific scene with explosive effect (like Mendel and his peas). It was an article by G. Fraenkel in *Science* in 1959 drawing attention to the many intimate interrelations between plants and insects that triggered off this particular explosion, and it is the chemical basis of these interactions, and those between plants and other animals, between plants and plants, and between animals and animals which is the subject of the present book. Moreover, the nature of Man as an animal is taken for granted, and this is equally an account of the chemical world with which we ourselves are necessarily involved.

To myself, this book is full of reminiscence, and I make no excuse for reviewing it in this light. The Robinsons' work on anthocyanins was perhaps for me the starting-point, amplified by Lawrence and Scott-Moncrieff on the genetics of flower colours in the dahlia. This was followed by the systematic distribution of flavonoids, the 'privileged class' of plant constituents implicated in pollination and seed dispersal, in attractance and repellence, in defence mechanisms and physiological reactions in all departments of biological ecology. Jeffrey Harborne's own contributions in these areas are themselves sufficient to write a book about, but it is his integration of others' work in all these respects which is the important feature of the present one.

Some landmarks in this area I especially recall: work on bloat in ruminants at Jealott's Hill, leading deviously to the recognition of tricin as the flavone pigment in the marbled white butterfly (which feeds on grasses); isoflavones as the oestrogens in 'sub-clover', responsible for infertility in Australian sheep; the structure of ginkgetin, the first of the biflavones, of pisatin, the first of the phytoalexins, of vitexin, the first of the glycoflavones and of asperuloside, the first of the iridoids. And of course the tannins, then dismissed as unwanted debris of plant digestion, are now key substances in numerous interactions with other organisms.

A landmark also is Harborne's own work on the Old and New World gesneriads, an exciting contribution to the understanding of attractance to pollinators which forms one of the nine chapters in the book. Another chapter, dealing with the feeding preferences of vertebrates, including man, also makes fascinating reading. Even to the initiate it will come as a revelation what effect seemingly trivial differences in configuration can have on the taste and flavour of a molecule—the sweetness and bitterness of naringenin glycosides, for instance.

In fact every chapter possesses a fascination of its own, so that in sum the book can be recommended as reading value for its own sake as much as a source of reference which is unusually up-to-the-minute. Credit for this must go to the publishers for the speed with which it was produced.

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Plant Tissue Culture and its Bio-technological Application: edited by W. BARZ, E. REINHARD and M. H. ZENK. Springer, Berlin, 1977. 419 pp., 196 Figs., 60 Tables. DM 88.00 (approx £22).

This volume contains the proceedings of one of the two Symposium Sessions of the First International Congress on Medicinal Plant Research, held in the University of Munich in September 1976. The title is misleading, since the book in fact contains the most complete account ever produced of the biochemistry of secondary metabolism in plant tissue culture. Indeed, two thirds of the volume are devoted to this. The remaining one third deals with purely biological aspects of applied tissue culture, i.e. somatic hybridization, protoplast fusion, haploid production and plant regeneration. These are fashionable areas of research and have been covered before in other symposia proceedings.

To me, the outstanding chapter is that by Zenk and his co-workers describing their success in inducing suspension cultures of *Catharanthus roseus* to produce the two indole alkaloids serpentine and ajmalicine in good yield. It is a remarkable story. These authors show how it is possible by the adoption of a new analytical tool (radioimmunoassay), by the selection of variant strains and also by patience, persistence and brilliant management, to make cells in culture yield as much as 1.3% dry wt of alkaloid. This value exceeds that in the original plant by a factor of 1.5 and that of the average intact root by a factor of 5. It is also the highest yield of alkaloid ever recorded in callus or cell culture. This work brings the cell culture of medicinal plants from the realms of science fiction to those of fact.

The potentiality of tissue culture for the production of pharmaceutically important substances is also discussed in chapters by M. Tabata and M. Misawa and it is clear that a number of other secondary constituents can be formed in considerable amounts in appropriate cultures. Thus diosgenin is synthesized in *Dioscorea* in 1.5% yield and glycyrrhizin in *Glycyrrhiza* in 4% yield, while anthraquinones are formed in *Morinda* in 10% yield and naphthoquinones in *Lithospermum* in 12% amounts/dry wt.

Space forbids a detailed account of other chapters in this excellent book. Suffice to say that there are appropriate reviews on cardiac glycosides, lipids, steroids and phenylpropanoids and that the regulation, biotransformation, analysis and catabolism of these various substances in cell cultures are fully discussed. One unexpected biochemical feature of tissue culture is the variety of conjugates that may be formed when exogenous compounds are supplied. In describing this phenomenon, W. Barz reports the discovery of his own group at Münster that nicotinic acid is metabolized *either* to the *N*-methyl derivative trigonelline *or* to the *N*-arabinoside, depending on the taxonomic position of the plant culture used. Nicotinic acid metabolism in cell culture thus represents a new chemosystematic marker for assessing relationships in the plant kingdom.

The book is produced in camera copy but up to the usual high standards of Springer. It is nicely illustrated and has an adequate subject index. Tissue culture buffs will doubtless read it from cover to cover, since it contains splendid up-to-date reviews of the very latest developments. Phytochemists should not, however, be misled by the title; there is much of interest here for them too!

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Chromenes, Chromanones and Chromones: edited by G. P. ELLIS. Wiley, New York, 1977. £75.

Here is another volume (the 31st) in the well known series from Weissberger and Taylor on heterocyclic compounds, and a particularly welcome one. Notwithstanding its scope and importance, the subject matter has not been comprehensively summarised since the 1950s in the Elderfield series. The book does not treat the major subdivisions known as flavonoids, coumarins, or xanthenes, yet it has still taken nigh 1200 pages to encompass the rest. The cost is correspondingly high so that, while the book is in any case an essential purchase for a chemistry library, individual purchasers may well feel dubious about the outlay unless they are assured that their particular needs will be met. The rest of this review was undertaken with that point in mind.

Even when the large groups mentioned above have been set aside, chromene and chromone derivatives are so numerous as to necessitate further selection to keep the book to a reasonable size. Most derivatives of chroman will be found in another volume unless the dihydropyran ring happens to be modified by carbonyl groups or hydroxy substituents so that the closest structural affinity is with chromone. The book does deal with naphthopyrans and with compounds in which the benzene ring is reduced, and also with certain lactones that might have been given the alternative classification as coumarin derivatives. The book does not normally treat chromenes fused to a second heterocycle even when this is itself derived from pyran or chromene.

To make it manageable the subject matter has been strictly systematized by chemical constitution. There is a chapter devoted to chromone itself; alkylchromones, hydroxychromones, alkoxychromones, halochromones, nitrochromones, aminochromones, ketonic chromones, chromone carbonitriles, tetrazoles, aldehydes, and carboxylic acids all have chapters of their own. Other chapters deal with chromenes, chromanols, chromanones, and chromandiones. Throughout special attention has been paid to naturally occurring compounds and to those with important physiological activities. There are special sections and sometimes chapters devoted to spectroscopic properties and reactions of analytical value. Bischromones, bichromones, and spiropyrans are all accorded separate sections, and some attempt has been made to guide the reader through the confusing maze of nomenclature changes over the years.

Although necessary, the strict assignment of structural types between the various other volumes in the series and between various chapters in this one has some rather unfortunate consequences that have not always been sufficiently mitigated by cross referencing, For example, Chapter III perforce deals with chroman-3,4-diols without mentioning the important chemical and stereochemical studies on samidin and its congenors; since these are also coumarins they have to be sought in a different volume. Again, tautomerism in the chroman-2,4-diones is a great nuisance from a systematic point of view, because it can furnish derivatives of 2-hydroxychromone or of 4-hydroxycoumarin; reasonably, therefore, it has been decided that such diones and their enols should be considered together in this volume notwithstanding the fact that some are properly coumarins. However, this decision seems to have left an area of uncertainty, so that the enol ethers (if chromones) are mentioned only in a Table, or (if coumarins) are not discussed at all. The extensive studies on 3,3′-methylene-bis-(4-hydroxycoumarin) and its important anticoagulant activities are likewise barely touched upon, and not indexed, though several more complex related compounds receive due mention.

Although the authors have tried hard to avoid it, the high degree of compartmentation results in a good deal of repetition that was not really necessary. Thus the reaction of 3-acylchromones with amines is dealt with as a reaction of 3-acylchromones, as a means of preparing chromones, and as a means of orientating substituents in some chromones. One full discussion, cross referenced, would probably have been shorter and more vivid than the three partial discussions presented. A more extreme case is found upon reading a series of spectroscopic sections, each of which makes such standard points as the shift of carbonyl frequency produced by hydrogen bonding with an adjacent (*ortho*) hydroxy groups.

The coverage is remarkably extensive, and there are many tables listing compounds according to details of their structures. Your reviewer found no omissions of importance, and a good deal of information that he had not known existed before. As a rule the authors have kept to straight reporting, seldom offering any