

BOOK REVIEWS

Natural Product Chemistry—A Mechanistic and Biosynthetic Approach to Secondary Metabolism by KURT B G TORSSELL. Wiley, London, 1983 xi + 401 £23 00 hardback £9 50 paperback

I must admit to being pleased when asked to review this book, since the advance publicity suggested a potential competitor of my own book, *Secondary Metabolism* (OUP, 1978 and 1980). Professor TorsSELL does not mention my book, though the two books are similar in many respects. One major difference, that enhances the value of TorsSELL's book, is the combination of certain key aspects of primary metabolism, and most of secondary metabolism, in one book. In this respect the book is similar to *Basic Organic Chemistry, Part 4, Natural Products* by Tedder, Nechvatal, Murray and Carnduff (Wiley, 1972), and may be intended as a replacement. This new book is primarily concerned with the organic reaction mechanisms by which natural products are produced, but as befits a book for the eighties, the enzymes which catalyse these processes are also given due prominence.

The first chapter commences with a short historical introduction, and definitions of primary and secondary metabolism. An account of ecological chemistry follows, and TorsSELL includes most of the proven types of chemical communication mediated by secondary metabolites, but only in a very superficial way. The rest of the chapter includes sections on the key biochemical reactions upon which primary and secondary metabolism depend, and a concise but useful description of methods for the elucidation of biosynthetic pathways. The uses of mutants and stable isotopes are highlighted.

Carbohydrates are dealt with in chapter two, and two topics occupy the first half: the pathways of carbohydrate production during photosynthesis, and the role of acetyl coenzyme A. The chapter concludes with a longish account (17 pages) of mono-, di- and polysaccharides. Throughout, reaction mechanisms are stressed, and it is particularly refreshing to see ATP described as a phosphorylating agent and not as a source of 'energy-rich' compounds. Chapter three commences with a full mechanistic treatment of the biosynthesis of shikimic acid, and the amino acids phenylalanine, tyrosine and tryptophan, it then continues with an extensive discussion of biological hydroxylation and includes sections on cinnamic and benzoic acids, coumarins, quinones, lignins and lignans.

The polyketide pathways appears in chapter four, and the highlights include a good account of β -oxidation, a useful introduction to the utility of ^{13}C -, ^2H - and ^3H NMR studies for the elucidation of biosynthetic pathways, and extensive sections on flavonoids and oxidative coupling of phenols. There are some serious omissions, however, including the aflatoxins, and the

macrolide antibiotics.

The next chapter contains a good description of the work on the biosynthesis of mevalonic acid and the biogenesis of the C_5 units, and the current ideas about the prenyltransferase step are well presented. The other simple terpenoids are treated in a conventional way, and some of the references are a little dated (e.g. for the biosynthesis of juvenile hormone and the trichothecanes). Steroids and triterpenes merit seventeen pages, but carotenoids receive only a page and a half, and as in other chapters surprisingly little is mentioned of biological functions. A particularly serious omission is a comment on the potent metabolites of vitamin D.

An account of essential and non-essential amino acids follows in chapter six, and includes a substantial section on reactions promoted by pyridoxal phosphate, and sections on various secondary metabolites derived from amino acids. The biosynthesis of the penicillin and cephalosporin nuclei is covered reasonably well (though some of the key 1981 references are not mentioned), and the mechanistic proposals are clearly set out. Finally, there is an interesting comparison of the *in vivo* synthesis of 'odd' peptides with the Merrifield solid-phase method of peptide synthesis. The treatment of alkaloid biosynthesis is straightforward but comprehensive (all types—even obscure ones—are included), and again the emphasis is mechanistic. The pathway given for morphine biosynthesis is incorrect, but overall this is probably the best chapter. Porphyrin biosynthesis is highlighted in the final chapter, and there is in addition a good account of reactions involving the intervention of vitamin B_{12} . At the end of every chapter, except this final one, there are demanding questions, and answers are supplied. There is an author index to accompany the multitude of references, and a 15 page general index.

The book is largely free of errors, and will be widely accepted, I am sure, by chemists at all levels, who will appreciate the mechanistic approach to biosynthesis, but biochemists will also find much of value since enzyme studies are emphasised. My one reservation is that there is too little coverage of the toxic, pharmacological and ecological importance of natural products—indeed it is an interest in these properties which often provides the initial incentive for the investigations. Certain aspects of ecological chemistry are covered briefly in chapter one, but not elsewhere, and the terms phytoalexin and allelopathy are not mentioned at all. It is now perfectly respectable for chemists to be interested in the biological properties of natural products, and this book could have been more valuable if this aspect had received more attention.

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