

complexity; it is far easier to postulate ecological functions for plant constituents than to prove the latter unequivocally.

The fourteen chapters treat several types of chemical interactions in nature. Chapter 1 (M. Rothschild) discusses protection of phytophagous insects against predators by substances elaborated by host plants. J. M. Cherrett analyses factors involved in leaf choice by fungus-growing leaf-cutting ants and Chapter 3 (H. F. van Emden) is devoted to host selection by aphids. E. C. Bate-Smith and G. W. Arnold and J. L. Hill treat food selection by mammals and ruminants. D. A. Jones illustrates, notwithstanding the complexity of the situation, that it is possible by careful experimentation to prove that cyanogenesis of plants represents a defence mechanism. In Chapter 10, E. A. Bell reviews non-protein amino acids of Leguminosae and discusses their possible functions. C. H. Muller and Ch.-H. Chou treat classical allelopathy, e.g. chemical interactions between higher plants. One chapter (B. J. Deverall) is devoted to phytoalexins and another one (W. G. H. Edwards) to the so-called *Orobanche* and *Striga* factors which stimulate the germination of seeds of these angiospermous parasites.

The chapters on aflatoxin and related mycotoxins (M. O. Moss), selenium toxicity (A. Shrift) and on toxicity and metabolism of *Senecio* alkaloids are perhaps a little beyond the narrower scope of phytochemical ecology, because they discuss toxicological, metabolic and physiological aspects of the respective compounds. The same may apply to T. A. Rohan's chapter on the chemistry of flavour. It must be stressed, however, that an understanding of animal perception and an exact knowledge of the biochemistry and toxicology of plant constituents are essential to chemical ecology.

Understandably, the book covers only part of the vast subject of chemical interactions in nature. Chemical stimuli involved in pollination and dispersal ecology are scarcely touched upon; the same applies to relationships between the chemical make-up of plants and their attack by most groups of phytophagous insects, slugs, snails, nematodes and phytopathogenic micro-organisms. The book, however, demonstrates clearly that phytochemical ecology is no longer a field of unproven theories; it is becoming rapidly a field of critical experimentation.

The editor and the authors are to be congratulated on their performance. For both biologists and phytochemists, this book will form a fascinating and most useful reading. The phytochemist interested in evolutionary aspects of plant metabolites should learn from it that natural products are very often involved in evolutionary strategies of plants and may therefore be as easily affected by convergencies and rapid divergences as are other characters.

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Carotenoids: edited by OTTO ISLER. Birkhäuser, Basle, 1971. 932 pp. Swiss Fr. 118.

THIS MAGNIFICENT monograph is intended to update the earlier classic account of these important natural pigments by P. Karrer and E. Jucker, which was published by the same press in 1948. Although this volume is very much longer than Karrer and Jucker (it runs to 932 pp.), it only briefly covers biochemical aspects, since it is intended as a complementary volume to the second edition of T. W. Goodwin's *Comparative Biochemistry of the Carotenoids*, which is due to be published in 1973-4. In spite of these restrictions, this is a valuable addition to the phytochemical literature and will be an essential source book for all research workers dealing with natural colouring matters.

The significant contributions carotenoids make to both animal and plant colours are beautifully illustrated in the opening pages of the volume by a series of ten colour plates, showing flamingoes, lobsters, starfish, rose hips, carrots and so on. These plates reminded me irresistibly of T. S. Eliot's lines, in the *Dry Salvages*:

*The starfish, the hermit crab, the whale's backbone;
the Pools where it offers to our curiosity
the more delicate algae and the sea anemone.*

What lines could be more appropriate to marine carotenoid sources than these!

The cost of the colour plates, inevitably, was borne by Hoffman-La Roche, the firm which has also provided 10 of the 17 contributors to the volume. The reason why carotenoid research merits industrial support is, of course, because carotenoids are essential dietary precursors of vitamin A. The importance of carotenoids are covered here in chapters on vitamin A itself (G. A. J. Pitt), on industrial uses of carotenoids (J. C. Bauernfeind *et al.*) and a more general one, on function (N. I. Krinsky) which deals especially with photofunctions—photoprotection, photosynthesis and 'blue-light' effects.

The central core of this book is devoted to the chemistry of carotenoids and there is a massive chapter (252 pp.) by H. Mayer and O. Isler on Total Syntheses. The application of modern spectral methods to elucidation of structure of carotenoids was delayed for some years because of the difficulties of isolating pure pigments in sufficient quantities for analysis. However, much rapid progress has been made very recently; as listed here, the structures of no less than 273 carotenoids were known at the time of writing (mid-1970). It is disappointing that methods of isolation and purification—such important preliminaries to structural investigation—are only briefly touched upon, in one of the opening chapters by S. Liaaen-Jensen. Spectral techniques are however adequately covered by W. Vetter *et al.* and B. C. L. Weedon deals authoritatively with stereochemistry. Excellent chapters on biosynthesis (T. W. Goodwin) and metabolism (H. Thommen) concludes the coverage of carotenoids in this monumental book.

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