

Book Reviews

J. Nat. Prod., **1993**, 56 (4), 648-649 • DOI:
10.1021/np50094a035 • Publication Date (Web): 01 July 2004

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Journal of Natural Products is published by the American
Chemical Society, 1155 Sixteenth Street N.W., Washington,
DC 20036

BOOK REVIEWS

Melanins and Melanogenesis. GIUSEPPE PROTA. Academic Press, 1250 Sixth Ave., San Diego, CA 92101. 1992. xiii + 290 pp. 15 × 23 cm. \$55.00. ISBN 0-12-565970-9.

Melanins and Melanogenesis is an admirable review of both the chemistry and the biology of melanin pigments. The book is well organized, which makes it useful to readers of widely varying backgrounds. The chapters include extensive reviews of melanin-producing cells, tyrosinase, natural and synthetic melanins, eumelanins, neuromelanin, pheomelanins and trichochromes, pigment cell metabolism including enzymatic and chemical control, the genetic and hormonal regulation of melanogenesis, and the photo-biology and photochemistry of melanogenesis. The text is very readable and is also exhaustively referenced. Dr. Prota has succeeded in pulling together the diverse and complicated chemical and biological aspects of melanins and melanogenesis into a single unified volume. This book is not only a useful reference; it is also an exhaustive review of the subject which will prove invaluable to those working in this complex, multifaceted field.

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The Total Synthesis of Natural Products, Vol. 9. JOHN APSIMON, ed. Wiley-Interscience, John Wiley & Sons, 605 Third Avenue, New York, NY 10158. 1992. ix + 534 pp. 15 × 23 cm. \$125.00. ISBN 0-471-55189-9.

Volume 9 of this prestigious series is a unique magnum opus covering a single topic: "The Synthesis of Insect Pheromones, 1979-1989." The coverage of the decade's literature on pheromone synthesis has been prepared entirely by Professor Kenji Mori from the Department of Agricultural Chemistry at the University of Tokyo. Professor Mori is without question the most creative and prodigiously productive researcher in the field. Indeed, although I did not count them all, I wager that 25% of the 1,221 references include K. Mori as one of the authors. It is difficult to imagine how severely the understanding of insect chemical communication would have been handicapped without Professor Mori's efforts.

The book is subdivided into twenty-three "chapters" (actually, they are treated as subheadings) and includes 1,221 references, a subject index with chemical names, Latin binomials, and common names, and a formula index. The first chapter summarizes a few general methods broadly applicable in pheromone synthesis (acetylide alkylation, olefin inversion, heterogeneous Wittig reaction, solid phase synthesis, α,ω -differentiating reactions). The next chapters cover pheromones based on the functional group(s) contained, with a vague sense that increasing complexity guides the progression from one section to the next. Thus, we progress from branched and unbranched alkanes as pheromones, to 1-alkenes, to *E* and then *Z* alkenes with terminal alcohols or acetates, to conjugated dienes or enynes, to unconjugated dienes, to trienes and tetraenes, to epoxides, to chiral alcohols and esters, to aldehydes, ketones, acids, esters, and lactones. Then there is a shift to isoprenoid hydrocarbons, isoprenoid alcohols, epoxides, esters, aldehydes, ketones, etc., and then to oxygen heterocycles (excluding epoxides, lactones, and acetals), then to acetals, to spiroacetals, and finally to nitrogen heterocycles and sulfur-containing pheromones.

The presentation will delight the synthetic organic chemist. Every page is chock full of synthetic schemes, showing the reagents and yields over the arrows (no need to hunt through figure legends!). The schemes are completely homogeneous in appearance and very easy to read. Most transformations have only one or two steps, so that it is simple for novice chemists to follow what stepwise chemical changes are occurring. Clearly, visual retrieval is of paramount importance with such a lengthy compendium. Although I was alert for errors in the structures or reactions, I could find only a few misspelled names of authors and no chemical mistakes.

The production of enantiomerically pure compounds, both by asymmetric synthesis and by elaboration of chiral precursors, is prominently featured, as one might expect given the extensive contributions from Mori's labs. For example, in the chapter on pheromone lactones, when a preparation of a compound such as (*R*)-5-hexadecanolide is described, the subsections include: (i) syntheses from chiral building blocks, (ii) syntheses by means of optical resolutions, (iii) syntheses based on chemical asymmetric reactions, and (iv) syntheses based on biochemical asymmetric reactions.

I noted an absence of citations for isotopically labeled pheromones and bioisosteric pheromone analogues. One cannot cover everything, and it seems reasonable to restrict the coverage to only those

methods used to prepare naturally occurring pheromones of insects. It is worth pointing out that bacterial, crustacean, mammalian, and other pheromones are excluded from this book.

Overall, one is awed by the thoroughness of the coverage. It is astounding how many pheromone syntheses have been completed in just a decade; it is even more intriguing to see how very different the synthetic approaches developed by different investigators for fundamentally quite simple target molecules can be. Perhaps my only criticism is that the written descriptions of all the synthetic routes are too neutral, except when mistakes in interpreting biological results or in presenting structures were made. Only rarely does one find a direct comparison of two or more methods with a subjective opinion regarding the preferred route based on considerations of yield, ability to be scaled up to the kilogram level, cost effectiveness, ease of analogue preparation, etc.

This is a book that belongs on the shelf of every chemist, biochemist, and biologist involved with insect chemical communication. The chemistry described herein provides leads for new analogues, ideas on isotopic labeling, possible sources of compounds for bioassay, and clever applications of new synthetic methodology and organic enzymology.

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The Alkaloids, Volume 40. Edited by ARNOLD BROSSI. Academic Press, Inc., 1250 Sixth Avenue, San Diego, CA 92101. 1991. ix + 354 pp. 15 × 23 cm. \$105.00. ISBN 0-12-469540-X.

The Alkaloids, Volume 40 is a recent addition to this comprehensive treatise. This volume contains two chapters. The first chapter, "Plant Biotechnology for the Production of Alkaloids: Present Status and Prospects," is a timely review of the "state of the art" of plant biotechnology. An introduction to the benefits and aims of the use of cell cultures and more advanced plant biotechnology for the production of commercially important alkaloids is followed by a discussion of specific strategies used to increase alkaloid production. An interesting section is also included on the problems of large scale production using biotechnological methods, and insight is given concerning the economic feasibility of scaling up alkaloid production. Specific examples illustrate the current successes and limits of plant biotechnology in the generation of plant alkaloids presently produced on an industrial scale by the extraction of plant materials. Classes of alkaloids discussed in depth include tropane, isoquinoline, *Cinchona*, indole, and steroidal alkaloids in addition to nicotine and caffeine. The text is supplemented with clear tables which summarize the data and allow quick access to the cited literature. The most recent references are from 1990. Chemical structures used in the chapter are easy to read and indicate pertinent stereochemistry. However, it was noticed that the structure given for the alkaloid cuscohygrine was misleading. Cuscohygrine is an alkaloid found in many plants which produce tropane alkaloids. The only structure shown in this chapter represents a meso compound, while in nature, cuscohygrine is present as a mixture of the *meso* and *dl* compounds.

The second chapter is titled "Alkaloids from Mushrooms." For the first time in this series, a chapter consolidates information concerning mushroom alkaloids. While it is not comprehensive, it does refer readers to recent reviews concerning material omitted. The information is organized according to structural type. Alkaloids discussed include amine and peptidyl, indole, pyridine, hydrazine, and nucleoside-type alkaloids, and unusual α -amino acids. In each case, the occurrence, synthesis, and biosynthesis of the alkaloids are presented along with information about biological activity. The references cover the literature through 1989 (there are only 4 references cited from 1990). As in the first chapter, chemical structures are of high quality and easy to read. One complaint is that there is some inconsistency in the abbreviations used for protecting groups. This can cause some confusion when viewing synthetic schemes.

The Alkaloids, Volume 40 is a well edited and welcome addition to a highly successful series.

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