Book Review: Phytochemistry in the Genomics and Post-Genomics Eras. Recent Advances in Phytochemistry. Vol. 36 Edited by John T. Romeo (University of South Florida) and Richard A....

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Book Reviews

Phytochemistry in the Genomics and Post-Genomics Eras. Recent Advances in Phytochemistry. Vol. 36. Edited by John T. Romeo (University of South Florida) and Richard A. Dixon (Samuel Roberts Noble Foundation). Pergamon/Elsevier Science Ltd., Oxford, UK. 2002. x + 258 pp. 6 × 9 in. $165.00. ISBN 0-08-044116-5.

This volume presents a selection of papers from the symposium of the same title held at the 2001 meeting of the Phytochemical Society of North America. It represents some of the first fruits of attempts to apply genomics techniques to the field of phytochemistry. A baker's dozen (13) of authors report on advances they have made in the field. As might be expected, some of the first problems to yield results are in the domain of biosynthesis. Lange et al. report on their functional genomic strategies for essential oil biosynthesis, using gene expression in isolated peppermint glandular trichome cells to prepare a cDNA library containing biosynthetic enzymes for mint monoterpenes. Similarly, the abundant cytochrome P-450 enzymes of plants that appear to catalyze many biosynthetic oxidations have been clustered from *Arabidopsis* by Feldmann et al., and specific steps in brassinosteroid biosynthesis are linked to the individual enzymes. Halkier et al. contribute a chapter applying similar techniques to glucosinolate biosynthesis.

A second theme in the chapters is the application of metabolite profiling by LC-MS as a technique in plant functional genomics. This is more familiar territory for phytochemists, and it is only the comprehensive profiling strategy that moves beyond basic analytical chemistry. A number of other themes centered on other types of compounds (e.g., saponins) or species (in the genus *Medicago*) show that this is a fertile field for both basic and applied research. Clearly genomics is beginning to have an impact beyond the more heavily funded human medical genomics. The frontiers of science are rapidly expanding in the plant genomics dimension, limited only by funding and the willingness of investigators to enter the field.

For plant scientists, especially those interested in biosynthesis, this would be a useful book to summarize the state of the art. For those not familiar with genomic sciences, it may be tough reading; however, the editors have done a good job of producing an up-to-date and readable summary of the field.

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Alkaloids. Nature's Curse or Blessing. By Manfred Hesse. Verlag Helvetica Chimica Acta, Zürich, Switzerland, and Wiley-VCH Weinheim, Germany. 2002. xii + 413 pp. 16 × 18 cm. $135. ISBN 3-906390-24-1.

The explanation for the rubrick "Nature's Curse or Blessing" was not apparent, even after a frustrating search, but a similar rubrick could be applied to Hesse's book, namely, "Fascinating and Frustrating". This book represents a truly scholarly approach to the realm of alkaloids, but all too often, when one is fascinated by an interesting statement or speculation, there is no reference or other means to pursue or verify; hence, frustration. There are far too many misleading or nonreferenced statements to attempt to enumerate them all.

The first chapter delves into the history behind the term "alkaloid" and then provides the author's definition, namely, "nitrogen-containing organic substances of natural origin with a greater or lesser degree of basic character". Amides (paclitaxel) are included (certainly an example of a lesser degree of basic character), as are amino acid decarboxylation products, such as serotonin, which serves as a widely distributed neurotransmitter. A logical extension would be to include norepinephrine, histamine, and dopamine, compounds that few if any chemists would call "alkaloids". Surprisingly, mescaline and mescal bottons are not treated at all.

The second chapter provides a classification of alkaloids, based on heterocyclic ring systems, with comments on occurrence in the plant kingdom. For the nonbotanist a chart depicting orders and families of plants would have been useful. Comments, often lengthy, on the biological activity of certain alkaloids are introduced in both the text and occasionally in a footnote. Readers are advised to look at each reference as they proceed through the book, in order not to miss some salient point. The chapter does present a useful attempt at structural classification of a wide range of plant alkaloids, but animal alkaloids are relegated for the most part to a brief section in Chapter 9. There is a misleading statement (p 32) that the order "Hymenoptera (ants and wasps) are known for ....alkaloids". Only the family Formicidae (ants) are known for such alkaloids. Nor is how poisons of fire ants can "cause grain harvest failures" referenced. In some cases, a figure, such as Figure 2.7, occurs several pages before the alkaloid (but not the plant) is mentioned in the text. That figure is cited in the text as a source of glaucine from *Carydalis* and *Dicentra*, not berberine from *Mahonia*, as stated in its legend.

The third chapter presents in detail two examples of structure elucidation; the case of coniine is interesting from a historical context, and the case of villastonine from a standpoint of combined chemical and spectroscopic solution of a very complex structure, before the advent of current powerful NMR spectral techniques.

The fourth and fifth chapters discuss possible artifacts and chiral properties. The sixth chapter presents the synthesis of coniine and several more complex alkaloids. The seventh chapter on chemotaxomy opts to present a detailed analysis of the occurrence of indole alkaloids with a monoterpene component in three plant families. Only a limited attempt to present the broader picture of alkaloids as possible taxonomic indicators is provided. In the eighth chapter, both established and speculative biosynthetic routes are presented for a variety of alkaloids.

The ninth chapter is titled "Biological Significance of Alkaloids" and proposes a variety of possible reasons, some quite speculative, of how plants might have benefited from evolving such compounds. Unfortunately, the section on "Poisons from Amphibians" is replete with errors and