

## Book Reviews

**Recent Advances in Phytochemistry, Vol. 31: Functionality of Food Phytochemicals.** Edited by Timothy Johns (McGill University) and John T. Romeo (University of South Florida). Plenum Press, New York, NY. 1997. viii + 273 pp. 15 × 22.5 cm. \$95.00. ISBN 0-306-45691-5.

This book is the 31st volume of the continuing series on advances in phytochemistry. It is based on the proceedings of the thirty-sixth annual meeting of the Phytochemical Society of North America's timely symposium on food phytochemicals. The book contains eleven chapters with reviews on various aspects of flavors, stimulants, and health promoters in food plants.

In the first chapter, E. Block and co-workers review organosulfur and -selenium phytochemical from plants in the genus *Allium*, mainly onion and garlic. It focuses on their recent work related to the characterization of organosulfur and organoselenium compounds formed upon tissue disruption of *Allium* plants. The authors present an impressive case of sophisticated studies of chemical processes to better understand the flavor and medicinal chemistry aspects of natural and artifact *Allium* components. This excellent chapter concludes with a brief treatment of garlic flavorants following cooking and ingestion and organoleptic characteristics of *Allium* flavorants. Health-promoting phytochemicals in citrus fruit and juices are reviewed by A. Montanori, W. Widner, and S. Nagy. The authors focus on the potential role of citrus flavonoids, limonoids, and essential oils in cancer prevention as well as citrus dietary fibers and pectin and glucaric acid from citrus on coronary heart disease by influencing LDL-cholesterol serum levels. Phytochemicals with chemopreventive activity in foods are comprehensively covered by B. Stavric, mainly covering vitamins and antioxidant flavonoids in selected foods and beverages and other chemopreventives in fruits, vegetables, and natural flavoring agents. The following two chapters emphasize the potential of indigenous food plants as food sources in other regions of the world. The review by A. Sotelo on constituents of Mexican wild food plants covers the nutritive value of beans, oil seeds, leaves, and flowers used in Mexican traditional culinary practices as well as antinutritional factors and toxins in edible plants. H. E. Flores and T. Flores summarize the biology and biochemistry of underground plant storage organs with major emphasis on Andean root and tuber crops. T. Johns discusses the behavioral effects of food and herbal constituents and provides a perspective on physiological and psychosocial factors to explain the ingestion by humans of phytochemicals with a wide range of biological activities. The importance of flavor in plant products is illustrated by S. E. Ebeler, who discusses the sensory properties of wine constituents including tannins, flavonoids, nonflavonoid phenols, and volatiles from terpenoids and their glycosides, which play a major role as bitter and astringent components. The biogenesis of flavors with a brief introduction to the biosynthesis of flavor constituents followed by the biogenesis of aroma compounds by enzymatic and nonenzymatic oxidative processes is reviewed by J. Crouzet. Biotechnological advances in the production of food phytochemicals are covered in two chapters. Food colorants from plant cell cultures are reviewed by F. Cormier, and

T. Voelker presents data on the transgenic manipulation of edible oilseeds. The volume concludes with a chapter on quantitative microscopic approaches to carbohydrate characterization and distribution in cereal grain by R. G. Fulder et al.

Very often symposia proceedings represent a collection of heterogeneous topics. This excellently edited volume with many references and a cumulative subject index suffers somewhat from this problem. However, the editors coordinated a relatively diverse topic into a timely and valuable book, which would be of particular interest to researchers in natural products chemistry, pharmacognosy, pharmacology, the food sciences, and medicine.

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**Second Supplements to the 2nd Edition of Rodd's Chemistry of Carbon Compounds. Volume IV. Heterocyclic compounds. Part F. Six-Membered Heterocyclic Compounds with a Single Hetero-Atom in the Ring: Pyridine, Quinoline, Isoquinoline and Their Derivatives. Part G. Six-Membered Heterocyclic Compounds with (a) Single Nitrogen Atom in the Ring (cont'd): Polycyclic Fused Ring Compounds, (b) an Atom of Phosphorous, Arsenic, Antimony or Bismuth. Alkaloids with a Six-Membered Heterocyclic Ring (Chapters 28–33 in this Volume).** Edited by M. Sainsbury (University of Bath, Bath England). Elsevier Science BV, Amsterdam. 1998. xx + 620 pp. 15 × 22.5 cm. \$379.50. ISBN 0-444-82943-1.

This volume is part of a classical series of chemistry books. As can be learned from the long title, it is a supplement to the 2nd edition and covers approximately the period 1985–1996 for the compounds mentioned in the title. This volume covers Chapters 24–33, each written by experts in the respective fields. The major emphasis of most of the chapters is the chemistry, and in particular the synthesis of a group of related compounds. For the natural product scientist Chapters 30–33 are of particular interest, since they deal with pyridine and piperidine alkaloids, quinoline alkaloids, acridine alkaloids, and isoquinoline alkaloids, respectively. Each chapter is written by different authors, which results in different ways of dealing with the subject matter in each chapter. For example, the chapter on isoquinoline alkaloids concerns mainly synthesis, whereas the other three chapters on alkaloids give much more detail about natural occurrence and biological activity. The groups of alkaloids mentioned include important molecules such as quinine and morphine, but nothing can be found concerning these alkaloids in this volume. Compared to series dedicated to alkaloids, the information in this volume is thus rather limited.

A major point of criticism is the layout. Thus, the various chapters have different subdivisions, different fonts, and even different spacing between lines in the various chapters (sometimes even on one page). Also the drawings are of

different quality. It is also surprising how many ways there are to present the references, if no strict rules are given for bold, underlined, and italics for different part of the references (such as et al., journal name, volume, year). In this series the references are given directly in the text. This makes it rather difficult to rapidly scan a page for certain information. For example, if you are interested in finding substances containing a 1- or a 2-azaanthracene unit, you have 17 lines of text with references in which with some effort you can find 6 or 7 different materials hidden.

In conclusion, the purchase of this volume might be useful to keep the series of *Rodd's Chemistry of Carbon Compounds* in a library complete, but the price of \$379.50 seems quite high for an individual to purchase it as a reference source when compared with the amount of information obtained. This is especially so as the topics of the various chapters are not very closely related, and other sources of information in the form of reviews are available for the natural products related chapters.

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**Second Supplements to the 2nd Edition of Rodd's Chemistry of Carbon Compounds. Volume IV. Heterocyclic compounds. Part G. Six-Membered Heterocyclic Compounds with (a) Single Nitrogen Atom in the Ring (cont'd): Polycyclic Fused Ring Compounds, (b) an Atom of Phosphorus, Arsenic, Antimony or Bismuth. Alkaloids with a Six-Membered Heterocyclic Ring (Chapters 34 and 35 in this Volume). Part H. Six-Membered Fused-Ring Heterocyclic Compounds with a Single Nitrogen Atom in the Ring (cont'd). Monocyclic Ring Compounds with Two Hetero-Atoms in the Ring from Group VIB, or One Each from Groups V and VIB. Alkaloids (cont'd).** Edited by M. Sainsbury (University of Bath, Bath England). Elsevier Science BV, Amsterdam. 1998. xx + 650 pp. 15 × 22.5 cm. \$402.50. ISBN 0-444-82979-2.

This volume is part of a classical series of chemistry books. The long title tells us that it is a supplement to the 2nd edition (from 1987); it covers approximately the period 1985–1996 for the compounds mentioned in the title. This volume covers Chapters 34–41. These chapters are written by experts in the field of the chemistry of the compounds concerned. Chapter 41 (about 260 pages) as a supplement to the previous volumes is now split up into seven separate chapters (41a–41g) and concerns six-membered rings having two hetero-atoms from Group VI B of the periodic table. Although from a pharmaceutical point of view several interesting compounds are found in this part, it is of limited interest from a natural products' point of view. The volume does contain a chapter devoted to alkaloids of the morphine-hasubanonine group, thus covering the gap I noted in the other volume which covers the other part of the Part G. Although in some other chapters the use of enzymes or microorganisms in synthetic approaches is mentioned, in this chapter only synthetic chemistry is discussed. There are two other chapters of interest for the natural products' chemists, Chapter 34 on Diterpenoid Alkaloids and Chapter 35 on Steroidal Alkaloids, both of which are focused on

the synthetic aspects of these compounds. The same shortcomings as discussed for the Volume covering the groups F and partially G, also apply to this volume. Apparently camera-ready manuscripts were used, resulting in quite different styles, even with handwritten symbols such as  $\alpha$  and  $\beta$  in one chapter. This volume is thus primarily of interest to complete the series in a library but has limited value as a separate book. As this volume of the series is more of a compilation than a critical assessment of published data, one can have some doubts about the usefulness of the continuation of such a series. With the present day possibilities of rapidly searching databases, a compilation of data on a certain group of compounds can easily be made.

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**Drugs of Natural Origin: Economic and Policy Aspects of Discovery, Development, and Marketing.**

Anthony Artuso (University of Charleston). The Pharmaceutical Products Press, Binghamton, NY. 1997. xi + 201 pp. 15 × 21 cm. \$24.95. ISBN 0-7890-0414-3.

The search for new drugs from natural product sources has become both more complicated and more competitive in recent years. The increased complexity has come about as a result of the widespread recognition that host countries have a right to be compensated for the use of their biodiversity, a right which has been codified in the Convention on Biological Diversity which was initially signed at the Earth Summit in Rio de Janeiro in 1992. This convention has led many countries to adopt policies for biodiversity prospecting. While in many countries these policies are fair and reasonable, in other countries they are so complex that they have the effect of inhibiting biodiversity prospecting almost completely, while in still other countries policies have not yet been developed. All of this makes it very difficult for an individual research worker, particularly in academia, to obtain access to source materials from other countries. Ironically, at the same time that it is proving increasingly difficult to access source materials, drug discovery from natural sources is coming under increasing pressure in the pharmaceutical industry as combinatorial chemistry and other approaches increasingly compete for scarce resources. For these reasons, the present book provides a timely opportunity to evaluate the economics of drug discovery from natural sources.

The author, Dr. Anthony Artuso, is a specialist in public policy issues at the University of Charleston, and he approaches the question of drug discovery from natural sources from an economic and public policy perspective. The first chapter, "Biodiversity and the Search for New Drugs," presents an overview of the drug discovery process and critiques some earlier attempts to set a value on plant species. The second chapter, "A Model of the Biochemical Prospecting Process," contains the heart of the economic arguments of the book. Dr. Artuso uses an analysis of the present value of R&D costs and expected benefits to develop an estimate of the value of screening an extract, and arrives at a value of \$316 per extract *in the absence of lower cost*

*sources of supply* (italics original) for a private organization such as a pharmaceutical company. This figure is based on a number of assumptions, chief among them being that one out of 11 000 extracts tested will lead to a new drug. The accuracy of the final extract valuation depends heavily on this assumption, which does, however, appear to be a reasonable one. However, since in the real world natural product-based drug discovery is competing with combinatorial chemistry and other approaches, these approaches may reflect "lower cost sources of supply," and the actual amount that a company would be willing to pay for screening an extract (as opposed to carrying out isolation work on it) may well be significantly less than \$316.

The third chapter, "Host Country Options for Conservation and Sustainable Development," presents an interesting analysis of three options for a particular bioprospecting site, and also discusses various strategies for sustainable development of biological resources. The fourth chapter, "Contractual Arrangements for Allocating Risks and Rewards," discusses various possible mechanisms for benefit sharing. The chapter discusses the pros and cons of a country granting exclusive rights to its biodiversity, and also discusses different models of royalty and profit-sharing agreements. As one example, the author calculates that the maximum royalty rate (based on gross revenues) that a company would pay would be 2.5% given the assumptions mentioned earlier. He also calculates the probability of various ranges of royalty payments, given certain assumptions about the probability of drug discovery and the size of the market, and calculates the present value of these future payments.

The final chapter five, "International Policy Implications," presents an overview of the Biodiversity Convention and various international policy options that flow from it. The book concludes with two appendices, one on a simulated distribution of returns from a biochemical prospecting opportunity and one on the present value of benefits for a two-period, two-site land use plan.

This book represents a serious attempt to address the economic and policy aspects of biodiversity prospecting from realistic assumptions about the drug discovery process. The values assigned to extracts are lower than some workers have suggested and higher than those indicated by others; they are probably a reasonable working estimate and will serve as a useful basis for negotiating biodiversity prospecting agreements. This book should be required reading for any scientists engaged in or planning biodiversity prospecting and for policymakers in this area in government and industry.

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**Alkaloids: Biochemistry, Ecology, and Medicinal Applications.** Edited by Margaret F. Roberts (University of London) and Michael Wink (University of Heidelberg). Plenum Press, New York, NY. 1998. xix + 486 pp. 16 × 25 cm. \$115.00. ISBN 0-306-45465-3.

Many scientists working on alkaloids focus on their specialties, concentrated on extending the frontiers of individual topics. This book is for every specialist to enjoy,

offering a broad sweep of science with a wealth of interdisciplinary and historical perspective. The chapters are divided into four groups: historical introduction; the biochemistry of alkaloid production in plants; the ecological role of alkaloids; and the medicinal utility of alkaloids. Only synthetic chemistry is not covered, since alkaloids comprise a major share of the important target molecules and their synthesis is well reviewed in other literature.

After a brief introductory chapter (Roberts and Wink), Part I, Historical and Cultural Perspectives, opens with a learned and interesting account (Wink) of the use of alkaloids from antiquity to modern times all over the world. Chapter 3, Alkaloids in Arrow Poisons (H. D. Neuwinger), describes not only the active principles of the poisons but also the technologies employed by indigenous peoples for their procurement and delivery.

Part II, Biochemistry, opens with a chapter on chemical taxonomy (P. G. Waterman) in which the author reviews the major biosynthetic pathways and considers why the role of alkaloids in plant classification is less global than was anticipated when the field opened up in the 1960s. Chapter 5, Enzymology of Alkaloids Biosynthesis (Roberts), summarizes the impressive recent advances in isolating and studying the enzymes that mediate biosynthetic pathways. A short chapter on genes in alkaloid metabolism (K. Saito and I. Murakoshi) covers the beginnings of what will become a major field of study, while the next two chapters, on production of alkaloids in plant cell cultures (Roberts) and biosynthesis of alkaloids in root cultures (R. J. Robins) show what has been achieved from these tantalizing yet frustrating technologies. Chapter 9 (U. Eilert) reviews the various factors eliciting alkaloid production by plants. This, together with Chapter 10, Compartmentation of Alkaloid Synthesis, Transport, and Storage (Wink and Roberts), leads somewhat naturally into Part III, Ecology.

Part III begins with a broad review (Wink) of chemical ecology of alkaloids, which precedes a summary of their modes of physiological action (Wink). The particular situation of plant parasites in relation to alkaloid production and uptake is then covered (F. R. Stermitz) while the role of alkaloids in allelopathy in plants is reviewed by J. V. Lovett and A. H. C. Hoult. Part III concludes with chapters on alkaloids in animals (J. C. Braekman, D. Daloz, and J. M. Pasteels) and marine invertebrates (P. Proksch and R. Ebel). These are brief chapters, and one wishes that, for example, Kem's ongoing study of the alkaloids of nemertine worms and the nemertine–crustacean interactions could have been covered as well.

Part IV, Alkaloids in Medicine, contains two chapters. Chapter 17, Antimicrobially Active Alkaloids (R. Verpoorte) collects information that is often hard to find and very interesting, while Chapter 18, Utilization of Alkaloids in Modern Medicine (T. Schmeller and Wink), lists all of the alkaloids in the modern medicinal armamentarium, with their indications and trade names.

This book is excellent reading for all interested in alkaloids. Much information and many insights are to be found in its relatively small size. It will be worthwhile for scientists in many fields.

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