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BOOK REVIEWS

Studies in Natural Products Chemistry, Volume 15, Structure and Chemistry (Part C). Edited by ATTA-UR-RAHMAN. Elsevier Science Publishing Co., P.O. Box 945, Madison Square Station, New York, NY 10159-0945. 1995, xvi+582 pp. 16.5−24 cm. $322.75. ISBN 0-444-82083-3.

This volume is the fifteenth in a series covering special topics in natural products chemistry. Like earlier volumes in the series, this book generally consists of extensively referenced, in-depth reviews of very specialized topics of interest to the contributing authors' laboratories. There is no major theme interrelating the chapters other than the general topic of natural products chemistry. There are 14 different chapters ranging from 14 to 76 pages in length, with an average of nearly 100 references each. Most of the chapters cover specific compound types. These include reviews of *Gelsemium* alkaloids (H. Takayama and S. Sakai), marine sesquiterpene quinones (R. Capon), xenocoumarins and related dihydroisocoumarins (B. McInerney and W. Taylor), lupine alkaloids from the Leguminosae (K. Saito and I. Murakoshi), diterpenoids from *Rabdosia* spp. (Y. Takeda and H. Otsuka), unusual terpenoids from *Eremophila* spp. (E. Ghisalberti), structure determination of saponins (G. Massiot and C. Lavaud), and detection of cardenolides by ELISA (K. Yoshimatsu, J. Sawada, M. Jaziri, and K. Shimomura). Most of these chapters consist of narrative discussions presenting thorough coverage of major aspects of these compound classes. One interesting exception is the chapter on *Rabdosia*, wherein nmr spectral data and information on species distribution are compiled for nearly 200 diterpenoids having mostly *ent*-kaurane-derived skeletons. Two of these chapters (those on lupine alkaloids and marine sesquiterpene quinones) also contain lengthy tables listing numerous structure examples along with their sources and stereochemical information. The reviews of *Gelsemium* and *Eremophila* metabolites place significantly more emphasis on approaches to chemical synthesis and interconversion than other chapters. Two of the other sections are dedicated to reviews of compounds from individual sources, specifically *Phomopsis* spp. (Y. Tsantrizos) and echinoderms (L. Minale, R. Riccio, and F. Zollo). The remaining entries describe screening of microbial metabolites for oncogene function inhibitors (K. Umezawa), antimicrobial activity of amphibian venoms (G. Habermehl), cd analysis of carbohydrate-molybdate complexes (Z. Shah, M. Geiger, Y. Al-abed, T. Al-tel, and W. Voelter), and structure-activity relationships of highly sweet natural products (D. Kinghorn, F. Fullas, and R. Hussain). The last chapter has a particularly interesting table that provides a comprehensive listing of the known plant-derived sweet compounds with references and potency values.

The chapters in this volume are uniformly neat, well-proofed, and attractively illustrated, despite the fact that all of the authors appear to have generated the final camera-ready material using their own font and formatting choices. Like preceding volumes in the series, the particularly high cost of this book will prevent most scientists from considering the purchase of a copy for their own personal use. However, the chapters generally provide thorough coverage of the specific topics listed above, and this volume would be a worthwhile addition to its predecessors in a Departmental or University library.

JAMES B. GLOER, *University of Iowa*

Organic Synthesis. Concepts, Methods, Starting Materials. 2nd Edition. Edited by J. FUHRHOP and G. PENZLIN. VCH Publishers, Inc., 220 East 23rd Street, New York, NY 10010. 1994. xvi+432 pp. 17×24 cm. $50.00. ISBN 1-56081-814-x.

This is an extensively revised edition of the 1983 guidebook and provides a comprehensive overview of modern organic synthesis. The text is easy to read and contains an abundance of easy to follow graphics. Although no topic is covered rigorously, useful up-to-date references are provided for those readers seeking additional information. The first two chapters focus on synthons in the synthesis of acyclic and cyclic systems, the common methods of carbon-carbon bond formation, and various selective functional group interconversions (i.e., reductions, oxidations, eliminations, and protecting group chemistry). An entire chapter is devoted to retro-synthetic analysis of simple and complex organic compounds, while nearly a third of the volume presents surveys of recent syntheses of oligonucleotides (including the polymerase chain reaction), peptides (including gene cloning), polydentate macrocyclic ligands, porphyrins, carbohydrates, prostaglandins, steroids, alkaloids, antibiotics (β-lactams, tetracyclines, macrolides), and unnatural polycyclic hydrocarbons including cyclobutadiene, cyclooctatetrene, dodecahedrane, methylene-bridged annulenes, kekulenes, and cyclocarbons (fully conjugated cyclopolyynes).

The new material which has been added is incorporated throughout the above chapters and emphasizes

enantio- and diastereoselective reactions, such as the aldol reaction, the Sharpless epoxidation of allylic alcohols, and reductions (including hydrogenations and 1,2-hydride additions). The most obvious change is the addition of a chapter on the synthesis of nucleic acids, host-guest complexes, and dendritic polymers.

In conclusion, this affordable work should be well-received by its intended audience of biochemists, organic chemists, and chemistry graduate students.

GEORGE MAJETICH, *The University of Georgia*

Asymmetric Catalysis in Organic Synthesis. R. NOYORI. John Wiley and Sons, Inc., 605 Third Avenue, New York, NY 10158. 1994. xvii+378 pp. 15.5×23.5 cm. $54.95. ISBN 0-471-57267-5.

This book provides an excellent survey of the field of asymmetric catalysis and places particular emphasis on its synthetic significance. After a brief introduction on the basic principles of asymmetric catalysis, the reader is introduced to the homogenous asymmetric hydrogenation of olefins, ketones, or imines (Chapter 2), as well as a compilation of the enantioselective isomerization of allylic amines, amides, and alcohols (Chapter 3). Most of the work cited in these chapters was developed in the author's laboratories at Nagoya University. In contrast, Chapter 4, "Asymmetric Catalysis via Chiral Metal Complexes: Selected Examples," features the work of others. In just 133 pages, it covers the asymmetric hydrogenation, hydroboration, and hydrosilylation of olefinic and ketonic substrates, the asymmetric epoxidation of simple olefins and allylic alcohols, the asymmetric dihydroxylation of olefins, and the chiral oxidation of sulfides and amines. Other topics of current interest also included in this chapter are the enantio- and diasteroselective coupling of Grignard reagents with organic halides, arylation of olefins, electrophilic allylations, carbene reactions, hydroformylations, hydrocarboxylations, conjugate addition to Michael acceptors, and asymmetric aldol and related reactions. An extensive section on asymmetric pericyclic reactions (Diels-Alder Reactions, hetero-Diels-Alder reactions, ene reactions, Claisen rearrangements, and miscellaneous cycloadditions) is also included. The next three chapters provide overviews of the asymmetric addition of organometallic reagents to carbonyl compounds, the synthesis of numerous prostaglandins via the asymmetric conjugate addition of the C-12 side-chain onto (*R*)-4-hydroxy-2-cyclopentenone to introduce the C-8 and C-12 appendages and the asymmetric catalysis of compounds whereby the reactive intermediates are formed *in situ* using a chiral catalysis. Included in this chapter are examples of asymmetric phase-transfer carbene additions, reactions of sulfur ylides, enolate alkylations, Robinson ring annulations and Michael additions. The final chapter (Chapter 8) presents a selection of reactions of chiral solid catalysis in the liquid phase (heterogeneous asymmetric catalysis). Since these immobilized solid catalysts are easy to handle, remove and recycle, these reactions are intriguing (albeit chirally less efficient than homogenous versions).

In the introduction, the author states, "I am certain that asymmetric catalysis will remain one of the most significant subjects in chemistry." I agree. This book is recommended reading for anyone hoping to gain an overview of this field and will prove invaluable to those engaged in asymmetric synthesis.

GEORGE MAJETICH, *The University of Georgia*

Alkaloids: Chemical & Biological Perspectives. Volume 9. S. WILLIAM PELLETIER, Elsevier Science Limited, The Boulevard Langford Lane, Kidlington, Oxford OX5 1GB, UK. 1995. xvi+290 pp. 15×22.5 cm. $125.00. ISBN 0-08-042089-3.

Volume 9 continues the traditions of this important interdisciplinary series with a striking diversity of subjects.

In Chapter 1, the history, development and status of taxol (paclitaxel) are succinctly reviewed by Wall and Wani, who discovered this powerful addition to the anticancer armamentarium. In addition to a capsule summary of the discovery and identification of taxol, the authors provide an excellent overview of approaches to supply, synthesis, SAR, and clinical trials issues. The only topic shortchanged would seem to be recent nmr and modeling studies, which have provided detailed spectral assignments and insight into taxol's three-dimensional conformation.

In Chapter 2, Hamaker and Cook present both a detailed summary of synthetic approaches to the macroline class of indole alkaloids and a capsule summary of the known biological activity of these alkaloids. This is a daunting task, given the large and continuously expanding number of indole alkaloids and the immense synthetic effort in this area for decades.

In Chapter 3, the *Erythrina* alkaloids are reviewed by Chawla and Kapoor. Coverage includes early history, isolation, structure elucidation methodology, biosynthesis, synthesis, and pharmacology.

While both Chapters 2 and 3 are well-written and easy to follow, there are relatively few recent

references (1989–1993) cited, and it is not clear how significantly different these reviews are from the many others available in these two areas of endeavor.

Chapter 4 is a comprehensive review of the pyrrolizidine alkaloids. Hartmann and Witte review the compounds and classify them by source and chemotype, discuss biosynthesis, transport, storage, and metabolism of the alkaloids, and provide a detailed discussion of the biological activity of the pyrrolizidines, with emphasis on their ecological roles. Two appendices catalogue the alkaloids, structures and sources. References span the early history to very recent publications in the field.

Chapter 5 addresses the important and timely subject of plant cell culture, but focuses on a single case, alkaloids from *Aspidosperma quebracho-blanco*. The article is interesting, but reads like a research report from one laboratory rather than a review of efforts by the scientific community at large.

Chapter 6, by Powell and Plattner, closes the volume on a strong note, with a detailed look at the fumonisins, a recently characterized class of mycotoxin of considerable importance. The occurrence of these unique compounds, as well as the peculiar challenges confronted in purifying and characterizing them, are well-documented. The biosynthesis and biological effects of the alkaloids are also discussed. The references are very current.

In summary, this volume covers six very different topics in the alkaloid field. It should be available, along with the rest of the series, in all scientific libraries. Individuals with particular interests in one or more of the topics covered will find this a useful personal reference as well.

JOHN H. CARDELLINA II, *National Cancer Institute*

Advances in Chromatography. Volume 35. Edited by PHYLLIS R. BROWN and ELI GRUSHKA. Marcel Dekker, Inc., New York, NY. 1995, xviii+430 pp. $165.00. ISBN 0-8247-9361-7.

This volume of "Advances in Chromatography" continues a series of timely reviews of topics of contemporary interest in chromatography. The contents of this volume are "Optical Detectors for Capillary Electrophoresis," (51 pp., 90 references); "Capillary Electrophoresis Coupled with Mass Spectrometry" (47 pp., 95 references); "Approaches for the Optimization of Experimental Parameters in Capillary Zone Electrophoresis" (69 pp., 195 references); "Crawling Out of the Chiral Pool: The Evolution of Pirkle-Type Stationary Phases" (27 pp., 101 references); "Pharmaceutical Analysis by Capillary Electrophoresis" (59 pp., 125 references); "Chromatographic Characterization of Gasolines" (84 pp., 202 references); "Reversed-Phase Ion-Pair and Ion-Interaction Chromatography" (39 pp., 185 references); "Error Sources in the Determination of Chromatographic Peak Size Ratios (34 pp., 68 references). Most of the chapters were apparently written very recently, as they contain numerous references from 1993 and 1994. The editors have selected experts to write the various chapters.

The first two chapters describe various optical and mass spectral detectors for capillary electrophoresis and Chapter 3 describes various approaches for the optimization of experimental parameters in capillary zone electrophoresis. All three chapters are excellently written by experts in their respective fields and are copiously illustrated with practical examples.

The fourth chapter describes in extensive detail the historical development of Pirkle-type chiral stationary phases (CSP) and explains the strategy for the *de novo* design of CSP to affect separation of specific analytes. For example, strategies for the design of CSPs to resolve racemates of both propranolol and naproxen are described. The chapter is profusely illustrated with chemical structures of most of the CSps discussed, including some that have not been developed commercially.

The fifth chapter is a review of pharmaceutical analysis by capillary electrophoresis. After a superficial discussion of various modes of capillary electrophoresis, the authors review various applications of this relatively new method in pharmaceutical analysis. Drugs are reviewed by pharmacologic class and many practical examples of separation of the analyte from other components of the formulation or biological sample are provided. This chapter is marred by numerous spelling and typographical errors.

The sixth chapter is a comprehensive and contemporary review of chromatographic methods used to identify various components of gasoline and to characterize their physical properties.

The seventh chapter is a detailed discussion of reversed-phase ion-pair and ion-interaction chromatography. The author has included a particularly lucid discussion of interdependent factors affecting retention and discusses the use of chemometric optimization methods during the method development process.

The eighth chapter is concerned with sources of errors in the determination of chromatographic peak size ratios. This chapter is well-organized and very well-illustrated. The author has included a number of unpublished simulations that illustrate the effects of resolution and other variables on the determination of peak areas and peak heights.

Overall this book has several chapters that are of interest to those scientists using chromatographic and electrophoretic methods in their research. Due to the rapidly changing nature of these fields, it is unlikely that many will purchase this book for their personal libraries, but would find a library copy useful.

RICHARD A. SAMS, *The Ohio State University*

Handbook of Natural Toxins, Volume 8. Bacterial Toxins and Virulence Factors in Disease. J. MOSS, B. IGLEWSKI, M. VAUGHAN, and A.T. TU. Marcel Dekker, Inc., 270 Madison Avenue, New York, NY 10016. 1995. xxv+627 pp. 17.5×25 cm. $195.00. ISBN 0-8247-9381-1.

This book is an in-depth look at the major bacterial toxins, focusing on the understanding of the structure and function of these toxic proteins gained over the past decade. Despite having four editors and 51 contributing authors, the sections are well-organized, providing concise and up-to-date information on most major bacterial toxin and virulence factors of the major bacterial pathogens. This compendium is organized into seven major sections, most containing three to five chapters, covering the following: I. Clinical use of bacterial toxins (e.g., botulinum, diphtheria, and liposomal vehicles), II. Structure and function of bacterial ADP-ribosyltransferase, III. Mechanisms of diphtheria toxin action, IV. Cholera toxin and *E. coli* heat labile toxin, V. Diversity of action in the enterotoxin family, VI. *Bordetella pertussis* virulence factors, and VII. Diversity of actions of other toxic bacterial products.

After a concise review of the creative uses of the botulinum toxin for the control of disorders involving excessive muscle contraction, the reader is led through several perspectives on diphtheria toxin (e.g., three-dimensional structures, receptors, and diphthamide) and ADP-ribosylation in general. Considerable coverage is then given to the synthesis, structure, and function of cholera toxin and *E. coli* heat-labile toxin, as well as other major enterotoxins including the Shiga, Vero, and *C. difficile* toxins. Although the more recently discovered toxins such as Zot and Ace of *V. cholerae* are reviewed, a noticeable gap exists in that the recently characterized enterotoxin of *Bacteroides fragilis* was not mentioned. The virulence factors of *B. pertussis* are covered with emphasis on general virulence determinants such as muramyl peptides as exotoxins and the biosynthesis and targeting of the 'classical' pertussis toxin (the ADP-ribosyltransferase).

The final section is a collection of thorough reviews on the other major bacterial toxins. It includes the structure, molecular biology, and receptors of the classical tetanus neurotoxin; the structure, biosynthesis, and mechanism-of-action of anthrax lethal factor (LF), and anthrax edema factor (EF), an adenylyl cyclase; the purification and characterization of the staphylococcal leucocidin and pseudomonal leucocidin (also an ADP-ribosyltransferase); and the biochemistry and therapeutic aspects of endotoxin (bacterial LPS associated with septic shock).

Overall, this is an excellent review for those interested in "toxinology" in general and a valuable reference for those specifically intrigued with these fascinating toxic bacterial proteins. Although the book is rather costly for purchase by individuals, it is highly recommended as addition to departmental and corporate libraries.

ROGER VAN TASSELL, *Virginia Polytechnic Institute and State University*

Monosaccharides: Their Chemistry and Their Roles in Natural Products. PETER COLLINS and ROBIN FERRIER. John Wiley and Sons, Ltd., Baffins Lane, Chichester, West Sussex PO19 IUD, UK. 1995. xix+564 pp. 15×23.5 cm. Paper price $39.95. Cloth price $89.95. Paper ISBN 0-471953431. Cloth ISBN 0-471953423.

This textbook on monosaccharides, consisting of eight chapters and five appendices, is an extensive compilation of new developments in the growing field of modern synthetic monosaccharide chemistry. The authors are to be congratulated for drawing together these new developments in an extremely modern and comprehensive way and with high-quality editorial work.

A short "Introduction" (3 pages) constitutes the first chapter. The second chapter deals with "Structures, Shapes, and Sources," which are discussed in six sub-chapters. Chapter 3 describes "Reactions and Products of Reactions at the Anomeric Centre," by compiling extensive and detailed methodologies for the derivatization of the anomeric center. The formation of glycosides, thioglycosides, glycosylamines, and reactions with carbon nucleophiles as discussed in four sub-chapters. Chapter 4 deals with "Reactions and Products of Reactions at Non-anomeric Carbon Atoms" describing the chemistry of amino sugars, thio sugars, deoxyhalo sugars, anhydro sugars, branched-chain sugars, dicarbonyl compounds (aldosuloses and diulose derivatives), and unsaturated sugars in ten sub-chapters. An extensive compilation of detailed methodologies for the synthesis of sugars of the above groups is reported. Selective derivatization via intramolecular displacements by nucleophiles other than the hydroxyl group, including ring contraction

reactions and reactions involving leaving groups at C-4 and C-2, and displacements with carbon atom participation are the important topics of sub-chapter 4.7. Chapter 5 describes "Reactions and Products of Reactions of the Hydroxyl Group" including ethers, esters, acetals, and oxidative cleavage of α-diols by way of cyclic intermediates. Chapter 6 is one of the most important and deals with "The Chemical Synthesis of Oligosaccharides," describing various methodologies for oligosaccharide synthesis. Glycosyl acceptors and donors including 2-deoxyglycosyl linking and the intramolecular approach are described. Examples of the synthesis of linear homo-, hetero- and branched homo-, hetero-oligosaccharides are included.

Chapter 7 describes "Synthesis of Enantiomerically Pure Non-Carbohydrate Compounds by use of Monosaccharides." Two sub-chapters, "Carbohydrates as Chiral Auxiliaries" and "The Conversion of Carbohydrates into Enantiomerically Pure Non-carbohydrate Compounds," deal with the synthesis of oxygen, nitrogen, and sulphur heterocycles. Synthesis of carbocyclic, acyclic, and macrocyclic compounds are also discussed here.

The eighth and final chapter is concerned primarily with "Natural Products Related to and Containing Monosaccharides," and is divided into three sub-chapters dealing with complex saccharides, other glycosides, and cyclitols. The sub-chapter on complex saccharides is sub-divided into four sections dealing with disaccharides, oligosaccharides, polysaccharides, and glycoproteins, including proteoglycans and glycolipids. The sub-chapter on other glycosides is divided into four sections dealing with *O*-glycosides from plants, animals and microbes, *N*-glycosides (including nucleosides, nucleotides, and nucleic acids), *S*-glycosides, and finally with a most important class of natural compounds, *C*-glycosides.

Extremely useful appendices, including "Nomenclature in Monosaccharide Chemistry," "^{1}H- and ^{13}C-Nmr Data," "Polarimetry in Monosaccharide Chemistry," and "Modified Sugars Found in Microbiological Sources," are also presented. The book concludes with an extensive Subject Index (13 pages) and a very useful Selective Index of Compounds (4 pages). The organization, unification, and presentation of the material is highly commendable, and, overall, the book is well produced and free of any obvious errors.

This textbook provides a foundation for a course in synthetic carbohydrate chemistry, or for a special topics course. For that reason it will be an indispensable reference source for lecturers, especially in the emerging field of synthetic application of monosaccharides in natural products chemistry. It should be a valuable and essential addition to institutional libraries. In addition, the attractive price of the paper edition should convince all scientists and graduate students engaged in research on the chemistry of carbohydrates to include this book in their personal library.

ZBIGNIEW J. WITCZAK, *University of Connecticut*