*Book Reviews**

The Way of Synthesis. Evolution of Design and Methods for Natural Products . By Tomáš Hudlickỳ and Josephine W. Reed (Brock University, St. Catherines, Canada). Wiley-VCH, Weinheim, 2007 . xv + 1004 pp. 17 × 24 cm. 69.00 euros (paperback). ISBN 978-3-527-31444-7.

This well-written, nicely illustrated book is not a compilation of selected syntheses, nor is it a basic textbook on organic synthesis. Rather, it is a historical and philosophical treatise on the evolution of the art and practice of organic synthesis, with emphasis on critical developments over the past 50 years. The authors include reminiscences of those who designed and executed these exemplary syntheses: the principal investigators and their postdocs and graduate students. These unique perspectives illuminate the thinking, limitations, strategies, and tactics operational at those particular moments in the history of organic synthesis.

The book is divided into eight parts. Part 1 provides some historical background, notably the inexorable link of natural products and the development of organic synthesis, summarizes some of the early milestones in synthesis, and discusses general approaches to total synthesis. Part 2 is a superb summary of strategy and tactics, and key considerations and approaches, to synthetic design; this part could be the basis of a full year course in organic synthesis. One of the noteworthy features of these two parts is a list of key problems in synthesis that was presented to the senior author by R. V. Stevens in a 1974 class on advanced synthesis; the senior author notes that only about half of these problems have been solved since then, some of them only partially, demonstrating that there is still much to do in organic synthesis.

Parts 3−5 address comparative design principles and approaches, using terpenes, alkaloids, and miscellaneous compounds, respectively, as illustrative templates. Herein numerous targets and approaches are examined in detail; many are classics well known to all, but there are some lesser known, but equally informative examples as well.

Part 6 is the most unusual feature of this book, a discussion (almost a lament) on the state of organic synthesis and the authors' concerns about its future. This brief but striking discourse on the numerous factors affecting the continuing development and practice of the science and art of synthesis, most of them negative, paints a rather bleak picture and, in essence, challenges all organic chemists to help address these issues and work to restore health and vigor to the field. This reviewer thinks that these arguments are quite relevant and, moreover, that they also apply to natural products discovery, and probably to all aspects of organic chemistry.

Part 7 contains acknowledgments and Part 8 a series of indices. As excellent as this book is, and as diligently as the authors have worked on its contents, there are a few apparent mistakes. On page 710, structure **100** appears to be one carbon too large, while structures **66** and **74** on page 771 are one carbon too small (ring contracted).

These few aberrations do not detract from the power and value of this excellent book. Without question, anyone who practices organic synthesis or wishes to should read this book cover to cover, but this reviewer thinks every natural products chemist should also study this book thoroughly. For its significant content, it is eminently affordable.

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Hyphenated Techniques in Grape and Wine Chemistry. Edited by Riccardo Flamini (Viticulture Research Center, Veneto). John Wiley & Sons, Ltd., Chichester, UK. 2008. xvi + 345 pp. 6 × 9 in. $160.00. ISBN 0-470-06187-1.

This book provides a comprehensive review of the analysis of the chemical constituents found in grapes, must, and wine. This eight-chapter book is extremely well referenced and provides experimental procedures for virtually every chemical constituent of interest in enology. Each chapter begins with a brief description of a particular class of compound found in wine followed by an extensive array of analytical techniques (both analysis and separation) that can be applied to that particular class of compound.

Chapter 1 provides a brief description of the wine-making process and describes the analysis of the major components associated with wine making (alcohols, organic acids, sugars, and aldeyhdes). There are some interesting chromatograms published in this chapter that allow one to observe the variation of chemical constituents in different varietals. Chapters 2 and 3 are devoted to the analysis of phenolic and polyphenolic compounds found in wines (from both the grape and the wine-making process). There is a brief description of the biosynthesis of these compounds, their reported health benefits, and how they affect the flavor of wine. There are tables in both chapters that provide structures of the various polyphenolic compounds associated with grapes and wines. Chapter 2 is devoted to simpler phenolics and addresses analytical techniques using HPLC and UV detection. Chapter 3 is devoted to more complex structures and emphasizes analysis using LC-MS techniques. There are numerous pages devoted to MS/MS analysis.

Chapter 4 provides analytical techniques used to identify and quantify grape and wine contaminants. These contaminants include compounds produced via fungal contamination (e.g., ochratoxin A), biogenic amines (from bacterial contamination), trichloroanisole (from corks), and volatile phenols (from degradation of cinnamic acids).

Chapter 5 is divided into aroma compounds and off-aroma compounds. The former are monoterpenes, norisoprenoids, and esters. Various analytical techniques are compared for the analysis and quantitation of these compounds. The second half of this chapter is devoted to the analysis "off-flavoring" aroma sulfur-containing compounds in wine. Pesticide residue analysis associated with grapes and wine making is addressed in Chapter 6. There is a nice table that lists all registered pesticides allowed on grapes in Italy.

Chapter 7 discusses the various proteins and peptides that are associated with wine and the wine-making process. In addition to a discussion of the analytical techniques associated with the wine proteins and peptides, there is a brief discussion on the proteomics used to identify the origin of these proteins and peptides based on MS analysis. The final chapter (8) is devoted to the analysis of metals and inorganic anions found in grapes and wine. A discussion of the origin of these ions, as well as a method of using ion analysis to determine geographical origin of a wine, is provided.

Overall, this book is an excellent resource for anyone interested in wine chemistry. The experimental procedures given are detailed enough so that one would not need to consult the original reference if attempting a particular analysis. The authors should be commended on the detail provided for sample preparation prior to each

* Unsigned book reviews are by the Book Review Editor.

analysis. The various tables included in this book provide a quick reference for structures of secondary metabolites that may be found in wine.

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Protein-Carbohydrate Interactions in Infectious Diseases. Edited by Carole A.Bewley (National Institutes of Health). Royal Society of Chemistry, Cambridge, UK. 2006. xiv + 250 pp. $6^1/_4 \times 9^1/_2$ in. £74.95. ISBN 0-85404-802-2.

It is difficult to imagine any natural products scientist who would not find this an interesting publication. Many of the unique molecular aspects of infectious disease science involving protein−carbohydrate interactions are discussed within this book. Protein−carbohydrate interactions are key events in many of the biological processes associated with both normal functioning and pathological situations, including cell adhesion associated with the initial steps in infections as invading parasites, bacteria, fungi, and viruses attach to host cells. Other important areas where the protein−carbohydrate interaction plays an essential role include enzymatic synthesis and degradation of oligo- and polysaccharides during sugar transport, and immunological responses to carbohydrate antigens.

The initial chapter (Atomic Basis of Protein-Carbohydrate Interactions: An Overview, by N. Sharon) provides background information and a brief review and summary of physicochemical issues of bonding and other interactions including the role of water. Although this is quite brief, it works as a quick update and covers many basic principles that help in understanding the chapters that follow.

Among the useful aspects of this collection are the discussions with immediate practical impact, as exemplified by Chapters 6 and 8 (respectively Retrocyclines: Miniature Lectins with Potent Antiviral Activity, by R. Lehrer, and Targeting Microbial Sialic Acid Metabolism for New Drug Development, by E. Vimr and S. Steenberger), with an unusually interesting introduction, which addresses drug discovery and development in detail. The vaccine work described in Chapters 9 and 10, Synthetic Carbohydrate-Based Antimalarial Vaccines and Glycobiology (A. Hölemann and P. Seeberger) and Studies Toward a Rationally Designed Conjugate Vaccine for Cholera Using Synthetic Carbohydrate Antigens (P. Kováč), provide a great update on the complementary approach to addressing some very difficult diseases and progress made in these promising fields.

The remaining chapters provide very interesting information concerning bacterial infections, including the mycobacteria that cause tuberculosis and leprosy (Mycobacterial Glycolipids and the Host: Role of Phenolic Glycolipid and Lipoarabinomannan, by G. Blaauw and B. Appemelk), the Gram-negative bacteria *Pseudomonas* (Structures and Roles of *Pseudomonas aeruginosa* Lectins, by A. Imberty et al.), the enterobacter group including *Campylobacter jejuni, E.coli, Klebsiella pneumoniae*, and *Salmonella typhimurium* (Protein-Carbohydrate Interactions in Enterobacterial Infections, by N. Sharon and I. Ofek), and finally a discussion on bacterial toxins associated with *E.coli* and the cholera-causing organism *Vibrio cholerae* (GM1 Glycomimetics and Bacterial Enterotoxins, by A. Bernadi et al.).

There is a discussion of the recognition of pathogens by an invaded host (C-Type Lectin Receptors that Regulate Pathogen Recognition through the Recognition of Carbohydrates, by S. Van Vliet et al.), which comments upon viral, bacterial, fungal, and parasitic infections. The final chapter addresses high-throughput analysis of protein−carbohydrate interactions including detailed methodology and applications (Carbohydrate Microarrays for High-Throughput Analysis of Carbohydrate-Protein Interactions, by I. Shin).

All of the chapters are very well written, and there are many truly excellent diagrams and illustrations reproduced in color. The target audience includes graduate students and those with an understanding of advanced biochemistry. In addition, those involved with research into infectious diseases will find this especially useful, and this reviewer would recommend the book to anyone with a strong interest in the molecular basis for infectious diseases.

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