Book Reviews

Commercial Biosensors. Applications to Clinical, Bioprocess, and Environmental Samples. Edited by Graham Ramsay (Wolpert Polymers, Inc). Wiley-Interscience: New York. 1998. v + 304 pp. $69.95. ISBN 0-471-58505-X.

This book is composed of seven chapters, each written by a different set of authors. The first five chapters cover topics related to biomedical applications of biosensors, the sixth chapter deals with biosensor instrumentation designed for industrial measurements, and the final chapter discusses the use of biosensors for biochemical oxygen demand (BOD) measurements. The editor indicates this book is intended for "students, teachers, and research workers in the biosensor field". I concur with this assessment. Indeed, most of the chapters provide the background information needed to understand the chemistry, physics, and engineering involved in the operation of the various sensors. In addition, most chapters offer new and interesting information for those with solid experience with biosensor technology. Because the book is intended to cover commercial biosensors, many of the authors are employed in industry and are directly affiliated with the biosensor-related products covered in the chapter. Unfortunately, this arrangement creates a narrow, almost biased, presentation in several cases.

Chapter 1 is a very good review of home blood glucose monitoring technology. This technology is a vital component in the daily control and management of diabetes mellitus. Although none of the information is proprietary, much of it is difficult to find in the literature, so the compilation of this information within a single chapter will clearly benefit those entering the field. Home blood glucose monitoring is a rapidly developing field, and as such, details within the chapter will soon become dated. Nevertheless, the basic information is sound and will remain relevant for some time.

Chapter 2 focuses on the i-STAT system which is designed for point-of-care clinical measurements. This chapter begins with a rather biased discussion of point-of-care testing. In the author's view, point-of-care testing benefits patient outcome and is better than the conventional method where samples are submitted and processed within a central laboratory facility. Actually, the benefits of point-of-care testing are still being debated by clinical chemists and healthcare providers. The bulk of this chapter is a historical presentation of the development of the i-STAT system along with a description of the capabilities and features of this instrumentation. The presentation is nearly an infomercial for their product with very little information provided about other point-of-care clinical instruments. Nevertheless, the chemistry associated with these electrochemical clinical measurements and the difficulties of engineering these chemistries within a single, hand-held instrument are discussed.

Chapter 3 is entitled Noninvasive Biosensors in Clinical Analysis. Noninvasive is a widely used term to describe a process for collecting in situ clinical information without invading the body for a representative sample. For the most part, this term has come to represent a set of optical methods, such as pulse oximetry, where electromagnetic radiation passes through the body and then the clinical information is selectively extracted from the resulting spectral information. Although technically accurate, the title of this chapter is a bit misleading in that the material presented corresponds to the application of electrochemical biosensors for measuring substances in nonblood clinical samples. Specifically, sensors are described for measuring (1) ethanol, lactate, and glucose in saliva, (2) lactate in sweat, and (3) glucose in transbuccal mucosa fluid.

Chapters 4 and 5 cover the timely topics of surface plasmon resonance (SPR) and other evanescence wave transduction schemes for monitoring binding events between biological molecules. In Chapter 4, Ronald Earp and Raymond Dessy provide an excellent review of SPR for biochemical measurements. Their review includes a thorough practical description of the theory behind these measurements as well as schematic descriptions of several commercial SPR instruments. Although some of this material is repeated in Chapter 5, this latter chapter nicely complements Chapter 4 by describing other evanescence wave transducers (such as surface acoustic wave (SAW) devices) and by providing a detailed discussion of binding and dissociation processes for biomolecules. Chapter 5 also provides several excellent examples that demonstrate the capabilities of this methodology.

Chapter 6 describes biosensor-based chemical analyzers that are commercially available for measuring various analytes of importance in the bioprocess industry. For the most part, this chapter briefly covers the history of the YSI glucose electrode followed by a detailed description of the operation and capabilities of the YSI Model 2700 Select biochemistry analyzer produced by Yellow Springs Instruments. In addition, similar instruments designed and marketed by other companies are briefly described. This chapter is weak in detailing actual applications of this technology, but it provides an excellent overview of the basic chemistry involved in the measurement of glucose, sucrose, alcohol, glutamate, glutamine, and choline. Practical issues, such as sample pH, temperature, stability of the enzymatic activity, etc., are covered nicely.

Chapter 7 reviews biosensor technology for measuring biochemical oxygen demand (BOD) in environmental samples. The chapter begins by describing the basic concept of using a biosensor for BOD measurements and discussing the inherent advantages of the biosensor approach. Following a brief review of 18 different microbial systems, the author discusses issues of commercialization, system calibration, and sensor stability. The last portion of the chapter is dedicated to problems and limitations associated with the practical use of BOD biosensors for wastewater monitoring.

Overall, this book offers a great deal to scientists and engineers entering the field of biosensors. The authors have done an excellent job of describing the chemistry associated with the measurements. Chapters 4 and 5 are highly recommended for those wishing to better understand surface plasmon resonance and the types of chemical interactions that can be examined by these relatively new instruments.

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Enantioselective Synthesis of *β*-Amino Acids. Edited by Eusebio Juaristi (Instituto Politécnico Nacional, Mexico). Wiley-VCH: New York. 1997. xviii + 491 pp. $135.00. ISBN 0-471-18627-9.

This is a multi-authored collection of 22 chapters focused mostly on the title subject. Production values are high—for example, there are no jarring differences in the styles of the structure art provided by the different authors—and publication seems to have been commendably rapid, with a few 1996 references apparent. There is an acceptably complete index.

Two lead-off chapters attempt to provide some perspective on the biological activity of *β*-amino acids that is responsible in part for the synthesis efforts summarized in later chapters. The first, by T. C. Boge and Gunda Georg, is an excellent survey of the synthetic and medicinal chemistry associated with the *β*-amino acid side chain of Taxol. The second chapter, by Joaquin Tamariz, takes on the biological activity of both *β*-amino acids and *β*-lactams in only 16 pages! Particularly strong methodologically oriented chapters are contributed by Frank Davis and R. E. Reddy (use of chiral sulfinimines), K. Ishihara, K. Hattori, and Hisashi Yamamoto (aza Diels−Alder and aldol-type condensations mediated by chiral Lewis acids), Dieter Enders, W. Bettray, J. Schankat, and J. Wiedemann (use of SAMP hydrazones and TMS−SAMP), Joseph Konopelski (use of chiral dihydropyrimidinones), and Eusebio Juaristi and Dieter Seebach (use of chiral perhydropyrimidinones). There are also very interesting chapters by J. L. Matthews, C. Braun, C. Guibourdenche, M. Overhand, and Dieter Seebach on the application of the Arndt−Eistert homologation to the conversion of α-amino acid and peptide derivatives to *β*-amino acid-related structures, and by Peter Jacobi and W. Zheng on the involvement of the Nicholas reaction in the pursuit of the title compounds. A lengthy discussion of the synthesis of *β*-amino acids from *β*-lactams is given by Claudio Palomo, Jesus M. Aizpurua, and Iñaki Ganboa.

The duplication of topics that typically plagues multi-authored volumes is not avoided by this one. For example, three chapters focus on the Taxol side chain, and its synthesis is brought up repeatedly throughout the remainder of the book; two chapter titles emphasize the elaboration of *β*-amino acids from aspartic acid. The problem, of course, is less a redundancy of detail (authors highlight their own

contributions) and more the lack of a cohesive critical overview. What currently are the most compelling β-amino acid targets (beyond the Taxol side chain!)? Which are the best ways to synthesize the Taxol side chain? Which methodologies are best at delivering the remaining β-amino acid structural types of current interest? Potential purchasers (and those responsible for library acquisition recommendations) will be left to decide whether enough of the high-quality, stand-alone chapters are of sufficient interest to merit buying the volume. Readers (especially graduate students) looking for a well-organized evaluative introduction to the field will be disappointed.

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Bioorganic Chemistry: Peptides and Proteins. Edited by Sidney M. Hecht (University of Virginia). Oxford University Press: New York. 1998. vii + 532 pp. $75.00. ISBN 0-195-08468-3.

This book, the second offering in the Topics in Bioorganic and Biological Chemistry series, covers the chemistry of peptides and proteins. Each volume in this series, which also includes the excellent first book on nucleic acids and an upcoming book on carbohydrates, is designed to present a survey of a broad area of bioorganic chemistry. These volumes are intended to serve as textbooks for one-semester graduate courses in each of the topics covered. Furthermore, books in this series are meant to provide a starting point for researchers interested in the field. This second volume should fulfill both of these roles. While 32 pages longer than the first volume, this book is well-suited for a special topics course on the structure, synthesis, analysis, and function of peptides and proteins. The 14 chapters each average more than 120 references, citing primary literature and key reviews from 1996 and earlier. This allows interested readers to easily delve into any of the topics covered.

The chapters of the book can roughly be divided into two groups: background topics and specific research areas. The former group includes chapters introducing basic peptide and protein biochemistry, the chemical synthesis of peptides, the chemical synthesis of proteins, structural analysis of proteins, and protein structure and folding. This group comprises roughly half of the book and provides concise but thorough coverage of these basic topics. This section is a most valuable resource for people entering the peptide and protein field. Especially good are the descriptions of methods for the chemical syntheses of peptides and proteins. The latter section presents more narrowly focused coverage of individual areas of current research. These include classic bioorganic subjects such as enzyme mechanisms, current techniques such as site-directed mutagenesis and the use of enzymes in organic synthesis, and current topics such as catalytic antibodies and peptide mimetics. Unfortunately, not every chapter works well in a textbook setting. For example, the chapters on zinc finger domains and engineered proteins in materials research are rather narrowly focused. While these chapters are well-written and interesting, their scope should have been expanded with more general examples of the type of research being discussed. The other topics in this section are of satisfactory scope for a textbook, and all of the chapters provide a flavor for the diversity of research being performed and should certainly spark the creativity of students and others entering the field.

Bioorganic chemistry is a rapidly expanding and evolving discipline. This book provides an excellent foundation of basic knowledge necessary to study the bioorganic chemistry of peptides and proteins. This valuable resource is enhanced by the collection of well-written snapshots of current research topics presenting some of the directions in which this field has moved. Overall, this book is highly recommended to graduate level bioorganic students as well as to all others interested in the organic and biological chemistry of peptides and proteins.

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Hydrocarbon Resins. By Rolf Mildenberg, Gerd Collin, and Mechthild Zander. Wiley-VCH: New York. 1997. xii + 179 pp. $140.00. ISBN 3-527-286179.

The authors have written an interesting book in a clear easy-to-read style. Their stated purpose, "This book is not meant to be a comprehensive manual of hydrocarbon resins; it aims to provide chemists, process engineers, applications technologist, technical sales personnel, and students of chemistry and chemical engineering, with a concise, overall view of raw materials, manufacture, physical and chemical properties, and the manifold applications offered by the various commercially available hydrocarbon resins.", seems to be well met.

Appoximately half (79 out of 170 pages) of the book is devoted to applications of hydrocarbon resins. In fact 65 separate applications are listed and discussed and consider such diverse topics as water and solvent borne adhesives, woodworking, book binding, tapes, labels, paints, inks, chewing gum, waterproofing, and many others. Although 32 pages are devoted to structure and properties of resins, some of the topics are not well referenced and are somewhat vague. However, they have a short discussion on almost any measurement of interest to the resin chemist.

In general the book is well written but has a few shortcomings; for example, some acronyms such as GLC are not defined. It has several typographical errors; for example, on p 18 they have two spellings for the same author Marshall or Maréchal and gasolin for gasoline, on p 14 the structure for β-pinene has an extra double bond, etc. The sections on raw materials and resin manufacture should be interesting to professionals in the area of resin processing; they comprise approximately one-fourth of the book.

Interestingly, the authors have devoted three chapters (although short) to areas of great interest to manufacturers and users of resins, i.e., Quantity and Quality Assurance, Toxicology and Legal Aspects, and Economic Aspects. These are areas not usually covered in a technical reference book.

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Transition Metals in Organic Synthesis: A Practical Approach. Edited by Susan E. Gibson. Oxford University Press: Oxford. 1997. vii + 234 pp. $125.00. ISBN 0-19-855845-7.

This text consists primarily of background and procedures for the more useful transition metal promoted/catalyzed organic reactions. The authors note that many of these processes, despite their significant value in organic synthesis, are not taught in undergraduate laboratories, and this text is partially intended to remedy this. Each procedure is preceded by a brief but reasonably comprehensive discussion of the chemistry involved, including limitations and major variants. The text emphasizes those reactions involving Pd, Fe, Ti, Zr, and Cr. In addition, the first chapter is devoted to oxidations mediated by metals in each of the groups 4 through 10, including the asymmetric epoxidations of Sharpless and Jacobsen, and the Sharpless dihydroxylation. Other chapters discuss palladium-catalyzed processes (the Heck, Stille, Suzuki, and Shonogashira reactions); dienyl iron tricarbonyl and acyl iron chemistry, including rather extensive treatment of ferrocene and derivatives; titanocene and zirconocene complexes; and arene chromium tricarbonyl chemistry. In addition, there is a chapter devoted to techniques for handling air-sensitive compounds. The contributing authors were almost entirely from the United Kingdom, and the procedures have a decidedly British feel (and spelling). While necessarily selective in its coverage, the text provides an excellent summary of the chemistry involved, and the procedures are so thoroughly explained (including *cautions*) that this could easily serve as an advanced organometallic laboratory manual (one of the author's stated aims). While some of these reactions might be found in *Organic Syntheses*, the background given here is far more comprehensive and the procedures are more appropriate for undergraduates. The references are slightly dated (none more recent than 1994) but acceptable for the intended purpose. This very practical text is an excellent addition to any chemistry library and, further, should be considered by those interested in teaching organometallic chemistry in undergraduate laboratories.

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