Book Reviews *

Microcharacterization of Proteins. 2nd Edition. By R. Kellner (Gutenburg University), F. Lottspeich (MPI für Biochemie), and H. E. Meyer (Ruhr University). Wiley-VCH: Weinheim. 1999. xxi + 325 pp. $115.00. ISBN 3-527-30084-8.

The burgeoning field of protein analysis would seem to defy condensation into one cohesive, timely volume. The three main authors of this volume partly succeed in doing exactly that, despite the editorial challenge of integrating the contributions of 30 additional authors. After an introduction, the text is divided into sections on microseparation and sample preparation, bioanalytical characterization, and computer sequence analysis. As expected, the multiauthor format is a source of uneven quality and frequently awkward English syntax. (A few outright errors are hard to rationalize even on these grounds, including misstatements of Ohm's law and of pH or p*I* conventions.) While most references are reasonably current and appropriate, some exclude article titles, detracting from their usefulness. Some material is needlessly repeated, including tables of LC flow rate regimes, the nomenclature for tandem mass spectrometric fragmentation of peptides, and tables of mass differences due to amino acid modifications.

The topics are organized roughly parallel to the steps required to proceed from a crude protein extract to an identified or sequenced protein, although a few chapters are a poor fit to this framework. For example, capillary electrophoresis is rarely used as part of an overall strategy for identifying unknown proteins. Instead, the CE chapter provides examples of the use of various protein separation modes for quality control. The chapter introducing high-performance liquid chromatography is a better fit since HPLC is used both preparatively and as a component of other techniques such as amino acid analysis. This chapter offers practical advice but does not always show how HPLC serves the overall analytical process (although much of this is accomplished in later chapters). More out of place is the chapter on Fourier transform mass spectrometry. Although it adequately explains the technique, this chapter fails to put the advantages (and disadvantages) of FTMS into a true bioanalytical context. Readers may have been better served by a chapter summarizing and critically evaluating the characteristics of the five types of mass analyzers.

Relevant ionization techniques are covered in separate chapters on electrospray ionization and matrix-assisted laser desorption/ionization. The MALDI chapter is a reprint of a 1994 review article, apparently updated to include delayed extraction and other recent developments. It also includes sections on non-protein biopolymers that should have been edited out of this volume. By concentrating mainly on analysis of intact proteins, this chapter understates the importance of peptide mapping by MALDI in combination with endoproteinase digestion. It also neglects current techniques for last-minute sample preparation and the combination of MALDI with exopeptidase digestion for sequence analysis, although a separate chapter is devoted to peptide sequencing by MALDI postsource decay. The electrospray chapter includes good discussions of spray modes and multiple charging but fails to discuss alkali metal adduction and barely mentions the deleterious effects of other ionic contaminants on the ESI signal. This chapter also unnecessarily overlaps a later chapter on mass spectrometric techniques for sequence analysis, and both understate the importance of nanospray for characterizing limited protein samples! Also omitted is a discussion of parent ion scans for class-selective detection, especially of post-translational modifications. Neutral loss scans are considered briefly, but parent ion scans are mentioned only once (and then not by name). Note also that there is no discussion of fast atom bombardment—although FAB is still used in many mass spectrometry facilities, it has been largely superseded by MALDI and ESI.

Much of the best material is provided by the three primary authors. The introduction is well illustrated with thoughtful diagrams, although it could better differentiate the roles of protein microcharacterization and large-scale protein mapping within the new field of "proteomics". The chapters on salt and detergent removal, chemical and enzymatic fragmentation, amino acid analysis, Edman degradation, and identification of posttranslational modifications all include sound practical information and excellent discussions of the chemistry involved. The best feature may be the short section on "Golden Rules" for protein and peptide handling. Given the central importance of adsorption to protein microcharacterization (both in unavoidable adsorptive losses and in binding to membranes or micropurification columns), this section could be profitably expanded into an entire chapter. (Some of this material was ably covered in an earlier chapter on electroblotting.) By contrast, many of the contributed chapters err on the side of being more descriptive than prescriptive, promoting a specific technique rather than providing context, critical evaluation, or practical advice.

The book concludes with two chapters on computer tools for protein identification and sequence analysis. The first is a thorough, practical explanation of Internet resources for protein identification, well supported with examples. The second is a discussion of protein and genomic sequence databases and analysis tools that, while useful, contains too much technical computer jargon. Overall, this volume is recommended to anyone needing a survey of current techniques for protein characterization and is appropriate for analytical chemists, biochemists, and biological research facility staff. Many chapters stand on their own merits, and most are at least good sources of leading references. The perspective may not be uniformly biological enough to satisfy molecular, cellular, or microbiologists, but this book should also prove useful to any biologist who relies heavily on protein analysis.

Brian T. Cooper, *The University of North Carolina at Charlotte*

JA995714S

10.1021/ja995714s

Spectral Properties of Lipids. Edited by Richard J. Hamilton and John Cast (Liverpool John Moores University). CRC: Boca Raton, FL. 1999. xvi + 398. $130.00. ISBN 0-8493-9736-7.

The material in this book is intended to provide a broad overview of how spectroscopic techniques are used to characterize lipids and lipid products both in industry and in the academic laboratory. The academic chemist is introduced to the many uses of spectroscopy in the oil and fats and food industries, whereas topics presented in basic lipid research give a flavor of what is currently being explored in the academic laboratory.

In general the book is well written and well illustrated and contains a relatively up-to-date literature representation. It is organized into 12 chapters. Each chapter discusses one spectroscopic method and its application to the analysis of lipids. Together the 12 chapters describe the various properties of lipids that are commonly analyzed and the spectroscopic techniques employed for each type of analysis.

A good balance of discussion between theoretical principles, practical details, instrumentation, and experimental application is provided in each chapter. These aspects are for the most part presented in sufficient detail that the reader is left with a good impression of the advantages and limitations of the individual spectroscopic techniques and some knowledge of how to apply them. A real case study is also presented to give the reader a feel for how a spectroscopic characterization of an unknown lipid sample is carried out from beginning to end. One of the main objectives of the book is to provide a series of topics that could serve as the basis for a lecture series. To this end the book is successful since a complete picture of each spectroscopic method and its application to the analysis of lipids is given in a well-organized format.

Overall, this book fulfills its objective to introduce to both the academic and industrial scientist a range of interesting topics in the area of spectral properties of lipids. It serves as a practical guide for the analytical chemist and provides a good foundation for a lecture series.

Katharine Carpenter, *AstraZeneca R & D Montréal*

JA995769U

10.1021/ja995769u

Inductively Coupled Plasma Spectrometry and Its Applications. Edited by Steve J. Hill (University of Plymouth). CRC Press LLC: Boca Raton FL. 1999. 370 pp. $139.95. ISBN 0-8493-9739-1.

When developing a review, I ask myself the question, "Who will

*Unsigned book reviews are by the Book Review Editor.

find this book useful?" Usually the answer lies in one or more of the following categories: the technician performing routine analysis, the researcher performing fundamental studies, or the professor teaching an advanced level course. The work under consideration only partially meets the requirements of any one of the aforementioned groups. The contributing authors have built very respectable careers in either applications or fundamental research in inductively coupled plasma (ICP) spectrometry. However, several of the 10 chapters provide too little detail on the respective subject matter. In many cases, the reader will need to consult the cited references for additional information on specific areas.

Those interested in the history of the ICP will find Chapter 1 an interesting treatise on the topic. The authors start at the point when crude plasmas were first created and develop a genealogy to modern-day ICP. The authors provide a limited discussion on analytical characteristics such as precision, detection limits, and interferences.

The second chapter is a definite high point. Those interested in the physical mechanisms and thermodynamic principles associated with the ICP will find this chapter a joy. The seasoned ICP user will find valuable principles involving the spectrosopic characterization of the plasma that can be easily applied to laboratory experiments.

For those who are new to the technique, the third chapter provides a good overview of ICP hardware. The authors start off discussing the ICP torch, move to spectrometers and detectors, and finish with sample introduction devices. Like several of the chapters, this one is written in a review style and provides many good references for the reader to consult.

An excellent treatise on the fundamental properties of sample introduction devices is provided in Chapter 4. The analyst will find this to be one of the most important areas of the analysis with regard to controlling accuracy and precision. The author thoroughly describes how aerosol properties influence mass transport to the plasma and the analytical signal. The effect of aerosol characteristics on mass transport is discussed for several different nebulizer types.

Chapters 5 and 6 are devoted entirely to inductively coupled plasma mass spectrometry (ICPMS). The general overview presented in Chapter 5 includes ion formation, ion sampling, and mass analyzers. The technical level will best serve those who are new to ICPMS. Seasoned users and novices alike will find the discussion of isotope ratio measurements in Chapter 6 a valuable resource. The authors provide an excellent description of the basic principles, applications, and errors associated with the technique.

Plasmas sustained in gases other than argon continue to be the subject of study in the academic community. Chapter 7 is devoted to describing the unique analytical characteristics provided by these plasmas for ICP optical emission spectrometry (ICPOES) and ICPMS. Potential advantages aside, these plasmas continue to remain mostly research curiosities.

The last three chapters of the book (Chapters 8−10) are devoted entirely to the specific application areas in which ICPMS and ICPOES have gained wide acceptance. Each is focused on addressing problems in environmental analysis, geological analysis, and food science, respectively.

Coverage related to the environmental area is limited to air and water analysis, with the authors providing a synopsis of sampling, sample preparation/preconcentration, and possible interferences. Unfortunately, soil and biological sample analyses were not included.

Those involved with the analysis of geological samples will find a wealth of knowledge in Chapter 9 relating to specific sample preparation methodology, which is arguably the most important step in any analysis. Specific coverage is provided for the determination of major, minor, rare earth, and platinum group elements. It was refreshing to see a section of this chapter devoted to discussing future analytical trends.

The last chapter of the book is focused on the analysis of practically anything that can be considered a food source. The authors have provided an ample serving of knowledge relating to specific sample types such as meats, fruits, vegetables, fish, and shellfish. Information regarding the chemical form of elements present in a sample is becoming of greater importance to fully evaluate biological activity. Appropriately, the authors include a section specifically relating to speciation analysis.

Overall, this book leaves the impression that it was intended to be more of a general overview than a stand-alone resource. Seasoned spectrosocopists or analysts will find this text of limited utility. However, those who are new to ICPOES or ICPMS will find this collection a valuable source of information.

Michael Dziewatkoski, *Leeman Labs, Inc.*

JA9957175

10.1021/ja9957175

Spectroscopic Methods in Bioinorganic Chemistry. ACS Symposium Series 692. Edited by E. I. Solomon and K. O. Hodgson (Stanford University). Oxford University Press: New York. 1998. 468 pp. $135.00. ISBN 0-8412-3560-0.

This volume was developed from a symposium sponsored by the ACS Division of Inorganic Chemistry in April 1997. The book is an account of the use of a range of spectroscopic methods in the study of the metal ion coordinations and reactions at the active sites of metalloenzymes and synthetic models and, in a few cases, in studies of the changes in the protein parts of enzymes. Each of the 25 chapters is a well-referenced, crisp account of recent developments in the use of spectroscopy to study electronic, structural, and dynamic chemical phenomena in bioinorganic systems. The chapters are clearly written, and each gives a brief but excellent introduction of the theory of the relevant spectroscopic technique(s) as well as background information on the subject matter. Well-organized and illustrated accounts of the use of spectroscopic information on specific or closely related metalloenzymes or model metal complexes are presented, along with elegantly rationalized interpretations. In most chapters, information from different spectroscopic techniques is put together to complement each other and is used to decipher such aspects as catalytic mechanisms and electronic states of metal clusters at metalloenzyme active sites and synthetic model complexes. In many chapters, methods of optimal experimental and instrument operational conditions are discussed.

The book chapters are grouped under the following five categories: (1) Recent Advances in Ground-State Methods; (2) Recent Advances in Excited-State Methods; (3) Electron Transfer; (4) Cluster Interactions; (5) Active Site Geometric and Electronic Structure; and (6) Intermediates.

The discussions in many chapters are based mostly on fundamental non- or semiquantitative chemical concepts that chemistry, biochemistry, and biology researchers of various stripes should be able to comprehend. The basic chemical and physical principles behind the spectroscopic methods, including EPR, MCD, NMR, Mossbauer, Raman, resonance Raman, and X-ray spectroscopic methods, are briefly described in the relevant chapters. The strength of the book lies in (a) the wide variety of spectroscopic techniques and the variety of enzymes and complexes discussed, (b) outlining the important practical considerations in the experimental designs and practice, and (c) pointing out the new developments in instrumentation that have revolutionized spectroscopic studies. A minor weakness is that the background, introduction to the specific spectroscopic technique, summary, and conclusion sections in a handful of chapters are not given fair attention.

This book is highly recommended as essential reading for researchers in the area of inorganic and bioinorganic chemistry as well as biochemistry and biology. It is excellent reading material for those interested in spectroscopic methods in general and is a good source book for special topic courses for graduate students headed into research in inorganic and bioinorganic chemistry.

Yilma Gultneh, *Howard University*

JA985777V

10.1021/ja985777v

Chemical Applications of Molecular Modeling. By Jonathan M. Goodman (University of Cambridge, UK). Royal Society of Chemistry: Cambridge, UK. 1998. xii + 224 pp. £25.00. ISBN 0-85404-579-1.

This book's objectives are to provide an introduction to molecular modeling and to examine the pros and cons of an array of computational tools for the undergraduate student as well as the experimental chemist. It includes applications of molecular modeling that range from its use in successful drug design and as a means to support experimental data to its function in elucidating the stereochemical features of a molecule. The references and suggestions for further reading are up-to-date and pertinent to the subject matter.

Following a chapter about the inception and methods of molecular mechanics calculations (including discussions on conformational searching, energetics, thermodynamics, kinetics, and quantum mechanics), Chapter 2 focuses on using force fields to provide further insights into conformational characteristics, i.e., bond angle, energy, torsion energy, etc., and to calculate the energy of a molecule.

Chapters 3−7 all begin with a focus on a particular aspect of molecular mechanics, which is preceded by a summary of key points and followed by pertinent questions/examples (that can be investigated via the implementation of molecular modeling) and discussion sections. Although some of the questions are not especially unique, they do serve to reinforce the concept. It is this reviewer's opinion that, although it is not mandatory for the reader to have a modeling program available in order to understand the concepts, applying the appropriate calculations will further deepen the chemical information gained via such computational tools. Thus, if an instructor wishes to use this book as part of a course, the students may be better served if the excellent discussion sections of the questions were separate from the text, i.e., a solution manual, thereby minimizing the temptation to read the discussion/answer prior to attempting to solve the problem.

Minimization techniques and methods are the focus of Chapter 3, which includes elaborate three-dimensional illustrations of minimized energy structures of organic molecules as derived from molecular modeling. These molecules range from flexible acyclic to rigid polycyclic organic molecules and encompass an entire range of size and stereochemical complexity, from hexane to a portion of the chiral biomolecule, DNA. Extensive use of color is incorporated to indicate degrees of electrostatic interactions in atomic orbitals as well as within different energy conformations of a molecule. Many of these three-dimensional representations serve as useful references to help visualize questions in later chapters.

Chapter 4 clearly defines and explains a variety of algorithms and mathematical strategies used to search a particular conformation(s). Advantages and limitations of available computational tools are analyzed and interpreted, and discussions are included on the brute force method of systematic searching as well as Monte Carlo, molecular dynamics, genetic algorithms, distance geometry, and several other rule-based methods.

Force fields are revisited in the next chapter, but this chapter differs from Chapter 2 in the context of analyzing, interpreting, and comparing results derived from molecular dynamics simulations (i.e., solvent effects, temperature effects, structural constraints, etc.) with those obtained experimentally.

Chapter 6 focuses on methods using ab initio molecular orbital calculations with an overview of quantum mechanics and molecular orbital theory. Molecular modeling techniques using semiempirical methods are explored and compared with ab initio methods.

The availability of several molecular modeling resources and their accessibility to a few relevant databases are discussed in Chapter 7. It is important to mention that anyone who has access to the Internet can use a browser to locate and, in some cases, download a wealth of (virtually) free molecular modeling software.[1] In fact, one criticism of the book is that references to pertinent Web sites on molecular modeling,[2] databases (i.e., other than crystallographic protein databases, see below), etc. were scant; if they had been available, they could have strengthened the resourcefulness of the book. Available software packages on drug design were also not mentioned.

In addition to the authors' Web page, some pertinent publications, Web sites, and references to crystallographic and protein databases are included. Techniques for string, substructure, and 3-D searching are addressed as well. URL's for World Wide Web sites and discussions on searching and transmitting HTML and SGML files and IMG images are also included. This chapter also contains a graphic analysis of the current and projected information explosion in chemistry.

The final chapter poses realistic application problems and explores appropriate strategies using molecular modeling techniques to solve them. Examples of problems include molecular modeling of epimers, polyaromatics, organometallics, transition states and reactions containing pericyclic rearrangements, cycloadditions, and asymmetric induction mechanisms.

Although the intended audience of this book is anyone interested in organic chemistry and molecular modeling, this book can be used as a reference for practicing chemists as well as graduate and postdoctoral students, as a textbook in organic chemistry/molecular modeling, or as supplemental reading to complement a course. The information in this book serves as a how-to guide that addresses the following: (i) what questions molecular modeling can answer, (ii) how to implement molecular modeling techniques and add parameters to an existing force field, (iii) how to analyze and interpret the output of theoretical molecular modeling calculations, and (iv) how to assess and evaluate the reliability of the output. Another attribute of the book is its concise glossary, which contains a comprehensive list of defined acronyms as well as a dozen appendixes of pertinent information, from useful mathematical formulas, to structures of amino acids, to a list of force fields. In fact, one appendix contains information on parametrizing different force fields, which is discussed in Chapter 2 and visited again in Chapter 5.

In essence, this book serves as a how-to guide with straightforward language and mathematical descriptions, eliminating much of the technical and computational jargon characteristic of innumerable books on this subject.

Madeline Adamczeski, *San Jose City College*

JA985774I

10.1021/ja985774i

Szycher's Handbook of Polyurethanes. By Michael Szycher (CardioTech International, Inc.). CRC Press: Boca Raton, FL. 1999. xviii + 673 pp. $129.95. ISBN 0-8493-0602-7.

This useful handbook compiles data from a numbr of sources, in particular the patent literature, and is intended to serve as an exhaustive source of information about polyurethanes. It contains reviews of the chemistry of polyurethanes, descriptions of the types and forms available on the market, and lists of polyurethane suppliers and manufactureres. The scope of the discussions of polyurethanes includes block and heteroblock systems; rubber plasticity; structure−property relationships; microphase separation; catalysis of isocyanate reactions; synthesis of polyurethanes for thermoplastics, thermosets, and curable compositions by either heat or UV energy; biomedical applications of urethane elastomers; castables, sealants, and caulking compounds; flexible and semi-flexible foams; and the health and safety aspects of handling isocyanates.

JA004704K

10.1021/ja004704k

Recent Advances in Carbohydrate Bioengineering. Edited by H. J. Gilbert (University of Newcastle upon Tyne), G. J. Davies (University of York), B. Henrissat (Centre Nationale de la Recherche Scientifique), and B. Svensson (Carlsberg Laboratory). Royal Society of Chemistry: Cambridge, UK. 1999. xii + 312 pp. $150.00. ISBN 0-85404-774-3.

This book covers the latest developments in glycobiology as presented at the 3rd Carbohydrate Bioengineering Meeting in April 1999. Aside from the keynote address, there are seven major sections, comprised of a total of 31 papers, which address the following topics: Structure and Synthesis of Carbohydrates and Carbohydrate Analogues; Post-translational Glycosylation of Proteins; Biochemistry of Carbohydrate Modifying Enzymes; Structure of the Catalytic Domains of Carbohydrate Modifying Enzymes; Structure and Function of Non-

(1) Some useful sites with molecular modeling programs can be obtained by typing in the following URLs: http://www.molsci.ucla.edu; http://newtraditions.chem.wisc.edu/; http://chemlinks.beloit.edu/; http://wunmr-.wustl.edu/EduDev/index_org.html; http://www.molecules.org/VSEPR_list.html. This latter molecular modeling for chemical education Web site was developed at Lebanon Valley College. Two other excellent molecular modeling Web sites for viewing molecules using CHIME were developed at Cabrillo College and Washington State University: http://c4.cabrillo.cc.ca.us/projects/library/index.html and http://www/wsu.edu/~wherland/wwwlist99.html.

(2) See also Dr. Ronald Rusay's extensive Web site on molecular modeling (software) and links within http://ep.llnl.gov:80/msds/orgchem/Chem226/Mol-Modl-II.html. Dr. Rusay is a chemistry instructor at Diablo Valley College, Pleasant Hill, CA.

catalytic Modules; Industrial Exploitation of Carbohydrate Modifying Enzymes; and Engineering Carbohydrate Modifying Enzymes.

JA004705C

10.1021/ja004705c

Handbook of Thermal Analysis and Calorimetry. Volume 4. From Macromolecules to Man. Edited by R. B. Kemp (University of Wales). Elsevier: Amsterdam. 1999. xxviii + 1032 pp. $521.00. ISBN 0-444-82088-4.

This book, comprised of 17 chapters, provides a wide-ranging review of the application of thermal analysis and calorimetry to biological systems. The chapters range in coverage from combustion calorimetry and calorimetry of small animals to thermal analyses in foods, food processes, and pharmaceuticals. Because some chapters of the book were completed over three years ago, their references are not as current as might be desired. However, as noted by the editor, "...a Handbook is not intended as a flagship for disseminating the latest research results,...but rather 'how and what to do and when to do it'." This goal is accomplished in the present case.

JA0047065

10.1021/0047065

The Porphyrin Handbook. Volumes 1−10. Edited by Karl M. Kadish (Univeristy of Houston), Kevin M. Smith (University of California, Davis), and Roger Guilard (Universite de Bourgogne). Academic Press: San Diego, CA. 2000. $2975.00 (set). ISBN 0-12-393200-7 (set).

This valuable series gathers together world-renowned experts in porphyrin research to discuss the chemistry, physics, biology, and medicine of porphyrins and related macrocycles. Because porphyrin research expands many fields of science, the handbook is divided into the following volumes: Volume 1, Synthesis and Organic Chemistry; Volume 2, Heteroporphyrins, Expanded Porphyrins and Related Macrocycles; Volume 3, Inorganic, Organometallic and Coordination Chemistry; Volume 4, Biochemistry and Binding: Activation of Small Molecules; Volume 5, NMR and EPR; Volume 6, Applications: Past, Present and Future; Volume 7, Theoretical and Physical Characterization; Volume 8, Electron Transfer; Volume 9, Database of Redox Potentials and Binding Constants; and Volume 10, Database of Tetrapyrrole Crystal Structure Determination. Comprehensive coverage extends through 1998 (the manuscript deadline was October 1998), with some literature citations from 1999 added after the deadline. As the editors state in the preface, however, "we asked each of the authors to write a manuscript which would be definitive in this field for fifteen years to come, and we believe that most of them, if not all, rose to this challenge."

JA004708P

10.1021/ja004708p

Theilheimer's Synthetic Methods of Organic Chemistry. Volume 56. Edited by Alan F. Finch (Cambridge). Karger: Basel, Switzerland. 1999. xxiv + 324 pp. $430.50. ISBN 3-8055-6890-8.

The latest volume in this valuable series contains abstracts of new synthetic methods in organic chemistry and supplementary data mainly from papers published in the period October 1998 to March 1999, and a listing of reviews in synthetic organic chemistry for the period of March to September 1999. It also presents a "trends" section in which recent advances in synthetic organic chemistry up to and including September 1999 are discussed.

JA004709H

10.1021/ja004709h

Separation of Fullerenes by Liquid Chromatography. Edited by Kiyokatsu Jinno (Toyohashi University of Technology). The Royal Society of Chemistry: Cambridge, UK. 1999. xviii + 180 pp. ISBN 0-85404-520-1.

This volume is one of four in the series on chromatography published by the Royal Society of Chemistry. The series is intended for the individual practicing chromatographer. The stated intention is to provide guidance and advice on a wide range of chromatographic techniques with emphasis on practical aspects of the subject.

This volume contains seven chapters written by some of the leading investigators in the field. The titles and authors of the chapters are as follows: Technical Advances in the Liquid Chromatographic Separation of Fullerenes (K. Jinno and J. Wu); The Preparative Separation of Fullerenes (J. C. Fetzer); Separation of Fullerenes by LC with Octadecyl Silica (ODS) Stationary Phases (K. Jinno, H. Ohta, and Y. Sato); Development of a High-capacity Stationary Phase Containing Heavy Heteroatoms for the Separation of Fullerenes (N. Tanaka, K. Kimata, and K. Hosoya); Highly Selective Separations of Fullerenes on Porphyrin-silica Stationary Phases (D. E. Coutant, S. A. Clarke, A. H. Francis, and M. E. Meyerhoff); C_{60} as Stationary Phase in Liquid Chromatography (K. Jinno, K. Tanabe, Y. Saito, and H. Nagashima); Separation of Fullerenes with Non-aqueous Capillary Electrophoresis (T. S. M. Wan, G. N. W. Leung, T. S. C. Tso, K. Komatsu, and Y. Murata).

The first chapter, by Jinno (who is also the editor) and Wu, covers recent advances in the liquid chromatographic separation of fullerenes that are found in soots. The discussion is focused primarily on the stationary phases that are used for these separations. The chapter also includes a section on the separation of metallofullerenes that will be useful to workers in this area. The chapter is referenced through 1998. The contribution by Fetzer that follows is a well-written account describing advances in the field since 1990, when the fullerenes were first isolated. This chapter will provide a nice review for new investigators who might wish to gain knowledge in this field.

A detailed chapter by Jinno, Ohta, and Sato on the uses of the popular stationary phase octadecylsilica (ODS) follows the Fetzer chapter. The commercial availability and ease of optimization are proposed as major advantages of this stationary phase. The chapter provides a detailed account of work using the ODS system for the separation of the higher fullerenes. Unfortunately, a few of the figures are not reproduced very clearly, but this does not detract seriously from the large body of useful information found in this chapter.

The following chapter, by Tanaka, Kimata, and Hosoya, describes the development of a high-capacity stationary phase containing heavy heteroatoms for the separation of fullerenes.

In Chapter 5, Coutant, Clarke, Francis, and Meyerhoff discuss the selective separations of fullerenes on porphyrin−silica stationary phases. It is stated in the conclusions that the high selectivity of tetraphenylporphyrin−silica (TPP−silica) and the ability to use solvents in which the fullerenes are most soluble should facilitate the use of these materials for preparative-scale collection of fullerenes.

The penultimate chapter, by Jinno, Tanabe, Saito, and Nagashima, describes the use of C_{60} itself as a stationary phase in liquid chromatography. Results are described in which a C_{60} fullerene-bonded silica as a stationary phase is used and compared to ODS phases in analyses of PAHs. Various chemically bonded C_{60} silica phases are evaluated as stationary phases, and the retention behaviors of PAHs, fullerenes, and calixrenes are described.

The volume concludes with the chapter by Wan, Leung, Tso, Komatsu, and Murata devoted to the description of a new procedure for the analytical separation of fullerenes by non-aqueous capillary electrophoresis (CE). The authors point out that although a successful CE method is unlikely to be of use in the preparative-scale isolation of these materials, the inherent advantage of a non-chromatographic technique could make it an ideal alternative method for mixture analysis as small samples can be used and expensive columns and large amounts of solvents are not required. Electropherograms of several mixtures that demonstrate the applicability of the method are presented. A description of the apparatus, reagents, and procedures is presented.

The book appears to be free of errors. The Fullerene Gallery that appears near the beginning of the volume is a nice addition. The structures of the fullerenes C_{60} through C_{90} are presented here. The URL where these structures may be found is provided.

In summary, this book will be a valuable addition to the departmental library as well as to the collections of those individuals who work in this area.

W. E. Billups, *Rice University*

JA9957231

10.1021/ja9957231

Lipid Synthesis and Manufacture. Edited by Frank D. Gunstone (Professor Emeritus, University of St. Andrews, Dundee, Scotland). CRC Press: Boca Raton. 1999. xv + 472 pp. $135.00. ISBN 0-8493-9737-5.

This monograph, the first in a series by edited by R. J. Hamilton on the Chemistry and Technology of Oils and Fats, was designed to be useful to scientists working in both industrial and academic research laboratories. Certainly, the work will be useful to any synthetic chemist wishing to obtain pure samples of almost any lipid, and may be of considerable value to analytical chemists, too. Since many of the chapters contain references to the commercial manufacture of lipids from natural sources, the book may well be useful to chemists interested in substantial quantities of lipids as well. The only principal classes of lipids not covered in this volume seem to be glycosphingolipids and gangliosides, steroids, and prostaglandins, which should all be the subjects of separate monographs.

The first chapter, on polyene acids (45 pages, ~150 references), contains many classical and reliable synthetic routes to stereochemically pure polyolefins, as well as some esoteric routes that are likely to be applicable only in small scale, or requiring further refinement. Of particular use is a section on the availability of particular polyunsaturated fatty acids (PUFAs) from natural sources and fermentation processes. The following chapters on isotopically labeled fatty acids and conjugated unsaturated compounds seem to be exhaustive, well referenced, and useful. Even a list of suppliers has been compiled, although one leading lipid supplier (Matreya) was not listed.

The chapter on eicosanoids (prostaglandins and relatives) provides a brief overview of the field but seems narrowly focused in terms of synthetic examples provided. Useful work published by Stork and the Upjohn group was notably absent. Again, this subject is broad enough that it likely deserves its own monograph. The chapter on sphingolipids, by R. R. Schmidt, is quite complete, outlining all the principal routes to sphingosine and derivatives. Substantial chapters on fats, glycerophospholipids, antioxidants, vitamin E, "fat replacers", biosynthesis, derivatives for lipid analysis, and commercial preparation of surfactants round out the book to make this work a fairly comprehensive volume. Certainly it is well worth the modest cost, and worthy of all chemistry library bookshelves.

Robin Polt, *University of Arizona, Tucson*

JA995685L

10.1021/ja995685l

Subcellular Biochemistry, Volume 28. Cholesterol: Its Functions and Metabolism in Biology and Medicine. Edited by Robert Bittman (Queens College of the City of New York). Plenum Press: New York and London. 1997. xxviii + 548 pp. ISBN 0-306-45478-5.

In spite of the large number of research papers devoted to cholesterol (nearly 5000 in 1999), its importance as a building block for membranes and plasma lipoproteins and as a precursor to a myriad of molecules involved in cell signaling ensures that research on this distinguished molecule will continue for many years. This book summarizes the important areas of cholesterol research from biosynthesis to cell function and lipid metabolism. The contributors are experts who are currently involved in one or more areas of cholesterol research.

Part of the book is devoted to biochemical aspects of cholesterol chemistry, including its synthesis, conversion to bile salts and steroid hormones, and modification by enzymes that alter the 24-carbon alkyl side chain and increase the unsaturation of the sterol unit. Two chapters are devoted to the physical chemistry of cholesterol in membranes and lipoproteins. One of these emphasizes the role of cholesterol in the lateral organization of lipids and the important role that each part of the cholesterol molecule plays in the membrane structure. Another chapter provides an excellent discussion of the physical chemistry of cholesterol transfer among lipid surfaces. This chapter is nicely balanced with a discussion of the mechanism of cholesterol transfer within living cells and between lipid surfaces, including cell membranes and plasma lipoproteins. This chapter also ties in with another on the structural and metabolic roles of cholesterol in macrophages, which are cellular models of atherosclerosis, and with a chapter on the design of antiatherogenic compounds that inhibit cholesterol synthesis or oxidation or enhance cholesterol catabolism.

Other parts of the book contain chapters on the role of cholesterol in specific tissues and diseases that affect those tissues. One chapter reviews the association between defects in cholesterol biosynthesis and diseases of the nervous system, particularly Alzheimer's disease and the Smith−Lemli−Opitz syndrome. Related chapters are devoted to the biochemistry of cholesterol in myelin and the role of sphingomyelin in cholesterol metabolism. Three other chapters relate directly to the involvement of cholesterol in Nieman−Pick disease and in sitosterolemia, while yet another chapter reviews the methodologies that may be used to study the organization of cholesterol in cell membranes from normal and diseased tissues.

In summary, this book will fill a place on the bookshelves of chemists and cell biologists who want a quick reference on cholesterol in a few specific areas. The chapters are well organized into headings and subheadings within the table of contents, and the index is adequate. Some chapters are more current than others, and in some chapters there is a dearth of recent articles cited.

Henry J. Pownall, *Baylor College of Medicine*

JA9957128

10.1021/ja9957128

Houben-Weyl. Methods of Organic Chemistry. Additional and Supplementary Volumes to the 4th Edition. Volume E 10c/Part 1. Organo-Fluorine Compounds. Methods Index. Georg Thieme Verlag: Stuttgart. 2000. lxxxiv + 812 pp. $1940 (series subscription price DM 2970). ISBN: 3-13-117494-3.

JA004714L

10.1021/ja004714l

Houben-Weyl. Methods of Organic Chemistry. Additional and Supplementary Volumes to the 4th Edition. Volume E 10c/Part 2. Organo-Fluorine Compounds. Methods Index. Georg Thieme Verlag: Stuttgart. 2000. 800 pp. $1940 (series subscription price DM 2970). ISBN: 3-13-125424-6.

These volumes provide a comprehensive index of the Houben-Weyl E10 series on organo-fluorine compounds.

JA004715D

10.1021/ja004715d

Houben-Weyl. Methods of Organic Chemistry. Additional and Supplementary Volumes to the 4th Edition. Vol. E 23i. Substance Index. Cyclic Compounds V. Bicyclic Compounds I. Georg Thieme Verlag: Stuttgart. 2000. viii + 1160 pp. DM 3300 (series subscription price DM 2970). ISBN: 3-13-111684-6.

This volume of the general index lists chemical compounds containing three- through five-membered carbocyclic, heterocyclic, and organometallic bicyclic systems.

JA0047166

10.1021/ja0047166

An Introduction to Nonlinear Chemical Dynamics: Oscillations, Waves, Patterns, and Chaos. By Irving R. Epstein (Brandeis University) and John A. Pojman (University of S. Mississippi). Oxford University Press: New York. 1998. 408 pp. $75.00. ISBN 0-19-509670-3.

Nonlinear chemical dynamics is a new field of chemistry that began accidentally in the 1950s when B. P. Belousov observed time periodic oscillations in a homogeneous solution of bromate, citric acid, and ceric ions, and chemical waves in an unstirred sample. This reaction, now called the Belousov−Zhabotinsky (BZ) reaction, at first appeared to

violate the second law of thermodynamics. However, in 1968, Lefever and Prigogine showed that the observed oscillatory phenomena could be explained by nonlinearities resulting from the autocatalytic nature of the reaction, and that there was no violation of the laws of thermodynamics. Field and Noyes later established the exact chemical steps leading to oscillation in the BZ reaction itself. Thus, the foundations were laid for a field that has grown enormously, particularly because of its profound implications for the dynamics of biological and social systems.

This book is not the first book written on this subject, but it may be the most readable. The authors are both chemists with impressive research credentials in the field of nonlinear chemistry. The book does several things. It gives an overview of the current status of the field, with an extensive list or references. It provides recipes and flowcharts for making new nonlinear chemical reactions in the laboratory. It describes the experimental apparatus needed to study waves and oscillations in these reactions. It describes in simple terms the mathematics needed to understand the underlying nonlinear processes. It describes the numerical methods commonly used to simulate autocatalytic reactions. Throughout the book, the authors give useful tips and warnings about the pitfalls that one might encounter.

The book is divided into two parts. Part I is an overview and contains material on the history of chemical dynamics, the necessary chemistry, the apparatus used in experiments, and the methods for synthesizing and analyzing chemical oscillations. It also provides descriptions of waves and patterns, and computational tools. This part of the book requires some knowledge of chemistry and some familiarity with differential equations, but it can be read even without extensive knowledge of these. Everything is carefully explained in simple language.

Part II contains a series of special topics including chemical chaos, the effects of transport processes and external fields, the modeling of reactions using time delays, chemical waves in polymer systems, the coupling of different chemical oscillators, biological oscillators, and Turing patterns. Part II may be a little harder going than Part I, but the breadth of subjects covered and the extensive lists of references will give readers perhaps the easiest access they will find anywhere to these topics.

As a bonus for the reader, the authors have included recipes for preparing the Belousov−Zhabotinsky reaction, the Briggs−Rauscher reaction, and polymer reactions that exhibit chemical waves. These recipes can be used for demonstrations and undergraduate laboratory work. For students who wish to learn about this field, this book is an excellent starting place.

Linda E. Reichl, *The University of Texas at Austin*

JA995716C

10.1021/ja995716c

Organic Photoreceptors in Xerography. Vol. 49 Optical Engineering Series. By Paul M. Borsenberger and David S. Weiss. Marcel Dekker, Inc.: New York. 1998. xxiv + 768 pp. $195.00. ISBN 0-8247-0173-9.

This book attempts to update the technology and the fundamental understanding of the processes of charge generation, recombination, and transport in organic photoreceptors. It is intended for researchers and students of imaging science and technology. The terminology used requires prior contact with theories of charge generation, recombination, and transport. The authors of this book are or were (Dr. Borsenberger is, unfortunately, deceased) employed by the Eastman Kodak Co. and have contributed significantly to the development of the field described by the title of the book.

There are several ways in which an image of a flat surface may be reproduced, using the interaction of light and electricity. There is one that involves the creation of an object-imaged electrostatic charge pattern on surfaces of photoconducting insulators. This process is referred to as xerography.

This book is divided into 11 chapters. Appendices and tables are superb and encyclopedic, listing the chemical formulas, chemical name, acronyms, and location within the book of polymers, binders, overcoats, complexes, polyacenes, alkanes, and arylamines. There is also a glossary of symbols and acronyms. The book is a bibliographic treasure. The author and subject indexes are a welcome presence. Chapter 1 gives a brief overview of the history of electrophotography and xerography. At the end of each chapter, the references are listed. Where I have disagreed with a few of the assertions made regarding the theory, there are ample references to the literature that would set matters on course. In addition, chapters end with a useful summary.

Chapter 2 discusses various xerographic photoreceptors that have been used in the past, and in particular, there is an excellent summary of the properties of amorphous silicon. Chapter 3 treats charge acceptance and potential discharge methods. In passing, I must point out that in the brief description of recombination, the statement is made that carrier mean free paths at room temperature in crystalline organic materials exceed 100 Å, which is the Coulomb radius. This is not true in general. Mean free paths at room temperature are generally small, seldom exceeding that of nearest neighbors. Thermalization distances can be as much as 50 Å. Thermalization distances are comprised of many mean free paths. Throughout the book, reliance is placed on the use of figures. It is a pity, however, that there are annoying lapses in the quality of the printing, and that unnecessary economies were taken in the small size of the figures, as well as in the labeling within the figures and the legends attached to each figure.

Chapter 4 deals with experimental methods. These include photoreceptor preparation, latent image characterization, and photoreceptor evaluation. The subjects in part describe fabrication techniques and physical and chemical characterization. This is a valuable chapter for novices and as a review. Helpful recipes and warnings are provided. Mathematics are kept to a minimum and are usually not justified on physical grounds but are merely stated. In the discussion of the techniques of measuring photogeneration efficiency, the limitations and advantages of various techniques are given. Photogeneration theories are discussed in Chapter 5. These include surface-enhanced exciton dissociation, steady-state and time-dependent geminate recombination, and energetic and positional disorder. There is some confusion regarding the surface-enhanced exciton process. Excitons that require surfaces in order to dissociate can produce only one free carrier, not a free electron−hole pair. In addition, the role of the electrode is not mentioned at all. The photogeneration efficiency involving the exciton−surface interaction exciton is given in one equation for bipolar injection, although only unipolar injection is operative.

The 1938 Onsager theory of geminate recombination is given a detailed treatment. The authors in later discussions assume that this theory predicts a weak temperature dependence and a strong field dependence for electron−hole pair dissociation. However, the field strength always appears as a ratio with the temperature in all the relevant Onsager efficiency equations, so the alleged weak temperature dependence is a consequence of the experimental ease of making large fractional changes in the field strength, but small fractional changes in the temperature. Chapter 6 treats photogeneration in organic solids. This chapter provides a good discussion of the photogeneration efficiency in a variety of aggregate materials, perylene diimide pigments, phthalocyanine and squaraine pigments, and polyacenes. The important model polymer poly(*N*-vinylcarbazole) is discussed at length, as well as the triphenylamine- and tri-*p*-tolylamine-doped polymers. Chapter 7 discusses the various charge transport theories. The treatment here is generally adequate, but the serious reader would be better served by referring to the original papers mentioned in the excellent list of references, including the recent papers by Kenkre, Dunlap, and their group. Chapters 8 and 9 provide a wealth of data on hole, electron, and bipolar transport in a wide variety of doped polymers. The dopants include the arylalkanes, arylamines, phthalocyanines, and polysilanes. Chapter 10 provides an excellent treatment of the practical problems faced in preparing the organic photoreceptors for xerographic use, including problems of photoreceptor fatigue and material damage caused by corona discharge and radiation. The final chapter gives a summary of the entire book and ends with a valuable list of future requirements and directions that should lead to improved performance in xerography.

In summary, this book should be an essential component of any library that serves those interested in the practice of xerography.

Martin Pope, *New York University*

JA995764X

10.1021/ja995764x