

lation-controlled addition to the carbonyl group.<sup>13,14</sup> However, reaction of the chiral allene **7** with the chiral  $\alpha$ -alkoxy aldehyde **13** yielded three diastereomeric products in a 2.7:1:0.8 ratio. <sup>1</sup>H NMR analysis identified the major and minor isomers (**15a** and **15b**) as *trans*-substituted dihydrofurans; the configuration of the benzyloxy group could not be established with certainty. The mechanistic basis for this interesting reversal from syn to anti diastereoselectivity is under further investigation.

The examples presented in Table II illustrate the application of our [3 + 2] annulation strategy to the synthesis of nitrogen heterocycles. Two limitations of the method have been identified. Annulations employing acyclic *N*-acyl iminium ions (e.g., entry 6) produce the desired 2-pyrroline derivatives in relatively low yield.<sup>15</sup> Interestingly, reaction of **4** with the iminium ion derived from phthalimide (entry 4) leads to a mixture of **24** and the aromatized product **23**.

The heterocyclic systems generated in our new [3 + 2] annu-

(12) We have found that the TiCl<sub>4</sub>-promoted addition of 3-substituted allenyltrimethylsilanes to aldehydes produces (mainly) *syn*-homopropargylic alcohols; the stereochemistry of these products was established by conversion to known compounds: Danheiser, R. L.; Carini, D. J.; Kwasigroch, C. A., unpublished results.

(13) The stereochemical identity of **14** was established by its conversion to *d,l*-5,6-decanediol via the sequence (a) anhydrous HCl, MeOH, (b) HSCH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>SH, BF<sub>3</sub>·Et<sub>2</sub>O, CH<sub>2</sub>Cl<sub>2</sub>, and (c) Li, EtNH<sub>2</sub>.

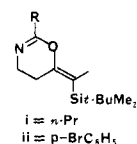
(14) For examples of the related addition of *allylsilanes* to chiral  $\alpha$ -alkoxy aldehydes, see: (a) Reetz, M. T.; Kessler, K.; Schmidtberger, S.; Wenderoth, B.; Steinbach, R. *Angew. Chem., Int. Ed. Engl.* **1983**, *22*, 989. (b) Heathcock, C. H.; Kiyooka, S.-I.; Blumenkopf, T. A. *J. Org. Chem.* **1984**, *49*, 4214. (c) Reetz, M. T.; Kessler, K.; Jung, A. *Tetrahedron Lett.* **1984**, *25*, 729. (d) For a general review of addition reactions of chiral  $\alpha$ - and  $\beta$ -alkoxy carbonyl compounds, see: Reetz, M. T. *Angew. Chem., Int. Ed. Engl.* **1984**, *23*, 556.

lation strategy are incorporated as key structural features in several important classes of natural products, including the pyrrolizidine alkaloids and the carbapenem and ionophore antibiotics. Further studies are planned in our laboratory to demonstrate the utility of this methodology in the synthesis of these biologically significant compounds.

**Acknowledgment.** We thank the National Science Foundation, Firmenich SA, and Eli Lilly and Co. for generous financial support. We are grateful to Dr. John C. Dewan for the X-ray structure determination of the dihydro-1,3-oxazine ii.

**Supplementary Material Available:** Full characterization (250-MHz <sup>1</sup>H NMR, <sup>13</sup>C NMR, IR, and high-resolution mass spectral data and/or elemental analyses) for all annulation products and details of the X-ray diffraction analysis of the dihydro-1,3-oxazine ii (21 pages). Ordering information is given on any current masthead page.

(15) A second product identified as the dihydro-1,3-oxazine i was also generated in this reaction (41%). The structure of this side product was



established by an X-ray diffraction analysis of the analogous annulation byproduct ii (see Supplementary Material).

## Book Reviews\*

**Principles of Adsorption and Absorption Processes.** By D. M. Ruthven (University of New Brunswick, Fredericton). John Wiley & Sons: New York. 1984. xxiv + 433 pp. \$49.50 ISBN 0-471-86606-7.

This book is aimed at the chemical engineering of physisorption processes (separations and removal of impurities) with particular emphasis on molecular sieve adsorbents. However, the book starts with a rather detailed, general treatment of the physical chemical background of adsorption processes, the structure and nature of silica gel, alumina, adsorbent carbons, and zeolites, the experimental and theoretical characteristics of physisorption, the thermodynamics of physisorption, isotherms, and diffusion in porous media. It then proceeds through the chemical engineering aspects of adsorption processes and closes with chapters on chromatographic separation processes and adsorption separation processes in cyclic batch systems and then in continuous countercurrent systems. The details of the design of units for adsorption processes are treated in detail. A number of specific commercial processes are described, but the removal of water from solvents and the purification of waste water are specifically excluded from consideration.

The book is well organized and should be very useful to those concerned with the area.

Robert L. Burwell, Jr., *Northwestern University*

**Determination of Organic Reaction Mechanisms.** By Barry K. Carpenter (Cornell University). John Wiley and Sons: New York. 1984. 1X + 247 pp. \$34.95. ISBN 0471-89369-2

This book is based on a one-semester course offered by the author at Cornell. The author states "it is intended for students who have already had substantial exposure to organic chemistry, probably including a graduate-level course". The reviewer agrees with this evaluation.

The techniques considered in this text include isotopic labeling, chirality and stereochemistry, kinetics, isotope effects, methods in acid-base chemistry, interpretation of activation parameters, and direct detection of reactive intermediates. The approach to these topics is to use literature examples, which is of course the best and most interesting way. Each example is fully referenced, which is good, because beginners may well

wish to read the original papers for further amplification of the nuances of the work. The author's style is terse. Nothing is left out, but certainly in some cases further readings will be of value. The choice of examples reflects the author's interests. Those readers who have lived through physical organic chemistry's finest hours will be subject to waves of nostalgia as they study the various examples. Finally there is a rather extensive discussion of kinetic analysis by linear algebra techniques.

This book will be of interest to all mechanistically inclined organic chemists.

Donald A. Denney, *Rutgers, The State University of New Jersey*

**The Science and Technology of Coal Utilization.** By B. R. Cooper (West Virginia University) and W. A. Ellingson (Argonne National Laboratory). Plenum Press: New York and London. 1984. 666 pp. \$85.00. ISBN 0-306-414368.

This book, as stated by the editors, is intended to review the current status of coal utilization and technology. The book is written for scientists wishing to acquaint themselves with the characterization and uses for this fossil fuel resource.

Chapter 1, with the same title as the book itself, is a review of following chapters along with the editors' opinions on energy policy and research funding. The second chapter, Coal Characterization, gives a broad review of this subject, with particular emphasis on coal petrography and the porosity/surface area characteristics of coal. The third chapter concerns itself with Coal Preparation and Cleaning, and a good treatment of present preparation practices as well as more advanced pilot-plant scale technologies and chemical cleaning approaches is given. Chapter 4 (ambiguously titled Role of Impurities) is a discussion of mineral matter effects operative during coal utilization and draws extensively on the chapter authors' research on pyrite decomposition and catalysis during coal liquefaction. Chapter 5 treats the subjects of Gasification and Indirect Liquefaction, while Chapter 6 reviews Direct Liquefaction. The former chapter is process and technology oriented while the latter provides a more fundamental chemical and mechanistic treatment. Chapters 7 through 9 cover Fluidized-Bed Combustion, Coal-Fired Open-Cycle MHD Plants, and Fuel Cell Power Plant Systems, respectively. Chapter 10 provides a comprehensive review of Catalysis and Catalytic Deacti-

\*Unsigned book reviews are by the Book Review Editor.

vation. The book is completed with chapters on Materials on Construction and Instrumentation and Monitoring.

Overall the book accomplishes its stated intent. The major fault is the lack of attention given to the major coal utilization technology—combustion for residential and industrial power generation. Considering the title of the book, it is a significant omission.

David W. Koppelaar, *University of Texas at Austin*

**Organic Reaction Mechanisms.** 1983. Edited by A. C. Kripe and W. E. Watts. John Wiley and Sons: New York. 1985. ix + 589 pp. \$130.00. ISBN 0-471-90503-8.

This very useful work continues on with the help of two new contributors, C. I. F. Watt and W. J. Spillane, replacing two of the team of 16 indefatigable scrutineers who work so hard digesting, assessing, and organizing the new research on mechanisms of organic reactions. The 15 chapters, selected according to type of compound, type of intermediate, or type of reaction, are those that have stood the test of time. If one is interested in reactions of aldehydes, nucleophilic aromatic substitution, or carbocations, for example, one will find the year's research succinctly laid out for inspection, with just the right amount of detail, and with satisfyingly complete bibliographies. This work continues to be a valuable means of keeping abreast of the literature.

**Theoretical Drug Design Methods.** By Rainer Franke (Academy of Science of the GDR). Elsevier: New York. 1984. x + 412 pp. \$75.00. ISBN 0-444-99634-6.

This book is a comprehensive textbook that discusses the plethora of quantitative methods available to the drug designer. Each chapter has a brief introduction to the topic followed by the necessary theoretical treatment. Several examples from the literature are presented at the end of each chapter.

The book is systematically organized and can be considered as consisting of two distinct parts. Chapters 1–7 are of an introductory nature. Chapter one contains a brief overview of the economic problems of screening thousands of compounds to find one marketable product. A case for using quantitative structure activity relationship (QSAR) methodologies to focus the search at the early synthetic stages is made. The necessity of obtaining a valid dose response curve is made in Chapter 2 because QSAR models are only as good as the biological information found in the dependent variable.

Thirty percent of this textbook (six chapters) is devoted to a discussion of the independent variables used in the extrathermodynamic model or Hansch analysis. There is a brief introduction to this most common QSAR model in Chapter 3. Chapter 4 contains an extensive discussion of the hydrophobic effects on biological activity. Electronic influences and steric effects are covered in Chapters 5 and 6, respectively. Chapter 7 discusses the colinearity problem so commonly encountered between independent variables. Chapter 8 brings this section of the book to a close with a presentation of several practical Hansch models.

What could be called Part II is devoted to a variety of alternate approaches used in the design of biologically active molecules. The increasingly used multivariate methods, principal component and linear discriminant analysis, are described in chapter nine particularly as they apply to classification problems. Chapter 10 can be considered a pause as three noncomputer methods are described: the Topliss decision tree, the sequential simplex procedure, and the Fibonacci search technique. These approaches, within certain limitations, can provide the synthetic chemist rapid feedback.

Chapter 11 contains nearly 15% of the book and provides a good overview of the use of structural parameters used in QSAR investigations. It starts with the classical Free-Wilson model and moves onto substructure approaches including various environmental, topological, and geometrical descriptors. Several methods of feature extraction and selection are presented. This chapter also briefly describes pattern recognition methodology including linear learning machine and *k*-nearest neighbor.

Receptor mapping and pharmacophores are reviewed in Chapter 12. The fact that few actual receptors have been isolated is emphasized along with the sequence of events when the drug and receptor interact with each other. Methods of obtaining drug molecule geometry are described.

The fact that drugs usually are investigated in a battery of biological tests is emphasized in Chapter 13. A well-designed study can lead to structure–selectivity relationships where the investigator wants to enhance potency while simultaneously decreasing toxicity. Test strategies for screening biologically active molecules are reviewed. The text concludes with Chapter 14 which is a discussion of the practicality of the QSAR approach to drug design. Does it permit prediction of mechanisms of action or new analogues with high potency? Over 70 examples from the literature of correct predictions from QSAR studies are presented.

"Theoretical Drug Design Methods" is well written and referenced. The author is candid in his comments on the many studies used as ex-

amples. He points out that any QSAR model must make chemical and biological sense. Predictions are only as good as the training set of molecules. The only drawback to this book is that the most recent references are 1981 even though the copywrite is 1984. This is probably due to the fact that it is an updated version of a German text written in 1980. Nevertheless, it is recommended for purchase by medicinal and agricultural chemists and other scientists investigating the interaction between molecule and receptor.

John H. Block, *Oregon State University*

**Recent Developments in the Chemistry of Natural Carbon Compounds.** Volume 10. Edited by R. Bogar and Cs. Szantay (Hungarian Academy of Sciences). Akademiai Kiado (Publishing House of the Hungarian Academy of Sciences): Budapest. 1984. 209 pp. \$18.00. ISBN 963-05-3255-7.

The present volume in the series covers topics in two important classes of biologically active natural products, the synthesis of benzo[*c*]phenanthridine alkaloids and the structures of the vancomycin group of glycopeptide antibiotics. The first half of the book is an excellent review of the numerous synthetic approaches to the benzo[*c*]phenanthridine alkaloids, written by I. Ninomiya and T. Naito of Kobe Women's College of Pharmacy. After a brief survey of the classification and chemistry of these alkaloids, the many synthetic strategies employed to construct these compounds, many of which have marked antileukemic activity, are presented in a thorough, well-organized manner. The synthetic approaches are subdivided into those which construct the ring skeleton with closer of the B ring as the final step and those which close the C ring as the final step. A brief description is also given of the intramolecular cycloaddition of *o*-quinodimethanes to acetylenes with simultaneous closure of the B and C rings. The final chapter of this section details the many total syntheses which have achieved the formation of the benzo[*c*]phenanthridine alkaloids. This half of the book is a very useful text and nicely complements, but does not repeat, the chapter concerning enamide cyclizations by the same authors in "The Alkaloids", Volume XXII (Academic Press).

The second half of the book concerns the chemistry of the vancomycin group of antibiotics. This section mainly covers the studies directed toward the elucidation of the structures of these molecules. Given the complexity of these glycopeptides, most of these studies are degradation approaches. The first chapter of this section covers the structure elucidation of vancomycin itself and is well presented. Included in this description is both the degradation studies and the syntheses of the degradation products which comprise the separate moieties of the glycopeptide structure. The remaining chapters describe the structure elucidation of the other currently known vancomycin alkaloids, actinoidin, avoparcin, ristomycin (ristocetin), and antibiotic complex A-35512. Given the structural similarity with vancomycin and the near identical degradation approaches, these chapters are somewhat redundant and could have been better organized. Unfortunately, no spectroscopic structural evidence is presented, and only a few such studies are even mentioned.

In general, this book serves as a good reference, but only for the two specific topics: the syntheses of the benzo[*c*]phenanthridine alkaloids and the structural studies concerning the vancomycin group of glycopeptides. One advantage of the section concerning the vancomycin glycopeptides is the excellent coverage of the Eastern European literature which is not as easily accessed in the West.

J. K. Snyder, *Boston University*

**Field, Thermionic, and Secondary Electron Emission Spectroscopy.** By A. Modinos (University of Salford). Plenum Press: New York. 1984. xi + 375 pp. \$55.00. ISBN 0-306-41321-3.

This book presents a thorough and well-balanced coverage of the theory of field, thermionic, and secondary emission spectroscopies. The emphasis is on providing a firm base for the use of these spectroscopies as a means of investigating the electronic properties of the emitting surface. The coverage is generally fundamental but also includes discussion of some recent advances in the field. References up to 1982 are covered.

The topics of Electron Emission from Free-electron Metals, and Work Function and Other Emission Measurements are covered in the first two chapters, using the free electron model. Chapters 3 and 4 cover the topics of Crystalline Solids as Stacks of Atomic Layers with Two-dimensional Stability, and Electron States in a Semi-infinite Metal. These aspects of the theory of solids and surfaces provide a base for later discussion of quantitative theory. The remaining six chapters of the book cover the theory, illustrated with some experimental data, of field, thermionic, and secondary emission spectroscopies. The chapter topics are Field Emission Spectroscopy of Metals, Field Emission from Adsorbate-covered Surfaces, Field Emission Spectroscopy of Singly Adsorbed Atoms, Field

Emission from Semiconductor Surfaces, Thermionic Emission Spectroscopy of Metals, and Secondary Electron Emission Spectroscopy. Throughout the book, it is generally assumed that the emitting surface is a single-crystal plane.

**Richard F. Browner**, *School of Chemistry, Georgia Institute of Technology*

**Macrolide Antibiotics: Chemistry, Biology, and Practice.** Edited by Satoshi Omura (Kitasato University and the Kitasato Institute). Academic Press, Inc.: Orlando, FL. 1984. xiv + 635 pp. \$89.50. ISBN 0-12-526450-X.

This volume is an attempt at summarizing 40 years of work in the field of macrocyclic lactone antibiotics. Given this somewhat ambitious task, it succeeds quite well as an overview of the field. It will be particularly useful to chemists who seek a concise and well-referenced source of biological data on macrolides.

The volume consists of two parts. The first covers "true" macrolides such as erythromycin, while the second describes a variety of other macrocyclic lactones with antibiotic activity, including the polyenes and avermectins. Part I consists of chapters on such diverse subjects as (1) Discovery, Production, and Isolation, (2) Structure and Stereochemistry, (3) Structure/Activity Relationships, (4) Total Synthesis, (5) Biosynthesis, (6) Mode of Action, and (7 and 8) Uses in Clinical and Veterinary Practice.

Part II devotes four of its six chapters to the polyene antibiotics' production, biosynthesis, mode of action, and use in clinical practice. A fifth chapter serves as the catch-all for other classes, including brefeldins, cytochalasins, verrucarins, boromycin, nonactin, and many others. This guided tour of known miscellaneous types of macrolides provides a small amount of biological data for each entry but, unfortunately, very little chemistry. The final chapter covers, in considerable detail, the avermectin family.

The considerable number of references cited in the book are as up to date as can be expected; most chapters appear to cover through 1982, with occasional citations of papers published in 1983. An index of microorganisms is provided, as is a rather brief general index.

**A. Richard Chamberlin**, *University of California, Irvine*

**Pharmaceutical Microbiology. 3rd Edition.** Edited by W. B. Hugo (University of Nottingham) and A. D. Russell (University of Wales). Blackwell Scientific Publications: Boston. 1983. x + 470 pp. \$29.00 (paper). ISBN 0632-01048-7.

This book consists of the contributions of 25 authors thoroughly covering microbiological aspects of pharmacy and the pharmaceutical industry. This updated and extended third edition includes two new chapters on contamination of pharmaceutical products and a very timely chapter on recombinant DNA technology as it applies to pharmaceutical products.

The book is divided into three parts. Part I consists of three chapters concerning the Biology of Microorganisms including bacteria, moulds and yeasts, and viruses. Each chapter consists of an excellent, concise summary of the fundamental biology of each group (anatomy, physiology, reproduction, growth, etc.) and their medicinal importance. These overviews are particularly appropriate as an introduction for the rest of the volume, since the backgrounds of potential readers may vary considerably.

Part II on Antimicrobial Agents consists of six chapters on antibiotics, four chapters covering non-antibiotic antimicrobials, and two chapters on immunology. Chapters 4-9 discuss various aspects of antibiotics, including classification according to structural groups, manufacture (using Penicillin G as a detailed example), the discovery and assessment of new antibiotics, antibiotic assays, mechanism of action, and resistance development. Chapters 10-13 focus on non-antibiotic antimicrobials using a similar approach (with an equally thorough coverage) to that used for antibiotics, i.e., classification according to the structural class, evaluation (particularly where methods differ from those used in antibiotic assessment), mode of action, and resistance development. Chapters 14 and 15 cover the fundamentals of immunology and the manufacture and evaluation of immunological products (vaccines and immunoglobulins).

Part III, Microbiological Aspects of Pharmaceutical Processing, consists of seven chapters (16-22) covering sources of contamination control, including the ecology of common contaminants, microbial spoilage, principles of sterility, and the use of sterilization techniques in hospital, community, and manufacturing settings. Chapter 23 consists of an overview of the more important chemical and pharmaceutical products (other than antibiotics) derived from microorganisms, including dextrins, organic and amino acids, and enzymes, as well as the use of microorganisms as catalysts in the pharmaceutical production of steroids. The final chapter provides an excellent overview of Recombinant DNA Technology, with specific examples focusing on the production peptides

and proteins of therapeutic importance.

A high degree of continuity of format exists between the individual chapters, providing a very "readable" textbook. The chapters are quite complimentary, with little redundancy except where it is reinforcing. In many cases, the thorough coverage consists of not only the expected "heart" of the topic but unexpected coverage of fundamentals, as well as extended topics. For example, Chapter 7 on the Assessment of New Antibiotics includes several pages on the fundamentals of HPLC and quantitative analysis (rather than simply assuming an appropriate background) before discussing applications in antibiotic analysis. Chapter 8 on Mechanism of Action includes not only established therapeutic entities but also a discussion on nontherapeutic antibiotics used as biochemical tools to decipher steps in protein synthesis as well. A few minor omissions were evident. For example, Figure 4.11 under Miscellaneous Antibiotic Agents includes the structures of chloramphenicol, fusidic acid, and two structural diagrams (both flat and perspective drawings) for lincomycin and clindamycin. Yet, only chloramphenicol is discussed in the text; the others are not even mentioned (the mechanism of action of fusidic acid is discussed in another chapter). The chapter on the Manufacture of Immunological Products represents a thorough and detailed coverage of current vaccine production but does not discuss the rationale and potential of using simple peptides or proteins (derived synthetically or by genetic engineering) as antigens for use as vaccines. Alternatively, this might have been discussed in the chapters on Fundamentals of Immunology or Recombinant DNA Technology.

Overall, "Pharmaceutical Microbiology" represents an excellent coverage of all major aspects of microbiology that impinge on pharmacy and the pharmaceutical industry. The editors indicate in the Preface that the major audience for this book is intended to be undergraduate pharmacy students, hospital pharmacists, and microbiologists entering the pharmaceutical industry. While it is an excellent text for those readers, it may be of interest to a much broader audience, because of the complete coverage of the chapter topics, including both fundamentals (accommodating diverse backgrounds) and, in many cases, a coverage of advanced topics, satisfying specialized interests.

**Patrick J. Davis**, *College of Pharmacy, University of Texas*

**Polymer Colloids.** Edited by R. Buscall, T. Corner, and J. F. Stageman. Elsevier Applied Science Publishers, Ltd.: London and New York. 1985. xii + 324 pp. \$57.00. ISBN 0-85334-312-8.

This book is intended to be an accessible but nontrivial introduction to the field and a source of information for an expert in the area who wishes to become more familiar with some other aspect of the subject. The volume is largely devoted to fundamentals, but three of the chapters do contain material of a more applied nature. The topics covered in the book are the following: types of polymerization, mechanisms and kinetics of emulsion polymerization, adsorption from solution, stability of polymer latices, rheology of polymer colloids, natural and synthetic rubber latices, and colloidal aspects of poly(vinyl chloride) production processes. Those portions of the book which deal with fundamentals are quite well done and provide the needed information in good form. Chapter 1 of the book, by the late M. W. Thompson, is very useful as a source of information concerning types of polymerization relative to polymer colloids and provides an excellent introduction to polymer colloids. The book does fulfill the purported functions. However, inclusion of more applied material would have enhanced the book. Particularly lacking is material on inverse emulsions.

The volume is well written, well edited, and easily read. The bibliography should be most useful. The figures, tables, and equations are well done. The index is satisfactory. All in all, the book fulfills its mission and is worth owning, particularly for a neophyte in the area.

**L. G. Donaruma**, *University of Alabama in Huntsville*

**Synthetic Organic Photochemistry.** Edited by William M. Horspool. Plenum Press: New York. 1984. xvii + 534 pp. \$75.00. ISBN 0-306-41449-X.

Both the foreword and the preface of this book express the hope that the review of various photochemical reactions presented here will encourage the use of photochemical reactions in organic syntheses, particularly in industrial settings, possibly even utilizing solar energy for this purpose. Whether the publication of this book will have such an outcome is yet to be seen. Whether or not this is the case, however, consultation of "Synthetic Organic Photochemistry" will provide synthetic organic chemists and organic photochemists with much information and many intriguing problems to ponder.

The book is divided into nine chapters: Photoaddition and Photocyclization Processes of Aromatic Compounds by Andrew Gilbert; Enone Photochemical Cycloaddition in Organic Synthesis by Alan C. Weedon; Synthetic Aspects of Photochemical Electron Transfer Reactions by Patrick S. Mariano and Jerome L. Stavinoha; Phthalimide and Its De-

rivatives by John D. Coyle; Photochemical Addition Reactions in the Benzo(*b*)Thiophene, Benzo(*b*)Furan and Indole Series by Douglas C. Neckers and Alois H. A. Tinnemans; Azirine Photolysis and Cyclo-addition Reactions by Albert Padwa; Photoremovable Protecting Groups by Roger W. Binkley and Thomas W. Fletchner; Photochemical Synthesis of Oxetans by Howard A. J. Carless; and Equipment and Techniques by William M. Horspool.

In general in each of these chapters, emphasis is on reactions that have synthetic utility though the mechanisms of the major transformations and the nature of the excited states involved are also discussed when important to understanding the limitations of the reactions. Several chapters contain tables summarizing applications of the reactions, giving structures of starting materials and products and mentioning yields. Most of the chapters have well-designed reaction schemes that make it easier to follow the discussion. The last chapter gives the practical information that a chemist would need to get started in photochemistry.

While some of the material found in this book has been extensively reviewed elsewhere, the coherent presentation of these topics in one place will be useful to those wishing an overview of the subject matter. The book has an adequate index and a detailed table of contents, which make it easy to locate information. The literature references include some in 1982, providing fairly recent coverage of the subject matter.

In general the book is well-prepared but does have some typographical errors, some of them minor and merely annoying but others, unfortunately, more serious, such as cases where a yield is given as 65% when it is in fact 6.5%, or the number of or the page for a reference is wrong so that the information alluded to cannot be located where it is supposed to be. On the whole, though, the book is a useful review of a wide range of photochemical reactions and a good introduction to the field of organic photochemistry for organic chemists who are not familiar with it.

Seyhan N. Ege, *University of Michigan*

**A Course In Statistical Mechanics.** By Harold L. Friedman (State University of New York at Stony Brook). Prentice Hall, Inc.: Englewood Cliffs, N.J. 1985. x + 341 pp. \$54.95. ISBN 0-13-184565-901.

This brief and lucid graduate-level textbook by Harold Friedman differs from most statistical mechanics textbooks written for chemists in that it emphasizes contemporary work on the theory of condensed matter. The standard topics (ensemble theory, ideal classical and quantum gases, and ideal crystals), are covered in the first two chapters (ca. 60 pages). The remaining twelve chapters (ca. 260 pages) are devoted mainly to exposing the modern theory of liquids and solutions. The major topics in equilibrium statistical mechanics are covered, including computer simulation techniques, cluster expansions and graph theory, functional differentiation, integral equations, and perturbation theory. Chapters on molecular liquids and solutions are also included. Time-dependent phenomena are given extensive and excellent coverage. The final four chapters are devoted to linear response theory, time correlation functions, Langevin equations, and computer simulation techniques for dynamic processes.

By design this is a textbook. Many important results are given only in the problems which go well beyond the material in the text. At appropriate points the reader is instructed to do the relevant problems at the end of the chapter. This is an excellent pedagogical technique, but it makes the book less useful as a reference. There is a short bibliographical essay at the end of each chapter directing the reader to references in which the material in the chapter is covered in more detail.

The most exciting aspect of Friedman's book is that it approaches statistical mechanics as a living, developing subject. It is written with great enthusiasm and insight and tries to bring the student to the point where he can understand and perhaps contribute to the most recent developments in the field of liquid state and solution statistical mechanics. It is, however, a book written for people who like mathematics. A student without a background in graduate level chemistry or physics courses with a strong mathematical content will find the book difficult. For the adequately prepared student Friedman's book can provide an entry into the fascinating world of contemporary statistical mechanics.

Jeffrey Kovac, *University of Tennessee, Knoxville*

**Toxic Contaminants in the Great Lakes.** Edited by Jerome O. Nriagu (National Water Research Institute) and Milagros S. Simmons (The University of Michigan). John Wiley and Sons: New York. 1984. xiii + 527 pp. \$95.00. ISBN 0471-89087-1.

This book provides an excellent review for researchers and administrators concerned with the health of the Great Lakes. It covers the literature through 1981 in a collection of 19 articles by recognized scholars in the field. The volume provides extensive data regarding the entry into, the exodus from, the persistence in, and the effects of a wide variety of toxic materials in the Great Lakes, with emphasis on chlorinated hydrocarbons, polynuclear aromatic hydrocarbons, toxaphene,

mirex, and toxic metals. For completeness, the Great Lakes Water Quality Agreement of 1978 is also included as an appendix. The subject matter is approached from a geographical as well as a media-oriented point of view, which will be useful to the regulator, although there is sometimes a disjointed perspective in articles describing either Canadian or U.S. work alone. The latter will be disconcerting to readers looking for a synthesized picture.

A number of articles focus on the thermodynamic balance of specific pollutants, with comprehensive coverage of the partition functions for trace materials in the solid and liquid phases. These articles provide a good fundamental discussion of fugacity concepts as well as providing useful data for future work.

Several articles attempt mass balances for specific pollutants. It is clear that the present data are not adequate for a rigorous statistical treatment; however, it is clear that atmospheric deposition is a major contributor for trace species in the Great Lakes.

In the one unique article, Owen and Meyers draw attention to the surface microlayer and demonstrate many-fold enrichments over concentrations in the subsurface water for both organic and inorganic compounds; this effect could have a potentially important influence on exchange rates between the atmosphere and the Great Lakes.

Finally, most of the authors provide an analysis of future research needs in their areas of specialization. This combination of fundamentals, data, and analysis makes the work of the editors, Nriagu and Simmons, a worthwhile addition to Great Lakes literature.

Ralph H. Kumler, *Wayne State University*

**The Plasma Proteins. Structure, Function, and Genetic Control. Volume IV. Second Edition.** By Frank W. Putnam (Indiana University). Academic Press: Orlando, FL. 1984. xiv + 420 pp. \$65. ISBN 0-12-568404-5.

The new edition of "The Plasma Proteins, Structure, Function, and Genetic Control" will be well-received by both the specialist in these research areas and others interested in significant advances in protein chemistry. Because of the central role of plasma proteins in the function of mammals and because of the intensive study of these proteins in basic research projects, the reports in the monograph clearly present fundamental knowledge that will be of interest to all readers. The general reader will find that the first two chapters contain a thoughtful essay on the progress, present status, and limitations in our knowledge of the structure and function of the plasma proteins. Throughout the monograph a wealth of information is presented on the size, subunit structure, charge characteristics, carbohydrate content, the concentration in serum, and the complete amino acid sequences of the major and minor plasma proteins where these properties are known. A review of the cataloging of plasma proteins is given after a remarkable separation is accomplished by two-dimensional electrophoresis. An accounting of the synthesis, structure, and function of the plasma glycoproteins includes mention of the mechanism of glycosylation, the secretion of these proteins, and the interactions of the carbohydrate with cell receptors. The evolutionary relatedness of the plasma proteins is based on a computer analysis of amino acid sequences. These findings are reported and thoughtfully discussed in the concluding chapter of this remarkably informative book.

Albert Light, *Purdue University*

**Ion-Selective Electrodes. Second Edition.** By J. Koryta and K. Stulik (Charles University, Prague). Cambridge University Press: New York. 1984. 217 pp. \$49.50. ISBN 0-521-23873-0.

This book is an extensive reworking, from historical background to applications that appeared in mid-1981, of Professor Koryta's 1975 little book on ion-selective electrodes (ISEs). The text contains carefully presented theory for membrane potentials in greater detail than the first edition. The treatment has a practical bent in that theory is developed for dissolved ion-exchanger, neutral ion-carrier, and solid-state membranes to a depth such that the reader can understand the principles of the measurements while being made aware of the inherent assumptions in the theory.

Much new material on ISE technology is to be found in this edition including the following: ion-selective field-effect transistors, composite assemblies such as the Clark electrode, an expanded treatment of ISE response time, many new examples of ISEs based on ion-exchanger ions and ionophores, new material on biosensors (e.g., bacterial, tissue, and immunosensor electrodes), and a chapter on voltammetry at the interface of two immiscible electrolyte solutions. In addition there is an essentially new chapter containing detailed material on experimental techniques. This is a useable book with extensive references for each chapter and an adequate index. In spite of the expanded coverage in this edition, the authors have somehow managed the rewriting without increasing the length appreciably!

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