

Book Reviews*

General Principles of Biochemistry of the Elements. By Ei-ichiro Ochiai (Juniata College). Plenum: New York. 1987. ix + 461 pp. \$79.50. ISBN 0-306-42647-1.

This 461-page book is packed with information of interest to the bioinorganic chemist. It gives the immediate impression that it would serve admirably as a text for a senior undergraduate or a graduate course in the subject. The book is organized into five parts comprised of an overview, biochemistry of the elements, transport, metabolism, and toxicity.

Considering the section most familiar to this reviewer reveals a number of minor errors. Thus on page 258 the siderophore aerobactin is said to be two rather than three carboxyl groups. On page 304 *Escherichia coli* is alleged not to make hydroxamate siderophores whereas, in fact, many strains of the bacterium synthesize aerobactin from both chromosomal and plasmid coded genetic determinants.

The subject of metal ion mediated regulation of gene expression, now one of the most active subsections of bioinorganic chemistry, has been more-or-less completely ignored. On the other hand there is a quite complete chapter on both oxygen stress and defense mechanisms against oxygen toxicity.

On balance this book is probably the best of its genre currently available. The scope and level of the subject matter treated is such that the volume will be useful in both the classroom and the research laboratory.

J. B. Neilands, *University of California, Berkeley*

Binding Constants: The Measurement of Molecular Complex Stability. By Kenneth A. Connors (University of Wisconsin—Madison). John Wiley & Sons: New York. 1987. xiv + 411 pp. \$69.95. ISBN 0-471-83083-6.

Molecular associations, chemical or physical, and solvent effects on them are of key importance in a wide range of fields. Drug-receptor interactions in pharmacology, polynucleotide or protein tertiary and higher structures in molecular biology, complexes in physical organic chemistry, binding to column materials in HPLC, adsorption of trace carcinogens from water to charcoal in environmental chemistry, ..., are examples where the theory of "solvophobic forces" has been widely applied and used with practical success by diverse experimentalists. Dr. Connors has made some of the key experiments not only of interest in pharmacology but also of broader implication. Experiments in these fields require expertise and great care in extracting statistically and theoretically meaningful data. The book provides a valuable source of such expertise. It should be of great utility to experimentalists using diverse techniques ranging from NMR, to dialysis, to chromatography. Theorists should find the book useful too in gaining an understanding of the reliability of interpretations of experiments. The book itself does not treat the theory of molecular associations and solvent effects to any significant extent by choice. It would indeed be worthwhile to have a companion book on solvophobic theory and molecular associations with a broad application perspective as in the book chapter of this reviewer. [*Molecular interactions within liquids: the solvophobic force and molecular surface areas] by O. S. in *Molecular Interactions* (Orville-Thomas, E. J., Ratajczak, H., Eds.; Wiley: New York, 1982; Vol. III, pp 283-242). Cf. also *Biophysical Chemistry* [1985, 21, 157-162], dealing with the remarkable works of C. Horvath (HPLC), G. Belfort (environmental chemistry), D. Crothers (nucleotides), J. Sturtevant (proteins), S. Timasheff (biochemistry), V. I. Danilov (nucleotides), and many other distinguished authors.

Oktay Sinanoğlu, *Yale University*

Atomic Absorption and Emission Spectroscopy. By Ed Metcalfe (Thames Polytechnic). John Wiley and Sons: New York. 1987. xxi + 289 pp. \$23.95. ISBN 0471-91385-5.

This book is part of the *Analytical Chemistry by Open Learning Series*. It is presented in a format that will be of direct benefit to those interested in learning the basics of the topic. The presentation is easy to read, covers all of the most essential fundamentals of the subjects, includes study and learning reinforcement questions, and contains adequate practical information. Those requiring an introduction to atomic absorption and emission spectroscopy will find this text unusually useful; those familiar with the field may also find it a helpful means of review.

It can be particularly recommended as a self-study text for students in the physical sciences.

R. K. Skogerboe, *Colorado State University*

Crystals. Volume 11. Edited by H. C. Freyhardt. Springer-Verlag: New York. 1988. 196 pp. \$101.80. ISBN 0-387-18602-6.

This volume contains three unrelated reviews: Shock-induced Growth of Superhard Materials (R. B. Heinmann and J. Kleiman); Surface-Tensions-Driven Flow in Crystal Growth Melts (D. Schwabe); and Electrooptical Effects, Crystals and Devices (H.-J. Weber). The first is about the production of diamond and cubic boron nitride, a subject that has assumed great importance because the demand has exceeded the natural supply of industrial diamonds. Judicious use of shock waves "generated by sudden release of mechanical, chemical, electrical, or radiation energy in a confined space" followed by controlled shock-quenching seems to be a practical solution. The second review explains the importance of surface tension in the growth of crystals, and its role in growing crystals under gravity-free conditions. The third review describes the propagation of light through an electrooptical crystal on a phenomenological basis, and is intended as "an introduction to electrooptical effects".

There is no index.

The Chemistry of Organic Selenium and Tellurium Compounds. Volume 2. Edited by S. Patai. John Wiley & Sons: New York. 1987. xiv + 864 pp. \$298.00. ISBN 0-471-90425-2.

With this volume, the Editor has completed the planned coverage of the subject, begun with Part 1 in 1986, except for a hoped-for chapter on UV-vis, IR, and Raman spectroscopy. Volume 2 contains 15 chapters by an international group of contributors.

Two of the chapters are concerned with spectroscopy (photoelectron and Mössbauer). Seven are devoted to particular types of selenium and tellurium compounds (e.g., compounds with Se-N or Te-N bonds; Se and Te derivatives of carbohydrates). Uses of Se and Te compounds in synthesis are discussed in two chapters, and four chapters take up different reactivity aspects, such as acidity, photochemistry, and insertion reactions. Biochemical and pharmacological aspects compose three chapters, and one is devoted to synthesis of organic conductors. The references cited are through 1985 or into 1986.

A true author index (very large) and a good subject index complete this volume. It is a small matter, but a list of the chapter titles in Volume 1 would have been useful. A pleasing feature of this series is its consistently high quality of production; the many structural formulas, for example, are uniformly and professionally drawn throughout. Altogether this is a valuable addition to the literature resources for organic chemists.

Introduction to Physical Polymer Science. By L. H. Sperling (Lehigh University). John Wiley & Sons: New York. 1986. xxi + 439 pp. \$39.50. ISBN 0-471-89092-8.

This is a well-written textbook on the physical chemistry of polymers. The book is divided into nine chapters, with the first providing introductory material on the nature of polymers and their structure, including a short section on polymer organic chemistry. Stereochemistry, copolymers, and polymer blends form the subject of Chapter 2. Chapter 3 discusses the measurement of average molecular weight and molecular weight distribution. Mixing, phase separation, and diffusion are treated in Chapter 4. Chapter 5, The Bulk State, is devoted to crystallinity and the kinetics of crystallization, as well as the properties of amorphous polymers. The glass transition and other second-order transitions are the focus of Chapter 6. The remaining three chapters discuss rubber elasticity, (linear) viscoelasticity, and mechanical properties.

Each chapter is developed in a logical manner and ends with a brief, qualitative summary of the important points. All the pertinent equations are clearly derived. In cases where there is disagreement in the literature, for example, on the question of order versus disorder in amorphous polymers, or the various theories for the glass transition temperature, all sides of the issue are evenly presented, and usually summarized with a table. While maintaining the readability of an introductory text, the author gives numerous references to the literature and supplements each chapter with a list of reference books.

Each chapter contains a good selection of homework problems. These range in difficulty from the very elementary, illustrating the important qualitative ideas in the chapter, to more complicated numerical questions, to "open-ended" types of problems. Many of the chapters also contain

*Unsigned book reviews are by the Book Review Editor.

appendices on related information (such as the history of the random coil) as well as some experiments illustrating some aspect of the chapter subject. These experiments are both of the in-class as well as at-home varieties. The latter include, for example, the measurement of the modulus of gelatin (both flavored and unflavored).

This book should be seriously considered for adoption as a text for a one-semester, introductory course on the physical chemistry of polymers. It is suitable for third or fourth year college students or graduate students who have little or no background in the area of polymers.

Peter C. Sukaneck, *Clarkson University*

Topics in Current Chemistry. Volumes 145 and 146. Springer-Verlag: New York. 1988. Volume 145: 239 pp. \$79.50. ISBN 0-387-18385-X. Volume 146: 209 pp. \$89.70. ISBN 0-387-18541-0.

Volume 145 is a collection of eight review papers reflecting the present state of research in synchrotron radiation. Five of the papers are concerned with chemistry and associated physics, especially EXAFS, and three are on applications to biology (membranes; chromatin fiber). The detailed information that can now be obtained about the nucleus of cells is impressive. The preface is dated August 1987, and references seem to be well into 1986. An author index for Volumes 101–145 is included.

Volume 146 is subtitled "Physical Organic Chemistry" and consists of five apparently unrelated contributions: Rearrangements of "Carbanions" (G. Bocke); Complex Eliminations (Eliminations with Rearrangement) (G. Kaupp); Polycyclic Anions—From Doubly to Highly Charged π -Conjugated Systems (M. Rabinovitz); and Methods of Analysis of the Relative Hydrophilicity of Biological Solutes (Y. Zaslavsky and E. A. Masimov). The last of these is written from the standpoint of structure–activity relationships among biologically active compounds. There is no preface, but the extensive lists of references have citations into 1986.

Elements of Inorganic Photochemistry. By G. J. Ferraudi (Notre Dame). John Wiley and Sons: New York and Chichester. 1988. xii + 248 pp. \$37.50. ISBN 0-471-81325-7.

The photochemistry of metal complexes is an area that is attracting increasing attention. This book covers the basic principles of the subject, emphasizing the formal physicochemical aspects. For example, 120 pages are devoted to the photochemical laws, detection of intermediates, inorganic spectroscopy, and photoluminescence. The average page in this part of the book contains many more mathematical than chemical equations. A useful table deals with quantum yields for various actinometers. Potential energy surfaces and mechanisms of energy transfer are also well covered. This theoretical matter is treated carefully, although this reviewer would have preferred to see more examples to illustrate the theoretical points. Nevertheless the coverage in this part is well-balanced.

The second part of the book (60 pages) covers photoredox reactions, ligand field effects, and organometallic photochemistry and is presumably intended to cover chemical reactivity. In a decade that has seen important advances in photochemical water splitting, photosynthesis, photocatalysis, and photochemical generation of highly reactive species (notably for alkane activation), all of which involve the photochemistry of metal complexes, it is surprising to see no mention of these subjects in this book. Indeed, fully three-quarters of the references are more than a decade old.

Finally, there are 50 pages of appendices on such subjects as character tables for symmetry groups and chemical bonding in coordination complexes (a description of the coordinate bond in formal wave mechanical terms).

Readers will therefore appreciate this book for its careful coverage of the physicochemical basis of this subject, rather than for any special sensitivity to its chemical implications.

R. H. Crabtree, *Yale University*

Plant Corrosion: Prediction of Materials Performance. Edited by J. E. Strutt and J. R. Nicholls (Cranfield Institute of Technology). John Wiley & Sons: New York. 1987. 332 pp. \$71.95. ISBN 0-470-20906-2.

This book is the compilation of papers from a conference, apparently held in Britain, sponsored by The Institution of Corrosion Science and Technology, The Materials Technology Institute, The Corrosion Control Engineering Joint Venture, and The Society of Chemical Industry. It contains 17 papers, each on a separate topic, all but one by authors from British industrial, governmental, or academic institutions.

The unique aspect of this conference (and the book) is an emphasis on novel modelling and data-analysis techniques involving computer-based tools such as data bases, expert systems, finite-element and boundary-element analysis, and statistical analysis techniques that complement the more traditional approaches to corrosion analysis. This

approach is intriguing, as well as refreshing, and is one of the first attempts to develop techniques applicable to the prediction of corrosion rates under the complex and highly variable conditions that pertain in typical industrial environments, as opposed to the highly controlled and idealized systems usually considered in laboratory or theoretical studies. Consequently, as the title implies, the emphasis is on practical industrial situations, with extensive reliance on empirical information and experience, data bases, empirical correlations, statistical analysis, risk assessment, and simplified models applied by means of computer techniques to highly specific problems as opposed to generalized situations.

Some of the specific problems addressed in the various chapters include Downhole Corrosion in Oil and Gas Production, Seawater-Carrying Plants, Erosion Corrosion, Fatigue Cracks in Structural Steel Cathodically Protected in Seawater, Corrosion Fatigue of Steels in Biologically Active Seawater, Hydrogen-Assisted Cracking of Steels, Marine Corrosion on Off-shore Pipelines, A CAD System for Cathodic Protection Systems, Distribution Function of Pit Depths During High-Temperature Oxidation of a 20 Cr Austenitic Steel, Contaminate Effects and Materials Performance in Residual Oil-Fired Industrial Gas Turbines, and High Temperature Erosion.

This book is highly recommended for those interested in the practical and applied aspects of corrosion, especially with respect to industrial environments. Although each separate topic is covered in a relatively short (10 to 30 page) chapter, the information is largely specific and useful, with a list of references to more extensive related literature on each topic.

Ron Darby, *Texas A&M University*

Survey of Industrial Chemistry. By P. J. Chenier (University of Wisconsin, Eau-Claire). John Wiley & Sons: New York. 1986. 422 pp. \$45.00. ISBN 0-471-01077-4.

The author has done a good job in meeting the objectives of this book, which are the following: (1) to produce a book that bridges the gap between basic R and D and at least two other disciplines, chemical engineering and chemical marketing; and (2) to instill in chemists an appreciation of the economic problems facing the chemical industry daily. The author has covered about 84% of the total industry. Students should study other areas of applied chemistry that contribute to the other 16%. The book is weak on synthesis of chemicals, particularly from a process viewpoint. Overall, it is a text worthy of an introductory course in industrial chemistry.

Kenneth E. Daugherty, *University of North Texas*

Annual Reports on NMR Spectroscopy. Volume 19. Edited by G. A. Weber (University of Surrey). Academic Press: Orlando. 1987. vii + 325 pp. \$99.00. ISBN 0-12-505319-3.

This is another volume in this series that deals with highly specialized topics in experimental nuclear magnetic resonance spectroscopy. This volume consists of four chapters: [1] Sulphur-33 NMR Spectroscopy by J. F. Hinton (University of Arkansas); [2] High-Resolution NMR of Liquids and Gases: Effects of Magnetic-Field-Induced Molecular Alignment by E. W. Bastiaan and C. Maclean (the Free University, Amsterdam) and P. C. M. van Zijl and A. A. Bothner-By (Carnegie-Mellon University); [3] Dynamic NMR Spectroscopy in Inorganic and Organometallic Chemistry by K. G. Orrell and V. Sik (The University, Exeter, UK); and [4] Nuclear Magnetic Resonance of Cyclophosphazenes by S. S. Krishnamurthy and M. Woods (Indian Institute of Science). This book well worth the purchase for any library and for individuals who are interested in the topics listed above.

The first chapter deals with limited but exciting applications of sulfur-33 NMR spectroscopy. As Dr. Hinton mentions, sulfur-33 was one of the first nuclei to be observed, but because of its limited sensitivity and quadrupole moment, it has not often been employed for NMR studies. With the advent of fast Fourier-transform NMR spectroscopy, it has become practical to observe ^{33}S , but as indicated in this short chapter (33 pages), there are still some severe drawbacks and obstacles that limit its application to the chemistry field and especially to the biochemistry field. This chapter provides ample chemical-shift and linewidth data for this nucleus and most, if not all, references (total of 74) are related to the NMR studies involving this nucleus.

The second chapter deals with high-resolution NMR of liquids and gases. Additional geometric molecular information is deduced from dipolar and quadrupolar spin couplings obtained from the spectra by the orientation of the molecules in liquid-crystal solutions. The authors give an excellent and detailed introduction to the theory involved and present numerous applications, with the results tabulated in seven tables. One hundred and twenty eight references are provided and most of these are since 1980.

The third chapter deals with the use of multinuclear NMR for gathering information about the dynamics of inorganic and organometallic

complexes. This is a rather detailed and extensive review comprising 94 pages. Although the authors claim that this is not an exhaustive literature review, it does contain 316 recent references. They have focused on recent papers that describe either (i) an important development of dynamic NMR theory, or (ii) an important advance in dynamic NMR bandshape, relaxation time, or magnetization transfer technique, or (iii) new and accurate rate-constant/energy-barrier data, or (iv) new and novel dynamic processes. The chapter is filled with 1D and 2D spectral analyses as well as experimental and theoretical bandshape analyses.

Chapter 4 deals with a multinuclear NMR analysis of cyclo-triphosphazenes and cyclotetraphosphazenes. Multinuclear [^1H , ^{31}P , ^{19}F , ^{13}C , and ^{15}N] chemical shift and coupling constants are provided for structural elucidation and empirical correlations of cyclophosphazenes. Extensive tabulation of the various data is given in 28 tables and extensive up-to-date references are also provided.

Kilian Dill, *Clemson University*

Polymers: An Encyclopedic Sourcebook of Engineering Properties. Edited by Jacqueline I. Kroschwitz (John Wiley & Sons). John Wiley & Sons: New York. 1987. xxvi + 665 pp. \$64.95. ISBN 0-471-85652-5.

This book is a collection of eighteen unabridged chapters from the first nine volumes of the 19-volume second edition of the *Encyclopedia of Polymer Science and Engineering*, edited by Herman F. Mark, Norbert M. Bikales, Charles G. Overberger, and Georg Menges. Thus it covers only a preface of Conversion Factors, Abbreviations, and Unit Symbols, and chapter titles A-M: Abrasion and Wear; Aging, Physical; Chemically Resistant Polymers; Composites; Composites, Fabrication; Composites, Testing; Crazing; Dynamic Mechanical Properties; Engineering Plastics; Fatigue; Fibers, Engineering; Fracture; Hardness; Heat-Resistant Polymers; High Modulus Polymers; Impact Resistance; Liquid Crystalline Polymers; Mechanical Properties. Every good chemistry and engineering library should have the full encyclopedia. Some individuals may wish to purchase this short collection.

Warren T. Ford, *Oklahoma State University*

Mizellen-Vesikel-Mikroemulsionen. Tensidassoziate und ihre Anwendung in Analytik und Biochemie. By Uwe Pfüller (Staatliches Institut für Immunpräparate und Nährmedien). Springer-Verlag: Heidelberg and New York. 1987. 284 pp. DM 138.00. ISBN 3-540-17071-5.

At a first glance it may seem that the author of this book has attempted a task next to impossible. Giving an acceptable review of surfactant association structures and their use in analytical technique and biochemistry within 275 pages may seem an endeavor doomed to failure. However, the book is anything but a failure. The author gives a clean, systematic, and very useful overview of the chemical structure of surfactants, their association structures, and solubilization within 87 pages. This part is an excellent primary introduction to the *chemistry* of surfactants.

The section on surfactants in analytical methods describes 14 areas, of which the use of solubilization to prepare samples for analysis, the different separation methods, and the different biochemical applications are emphasized.

The final 100 pages are concerned with amphiphiles in biology and medicine.

The author has covered a huge area (the reference list covers 60 pages!) remarkably well. The book is concise and the selection of illustrative references in general excellent. It is strongly recommended.

Stig E. Friberg, *Clarkson University*

Treatise on Clean Surface Technology. Volume 1. By K. L. Mittal (IBM Corporate Technical Institute). Plenum Press: New York and London. 1987. XVI + 331 pp. \$59.50. ISBN 0-306-424207.

This book contains reviews on specific topics in clean-surface technology, discussing preparation techniques for clean surfaces and problems caused by surface contaminations in technological applications. Clean surface technology is of importance in many technologies, where surface contaminations interfere with the manufacturing process and the performance and stability of the final product. In areas such as microelectronic device fabrication, where future breakthroughs in performance will depend on further miniaturization, environmental control and particulate-free environmental conditions in the manufacturing process are of paramount importance.

The chapters in the book are authored by experts in the respective technological areas, but with a few exceptions, they are written from an applied technological point of view, rather than outlining the basic physical and chemical mechanisms by which contaminations occur or can be removed. Accordingly, the book contains many recipes for surface cleaning and statistical data on contamination problems that are of interest to engineers working in the respective field, but make it less exciting to read for someone interested in the basic physics and chemistry

of clean-surface technology.

The first chapter, by John R. Vig, describes the methods and effects of UV/ozone cleaning of contaminated surfaces, which provides a way to remove surface contaminations by oxidation, but in turn also oxidizes the substrates. Examples are given where UV/ozone cleaning provided an effective means to improve adhesion properties of surfaces.

Chapter two, by John C. Scott, summarizes the techniques to clean liquid surfaces and the choice of the right materials for clean liquid surface experiments. Hydrosonic cleaning of surfaces is described in Chapter 3 by R. Walker and is compared to ultrasonic and megasonic techniques. The measurement of ionic contaminations of surfaces is discussed in Chapter 4 by J. Brown; Chapter 5, by Tuan Vo-Dinh, summarizes the characterization of surface contaminants by luminescence using UV excitation.

In Chapter 6 the effects of particulate surface contamination on device failure are discussed by J. R. Monkowski. Included is a summary on the sources of particulates and their specific influence on device performance. The next chapter, written by D. C. Jolly, deals with the implications of surface contaminations on high-voltage insulators, and Chapter 8, written by M. Antler, describes how surface contaminants impede electrical contacts. In Chapter 9, J. C. Jellison reviews how solid-state welding is affected by surface contaminants, and Chapter 10, by K. P. Homewood, summarizes how contaminants influence contact electrification, for example, in xerography.

How biomaterials, e.g., prosthetic devices, can be cleaned and how their function and long time behavior is affected by contaminants are discussed by B. D. Ratner in Chapter 11. Another aspect, how surface contaminants can influence human health is the redispersion of indoor contaminants, as reviewed by E. B. Sansone in Chapter 12.

The volume concludes with a chapter by P. Lilienfeld on the application of pellicles to keep optically critical surface clean, i.e., on one aspect of a preventive approach to avoid cleaning at a late stage.

M. Grunze, *Angewandte Physikalische Chemie, Universität Heidelberg*

Preparative Liquid Chromatography. Edited by Brian A. Bidlingmeyer (Waters Chromatography Division of Millipore). Elsevier Publishers: Amsterdam and New York. 1987. xiv + 341 pp. \$97.50. ISBN 0-444-42832-1.

The division of chromatography between analytical and preparative has nothing to do with scale. It is, rather, a division of purpose and goals. The "goodness" of an analytical separation is measured by the quality and/or quantity of information generated, while the preparative separation is similarly judged by the quality and/or quantity of material generated. Preparative separations of nanograms are just as valid as those of kilograms, a philosophy that is evident throughout various portions of this fine volume.

The Editor states in the Preface that the point of view of the book is that of the practical, rather than the theoretical. From this, I expected a cookbook approach to the "kg is 10^9 larger than the microgram" problem. Instead, I discovered a rich, practical array of chapters geared toward the practicing analyst (or more accurately, "preparatist", I suppose) which integrate theory smoothly into practice. Lacking are theoretical discussions of the problems of peak-shape models resulting from nonlinear isotherms, which remain among the most difficult obstacles to theoretical treatments of grossly overloaded separations. The theory in this area is still in a formative stage, however, so in retrospect, its inclusion is not critical.

The chapter topics are varied and include general preparative strategies, preparative thin-layer, very large scale prep (including multithousand kilogram simulated moving-bed separations of corn fructose), pharmaceutical applications, synthetic organic considerations, biochemical applications, chiral separations, and preparative size-exclusion chromatography. All of the contributors chosen are unquestionably highly expert in their fields, and overall do an excellent job of conveying both the details and general directions of preparative HPLC in their fields.

The chapters overall represent a wealth of practical (and even theoretical) information on the specifics of how to scale up an HPLC separation from analytical to preparative, as well as how to recover the collected fractions. Chapter 1 in particular serves as a valuable overview of the practice and principles of preparative separations. The ensuing chapters follow this high standard, each presented by experts in the field. There are no weak chapters in the book, and together, they present a broad range of practical knowledge for many sample types, including synthetic organics, biological samples, polymers, and general pharmaceuticals.

The volume should be of great utility, especially to chemists and to biochemists who need to purify and to isolate milligram to gram quantities of substances. Generous discussions of scale-up theory based on

linear isotherms abound throughout the chapters and are sufficiently accurate for most practical applications at the bench. Details are given as to hardware, scale-up strategies, separations of specific chemical species, and ancillary techniques so as to make this volume a well-used and necessary addition to a working chemist's library. The Dr. Bidlingmeyer has done an excellent job of integrating a diverse, complex field into a well-conceived and tightly executed volume. I strongly recommend the purchase of this book to anyone who has ever needed to put a scintillation vial onto the end of his or her HPLC.

Richard A. Hartwick, *Rutgers University*

Laboratory Methods in Vibrational Spectroscopy. 3rd Edition. Edited by H. A. Willis, J. H. Van der Maas, and R. G. J. Miller. John Wiley and Sons: New York. 1987. xviii + 600 pp. \$106.00. ISBN 0-471-90343-4.

This book was previously entitled *Laboratory Methods in Infrared Spectroscopy* but under the above title has been labeled Edition 3. The difference is that two chapters on Raman spectroscopy have been added. There are twenty chapters on infrared and one chapter giving a concise review of the theory of infrared spectroscopy.

This is a practical book and it is laid out so that each aspect of the subject is covered in one chapter. Nevertheless the subject is systematically introduced in a very readable way. The first seven chapters are an introduction to the infrared technique covering terminology, group frequencies, physical properties of infrared transmitting materials, spectra of commonly used solvents and contaminants, dispersive infrared, and fourier transform infrared spectrometers. Then follows an excellent review of spectroscopic methods in quantitative analysis.

The next eleven chapters cover the details of various methods of infrared sampling, including high and low temperature and pressure cells, reflection spectra, microsampling, matrix isolation, GC, HPLC, and TLC-IR, absorbed species, polymer films, and emission spectra. Ample references are given which in this edition have been updated to early 1986.

Although only two chapters are devoted to Raman spectroscopy, an excellent discussion of modern instrumentation is given, followed by a chapter on sampling methods including solid (powder and single crystal), GC fractions, spinning solid samples, resonance Raman, thin films, high and low temperature and pressure cells, and the Raman Microprobe. These chapters are supported by 156 recent references.

This is a useful reference book but is also recommended reading for anyone who simply wants to become acquainted with the subject. Every chemistry or biochemistry department should have at least one copy.

J. Lawrence Hencher, *University of Windsor, Canada*

The Alkaloids. Volumes 30 and 31. Edited by Arnold Brossi (National Institutes of Health). Academic Press: New York. 1987. Volume 30: ix + 387 pp. \$95.00. ISBN 0-12-469530-2. Volume 31: vii + 395 pp. \$95.00. ISBN 0-12-469531-0.

To compare Volumes 30 and 31 of *The Alkaloids* with the earliest volumes of this indispensable series is to see the flowering of the study of these fascinating compounds over the last 35 years. The chapters of these two volumes demonstrate very well the variety and elegance of current approaches to the study of alkaloids.

Volume 30, which has been dedicated by Dr. Brossi to the memory of the late Karel Wiesner, begins with a long and thorough review of recent advances in the chemistry of bisbenzylisoquinoline alkaloids. Keith T. Buck cites 649 literature references in his survey of isolation, structure determination, synthesis, biosynthesis, and pharmacological activities of these compounds. The next chapter is quite a contrast in size; in it, R. A. Jacquesy and J. Levesque review the alkaloids of the small, fascinating genus *Pauridiantha* (Rubiaceae). These plants, mostly from Madagascar and tropical Africa, produce biosynthetically primitive strictosidine-related bases and harman derivatives. The plants are of ethnobotanical interest and there is a rich variety of structures encountered within the framework of *Pauridiantha*'s biosynthetic capabilities. A chapter like this reminds one that organic chemists as well as biologists must be concerned with the extirpation of tropical species presently in progress. The last chapter is a masterly review, by Stephen F. Martin, of the Amaryllidaceae alkaloids. The emphasis here is on the intellectual development and deployment of varied synthetic strategies for these compounds.

The chapters of Volume 31 are shorter than the major ones of Volume 30 but are highly varied and interesting. Chapter 1, on Reissert synthesis of isoquinoline and indole alkaloids, is by G. Blasko, P. Kerekes, and S. Makleit, and it reviews recent developments in this old but versatile synthetic methodology. In Chapter 2 Zhong-liang Chen and Da-yuan Zhu review the *Aristolochia* alkaloids. These compounds, of which the nitrophenanthrene carboxylic acid aristolochic acid is the prototype, have aroused new interest because of their antitumor activity (discovered by

the late Morris Kupchan) and also because they are implicated in some important plant-insect interactions. In Chapter 3 Peter J. Houghton reviews the chromone alkaloids, which are interesting variants on flavonoid biosynthesis, and a small chapter on dibenzopyrrocoline alkaloids, by I. W. Elliott, follows. Chapter 5 is a major review of recent advances in lupine alkaloids. This review, by Kh. A. Aslanov, Yu. K. Kushmuradov, and A. S. Sadykov, emphasizes modern structural approaches, especially CMR and X-ray crystallography, to structure determination. Chapter 6, by A. Numata and T. Ibuka, reviews alkaloids from ants and other insects, and will be of special interest to those working in the field of chemical biology of insects. The final chapter, by B. Gozler, is an interesting summary, emphasizing synthetic aspects, of recent chemistry in the pavinic and isopavinic series of alkaloids.

In summarizing the chapters of these two volumes I have tried to emphasize the rich variety of subject matter as well as the skill with which topics have been selected and reviewed. Those who already work with alkaloids will not need to be convinced of the value of these members of the series; I hope, as well, that others may find their perusal an attractive introduction to this broad and vital area of chemistry.

Philip W. Le Quesne, *Northeastern University*

Reagents For Organic Synthesis. Volume 13. By Mary Fieser and Jamie G. Smith. John Wiley & Sons: New York. 1988. 472 pp. \$39.95. ISBN 0-471-63007-1.

The latest volume in this ever-welcome series covers publications appearing in 1985 and the first half of 1986. It begins with a group photograph of those who helped in the work and ends with a valuable series of indexes: Type of Compound; Synthesis; Type of Reaction; Author; and Reagent. These indexes have been revised to conform to the style of the cumulative index to Volumes 1 to 12, which is promised shortly. The successful format of the series, with its terse descriptions, good structural formulas, and selected examples of application, continues.

Biosensors: Fundamentals and Applications. Edited by A. P. F. Turner (Cranfield Institute of Technology), I. Karube (Tokyo Institute of Technology), and G. S. Wilson (University of Arizona). Oxford University Press: Oxford, New York, and Tokyo. 1987. xvi + 770 pp. \$120.00. ISBN 0-19-854724-2.

This book thoroughly reviews a wide range of techniques and applications of biosensors and has the potential to be a very valuable research and reference tool. The authors, who are among the leaders in the field, have written an excellent and timely account of this area. It is important to recognize that the wide field of biosensors encompasses a huge number of devices varying not only with the biological sensing element but also with the transducer. Transducers can be potentiometric, amperometric, conductimetric, impedimetric, optical, calorimetric, acoustic, and/or molecular electronic. Therefore, the authors' choice of kind of transducer is an excellent criterion for an organizational format.

The book has seven major sections. In the first section, "The Biological Component", there are eight chapters describing enzyme electrodes, micro-organisms, plant and animal tissue based sensors, immobilization of biological components, and genetic and protein engineering. This material deals mainly with biological aspects of biosensors and will be especially informative for electrochemists engaged in research in the area of biosensors. The second section, "Bioelectrochemistry", the longest with 19 chapters, deals with electrochemical transducers. Potentiometric, amperometric, impedance, and silicon-based sensors are described. Readers will gain an understanding, not only of fundamentals of electrochemical transducers but also of the design and development of sensors with special applications such as the following: in vivo chemical sensors, thin-film micro-electrodes for in vivo analysis, needle-type glucose sensors, and whole-cell sensors. This is an excellent part of the book especially recommended for biochemists and medicinal chemists. The following three sections, "Mechanical and Acoustic Impedance", "Calorimetry", and "Photometry", contain a total of seven chapters. These chapters present a clear discussion of the fundamentals and applications of piezo-electric, calorimetric, and photometric transducers. The photometry section concludes with chapters describing design of fiber-optic biosensors, internal reflection spectroscopy, and laser-light scattering based devices. The last two sections of the book, "Applications of Microprocessors" and "Commercialization and Future Prospects", are devoted to practical aspects of application of biosensors. The last section includes an unusual chapter titled "Exploiting Biosensors" which describes the potential market for biosensors which may be useful as a tool in grant and funding applications as well.

Unlike many modern multiauthored books, this book has been very well edited so that there is a uniform format and no overlap between individual chapters. It is well referenced and readable and the particular topics covered are all of current relevance. While there have been impressive accomplishments in the field, due to the interdisciplinary nature

of the subject and its applications, there is great potential for further development. Therefore, this book should be an exceedingly valuable addition to the literature on subjects of interest to many researchers in electrochemistry, biochemistry, and environmental and medicinal chemistry.

Tadeusz Malinski, *Oakland University*

Laser Remote Chemical Analysis. By Raymond M. Measures (University of Toronto). John Wiley and Sons: New York and Chichester. 1988. xi + 546 pp. \$75.00. ISBN 0-471-81640-X.

Laser beams sent through the atmosphere, natural bodies of water, and through optical fibers are being used for remote chemical analysis. This book presents the fundamentals of laser remote sensing and comprehensive overviews of different aspects of the subject, written by experts highly respected in their fields. Topics include instrumentation and mathematical models, the transmission characteristics of the atmosphere, infrared laser absorption in the atmosphere, pollution mapping using differential absorption, mapping atmospheric trace constituents, oceanic and terrestrial lidar measurements (note the analogy to radar), and fiber optic sensors.

One of the difficulties of remote chemical analysis through the atmosphere or large bodies of water is the lack of standards with which to calibrate the instrument. Another is the heterogeneous nature of the sample cell. Therefore considerable effort by many investigators has been made to develop mathematical models that relate the observed signals directly to the concentrations of the target chemicals. This emphasis is reflected in the first chapter. After a brief but well-documented introduction to the spectral interactions and the basic types of instrumentation used for remote chemical analysis, the first chapter presents the equations for signal-to-noise ratio and the equations that relate the signal to the relevant optical properties of the sample: elastic and inelastic (Raman) scattering, differential absorption, and fluorescence. The chapter concludes with a discussion of the factors that limit the detection of small concentrations and includes a comparison of the different lidar techniques.

A very useful presentation of the spectral transmission of the atmosphere is given in the second chapter. Many spectral plots are included along with a discussion of molecular absorption, emission, scattering, and attenuation by aerosols.

A comprehensive overview of environmental sensing using infrared absorption is included in the third chapter. In order to show how the absorption signal is related to concentration, this chapter gives an excellent discussion of spectral line profiles. Also included is an excellent overview of spectral modulation and detection methods that are used to observe weak absorption signals. The chapter concludes with a discussion of infrared absorption measurements for stratospheric and surface geology studies. A few pages are devoted to industrial applications of lead-salt diode lasers in order to indicate the potential of these infrared methods for other applications of remote chemical analysis.

Differential absorption lidar (DIAL) is the most sensitive lidar method. DIAL compares the attenuation of backscattered radiation at an absorption wavelength of a molecule with the attenuation at nearby wavelengths. Chapters 4 and 5 discuss the fundamental theory and instrumentation, and the mapping of pollutant and other gases in the atmosphere.

Mapping of trace metals in the atmosphere has been done mainly with resonance scattering, or fluorescence, lidar. The interpretation of the temporal behavior of the lidar signals is complicated by the finite lifetimes of the excited states of the atoms and ions. Chapter 15 discusses the theory, instrumentation, and applications to studies of Na, K, Li, Ca, and Ca⁺ in the atmosphere.

Oceanic and terrestrial lidar observations are discussed in Chapter 6. Applications include observations of waves, oil slicks, and monomolecular films on the surface of a body of water; chlorophyll and phycoerythrin and other organic materials in a body of water; and reflections off of the bottom of a shallow body of water. Downward-looking terrestrial lidar observations include elevation determinations of terrain and vegetation (e.g., tree heights), the identification of vegetation and its maturity and state of stress, and studies of surface mineral deposits.

A fiber optic can be used to guide a laser beam to a specific place remote from the main instrument—remote in terms of distance, or remote in terms of being otherwise inaccessible to the main instrument. The instrumentation and applications of remote sensing over fiber optics are covered in the last chapter. Electrochemical and piezoelectric sensors, also used in remote applications, are briefly discussed for comparison purposes. Also, some of them share with fiber optic probes similar chemical principles of operation at the remote end of the sensor that help to make the sensor respond specifically to a particular chemical or set of chemicals.

This book clearly achieves its goal of revealing how lasers are employed for the remote chemical analysis of our environment. Many equations show the complexity of relating the signals to concentrations, and are there for someone interested in the mathematical intricacies of the field. On the other hand, the equations can be overlooked by someone interested primarily in the instrumentation and applications. As picosecond lasers and picosecond optical switches increase the time resolution of a lidar measurement, lidar principles and equations may eventually find applications in the mapping of smaller samples such as biological systems. The book is well documented for those who wish to pursue particular topics in more detail.

Edward H. Piepmeier, *Oregon State University*

Intermediate Organic Chemistry. By John C. Stowell (University of New Orleans). John Wiley & Sons: New York, NY. 1988. xv + 268 pp. \$34.95. ISBN 0-471-09899-X.

One of the challenges in training advanced organic chemistry students is the transition from the order and focus of the science as presented in typical introductory courses to the breadth found in the current periodical literature. The traditional approach to this challenge is to present a somewhat historical introduction to organic mechanism and synthesis that leads from the classic experiments upon which the science is based to the latest developments in the current literature. This book attempts to short-circuit the traditional approach and is intended to serve as a guide to the advanced student for the first encounter with the chemical literature and current research problems. The "classics" are not presented but current examples from the literature form the basis of presentation.

The first three chapters are introductory and deal with nomenclature, searching the chemical literature, and stereochemistry. Each of these topics is presented with a "how to" perspective and the first two chapters would, for example, be quite informative to the undergraduate who is starting an independent research project. The nomenclature examples and problems are excellent and are presented at an appropriate level. The introduction to searching the literature is also at the appropriate level and the guides for use of Chemical Abstracts and Beilstein are clear and to the point while Science Citation Index, on the other hand, is neglected. The chapter on stereochemistry deals with most stereochemical concepts needed to read the current literature. There is a good review of chiral molecules, and topics such as asymmetric synthesis, chirality transfer, and topism are introduced.

Chapters 4 through 6 form a major unit dealing with the interconversion of functional groups and synthetic strategy. The functional group discussion (Chapter 4) covers most of the groups presented in the Patai Series on *The Chemistry of Functional Groups* and presents a few selected synthetic methods for each. This chapter is a bit tedious since it covers so much ground and has no unifying theme while the chapters on carbon-carbon bond formation (Chapter 5) and planning multistep syntheses (Chapter 6) are excellent introductions to current ideas and methods. Particularly useful is the straightforward presentation of electrophilic and nucleophilic reactive centers and "umpolung" and the use of these concepts in molecular disconnections. The examples chosen are, for the most part, current and the problems are helpful and well referenced.

Chapters 7 through 9 deal with mechanism and the study of mechanism. Kinetics, isotope effects, reaction coordinate diagrams, and extrathermodynamic relationships are presented in a very abbreviated form in the chapter on "Mechanisms and Predictions". Aromaticity, molecular orbitals, and concerted reactions are presented in Chapter 8 and solvent, temperature, and pressure effects, micellar catalysis, and two-phase reactions are presented in the chapter on "Physical Influences on Reactions". These three chapters are necessarily superficial given the scope of the topics and the space allocated. The ten pages on representative mechanisms is so abbreviated that it adds little to the book. The author nevertheless states that these examples are intended to be supplemented by the teacher and there is much latitude for this supplementation. These chapters cannot really stand on their own and need to be supplemented by additional examples and probably with additional reading material. A more substantial general reference list would also improve these and other chapters in the book.

The final chapter gives a short introduction to the interpretation of NMR spectra. Spin decoupling, correlation spectroscopy, and other useful topics are presented in an understandable way. Here, as in the rest of the book, the idea is to give the student a first exposure to these topics and here the presentation is brief and to the point. The examples and problems are well chosen.

Who would benefit from buying and reading this book? Could it serve as a useful text? The treatments are necessarily too broad and superficial to make the book very useful at the graduate level. Other texts would be required to supplement this presentation and the utility of this treatment would add little to the books already available. The treatment

does, however, seem appropriate for a third semester course in organic chemistry, and a student would undoubtedly benefit by exposure to the book before starting an undergraduate research project. A student preparing for entry into graduate school in organic chemistry might also find the book to be helpful for self-guided study.

Ned A. Porter, *Duke University*

Polymer Surfaces and Interfaces. Edited by W. J. Feast and H. S. Munro (Durham University). John Wiley & Sons: New York. 1987. xii + 257 pp. \$59.95. ISBN 0-471-91214-X.

This is a collection of papers presented at a symposium of the same name held at Durham University in 1985 under the auspices of the Pure and Applied Macromolecular Chemistry Group of the Royal Society of Chemistry and the (British) Society of Chemical Industry, and as such it provides a snapshot of part of the growing activity in the technically important area of polymer surfaces and interfaces. The emphasis is almost entirely on the experimental side of the subject, with the papers roughly split between characterization and generation/modification of polymer surfaces and interfaces. It is clear that progress in the latter area is strongly dependent on advances in the former and that thus at the moment it lags behind, perhaps because the high cost of the new surface and interface analysis equipment keeps it from being widely available. As might be expected from a symposium report of this kind, the papers vary widely in scope and emphasis. On the characterization side there are excellent reviews by Winnik on luminescence techniques applied to polymer interfaces, by Briggs on polymer surface analysis by secondary ion mass spectroscopy (SIMS) and by Luckham on the measurement of forces between surfaces with adsorbed layers of polymers, though the latter curiously ignores the similar work of the excellent group at the University of Minnesota under Tirrell. There is also an outstanding paper on protein adsorption from solution measured by ellipsometry, capacitance, and open-cell potential techniques by Lundström et al. On the generation/modification side there are papers by Petty on Langmuir-Blodgett films, by Howson on thin oxide coatings on polymers produced by sputtering, and by Yasuda et al. on plasma polymerization modification of surfaces. A paper by Kinloch on environmental attack at metal-polymer adhesive interfaces deserves special mention as a paradigm for how one can attack a very complicated, but technically very important, problem using the modern surface analysis techniques and hence modify the substrate, the substrate preparation (various silane treatments) and even the adhesive to produce joints resistant to water attack.

Edward J. Kramer, *Cornell University*

Volumes of Proceedings

Organo-Metallics in Organic Synthesis. Aspects of a Modern Interdisciplinary Field. Edited by A. de Meijere and H. Tom Dieck. Springer-Verlag: New York and Berlin. 1988. ix + 320 pp. \$57.00. ISBN 0-387-18592-5.

The symposium "Organic Synthesis via Organometallics", held in Hamburg in 1987, was organized to help overcome some of the bias that is too widely held against organometallic compounds. Misconceptions, such as that organometallics are difficult to handle or to obtain, and general lack of knowledge are preventing wider use of them, even though they are considered indispensable by leading chemists.

A group of 16 lectures, reproduced from typescript of good but variable quality, make up this soft-bound volume. The topics are reviews of defined areas rather than reports of the latest research results. Some focus on a type of reagent (e.g., organorhenium complexes), and others treat routes to a type of product (e.g., cyclopentenes). It is a pity that there is no index.

Trends in Medicinal Chemistry. Edited by E. Mutschler and E. Winterfeldt. VCH Publishers, Inc.: Berlin. 1987. ix + 634 pp. \$99.50. ISBN 0-89573-0.

The inaugural, plenary, and main lectures, plus papers on specialized topics, of the Ninth International Symposium are collected in this volume. The inaugural lecture, "Achievements, Problems, and Future Aspects of Drug Research", by K. H. Buchel, fills 34 pp. The main lectures fall into five categories: Computer-assisted Drug Design; Instrumental Techniques Useful for Medicinal Chemistry; Progress in Organic Synthesis Useful for Drug Development; How to Prevent Toxicity?; and New Trends in Receptor Research. The subject index occupies 5.5 pp.

Macromolecular Biorecognition. Principles and Methods. Edited by Irwin Chaiken, Emilia Chiancone, Angelo Fontana, and Paolo Neri. The Humana Press Inc.: Clifton, New Jersey. 1987. xix + 356 pp. \$59.50. ISBN 0-89603-141-1.

The ubiquity of molecular recognition in biological processes is now widely appreciated by chemists of nearly all types. The basic principles are beginning to be seen, and as new aspects are revealed, interest and even excitement grow. A group of suitably excited conferees met in Italy in 1986. Thirty typescript papers from the conference make up this volume. They are arranged in four groups: Specific Interactions in Proteins; Molecular Aspects and Functional Regulation; Interaction of Nucleic Acids with Proteins and Drugs; Immunological Recognition and Development of Synthesis Vaccines; and Analytical and Preparative Bioaffinity Methods. Indexed.

The Biological Alkylation of Heavy Elements. Special Publication No. 66. Edited by P. J. Craig and F. Glockling. The Royal Society of Chemistry: London. 1988. 298 pp. \$42.50. ISBN 0-85186-716-2.

The centenary of the birth of Professor Frederick Challenger was commemorated by a conference held in 1987 in London. The 27 typescript papers are arranged under the following headings: Pathways for Methyl Transfer; Biomethylation of Ge, Sn, Pb, As, Sb, Hg; Global Consequences and Toxicology of Alkyl Transfer; and Speciation and Analysis. There is no index.

Topics in Medicinal Chemistry. Special Publication No. 65. Edited by P. R. Leeming. Royal Society of Chemistry: London. 1988. 353 pp. \$47.50. ISBN 0-85186-726-X.

The biennial Cambridge Medicinal Chemistry Symposia are organized jointly by the Royal Society of Chemistry and the Society of Chemical Industry. The 1987 symposium emphasized five topics: Neuropeptides; Control of Enzymatic Processes in Medicinal Chemistry; Antiviral Agents; Antibacterial, Antifungal, and Antiparasitic Agents; and Application of Computing to Medicinal Chemistry; including 20 papers altogether. There is unfortunately no index.

Cadmium. Environmental Toxin Series 2. Edited by M. Stoeppler and M. Piscator. Springer-Verlag: Berlin, Heidelberg, and New York. 1988. xii + 235 pp. \$89.70. ISBN 3-540-15551-1.

The 3rd IUPAC Cadmium Workshop was held in Germany in 1985 and produced the 18 papers in this volume. They are set in type and arranged in the following categories: Toxicity, Carcinogenicity, Animal Experiments; Epidemiology; Cadmium in the Environment; and Methodology and Quality Assessment. The subject index of less than 1 page is hardly adequate.

Biologically Active Natural Products. Edited by K. Hostettmann and P. J. Lea. Clarendon Press; Oxford University Press: Oxford and New York. 1987. \$75.00. ISBN 0-19-854196-1.

The eighteen papers in this volume of the Annual Proceedings of the Phytochemical Society of Europe cover a wide range of subjects, from "Synthesis of Natural Products by the Zip Reaction" to "the Chemical Defenses of Oat Roots Against 'Take-All Disease'." The papers are set in type and provided with abstracts, and there is a good subject index.