

Book Reviews*

Advances in Chemical Physics. Volume 80. Edited by Ilya Prigogine (University of Brussels and University of Texas) and Stuart A. Rice (University of Chicago). Wiley: New York, 1991. ix + 489 pp. \$105.00. ISBN 0-471-53281-9.

In these days of stagnant or even decreasing library budgets, serials like this one play an increasingly important role, since serial subscriptions are likely to be maintained while monograph purchases slip. This situation places a great responsibility on publishers and editors to maintain or, hopefully, improve the quality of such series. Collections of unrelated reviews like this volume, especially at a price of over \$100, may have particular difficulty attracting individual buyers, since, unless the articles are very carefully crafted, it is unlikely that any single reader will get much out of more than one contribution to a collection.

The editors, Ilya Prigogine and Stuart Rice, seem to recognize this situation, and in their introduction they list among the goals of *Advances in Chemical Physics* that of serving "as a personalized learning text for beginners in a field." I applaud this effort and have used this aim as a major criterion in evaluating this volume.

The book consists of five rather hefty articles, from 60 to 126 pages in length. The first, by Bagchi and Chandra on "Collective Orientational Relaxation in Dense Dipolar Liquids", is clearly written and rich in detail and is relatively successful in making the subject accessible to nonspecialists. Unlike previous treatments of the subject, the authors stress collective dynamics at intermediate length scales of the cooperative motion of small numbers (2-100) of molecules. The treatment focuses on the theoretical aspects, but "beginners" will find the careful exposition of the relevant experimental techniques helpful in suggesting why they might want to look at the problem. The sections on polar solvent reactions, solvation dynamics, and electron transfer dynamics should be of particular interest to many chemists.

The article by Eiswirth, Freund, and Ross on "Mechanistic Classification of Chemical Oscillators and the Role of Species" seems to me to be addressed more to an audience of specialists. The use of such terms as limit cycle or supercritical Hopf bifurcation in the introduction without either explanations or references is likely to dissuade readers without some knowledge of dynamical systems from proceeding further. On the other hand, the authors make a promising start on an important problem, a classification of chemical oscillators and the species in those systems, and they propose a method to reduce complex mechanisms by the elimination of nonessential species. A very attractive aspect of this article is that it represents one of the first practical uses of Clarke's powerful but abstruse graph theoretical method of stoichiometric network analysis.

The aim of C. A. Chatzidimitriou-Dreismann's article on "Complex Scaling and Dynamical Processes in Amorphous Condensed Matter" is explicitly proselytizing, "to make this approach popular among experimentalists". This missionary goal has several benefits for the reader. Despite the inherent difficulty of the theory, the author makes a rather successful effort to focus on the physical content and the relation to experiments on such problems as proton transfer and delocalization, molten alkali chlorides, and high T_c superconductivity. Particularly intriguing are the relationships that are pointed out between the results of complex scaling methods, "coherent-dissipative structures" in disordered condensed quantum systems, and the dissipative structures studied by the Brussels school in far-from-equilibrium thermodynamics. I found the inclusion of an Appendix containing a "theoretical introduction for experimentalists being interested in applications exclusively" a particularly attractive feature.

I was initially put off by the title of Matzing's article on "Chemical Kinetics of Flue Gas Cleaning by Irradiation with Electrons", but I found the description of this technology to be fascinating. Instead of treating NO_x and SO_2 emissions from power plants separately to give the economically unimportant N_2 and CaSO_4 , one can irradiate the flue gas with fast (300-800 kV) electrons. This "electron beam dry scrubbing" gives high yields of radicals that eventually yield significant quantities of nitric and sulfuric acids that can be converted to fertilizer. The far-from-equilibrium processes are crucial, and the author has developed a computer code, AGATE, for modeling the system. The description of the code includes a valuable catalog of kinetic data on the remarkably complex chemistry of this system.

The final article by Kono, Nomura, and Fujimura has the forbidding title "A Theoretical Study of Origins of Resonance Raman and Reso-

nance Fluorescence using a Split-up of the Emission Correlation Function". This study of resonance secondary emission was largely focused on the issue of how and if one can distinguish between fluorescence-like and Raman-like components in observed spectra. Although the authors make some gestures toward beginners, I found this article the least successful in terms of drawing in the nonspecialist reader. The theoretical treatment appeared competent and highly original, but I would have appreciated more of an effort to relate it to experimental spectroscopy. A bit of Dreismann's missionary approach would have gone a long way here.

On the whole, this collection has mixed success in providing a set of introductions for beginners. There are certainly five excellent articles for specialists, but individuals who can relate to two or more will be rare indeed. The list price is high for a single article, but this volume is certainly a worthwhile purchase for libraries, because all of the articles are of value for specialists and several do provide the promised accessibility to a new field.

Irving R. Epstein, *Brandeis University*

Physical Chemistry of Membrane Processes. By Serge F. Timashev (Karpov Institute of Physical Chemistry, Moscow). Ellis Horwood: West Sussex, England, 1991. 246 pp. \$124.95. ISBN 0-13-662982-2.

Synthetic membranes have become a multibillion dollar global business. Membrane-mediated separations—microfiltration, ultrafiltration, and dialysis—utilize classical polymeric membranes. Substrate permeability and efficiency are governed by the composition of the polymer and the pore sizes therein. The thinner the membrane, the more permeable it becomes. Unfortunately, thin membranes are less stable than thick ones. Until now this problem has primarily been overcome by engineering approaches. It is increasingly being realized that improved separation and selectivity, as well as the use of membranes for high-tech applications, require an interdisciplinary and biochemically inspired approach to polymeric membranes. The virtue of the present monograph on the *Physical Chemistry of Membrane Processes* is that, in the first two chapters, it discusses ion transport, both in biological and synthetic membranes. An up-to-date account on membrane gas separation is presented in Chapter 3. The physical-chemical methods of membrane characterization are then illustrated on perfluorinated ion-exchange membranes in Chapter 4. The monograph then ends with a brief chapter in which the future avenues for studying membrane processes and related problems are explored. The monograph represents a useful summary of research carried out in what was then the Soviet Union. Unfortunately, glasnost has not arrived in time to allow discussion of the very significant recent research on biomimetically inspired synthetic membranes carried out in Japanese, German, and other European laboratories. Nevertheless, the present volume represents a much-needed introduction to integrated membrane science. It is thus recommended to researchers and industrialists who are interested in exploiting synthetic membranes to their full potential.

Janos H. Fendler, *Syracuse University*

Crown Ethers and Cryptands. By George W. Gokel (University of Miami, Florida). The Royal Society of Chemistry: Cambridge, England, 1991. xiv + 190 pp. £32.50. ISBN 0-85186-996-3.

In his novel *Foucault's Pendulum* Umberto Eco writes of a person who views the pendulum with studied indifference having been "trained on some textbook that had blunted his capacity for wonder"—an oft-repeated student criticism. It is this reviewer's opinion that Professor George Gokel is to be warmly congratulated for producing exactly the contrary, a textbook that is vibrant and alive, which should not fail to stimulate the reader to delve deeper into the subject area and which is above all "a good read".

The first chapter, Introduction to Macrocyclic Chemistry, charts the development of this area of chemistry paying particular homage to Pedersen, Cram, and Lehn, whose seminal contributions, leading to the 1987 Nobel Laureateships in Chemistry, may be viewed as having changed the face of organic chemistry. The author's personal experiences, deriving from this involvement at the same period of time, add much interest to the text. This is followed by chapters entitled Syntheses of Crowns, Cryptands and their Relatives; Complexation by Crowns and Cryptands; Structural Aspects of Crowns, Cryptands and their Complexes; and Applications of Crowns and Cryptands, all of which distill the essence of the subject into a very readable form and so give the author's intended audience—the beginner or generalist, most likely

*Unsigned book reviews are by the Book Review Editor.

graduate or senior undergraduate students—a superb perspective of the field and its importance. The last chapter collates the relevant literature such that the enthusiast can move rapidly on to find the frontiers of this rapidly expanding area of chemistry.

As one who also travelled the early pathways of crown ether chemistry I enjoyed reading this book very much. Professor Gokel, in his Preface, expresses the hope that those who read it will find it helpful; I have no doubt that they will.

David E. Fenton, *University of Sheffield*

Nucleic Acid Chemistry. Improved and New Synthetic Procedures, Methods and Techniques. Part 4. Edited by Leroy Townsend (University of Michigan) and R. Stuart Tipson (retired). Wiley-Interscience: New York. 1991. xii + 411 pp. \$69.95. ISBN 0471-54281-4.

This latest volume is quite similar in style and content to the earlier ones, the first of which was published in 1978. Part 4 contains 76 individual procedures, 72 of which describe the preparation of a specific compound. One procedure describes the preparation of two ¹⁸O-labeled pyrimidine nucleosides, two deal with the preparation of reagents, and the final contribution is a polarimetric method for determining the anomeric configuration of nucleosides. Most of the individual preparative methods are concerned with nucleosides and nucleotides, although several also deal with heterocyclic compounds, carbohydrates, and polynucleotides.

Unlike *Organic Syntheses*, in which submitted procedures are checked prior to publication, this series has no mechanism for "quality control", so the reproducibility of individual preparative procedures may vary a bit. This is probably a less serious concern than in other areas of chemistry, since the typical reader will likely be more interested in a particular type of transformation than in the specific compounds that comprise the examples in the text. While the mix of transformations is not terribly systematic, simply browsing through the synthetic schemes does readily provide the reader with a sense of novel transformations potentially of utility in related cases. It should also prove useful as a source of leading references. In reviewing Part 3 (published in 1986), I found that most of the earlier procedures had retained their illustrative value; the entire series should have considerable value as references for quite some time. The present volume should prove useful to those active in the fields of heterocyclic and nucleic acid synthesis. It would be a sensible addition for most library collections.

Sidney M. Hecht, *University of Virginia*

Bioinstrumentation and Biosensors. Edited by Donald L. Wise (Northeastern University). Marcel Dekker, Inc.: New York. 1991. xi + 824 pp. \$165.00. ISBN 0-8247-8337-9.

This volume collects 25 diverse chapters considering a variety of sensors and transducers across a very broad spectrum of measurements on biological systems. The authors of individual chapters are selected from an international team of experts. Fewer than half of the chapters will be of more than casual interest to chemists. Unfortunately, these chapters are not well coordinated. For example, Chapters 1, 2, 3, 9, 12, 22, and 25 all involve enzymatic reactions coupled to electrochemical sensors. Each chapter is written as if the authors were quite unaware of each others' chapters. They are not even grouped together in a logical manner. The most recent references in most chapters are from 1985 or earlier.

While this book might interest biomedical engineers, it is too diverse for most scientists. There is not much in common between those interested in the freshness of fish (Chapter 3), neural networks (Chapter 5), ultrasonics (Chapter 15), non-contact temperature measurements in medicine (Chapter 17), hearing loss (Chapter 20), EEG monitoring of brain function (Chapter 21), and the effect of visual stimulation on body equilibrium (Chapter 23).

Most of the chapters are well-written overviews of these very diverse topics. Overall, the book will be a useful reference for a biomedical engineering library, but there is not enough of a common thread to make it useful in very many individual bookcases.

Peter T. Kissinger, *Purdue University*

Reductions by the Alumino- and Borohydrides in Organic Synthesis. By J. Seyden-Penne (Université de Paris-Sud, Institut de Chimie Moléculaire d'Orsay). Translated by C. Nguyen. English Language editor: J. Burdett. VCH Publishers, Inc./Lavoisier TEC & DOC: New York/Paris. 1991. xiii + 193 pp. \$65.00. ISBN 1-56081-099-8.

Originally published in French, this book provides an overview of common reducing agents employed by synthetic organic chemists. The book is organized into three sections: (1) Description and Characteristics of the Main Reagents; (2) Reduction of the Main Functional Groups; and (3) Synoptic Tables. The first section provides a brief description of the physico-chemical properties of common reducing agents. Some of the information, however, is dated. For example Red-A1 (Vitride) is

currently available as a solution in toluene rather than in benzene. The second section describes the reduction of functional groups (organized by functional group) with various hydride-based reagents. This section provides recent examples (the majority of the references are from the 1980's), information about regio- and stereochemical issues, and in some cases proposed reaction mechanisms. Only limited information is provided concerning experimental details and product yields. The synoptic tables section provides a list of reducing agents that have been used to convert a given substrate to a given product. Finally, the organization of the references is confusing: alphabetically by the first letter of the last name of the first two authors. Based on its content, this book is appropriate for a graduate level course. For the practicing organic chemist, however, it will be of limited usefulness.

David J. Mathre, *Merck Research Laboratories*

Handbook of Vitamins. Second Edition. Edited by Lawrence J. Machlin (Hoffman-LaRoche, Inc.). Marcel Dekker, Inc.: New York and Basel. 1991. x + 595 pp. \$125.00 (U.S. and Canada); \$150.00 (all other countries). ISBN 0-8247-8351-4.

This book is an update of the first edition which attempted to provide in one volume "a relatively brief but authoritative and comprehensive source of information on the vitamins". Further, the reading audience was intended to be "the human and animal nutritionist, the dietician, clinician, biochemist, and interested lay person."

In general, one can find in 16 reasonably outlined chapters many of the highlights of our knowledge of vitamins. However, the quality and currency of information provided varies considerably. The chapters (1-4) dealing with fat-soluble vitamins (A, D, E, K) are sufficiently current and inclusive. They by-and-large reflect the expertise of authors who have been and continue to be active in research on these topics. The range of currency and indeed correctness among chapters dealing with water-soluble vitamins is of some concern and detracts from the whole. Whereas some chapters, e.g., 5, 12, and 13 on vitamin C, folic acid, and C, respectively, reflect present knowledge that spans from the chemical and biochemical to nutritional, others have noticeable gaps and out-of-date statements, structures, and references. For examples, the archaic (and sometimes incorrect) structure depictions for thiamin and derivatives in Chapter 6 detract from an otherwise useful text. Chapter 7 on riboflavin is rather out-of-date in several regards, but illustrative of this point is the claim (p 285) that "All the analogs and homologs have been described in a recent review(1)." The reference given was published in 1972 and has been superseded by more current information which includes advances along chemical, biochemical, and enzymologic lines published in volumes on *Flavins and Flavoproteins* that result from periodic symposia in this area. Chapter 8 on nicotinic acid omits such metabolic utilization of NAD as ADPR modification of nucleoprotein. Chapter 9 on vitamin B₆ is more than adequate on food science aspects but is notably weak in the biochemistry area, especially enzymology and metabolism. Much of the expansion in this area has been collated in recent symposia not cited. Chapter 10 on biotin suffers from incomplete understanding and reference to information on the metabolism of this vitamin. The discussion of biological action of analogs (p 396) is partly misleading. α -Dehydrobiotin is not just an "inhibitor" but a natural catabolite first found in a bacterial (pseudomonad) medium and then in other organisms including mammals, all of which can β -oxidatively cleave the valeric acid side chain of the vitamin. Substantially more information on the metabolism of biotin by humans and other animals is available than appears in this chapter. The chapters (14-16) that deal with substances that are non-vitaminic for the human, and are often discussed in the broader context of growth-enhancing or putatively of health benefit, are less critical to the *Handbook* but may be of interest to some readers.

Altogether, this current revision proffers a useful one-volume compilation of information on vitamins. It could be improved in any future edition, particularly in certain chapters on vitamins within the classic B complex, by more attention to selected current work along chemical, biochemical, and metabolic lines, and it may be better written by those with both current and long-standing activity in the field.

Donald B. McCormick, *Emory University*

Symmetry and Combinatorial Enumeration in Chemistry. By Shinsaku Fujita (Fuji Photo Film Co. Research Laboratories, Ashigara). Springer-Verlag: New York. 1991. ix + 368 pp. \$39.00. ISBN 0-387-54126-8.

Over the past few years, Dr. Fujita has published a number of articles in several journals (including *J. Am. Chem. Soc.*) in which powerful new group-theoretical techniques are developed for problems such as symmetry classification of molecules and isomer enumeration. The present book is most welcome in that it brings these techniques together in one place and presents everything in a unified manner.

Although the book is in principle self-contained, containing some

introductory chapters on the fundamentals of group theory, it is really aimed at readers who already are acquainted at least with the basic concepts of group theory and who are willing to think mathematically.

Group-theoretical concepts that are basic tools in Fujita's approach are those of coset representation and table of marks. Although these concepts do not belong to the standard repertoire of chemical group theory, they are no harder to understand than, e.g., the concept of irreducible representation. Given a group G and a subgroup G_i , each element of G applied to a coset of G_i gives another coset, and thus each element of G can be considered as a certain permutation of the cosets, leading to a representation of G in terms of these permutations, called the coset representation $G/(G_i)$. Given two subgroups G_i and G_j of G , the mark m_{ij} of G_j on $G/(G_i)$ is defined as the number of cosets of G_i left invariant by G_j . For example, if G_i is the subgroup leaving a particular site invariant, each coset corresponds to an equivalent site, and $G/(G_i)$ is the representation of G in which each element is pictured as permuting these equivalent sites. A subgroup G_j of G_i may leave more than one of these equivalent sites invariant, and the number that it leaves invariant is by definition m_{ij} .

Fujita shows most elegantly how these concepts can be utilized in the systematic classification of molecular symmetries and isomer enumeration problems such as the following: For a given skeleton with n sites and skeletal symmetry group G and a given assortment of ligands, how many isomers are there with symmetry G_j , where G_j is an arbitrary subgroup of G ? With the aid of mark tables and the concept of coset representation, Fujita shows how to solve this type of problem for various situations, including the case where the ligands are allowed to have internal structure and the case where some of the sites (e.g., bridge sites) can be occupied only by ligands of a certain minimum valence.

Essential to the approach is the availability of mark tables for the various molecular point groups. Typically, the mark table of a group is somewhat easier to construct than its character table, once one gets the hang of it. A useful aspect of this book is the provision of mark tables for the most important molecular point groups.

This book is not easy going, but the reader who makes the necessary effort will be rewarded by the acquisition of some powerful tools and deep insights. If the coming generation of chemists becomes as familiar with mark tables and their uses as the present generation is with character tables, much of the credit will go to Fujita and the present book.

C. Alden Mead, *University of Minnesota*

Radiation Effects on Polymers. ACS Symposium Series 475. Edited by Roger L. Clough (Sandia National Lab.) and Shalaby W. Shalaby (Clemson University). American Chemical Society: Washington, DC, 1991. xiv + 634 pp. \$109.95. ISBN 0-8412-2165-0.

This book was developed from a symposium sponsored by the Division of Polymer Chemistry, Inc. at the 200th National Meeting of the ACS in Washington, DC, August 26–31, 1990. It consists of a Preface and 38 chapters in typescript form organized under the following headings: Fundamental Studies of Polymer Radiation Effects; Technological Applications of Radiation to Polymers; and Degradation and Stabilization of Irradiated Polymers. The references are gathered at the end along with the indexes of the authors, their affiliations, and subjects.

Expression Systems and Processes for rDNA Products. ACS Symposium Series 477. Edited by Randolph T. Hatch (Aaston, Inc.), Charles Gooch (Stanford University), Antonio Moreira (University of Maryland), and Yair Alroy (Schering-Plough Corp.). American Chemical Society: Washington, DC, 1991. x + 118 pp. \$34.95. ISBN 0-8412-2172-3.

This book was developed from a symposium sponsored by the Division of Biochemical Technology of the ACS. It consists of a Preface by the editors and 8 chapters in typescript form with indexes of authors, their affiliations, and subjects.

Journal of Chromatography Library. Volume 50. Liquid Chromatography in Biomedical Analysis. Edited by T. Hanai (International Institute of Technological Analysis, Japan). Elsevier: Amsterdam, 1991. xi + 296 pp. \$154.50. ISBN 0-444-87451-8.

This volume contains 12 chapters which focus on strategies for the liquid chromatographic analysis of the major classes of natural compounds useful in the diagnosis of disease and inborn errors of metabolism. Individual chapters are dedicated to the amino acids, bile acids, carbohydrates, catecholamines, fatty acids, nucleotides, porphyrins, prostaglandins, and steroid hormones. It is formatted as a "how to" book and is, in general, successful in describing the procedures involved in isolating analytes of interest from biological matrices and preparing them for analysis, describing the exact conditions used for analysis (column, eluants, method of detection etc.), and giving the biomedical reasons for the analysis.

The chapters are well-illustrated with figures of chromatographic separations, flow charts, and tables of data and conditions. As a result, the clarity of the presentations is significantly enhanced and much useful information is immediately at hand to the reader. However, since seven different authors contributed to the book, it is not surprising that the quality of presentation is not consistent and ranges from excellent (chapters on amino acids, catecholamines, nucleotides, and porphyrins) to less than adequate (chapter on optimization). There is also a relatively infrequent, but annoying, occurrence of misspellings, missing words, and awkward phrases. Despite the deficiencies, the volume, on balance, provides a handy reference for any clinical laboratory or individual working in laboratory medicine.

William F. Trager, *University of Washington*

Partnerships in Chemical Research and Education. ACS Symposium Series 478. Edited by James E. McEvoy (Consultant, Industrial-Academic Relations). American Chemical Society: Washington, DC, xvi + 160 pp. \$49.95. ISBN 0-8412-2173-1.

This book was developed from a symposium sponsored by the Division of Industrial and Engineering Chemistry, Inc. at the 200th National Meeting of the ACS in Washington, DC, August 26–31, 1990. It consists of a Preface by the editor, an Introduction by Paul G. Gassman, and 15 chapters in typescript form. There are indexes of authors, their affiliations, and subjects.

Potentiometric Water Analysis. 2nd Edition. By Derek Midgley and Kenneth Torrance (National Power plc, Technology and Environment Centre). John Wiley & Sons: Chichester, 1991. xiv + 586 pp. \$125.00. ISBN 0-471-92983-2.

In this second edition the authors present an excellent manual on potentiometric methods for the analysis of inorganic species found in natural or contaminated water. This revision is particularly timely because of the rapid development of ion selective electrodes and the increasing concern about water quality. The authors' purpose is to provide a guide to the use of "practical, i.e. commercially available, ion selective electrodes for water analysis". The focus is on potentiometric methods to the exclusion of all other methods. It deals only with the measurement of inorganic chemicals using readily available equipment. Very little attention is paid to research and recent developments in this or related fields.

The book attempts to collect in one place all the necessary information for potentiometric measurements. It is divided into two parts. Part one provides an introduction into the theory and a discussion of the practical aspects of potentiometric measurements. The theoretical aspects are presented somewhat unevenly and are treated more adequately in any of several analytical chemistry or physical chemistry textbooks. The major advantage of including the theory in this volume is that theory and practice are gathered together in one volume.

The practical portions of Part One present a compilation of information not readily available in a single source elsewhere. It will certainly help newcomers to the field in selecting equipment, understanding the reason for certain procedures, and devising procedures. The second part provides detailed procedures for the analysis of over 40 species.

Chapter 2, on electrochemistry, introduces the Nernst equation. It discusses activity, reference electrodes, and liquid junction potentials and their relation to potentiometric measurements. Unfortunately, there is no discussion of electrochemical sign convention. The authors are at times careless in distinguishing between activity and concentration. However, this section does provide a good introduction to the limits of potentiometric measurements and the procedures needed for accurate potentiometric measurements. Those interested in the theory will want to supplement the information presented by referring to other publications, including some of the references at the end of Chapters 2 and 3.

Chapter 3 reviews the types of electrodes used for potentiometric measurement. The author divides them into metal-based electrodes and membrane electrodes. The latter discussion distinguishes between solid state, glass, and liquid membranes. The sections on reference electrodes in this chapter offer a lot of practical and useful information on their selection and use not generally found in textbooks. The chapter also suggests methods for using ion selective electrodes (ISE) to determine substances that are not electrochemically active including gas sensing membrane electrodes.

Chapter 4 which describes available equipment seems somewhat dated and provides no reference to Japanese instruments.

Chapter 5 on analytical principles provides guidelines on determining the precision, accuracy, and limits of detection of analytical methods. This material is available in any of the many books on statistics.

Chapter 6 on potentiometric titrations has limited value. Titrations are not in common use in most modern analytical laboratories and are only applied to very special analyses.

Chapter 7 may be the most valuable chapter in Part One. It provides many practical suggestions for maintenance of equipment and electrodes, sample collection, and calibration plus a discussion of sources of error.

There is essentially no discussion of membrane theory. An understanding of ion selective electrodes cannot be complete without an understanding of membrane selectivity, membrane transport, and membrane potentials.

The authors have chosen not to review recent advances or on-going research. For example, they do not discuss the use of field effect transistors (FETs), recent advances in membrane technology, microelectrodes, or potentiometric enzyme electrodes. There is no discussion of multiparameter measurements or advanced data reduction methods and very little attention paid to automated procedures.

The second part of the book, analytical methods, is by far the more valuable part of this text. It is essentially a laboratory manual for potentiometric analysis. The authors provide step by step procedures for a wide variety of inorganic species. Each section starts with an introduction which includes a discussion of sources of electrodes and equipment and their features. This is followed by sections on selection of apparatus, preparation of reagents, how to collect and preserve samples, conditioning and storage of electrodes, optimum concentration range, step-by-step analytical procedures, sources of error, precision and accuracy of the method, comparison with other, non-potentiometric methods, other applications of the procedure, suggestions for automatic and continuous analysis, and tracing faults. Sample calculations are included for many of the procedures. Each section has a bibliography of related references.

The procedures are detailed and easy to follow. I found the sections on comparison with other methods and on automatic and continuous analysis very helpful. Part Two is made more useful by including an index of analytical procedures by method and by electrode type. This book is recommended to anyone contemplating or engaged in potentiometric methods of analysis or water analysis.

Herbert P. Silverman, *Yellow Springs Instrument Company*

Introduction to Polymers. Second Edition. By Robert J. Young and Peter A. Lovell (University of Manchester and University of Manchester Institute of Science and Technology, respectively). Chapman and Hall: London. 1991. ix + 443 pp. \$75.00 hardcover; \$35.00 paperback. ISBN 0-412-30630-1 hardcover; 0-412-30640-9 paperback.

The present book is an enlarged, revised version of the 1981 edition. The overall size of the book has been maintained by printing on thinner paper. As with the original edition, the treatment of the subject is described as a "material science" approach and is mostly physical and mathematical in its development. Both editions are divided into five sections: a short introduction featuring classification and nomenclature, followed by chapters on synthesis, characterization, structure, and mechanical properties. The latter two are almost entirely unchanged, only minor additions having been made. Basically increases of 60–70% have been made in the synthesis and characterization chapters.

The chapter on polymer synthesis describes all the well-established methods of producing polymers, together with the newer group transfer and metathesis routes. Most attention is given to the former mechanisms where equations for polymerization rates, molar mass averages, and distributions are derived. The only omission noted was the absence of any mention of the major development in recent years in the field of cationic polymerization, namely the "living" and quasiling systems developed by the Akron and Kyoto research groups.

The chapter on polymer characterization is initiated by the derivation of the Flory-Huggins equations for chemical potentials of the components of polymer solutions. This is followed by a description of the freely-jointed chain model for flexible polymer chains and its developments including Flory's treatment of chain expansion. Molar mass determinations by osmotic (and related) methods and light scattering techniques are fully described, as are scattering methods (including neutron scattering) for determination of radii of gyration. Molar mass distribution measurement techniques (fractionation and size exclusion chromatography) are described both experimentally and in terms of the thermodynamics of phase separation and pore permeation. Short descriptions are given of IR and NMR methods for determination of polymer microstructure.

The polymer structure chapter is mainly concerned with the phenomenon of crystallinity in polymers, although short sections deal with the amorphous state (T_g and its relationship to free volume, plus the network structure of elastomers and thermoplastic elastomers). For polymers showing crystallinity, the determination of crystal structure and degree of crystallinity are described. The molecular factors influencing the crystal structure and its melting point are also discussed. The formation of single crystals, their morphology, and its dependence on chain folding and types of defect are dealt with. Crystallization rates and mechanisms are discussed.

The final chapter on mechanical properties deals generally with the effect of applied stresses on polymers. This includes viscoelastic phenomena in elastomers and the thermodynamics of their deformation. Yielding and crazing in glassy polymers, plastic deformation in polymer single crystals, and crystalline regions are also described. Fracture mechanisms are discussed, together with rubber toughening of glassy polymers to prevent brittle fracture.

As can be seen from the above description of the contents, this book gives a very comprehensive introduction to polymer science. In effect, it is a source book for beginners in the field. At the end of each chapter there is a list of books, which can be consulted for further, more detailed information. For students there also is a set of problems (and answers). The authors claim that it is designed for undergraduate and postgraduate students who are studying polymers but that it should also be of use to scientists generally, if they need to become familiar with the field. It probably contains more material than is required for the first group, but a judicious selection could be made for them. For the other two groups it is indeed a valuable introduction. Generally it is free of blemishes, although inevitably a few typographical errors remain.

S. Bywater, *National Research Council of Canada*

Specialist Periodical Reports. Volume 24. Spectroscopic Properties of Inorganic and Organometallic Compounds. Senior Reporter: G. Davidson (University of Nottingham). The Royal Society of Chemistry: Cambridge. 1991. xiv + 492 pp. £149.00. ISBN 0-85186-223-3.

This volume follows the established format for the *Specialist Periodical Reports*. There are eight chapters: 1. Nuclear Magnetic Resonance Spectroscopy (191 pp; 3357 references); 2. Nuclear Quadrupole Resonance Spectroscopy (29 pp; 136 references); 3. Rotational Spectroscopy (26 pp; 327 references); 4. Characteristic Vibrations of Compounds of Main Group Elements (33 pp; 401 references); 5. Vibrational Spectra of Transition-element Compounds (34 pp; 380 references); 6. Vibrational Spectra of Some Co-ordinated Ligands (52 pp; 524 references); 7. Moessbauer Spectroscopy (98 pp; 825 references); and 8. Gas-phase Molecular Structures Determined by Electron Diffraction (22 pp; 49 references).

Volume 24 in this series provides an extensive listing of references to all forms of spectroscopy applied to inorganic and organometallic compounds though late 1990. The chapter on NMR lists the compounds according to the "central" metal and by the nucleus investigated. In many cases, all that is given is the formula of the compound and the reference. The other sections are organized in a similar manner, but provide a one- or two-sentence description of the important parts in most papers, thus providing some information on the paper's content.

The book accomplishes its goal and serves as a useful, quick guide to the literature. It does not provide any discussion or critical comment on any of the work.

John P. Oliver, *Wayne State University*

International Journal of Quantum Chemistry. Quantum Biology Symposium No. 18, 1991. Edited by Per-Olov Löwdin (University of Florida). Special Editors: N. Yngve Öhrn, John R. Sabin, and Michael C. Zerner (University of Florida). J. Wiley & Sons: New York. 1991. xxxiv + 344 pp. \$100.00. ISBN 0-471-57348-5.

This volume contains the proceedings of the International Symposia on Quantum Biology and Quantum Pharmacology held at the Ponce de Leon Conference Center in St. Augustine, FL, March 9–16, 1991. Dr. Löwdin opens the book with an editorial in which he summarizes briefly the history and policies of the Journal; this is followed by an Introduction, a List of Participants, the Curriculum Vitae of Dr. William Nunn Lipscomb, and twenty-three chapters. An author index completes the book.