Book Reviews*

An Eight Peak Index of Mass Spectra of Compounds of Forensic Interest. Edited by R. E. Ardrey, C. Brown, A. R. Allan, T. S. Bal, and A. C. Moffat (Central Research Establishment, Aldermaston). Scottish Academic Press: London. 1983. x + 282 pp. $50.00.

This forensic science miniature of the classic "The Eight Peak Index of Mass Spectra" (Royal Society of Chemistry 3rd ed., 1983) contains a brief introduction, a listing of contributing laboratories (Appendix 1), and the names, molecular weights, and the eight most intense peaks representing 2787 compounds of forensic interest, arranged in three sections, each designed to facilitate a different search logic. First is an aliphabetical listing of compounds. The second list is organized by molecular weight. The following appendix lists compounds by the intensity of their base peak and second-most-intense peak.

The alphabetical section assists the user in comparing spectra of presumed known compounds with literature data and in checking the spectra of "unknowns" against suspected compounds. The molecular weights section is especially helpful for identifying unknown compounds which generate a significant intensity of molecular ions. The indexing of the two-most-intense peaks provides a higher rate of successful search.

We find several concerns with this book. The editors never specify the criteria used in defining "compounds of forensic interest". Next, we recognize the value of indexing the two most intense peaks in that variations in instrument design and/or operating conditions frequently cause a reverse in the order of intensity of these two peaks. However, it might be useful to reconsider the indexing of the second-most-intense peaks whose intensities fall below a certain level, e.g., 70%, relative to the base peak. This volume could have further assisted users by indicating the lowest cutoff mass when each spectrum was obtained. Also, the constant updating and insertion required by forensic users of these data would have been facilitated by a loose-leaf, rather than hard-bound, format.

On the positive side, it is a great pleasure to witness the increasing availability of spectra and other physical data of "compounds of forensic interest" in the literature. This volume compliments recent editions of mass spectral data in this category such as the "CRC Handbook of Mass Spectra of Drugs" (I. Sunshine, Ed., The Chemical Rubber Co., 1981) and "Instrumental Data for Drug Analysis" (Volume 1: T. Mills, W. N. Price, P. T. Price, and J. C. Roberson; Volume 2: T. Mills, W. M. Price, and J. C. Roberson, Eds., Elsevier, 1982).

The compilation of these data is undoubtedly helpful; we strongly recommend that every laboratory equipped with mass spectrometer facilities and with interest in forensic science problems acquire a copy of this volume.

Ray H. Liu and F. P. Smith, *University of Alabama at Birmingham*

Principles of Soil Chemistry (Books in Soils and the Environment). By Kim H. Tan (University of Georgia). Marcel Dekker, Inc.: New York. 1982. xii + 267 pp. $34.50.

This book is comprised of ten chapters entitled respectively Review of basic chemical principles; Electrochemical cells and chemical potentials; Soil solution; Colloidal chemistry of soil constituents; Adsorption in soils; Cation exchange; Anion exchange; Soil Reaction; Soil chemistry and soil formation; and, Chemistry of soil-organic matter interactions. Chapter 4, on colloidal chemistry, occupies one-half of the text. The book is intended to be an introduction to soil chemistry by presenting "the adaptation of pure chemical science to the scientific study of soils and plants" and "by bridging pure chemistry and soil science". The objective is a worthy one, but unfortunately, the book falls far short of its goal. Inconsistencies are encountered from the preface to the final chapter. For example, it is stated in the Preface that "Separate chapters are included on the use of x-ray diffraction, infrared analysis, differential thermal analysis..." While these topics are discussed in the text, they are not the subject of separate chapters, nor are they even listed in the Table of Contents.

The book is replete with spelling errors (e.g., emperical, pp xi and 165; molecular complexicity, p 43; polysterene, p 70; comparitively, p 152), misplaced words (e.g., energy for electrons, p 2; chlorine for chloride, p 33; concepts for constants, p 225), and the use of incorrect terminology (e.g., rate of light absorption, p 57; duplet and triplet in IR spectra, p 133; rate of stability, p 152).

The book begins with a discussion of elementary chemical principles and progresses to some rather advanced topics. However, throughout the text the author periodically reverts to very elementary discussions, thereby providing an uneven level of sophistication in the presentation. There is an excess of repetition throughout the book. The organization of the book is not pedagogically helpful. For instance, some theoretical background on IR spectroscopy is presented on pages 126–129, long after extensive discussions on the application of IR spectroscopy on pages 60–64.

One might be able to overlook the above shortcomings if it were not for the fact that the book abounds with technical errors. Selected examples of errors are the following: the discussion of assignment of atomic masses, p 3; "electrolysis" is equated with "the continuous separation of cations and anions", p 12; "an emf is applied" to drive a Galvanic cell, p 13; concentration and quantity (moles) are confused, pp 17 and 38; "only one in 10^7 molecules of water is dissociated at any one time", p 30; a half-reaction is confused with a reaction, p 34; "nucleic acids first isolated in 1969", p 47; glycerol is equated with a neutral lipid, p 47; "Humic acid spectra have in addition no absorption bands at 1000 cm^{-1}" (p 61) contrary to what is illustrated in the IR spectrum of humic acid in Figure 4.6; the assignments of pk_a = 11.2 (Figure 4.9a) and pk_a = 10.8 (Figure 4.9b) for humic substances are not justified; intercalation and solvation are equated, p 160; there is an inconsistency between eq 6.4 and 6.5; there are serious errors relating to the Nernst equation, p 210; and stability constant is incorrectly defined, p 218.

In addition to the above, almost every page contains unconventional grammatical construction. There are numerous statements throughout the text which have defied the reviewer to comprehend and/or appreciate, such as: "The largest atom is the uranium atom...", p 2; "In clusters, the free energy of water is lower than in 'free' water meaning that they are less free to move", p 22; "The average ionic strength for water in rocks is about 0.100...", p 40; "Phenolic-OH groups are OH attached to phenol groups", p 56; "...difficulties also arise from the fact that NMR analysis makes use of radio waves, which are known to have the lowest-energy form of electromagnetic radiation. The level of energy involved is too small to vibrate, rotate, or exite (sic) the poorly defined complex polymers of humic acid molecules", p 66; "...Tan and McCreery (1975) noted that the degree of polymerization or the size of the molecules isolated affected molecular weight", p 75; "The results of infrared analysis, as reflected by absorption curves, are using frequencies as the main units", p 128; "Depending on the stability of the complexes, they can be soluble or insoluble in water", p 218; "They found that the stability of the complex compound is high if the value of log K is large", p 219. In soil science the therm *organic matter* is reserved for natural organic materials; unfortunately, in this book, this term is also used to refer to discrete organic compounds such as pesticides, p 157.

Whatever advantages this book may have are overshadowed by its deficiencies. The students' efforts should be directed to comprehending correct material and not devoted to remedying author's errors. This book can only confuse the student and baffle the experienced reader and is, of course, not recommended.

Patrick MacCarthy, *Colorado School of Mines*

Epithelial Ions and Transport-Application of Biophysical Techniques. By Mortimer M. Civan (University of Pennsylvania School of Medicine). John Wiley and Sons Publishers: New York. 1983. IV + 204 pp. $59.95.

Physical chemistry for historical reasons has provided the dominant influence in shaping approaches for the study of ion transport across biological membranes. Consequently, the equations of mass action and ionic balance have been the language of most investigations of ion flow in biological tissues with less attention paid to the actual cell biology. In many electrical transport measurements, it has seemed that the biological system has been distorted to provide an appropriate target for the particular physical probe. The idea that the frog skin or toad urinary bladder was not a black-box of circuits but a complex mixture of cell types and intercellular compartments was avoided or ignored. The recent advances of cell biology in elucidating the complexity of cellular organization and its role in coordinating cell function have for the most part not been particularly well integrated into physiological studies of transport. It was a pleasure, therefore, to see that the first chapter of Dr. Civan's book provides a comprehensive review of morphological and biochemical investigations of a major tissue of biological transport investigations, the toad urinary bladder. By introducing the structure of the cells comprising the bladder tissue, the subsequent chapter discussing transepithelial electrical measurements can be put into a more physiological context and a more precise view is obtained regarding the limi-

*Unsigned book reviews are by the Book Review Editor.

tations of such approaches. Having stressed the importance of understanding and maintaining the organization of cellular compartments, cell sidedness, and cell coupling of the biological system during transport investigations, the next series of chapters provide a clear and concise explanation of non-invasive techniques such as NMR and Electron Probe X-Ray Microanalysis (EPMA) to measure Na, K, and other ion concentrations in tissues, cells, and of particular relevance sub-cellular compartments. The limitations of such technology are clearly defined, but one cannot but be amazed at a cited EPMA resolution of 0.02–0.03 μM in ultrathin sections for determining a topologically specific ion concentration. These techniques are all compared to each other and to more invasive methods of ion-selective probes. This results in a well-balanced presentation of the capabilities of each method. The final chapter presents a computer model of Na^+ transport across frog skin and toad bladder and further emphasizes the notion that mathematical models are still primitive in describing the multicomponent mechanism of ion transport, but none the less provide a useful means to exercise data and uncover hidden correlations. Although the book could have benefited with a chapter on recent advances in tissue culture models of kidney, particularly ionic and water transport in MDCK cells, it is clear and well written and could serve as a text for a graduate level topics course on ion transport in membranes.

Melvin Schindler, *Michigan State University*

Two-Dimensional Nuclear Magnetic Resonance in Liquids. By Ad Bax. Delft University Press, D. Reidel Publishing Company: Dordrecht, Holland. 1982. 200 pp. $70.00.

The special power that two-dimensional NMR techniques bring to problems of molecular structure determination lies in the fact that the two-dimensional technique gathers and processes, quickly and elegantly in a single procedure information that is otherwise obtained from a cumbersome sequence of one-dimensional experiments. For example, a single 2-D chemical shift correlation spectrum displays couplings which must otherwise be inferred from a more or less extensive array of conventional 1-D double resonance experiments. Moreover, the two-dimensional organization of spectra neatly separates the different kinds of spectral information obtained. In COSY spectra, the traditional 1-D spectrum lies along the diagonal of a two-dimensional map, and off-diagonal peaks link those resonances which display resolvable scalar couplings. NOESY spectra are similar, except cross-peaks reflect through-space dipolar couplings. 2-D sequences are known which accomplish complete homonuclear decoupling within proton spectra—a most useful feat for which no 1-D analogue exists. It is also possible to plot chemical shift information along one axis and spin–spin multiplets, without chemical shifts, along the other (J-spectroscopy). Other forms of 2-D techniques permit indirect detection of multiple and zero quantum transitions, which are entirely unobservable in conventional 1-D pulsed-FT NMR spectroscopy.

Dr. Bax has prepared an excellent monograph covering theoretical and experimental aspects of 2-D NMR. Chapter 1 develops a general theoretical description of the 2-D NMR experiment, and Chapters 2 and 3 describe the two most widely used variants, correlation spectroscopy (COSY) and J-spectroscopy. Chapters 4 and 5 depart for less-well-traveled ground, dealing with the detection of multiple quantum coherence. Multiple and zero quantum transitions are entirely absent in spectra obtained by traditional Fourier transform methods, and the phenomena therefore tend to be abstruse to many experienced NMR practitioners. In these chapters, Dr. Bax has leavened the text with useful physical and experimental insights which should be appreciated by many. Chapter 5 displays a similar flavor in its treatment of a recently developed method, INADEQUATE, in which double quantum spectra are used to detect (C-13)–(C-13) satellite peaks with simultaneous suppression of the parent single-quantum resonances. Carbon–carbon couplings provide a very powerful approach to molecular structure determination, at least when gram quantitites of compound are available, but the measurement of these couplings has been very difficult due to the unfavorable ratio (200:1) of parent-to-satellite peaks. This monograph is timely and substantial, both for its treatment of standard 2-D methodologies and for its discussion of less familiar topics.

Robert R. Sharp, *The University of Michigan*

Kirk-Othmer Encyclopedia of Chemical Technology. Third Edition. Index and Supplement Volume. Edited by M. Grayson and D. Eckroth. John Wiley and Sons: New York. 1984. Index: vi + 1274 pp. $185.00. Supplement: xxviii + 924 pp. $150.00.

The reviewer of the "final" volume of this massive work mused about what the editors would do with themselves now that they had completed their vast task. There was no more need to wonder about that than about what the painting crew does after having come to the end of painting Mackinac Bridge: back to the beginning! In the present case, this means picking up subjects that were originally omitted and describing subjects that "in recent years have undergone changes of a fundamental character". The result is 39 articles, ranging from Alcohol Fuels to Toxicologyl Understandably; most of the topics are from the applied side, although three predominantly fundamental topics—Antibiotics and β-lactams, Guanadine and guanadine salts, and Prostaglandins—are included. The treatment is exactly the same as in the main work: authoritative reviews concerning scientific background and applications, written for the educated nonspecialist, with bibiographies of leading references.

The index volume requires little comment, but that fact disguises its usefulness and importance. Helpfully, it begins with a comprehensive table of contents of the entire work, and the Supplement Volume is included in both this and the index proper. An accompanying announcement offers the Kirk-Othmer database online for computer searching.

Exotic Atoms. A Bibliography. 1939–1982. By Dezsö Horvath and Richard M. Lambrecht. Elsevier Science Publishers: Amsterdam and New York. 1984. viii + 628 pp. $132.75.

The subject of this work is defined as "atoms in which one or more of the electrons or the nucleus is replaced by another appropriately charged particle"; the scope is restricted to those with just a replaced electron and to muonium (positive muon plus an electron). These species are useful as nuclear probes of wide application. The subject is reviewed in the first 33 pages, after which comes the bibliography itself, arranged chromologically, with the full title of each citation. Access to desired references is provided by author and subject indexes. This appears to be the only comprehensive compliation of reference material on this far from mundane subject.

Structure–Property Relationships of Polymeric Solids. Polymer Science and Technology. Volume 22. Edited by Anne Hiltner (Case Western Reserve University). Plenum Publishing Company: New York. 1983. viii + 270 pp. $42.50.

This book is a collection of 17 research papers presented at the 55th American Chemical Society meeting in Atlanta, Georgia, in honor of the Borden award recipient, Professor Eric Baer, in 1981. All of the contributors are current or former colleagues and students of Professor Baer. For many years Professor Baer has attempted to find the functional relationship between solid-state structure of polymers and their mechanical properties. All the papers, although they cover many divergent topics, are oriented toward that goal.

The three papers by Professor Baer himself and his co-workers are all on craze, e.g., craze growth, craze distribution, craze extension, and crack-craze zone. Two papers are on gelation, e.g., thermoreversible gelation of crystallizable polymers, and four on single crystals, e.g., conformational characterization of the single-crystal surface. The remainder are on the transition from one solid state (e.g., crystalline) to another (e.g., amorphous) and the techniques used in the study of transition. There is, of course, some overlap in the selection of subject matter.

One of the interesting and important features of this book is the detailed description of techniques involved in the polymeric solids research. Examples are as follows: halogenation in the amorphous region without destruction of the crystalline core; cross-polymerization with UV, X-rays, and γ irradiation; control of the crystallization process; crystal transformation resulting in piezoelectricity and ferroelectric polarization; crystal nucleation in flowing polymer melts; flow-induced crystallization and orientation from the melt. Also described are profusion of crazes in high-impact polymer to induce properties associated with crystalline polymers; staining with ruthenium and osmium tetroxide for transmission electron microscope studies of polymer morphology; the time–temperature–transformation state diagram; network development in films cast from emulsion; strength prediction for short-fiber reinforced plastics; and thermally stimulated current of solid pullulan.

Approximately 12 polymers were covered in the 17 papers, ranging from polystyrene which is hard to crystallize to polyethylene and polypropylene which are easy to crystallize. The major instrumentation employed were the following: viscoelastic measurement apparatus (stress–strain relationship), X-ray diffraction, electron microscope, spectroscopy, and extruder. Nuclear magnetic resonance, however, was not mentioned.

Since all 17 papers consist mainly of research results, the book fails to provide any review on the subjects covered with the exception of the paper on gelation by Keller. Consequently, the book resembles a special issue on the solid-state polymers by a reputable journal such as the Journal of Polymer Science. This statement is not intended as a criticism, especially since most of the contributors present experimental data that stress basic principles and discuss the results in relation to theory. Even for readers who are not engaged in any work of this sort, the book could

have some practical value.

Regretfully, the preface is far too short, only one paragraph. More coherence would have been added for the readers if two or three pages were given to describe Professor Baer's work in a systematic way. But this is only a minor fault and does not affect the value of the book. The format of the book is not of the print-type set. Instead, it contains photocopies of the originally submitted manuscripts, presumably to save costs. The size of letters and the arrangement of contents are uniform, thereby eliminating any distraction from readers.

Overall, this is a good book. It serves as a convenient single-volume source of solid-state polymer properties and is a worthy addition to a polymer scientist's library.

S. F. Sun, *St. John's University*

Principles of Nuclear Magnetism. By A. Abragam (College de France). The Clarendon Press, Oxford University Press: New York. 1983. xvi + 599 pp. $29.50.

This is the bible of NMR, or at least the old testament. All serious students of the subject find it indispensable, and it is now out in paperback at an affordable price.

Chemists should be aware of two circumstances: (1) The book is a reprint (not a new edition) of the hardcover issue of 1961. (2) It was written by a physicist with physicists' interests in mind. For these reasons there is no mention of the interpretation of spectra in terms of structure, Fourier and other fancy signal-processing methods, two-dimensional spectroscopy, cutely named pulse sequences, etc. Also the emphasis is very much on fundamental principles rather than applications.

Nevertheless, the basic facts and theory are laid out elegantly and definitively and are not outdated. As Professor Abragam says in his latest prepatory remarks, "...although not *all* of Nuclear Magnetism is in there, whatever is, is both important and *not wrong*." A reader who learns it will have no trouble in appreciating the more recent decorations of the subject. In fact many of these (again with a physicist's emphasis) have been taken up in a series of other books from the author's group in Saclay: M. Goldman, "Spin Temperature and Nuclear Magnetic Resonance in Solids" (Oxford, 1970), J. Winter, "Magnetic Resonance in Metals" (Oxford, 1971), and A. Abragam and M. Goldman, "Nuclear Magnetism: Order and Disorder" (Oxford, 1982).

Several typographical errors have magically survived five iterations of "reprinted with corrections", but they are trivial. Every practitioner of magnetic resonance should have this book on his shelf and, preferably, read it.

John S. Waugh, *Massachusetts Institute of Technology*

Treatise on Analytical Chemistry. Part I. Second Edition. Volume 12. Section J. Thermal Methods. Edited by Philip J. Elving (University of Michigan). Associate Editor: C. B. Murphy (Xerox Corporation). Editor Emeritus: I. M. Kolthoff (University of Minnesota). John Wiley and Sons (Interscience), Publishers: New York. 1983. xxvii + 603 pp. $75.00.

This volume is a "mixed bag" of nine chapters. Some contain didactic summaries of important fundamentals, such as the remarkably concise write-up by D. D. Wagman on Elements of Chemical Thermodynamics. Others are devoted to relatively narrow topics, as, for instance, an extensive discussion of constant-temperature baths by L. D. Hansen and R. M. Hart. The remaining chapters cover the following subjects: nomenclature of thermal analysis, principles of thermometry, calorimetry, evolved gas analysis, thermodilatometry, electrothermal analysis, and thermoacoustimetry. Some of these are reviews of the state of the art of highly specialized analytical techniques. As such, they represent an excellent introductory reference for a novice. However, all 12 authors who have contributed to this volume are recognized authorities in their fields and have provided extensive bibliographies. Consequently, the book will also be a valuable source of information to experienced chemists who are already active in relevant areas of thermal analysis.

Generally, this volume has the advantage inherent in the diversified expertise provided by multiple authorships. The trade-off is lack of coherence between the discrete contributions of various authors and unevenness in quality. Emphasis ranges from pedantically belabored rules of terminology to some very basic concepts of physical chemistry, on the one hand, to experimental details appropriate for a technician's laboratory manual, on the other hand. Individual chapters are likely to appeal to different specific "audiences", rather than reflect a unified and balanced approach to the theory and practice of thermal analysis.

This book is the last of those volumes of Kolthoff's monumental Treatise which was edited by the recently deceased P. J. Elving. This reviewer hopes that the work will be continued under the leadership of an equally dedicated new editor. Indeed, the Kolthoff–Elving Treatise has become the "bible" of modern analytical chemistry. The continuation of its tradition of excellence is of vital interest to analytical chemists worldwide.

Joseph Jordan, *The Pennsylvania State University*

Ultrasensitive Laser Spectroscopy. Edited by D. S. Kliger (University of California—Santa Cruz). Academic Press: New York. 1983. x + 440 pp. $55.00.

"Ultrasensitive Laser Spectroscopy" describes several modern techniques which are currently in various stages of maturity: photoacoustic, one- and two-photon excitation, thermal lensing, multiphoton ionization, optical-phase-shift, intracavity, and analytical laser spectroscopies. Some of the chapters provide comprehensive experimental details as well as extensive examples and applications, while others emphasize theoretical aspects; all are good, and several are excellent. The monograph will appeal to a wide audience of academic and industrial chemists and to many physicists and engineers. As the title suggests, the book addresses methods for detecting species with weak spectroscopic transitions or those present in very low concentration. (The emphasis is not on high resolution or detection of transient species.) Most chapters are pragmatic, with discussion of advantages and disadvantages of the subject technique. They point to potential future applications, rather than simply providing retrospective review. The discussions of one-photon and two-photon excitation spectroscopy by Birge and of analytical applications of laser absorption and emission spectroscopy by Harris and Lytle are particularly outstanding.

The editor is to be commended for assembling an interesting selection of forefront laser methods, well described in each case by leading researchers in the area. Despite the continuing changes in laser and detector technology, "Ultrasensitive Laser Spectroscopy" will not soon be out of date.

George E. Leroi, *Michigan State University*

The Analysis of Gases by Chromatography. By C. J. Cowper and A. J. DeRose (British Gas Corporation, London Research Station). Pergamon Press: Oxford and New York. 1983. 146 + xii pp. $25.00.

This book is concerned with a special facet of gas chromatography, i.e., The Analysis Of Gases By Chromatography as opposed to the more conventional Analysis Of Liquids By Gas Chromatography. It is composed of nine chapters, the first of which, entitled Introduction, covers the history and theory of gas chromatography and particulary highlights the problems involved in the analysis of gases, such as the effects of nonideal gases and the fact that the relative retention times can be changed by the carrier gas. The problem also effects standards used for calibration since the true volume of the sample is altered by the non-ideal behavior of gases in mixtures.

The second chapter concerns the equipment used, paying particular attention to gas-sample-inlet systems, including sampling valves, which are observed to be more reproducible than other techniques. It also pays attention to detectors used and their special application to the analysis of gases.

Chapter three is concerned with the separation in the columns and pays particular attention to silica gel columns, zeolites, molecular sieve, and porous silicon columns. Attention is also paid to carbon molecular sieve, dusted columns, polymers, the "century" series, and the "porapak" series.

Chapter four is devoted to the carrier gas. It notes that the relationship between theoretical plate height and gas velocity varies from one carrier gas to another. It also affects the response by different detectors.

Chapter five concerns tactics used for the analysis of specific kinds of samples. In particular, mixtures, such as air, CO_2, and water, which is the mixture commonly analyzed, are discussed in some depth. Isothermal analysis is discussed, as is the use of two consecutive columns and two parallel columns which can be used for the simultaneous analysis of light gases and heavy gases without resorting to program temperature.

Chapter six discusses the use of backflush and the analysis of natural gases and associated gases, refinery gases, liquid petroleum, nitrogen compounds, halogen compounds, and isotopes such as $^{13}CH_4$ and $^{12}CH_4$.

Chapter seven is devoted to the analysis of gases in liquids. These include gases liquified by pressure, gases liquified by low temperature, and gases which are simply in solution.

Chapter eight is concerned with quantification and the preparation of standard solutions for calibration purposes. The related Chapter 9 is a short chapter on the preparation of standard mixtures.

There is a useful appendix which discusses sampling of gases. This is often overlooked in analytical textbooks but is a most important step, because no matter how good the analysis is, if the sample is poor the analysis is poor. Finally, there is a section devoted to recommended standard methods for different types of samples.

The book is very well put together and would be of great value to anyone running a routine lab concerned with the analysis of gases such as natural gas, coal gas, and many which are generated under industrial

conditions. It points out quite convincingly why there are a number of caveats in simply applying gas chromatography to the analysis of gases by chromatography. The book is well presented and written in a manner to communicate to the reader rather than dazzle him. The section on recommended procedures is particularly valuable.

It was not clear why program temperature GC was not used instead of a complicated system of backflushing which was abandoned in conventional liquid gas chromatography many years ago. Perhaps there are some unclear reasons for doing this, but it was not apparent in the appropriate chapter.

All considered, this book is to be recommended for any routine laboratory involved in the analysis of gases. It is particularly useful for pointing out the problems to be encountered and understood when setting up new reliable analytical procedures.

J. W. Robinson, *Louisiana State University*

Specialist Periodical Reports. Nuclear Magnetic Resonance. Volume 12. Edited by G. A. Webb (University of Surrey). The Royal Society of Chemistry: London. 1983. xxxviii + 338 pp. £68.00.

Volume 12 of this series follows a familiar format: a listing of books and reviews, 10 annual reports covering the literature for 1981–1982, and 2 biennial reports for the period 1980–1982.

The listing of books and reviews seems comprehensive, comprising 281 items, including a review published in Turkish. The annual and biennial reports vary in completeness of coverage; those dealing with topics where each year brings thousands of routine references, e.g., chemical shifts and coupling constants, limit the references to those considered particularly novel, while the newer topics, e.g., "the solid state" and the report dealing with 2-D techniques, seem much more comprehensive.

The annual reports are Theoretical and Physical Aspects of Nuclear Shielding (C. J. Jameson), Applications of Nuclear Shielding (G. E. Hawkes), Theoretical Aspects of Nuclear Spin–Spin Couplings (J. Kowalewski), Applications of Spin–Spin Couplings (D. F. Ewing), Nuclear Spin Relaxation in Fluids (A. Kratochwill), Solid State N.M.R. (G. R. Hays), Multiple Resonance (W. McFarlane and D. S. Rycroft), Natural Macromolecules (D. B. Davies), Synthetic Macromolecules (J. R. Ebdon), and Conformational Analysis (F. G. Riddell). The biennial reviews are no longer than the 1-year reviews, indicating the relative smaller number of new research papers in these areas: N.M.R. of Paramagnetic Species (K. G. Orrell) and N.M.R. of Liquid Crystals and Micellar Solutions (O. Soderman, B. Lindman, and P. Stilbs).

This series has established a tradition of skilled writing, a tradition which is maintained here. The personalities of the authors shine clearly through the reviews, with a range from detached elegance to breathless enthusiasm.

"Specialist Periodical Reports" provide a yearly overview of the NMR field, arriving in North America at a time when most of the journals quoted are available in University libraries. For the literature of one's precise area of specialization within the field, the Reports are no substitute for a computer search of the literature; however, they are a fine starting place for anyone considering a project in a different NMR area, where a general computer search might yield an intimidating number of references. The annual or biennial report will provide an expert guide to the reasonably recent literature and earlier volumes can provide a similar guide to the literature as far back as 1970.

Donald L. Hooper, *Dalhousie University*

Textbook of Polymer Science. Third Edition. By F. W. Billmeyer, Jr. (Rensselaer Polytechnic Institute). Wiley-Interscience: New York. 1984. xviii + 578 pp. $34.95.

The third edition of Professor Billmeyer's book on polymer science continues the tradition set by its predecessors in providing a clear presentation of many concepts critical to an understanding of the synthesis and application of polymers. In a marked departure from the first two editions, as well as other noteworthy texts, the synthesis of polymers is presented at the outset of the book; this is a step which greatly enhances the value of a textbook to be used in undergraduate or graduate courses where the students are being exposed to polymer chemistry for the first time.

After a short introductory chapter (Part I), Part II deals with the various aspects of polymer synthesis in five chapters, including a chapter on polymerization systems (bulk, suspension, etc.). Part III discusses the characterization of polymers (polymer solutions, molecular weight, and analytical techniques); Part IV presents polymer morphology, rheology, and characteristic properties such as the glass transition temperature. The remaining two parts of the book provide a valuable perspective of the polymer industry with an exposition of commercial polymers (Part V) and the processing of plastics, fibers, and elastomers (Part VI).

This edition would be valuable if it were only an updated version of the second edition; actually, it is an update with significant portions rewritten. The update can be seen from the fact that of the nearly 1200 references found in the book, 47% are post-1970. Another example can be seen in the chapter on hydrocarbon plastics and elastomers (Chapter 13) where reference is made to LLD polyethylene and economic data given to 1982; additionally, almost 85% of the references to the processing of plastics (Chapter 17) are to work carried out after 1976. A cursory examination of the subject index shows the inclusion of new concepts (Aramid fibers, Kevlar, polymer blends) and expanded treatment of other concepts (degradation, dyeing, extrusion) relative to the previous edition. Among the more significant allusions to new work is reference to de Gennes reptation model.

The value of this book as a classroom text is enhanced by the presence of problems at the end of each chapter (an average of ten per chapter). Also to its credit is the reintroduction of an appendix to trade names (found only in the first edition) listing the probable composition of 150 industrial products with their manufacturer. It is unfortunate, though, from the pedagogic viewpoint, that the error of using equilibrium arrows when the double-headed arrow implying resonance is intended (p 115) is maintained in all three editions.

In closing, Professor Billmeyer's current book can be highly recommended as a superb introductory text into polymer science. It provides a more detailed treatment than does, say, Seymour and Carraher's recent introductory text and so gives the instructor an alternative if a more in-depth approach is desired. An understanding of "Textbook of Polymer Science" then allows one to more fully appreciate the finer points in the treatment of kinetics offered by Odian, in the presentation of synthetic chemistry offered by Lenz, and in the engineering aspects offered by Rodriguez, each of which can be used to build an advanced course.

Spiro D. Alexandratos, *University of Tennessee (Knoxville)*

Optical Remote Sensing of Air Pollution. By P. Camagni and S. Sandroni (Joint Research Centre, Ispra, Italy). Elsevier Publishers: Amsterdam and New York. 1984. ix + 422 pp. $100.00.

This book is a compendium of lectures delivered in March 1983, apparently in an attempt to educate an ill-defined European audience. As in many multiauthored volumes, the articles are inconsistent in style and content. It is particularly sad that, apart from the COSPEC, very few results are described.

If the German long-path UV results and the French Sodium Lidar data had been included, at least the work would have been reasonably up to date. As it is, some lectures were clearly rewritten directly from the verbal score. Others were rewritten in essay format (or were very dull to listen to).

It is difficult to recommend this book to any segment of the scientific literary population. It is insufficiently consistent and up to date to be a reference work, and not careful enough with its introductory material to be a useful tutorial textbook.

Donald H. Stedman, *University of Denver*

Electron and Ion Microscopy and Microanalysis. By L. E. Murr (Oregon Graduate Center). Marcel Dekker, Inc.: New York and Basel. 1982. xiv + 793 pp. $65.00.

This volume covers a very broad range of topics, including the physics, optics, imaging, and analysis of electrons and ions. The author states in his preface that this is a textbook that should appeal to seniors and graduate students, as well as practicing professionals in many fields related to materials science and chemistry.

As with the author's earlier book, "Electron Optical Applications in Materials Science" (McGraw-Hill, 1970), the range of topics and the clarity of most of the figures in this book is very good. Topics include scanning electron microscopy, transmission electron microscopy, low- and high-energy electron diffraction, electron and ion probe microanalysis, several types of electron spectroscopy, analytical electron microscopy, and atom-probe field-ion mass spectroscopy. The first three chapters on the physics and optics of electrons and ions should be particularly helpful to beginning students. The chapters on transmission electron microscopy are the best written in the book and contain many useful figures. The appendix contains much useful information including a computer program for plotting electron diffraction patterns and a set of solutions to the 130 problems given throughout the book.

Unfortunately, many chapters of the present volume are little more than a retyping of sections from the earlier book with new material related to ions and to analytical electron microscopy included as additional sections. The most disconcerting chapter is Chapter 4, on electron and ion probe microanalysis. The discussion of the various correction factors in quantitative electron microprobe X-ray analysis is very weak. In fact, this topic appears in two parts of the chapter on either side of a section on electron spectroscopy. The recently added sections are not error free. For example, on p 155 in the discussion of energy dispersive X-ray spectroscopy, the author states that X-rays "enter a thin wafer of

pure silicon doped with lithium (to induce extrinsic semiconduction)". In reality, lithium compensates p-type silicon to produce an intrinsic region for photon detection.

In summary, this book discusses a very broad range of electron and ion techniques with many useful illustrations. However, the mating of chapters from the author's 1970 book with his new material appears somewhat awkward.

Charles E. Lyman, *E. I. du Pont de Nemours & Co.*

Topics in Stereochemistry. Volume 15. Edited by E. L. Eliel (University of North Carolina), S. H. Wilen (City College, N.Y.), and N. L. Allinger (University of Georgia). John Wiley & Sons: New York. 1984. xii + 377 pp. $89.95.

Volume 15, which is dedicated to the memory of San-Ichiro Mizushima, consists of four chapters: Walk Rearrangements in [*n*.1.0]Bicyclic Compounds by F. G. Klärner of Ruhr-Universität Bochum; Stereochemistry at Silicon by R. J. P. Corriu, C. Guérin, and J. J. E. Moreau of CNRS Université des Sciences et Techniques du Languedoc; The Synthesis and Stereochemistry of Chiral Organic Molecules with High Symmetry by M. Nakazaki of Osaka University; and Stereochemistry of Biological Reactions at Proprochiral Centers by H. G. Floss of Purdue University, M.-D. Tsai of The Ohio State University, and R. W. Woodward of the University of Michigan.

Walk rearrangements on [*n*.1.0]bicycles are defined as reactions in which a divalent group X (which is part of a 3-membered ring) undergoes migration along the surface of a cyclic π system. Although a more general review by R. F. Childs of migrations of mono-, di-, tri-, and tetravalent groups under the title of "circumambulatory rearrangements" appeared in 1982, the present review is a more detailed review of the divalent cases and examines mechanistic and theoretical aspects of specific examples. These are divided according to whether they are neutral (n = 2, 4, 6) or ionic (n = 1, 3, 5). The review of 42 pages has 129 references including some published in 1983.

The Chapter on stereochemistry at silicon is a very thorough review of this topic by a group very active in this area. However, since two of the authors (C and G) have written recent reviews (1980 and 1982) on stereochemistry and mechanisms of nucleophilic displacement at silicon, the need for another review so soon must be questioned, particularly when only two 1983 references are listed, and these by the same research group. However, sections on reactions with transition metals and hypervalent intermediate silicon species have been treated more thoroughly than in the previous reviews. (Incidentally, the journal name is omitted from one of the references, no. 348; it would appear to be *J. Organomet. Chem.* from the volume number.) The chapter contains 359 references in 159 pages. In the chapter on molecules with high symmetry by Nakazaki, the term "high-symmetry chiral" is proposed to define "chiral but not asymmetric" because of the misuse of the word "dissymmetry". The chapter is divided into 11 sections, mainly on the basis of types of high-symmetry chiral molecules or systems. There are 199 references in 53 pages of text. References are mainly to 1981, with the exception of four in 1982, including three to ones by the author's own group.

The chapter on biological reactions at proprochiral centers is divided into four sections: Introduction, Chiral Methyl Groups, Chiral Malonate, and Chiral Phosphate. The term "prochiral", coined in 1966 by K. R. Hanson, originated from the fact that one substitution step was required to transform a prochiral center x_{aabc} into a chiral center x_{abcd}. The systems X_{aaab} and x_{aabb}, which are one substitution step removed from a prochiral center and two substitution steps removed from a chiral center, are called proprochiral centers. These systems are important in mechanisms of biological reactions. The review is 69 pages and contains 175 references with numerous ones into 1982.

In general the volume is comparable to the ones preceding it; it can be recommended for libraries (or prosperous stereochemists) in view of the price.

A. G. Pinkus, *Baylor University*

Advances in Nuclear Quadrupole Resonance. Volume 5. Edited by J. A. S. Smith (Queen Elizabeth College, University of London). Wiley Heyden Ltd.: New York. 1983. xi + 182 pp. $99.95.

Nuclear quadrupole resonance (NQR) encompasses a broad range of techniques and can be used to probe questions of chemical bonding and dynamics. In this fifth volume of a series of advances, three articles are dedicated to experimental techniques; the effects of vibrations and isotopic substitutions are covered in the fourth article.

In NQR the condition of the sample can influence the choice of experimental method. Or alternatively, a wide range of NQR techniques are available to the spectroscopist to handle any conceivable problem. *Gas phase*: The impact of recent advances in microwave spectroscopy on NQR is discussed by J. Sheridan. Sensitivity has improved such that applications to van der Waals complexes is presently feasible and highly successful; 41 measurements are tabulated. Zero-point effects on the quadruple coupling constants in ArHBr/ArDBr are clearly apparent, as are the changes in the magnitude of Sternheimer shielding for noble gas atoms forming van der Waals complexes. The data treatment for determining nitrogen-14 efg parameters in small heterocyclic molecules is also discussed. *Liquid phase*: Isotropic solutions or liquid crystal phases may be used in NMR spectroscopy to determine relaxation times of quadrupolar nuclei, and thus the NQR parameters. Seven tables of deuterium and nitrogen-14 data are included in the highly useful article by A. Loewenstein. *Solid phase*: The potential for high-resolution spectroscopy exists; two-frequency methods, supplemented with the sensitivity enhancement of adiabatic demagnetization, have been shown by V. S. Grechishkin, V. P. Anferov, and N. Ja Sinjavsky to yield highly resolved nitrogen-14 spectra in several systems. This article is a significant extension of an article on the subject of two-frequency methods by two of the authors published in the fourth volume of the series. Given the NQR results in three phases, we may wonder about vibrational effects. While the data necessary to establish clear phase dependencies are limited, in the article by E. A. C. Lucken, the general aspects of vibrational and isotopic effects are covered in detail.

In summary, I find this book to be a useful and quite helpful, though rather expensive, addition to the series.

Les G. Butler, *Louisiana State University*

Small Bore Liquid Chromatography Columns: Their Properties and Uses. Edited by R. P. W. Scott (Perkin-Elmer Corporation). John Wiley & Sons: New York. 1984. xiii + 271 pp. $48.50. ISBN 0471-80052-X.

With the current interest in the minaturization of scientific instrumentation, this book is a welcome addition to the chromatographic literature. High-performance liquid chromatography (HPLC) continues to be the fastest growing instrumental technique in chromatography, and while a number of good books are available on conventional HPLC, this is the first book entirely devoted to the use of small-bore columns.

This book is comprised of 11 chapters, each written by an expert on the subject. Although five different authors contributed chapters to the book, excellent planning, coordinating, and editing have led to a rather complete and well organized treatment of the subject with little overlap between chapters.

Chapter 1 is a brief introduction to small-bore columns and gives the advantages and disadvantages of these columns compared to regular HPLC columns. Since small columns make certain stringent demands on the injection system, detector flow cell, and connecting tubes, band-dispersion contributions from these sources and their minimization are treated in Chapter 2. Chapters 3 and 4 describe the instrumentation necessary for microbore HPLC and Chapter 5 outlines the considerations and procedures for preparing small-bore columns. Chapters 6–9 describe the application areas of small-bore HPLC in terms of high resolution, fast analysis, molecular weight measurements, and trace analysis, respectively. Chapter 10 describes the application of small-bore columns for the analysis of biological samples, while chapter 11 includes additional application areas of inorganic analysis, environmental applications, pharmaceutical analysis, and biochemistry and natural products. This reviewer found the synopsis at the end of each chapter helpful in summarizing the important points covered in each chapter.

This book is an excellent treatment of the practical aspects of small-bore HPLC. In most cases, the fundamental or theoretical supporting information for these practical considerations is also given. This book is recommended for anyone doing HPLC, and especially for those interested in or considering the use of microbore columns.

Milton L. Lee, *Brigham Young University*

The Enzymes. Third Edition. Volume 16. Edited by Paul D. Boyer (University of California, Los Angeles). Academic Press Inc.: New York. 1983. xiv + 783 pp. $79.00.

This volume covers the enzymology of lipid metabolism and includes sections that deal with fatty acids, glycerides, phospholipids, sphingolipids, glycolipids, and cholesterol, as well as a special topics section. The organization of this volume, like Volumes 14 and 15 which deal with nucleic acids, is based on metabolic function rather than the nature of the reaction catalyzed. Volume 16 is an excellent addition to one of the standard reference sources in the field.

The first section is an informative and comprehensive review of fatty acid biosynthesis and oxygen-dependent fatty acid desaturation in animals. The section on glycerides includes digestion, absorption, and biosynthesis as well as a review of the hepatic, lipoprotein, and hormone-sensitive lipases. There are excellent reviews of phospholipid synthesis in liver, the biosynthesis of glycerolipids in bacteria (with emphasis on the *E. coli* system), and the structure and mechanism of phospholipases from various bacterial, plant, and animal sources. The chapter on the biosynthesis of splingolipids in mammals is thorough. This is followed

by a chapter on various sphingolipid storage disorders and another that discusses activator proteins that are required by certain glycosidases for hydrolysis of glycosphingolipid substrates. There is also a very interesting chapter that deals with the role of dolichol as a glycose carrier during the biosynthesis of the asparagine–saccharide chains of glycoproteins. Section 6 consists of reviews of the catalytic properties and regulation of two mammaliam enzymes (HMG-CoA reductase and Acyl-CoA: cholesterol *o*-acyltransferase) involved with cholesterol and cholesterol ester biosynthesis. The last section of this volume includes chapters that deal with the biosynthesis and catabolism of eicosanoids (with emphasis on prostaglandins), the topography of membrane-bound enzymes, carnitine acyltransferase (purification and properties), the cytochrome P-450 oxygenases involved in lipid transformations, and some clinical aspects of enzyme replacement therapy.

This collection of reviews is well written and carefully edited, and the selection of authors is excellent. It has very good author and subject indexes. Each of the 20 chapters is well documented, with a total of over 3200 reference citations. In addition, the book points out some of the major difficulties encountered by researchers in the lipid enzymology area and provides the reader with sufficient background information to recognize where additional work is needed.

John L. Aull, *Auburn University*

Books on Applied Subjects

Lithium Battery Technology. Electrochemical Society Monograph Series. Edited by H. V. Venkatasetty. John Wiley and Sons, Inc.: New York. 1984. xv + 247 pp. $42.50. ISBN 0-471-09609-1.

A monograph describing the status of lithium batteries as of early 1984, divided into nine chapters on subjects ranging from solvents for lithium batteries to medical batteries. Extensive bibliographies are included.

Dry Etching for Microelectronics. Materials Processing: Theory and Practice. Volume 4. Edited by R. A. Powell. Elsevier Science Publishers: Amsterdam and New York. 1984. xiv + 298 pp. $69.25. ISBN 0444-86905-0.

Consists of critical reviews in depth on five subjects: Plasma assisted etching of aluminum and alloys; Plasma etching of regractory metals and metal silicides; Dry etching of Groups II–V compound semiconductors; Reactive beam etching, and Dry Etching for microelectronics—a bibliography.

Degradation and Stabilisation of PVC. Edited by E. D. Owen. Elsevier Applied Science Publishers: New York. 1984. viii + 320 pp. $64.75. ISBN 0-85334-265-2.

Focusses on the two major problems in PVC technology and the solutions to them: thermal instability during processing and fabrication and photochemical instability, which can limit outdoor uses. Extensive lists of references are included.

Handbook of Plastics Testing Technology. Society of Plastics Engineers Monograph. By Vishu Shah. John Wiley and Sons: New York. 1984. xv + 493 pp. $69.95. ISBN 0471-07871-9.

Intended to be "a general purpose practical test—with the main emphasis on the significance of the test or *why* and not so much on *how*".

Outlines of Paint Technology. Volume 1: Materials. Volume 2: Finished Products. W. M. Morgans. John Wiley and Sons: New York. 1984. Volume I: x + 298 pp. $49.95. IBSN 0471-80859-8. Volume 2: x + 256 pp. $49.95. ISBN 0471-80860-8.

This new edition retains the purpose of the first one, to provide an outline of the subject. It has now been divided into two volumes: Materials and Finished Products. The organic structures fall short of modern standards, for benzene rings are shown in a way indistinguishable from cyclohexanes, but otherwise there are useful reviews of solvents, resins, plasticizers, pigments, etc.

Chemical Processing of Fibers and Fabrics. Handbook of Fiber Science and Technology. Volume I, Part B, and Volume II, Part B. Edited by M. Lewin and S. B. Sello. **Volume I: Fundamentals and Preparations.** xviii + 344 pp. $79.50. **Volume II: Functional Finishes.** xx + 515 pp. $99.75.

Volume I contains contributed chapters on Warp Sizing, Bleaching of Celluloses, Fluorescent Whitening, and Wool Bleaching. Volume II contains six chapters, dealing with flame retardance, finishing for repellency, soil release, antistatic properties, and radiation processing.

BASIC Programs for Chemical Engineering Design. Chemical Industries Series. Volume 16. By J. H. Weber. Marcel Dekker: New York and Basel. 1984. viii + 184 pp. $45.00.

This is Volume 16 in the "Chemical Industries" series; it is written for use with the TRS-80 or comparable pocket computer.

Chemical Processing of Synthetic Fibers and Blends. By K. V. Datye and A. A. Vaidya. John Wiley and Sons: New York. 1984. xvi + 565 pp. $80.00. ISBN 0471-87654-2.

Contains 21 chapters on subjects ranging from structure of synthetic fibers, their coloring and dyeing, finishing and processing, to pollution.

Industrial Hygiene Aspects of Plant Operations. Bol. 2. Unit Operations and Production Fabrication. Edited by L. J. Cralley and L. V. Cralley. Associate Editor J. E. Mutchler. MacMillan Publishing Co.: New York. 1983. xiii + 537 pp. $65.00. ISBN 0-02-949360-9.

Consists of 39 contributed chapters, divided into Unit Operations and Product Fabrication.

Chemical Reactor Theory: An Introduction. Third Edition. By K. G. Denbigh and J. C. R. Turner. Cambridge University Press: New York and Cambridge. 1984. x + 253 pp. $42.50 cloth, $14.95 paper. ISBN 0521-25645-3.

A text for undergraduate students, revised from the first edition of 1965.

Chemical Reactor Design and Operation. By K. R. Westerterp, W. P. M. van Swaaij, and A. A. C. M. Beenackers. John Wiley and Sons: New York. 1984. xxxi + 767 pp. $200.00. ISBN 0471-90183-0.

This is a completely rewritten edition, the original one having appeared in 1963. Among new material are two chapters that cover yield and selectivity and additional chapters on heterogeneous reactors.

Petroleum Refining: Technology and Economics. Second Edition. By J. H. Gary and G. E. Handwerk. Marcel Dekker: New York and Basel. 1984. ix + 414 pp. $34.50. ISBN 0-8247-7150-8.

Presents "basic aspects of current petroleum refining technology and economics—for technical managers, practicing engineers, university faculty members, and graduate or senior students in chemical engineering".

Applied Industrial Catalysis. Volumes 1 and 2. Edited by Bruce E. Leach. Academic Press: Orlando and London. 1983. Vol 1: xi + 314 pp. $43.00. ISBN 0-12-440201-1. Volume 2: xi + 291 pp. $49.00. ISBN 0-12-440202-X.

These volumes contain 17 reviews of practical operations of commercial units: Industrial Catalysis: Chemistry Applied to Your Lifestyle and Environment, by the editor; Catalyst Scale-up by E. F. Saunders and E. J. Schlossmacher, Laboratory Reactors for Catalytic Studies by J. M. Berty; Catalytic Hydrotreating in Petroleum Refining by D. C. McCulloch; Catalytic Reforming of Naptha in Petroleum Refineries by M. D. Edgar; Catalysis of the Phillips Petroleum Company Polyethylene Process by J. P. Hogan; Evolution of Ziegler-Natta catalysts for Propylene Polymerization by K. B. Triplett; Ethylene Oxide Synthesis by Berty; Oxychlorination of Ethylene by J. S. Naworski and E. S. Velez; and Mthanol Carbonylation to Acetic Acid Processes by R. T. Eby and T. C. Singleton in the first volume. In Volume 2, the chapters include the following: Catalyst Design and Selection by A. W. Slight and U. Chowdhry: Uses and Properties of Select Heterogeneous and Homogeneous Catalysts by F. S. Wagner: Hydrogenations—General and Selective by A. B. Stiles; Sasol Fischer-Tropsch Processes by M. E. Dry; Methanol Synthesis by F. Marschner and F. W. Moeller; and Oxidation Catalysts for Sulfuric Acid Production by J. R. Donovan, R. D. Stolk, and M. L. Unland.