

Book Reviews

BOOKS RECEIVED

Molecular Biology, Biochemistry and Biophysics. Volume 24. Chemical Relaxation in Molecular Biology. Edited by I. PECHT and R. RIGLER. Springer-Verlag, New York. 1978. xvi + 418 pp. \$36.80.

Advances in Polymer Science. Volume 27. Failure in Polymers, Molecular and Phenomenological Aspects. By E. H. ANDREWS, P. E. REED, J. G. WILLIAMS, and C. B. BUCKNALL. Springer-Verlag, New York. 1978. vi + 153 pp. \$38.00.

Technical Report Standards. How to Prepare and Write Effective Technical Reports. By LAWRENCE R. HARVILL (University of Redlands, Redlands, Calif.) and THOMAS L. KRAFT (Texana Bio Systems, Inc.). Banner Books International, 7435 University Ave., La Mesa, Calif. 1978. 56 pp. \$395 (softcover).

Applied Numerical Modelling. Edited by C. A. BREBBIA (Southampton University). Halsted Press, John Wiley & Sons, New York. 1978. 713 pp. \$37.50.

Proceedings of the First International Symposium on Drying, McGill University, Montreal, Canada, August 3-5, 1978. Edited by A. S. MUJUMDAR. Science Press, Princeton, N.J. 1978. vi + 254 pp. \$25.00.

Wood as an Energy Resource. By DAVID A. TILLMAN, Halcyon Business Publications, Inc. Academic Press, New York. 1978. xiv + 252 pp. \$13.50.

Perspectives on Energy. Issues, Ideas, and Environmental Dilemmas. Second Edition. Edited by LON C. RUEDISILI (University of Toledo) and MORRIS W. FIREBAUGH (University of Wisconsin-Parkside). Oxford University Press, New York and Oxford. 1978. xii + 591 pp. \$15.95.

Energy Utilization and Environmental Health. Methods for Prediction and Evaluation of Impact on Human Health. Edited by RICHARD A. WADDEN (University of Illinois-Chicago). Wiley-Interscience, New York. 1978. xiv + 200 pp. \$23.95.

International Journal of Quantum Chemistry. Volume XII. Supplement 1. Quantum Chemistry—A Scientific Melting Pot. A symposium sponsored by the Quantum Chemistry Group to mark the 500th anniversary of the University of Uppsala held 31 August through 4 September 1977. Edited by PER-OLOV LÖWDIN, JEAN-LOUIS CALAIS, and OSVALDO GOSCINSKI. Interscience-John Wiley, New York. 1978. xi + 423 pp. \$26.50.

International Journal of Quantum Chemistry. Volume XII. Supplement 2. Chemical Physics of Surfaces, Catalysis and Membranes. Proceedings of a colloquium held 28-31 August 1977 at the University of Uppsala under the sponsorship of the Quantum Chemistry Group of the University of Uppsala and the Chemical Physics Section of the European Physical Society. Edited by PER-OLOV LÖWDIN, OSVALDO GOSCINSKI, and JEAN-LOUIS CALAIS. Interscience-John Wiley, New York. 1978. xii + 179 pp. \$15.00.

Clothing Comfort. Interaction of Thermal, Ventilation, Construction and Assessment Factors. The Fiber Society, Inc., Comfort Symposium Proceedings. Edited by N. R. S. HOLLIES (Gillette Research Institute) and R. F. GOLDMAN (U.S. Army Research Institute of Environmental Medicine). Ann Arbor Science Publishers, Ann Arbor, Mich. 1978. x + 189 pp. \$24.50.

Statistics. Edited by R. F. HIRSCH. The Franklin Institute Press, Philadelphia. 1978. viii + 308 pp. \$21.00.

Introduction to Industrial Drying Operations. With Helpful Charts for Following Drying Operations and a Large Number of Worked Examples. By R. B. KEYE (University of Canterbury, New Zealand). Pergamon Press, London. 1978. xix + 376 pp. \$15.00.

Engineering Aspects of Asbestos Dust Control. By GYAN S. RAJHANS (Ontario Ministry of Labour) and GORDON M. BRAGG (University

of Waterloo). Ann Arbor Science Publishers, Ann Arbor, Mich. 1978. vii + 192 pp. \$28.00.

Polarized Light Microscopy. By WALTER C. MCCRONE, LUCY B. MCCRONE, and JOHN GUSTAV DELLY. Ann Arbor Science Publishers, Ann Arbor, Mich. 1978. vii + 251 pp. \$30.00.

Physics of Quantum Electronics. Volume 5. Novel Sources of Coherent Radiation. Edited by S. F. JACOBS, M. SARGENT, III, and M. O. SCULLY. Addison-Wesley Publishing Co., Inc., Reading, Mass. 1978. ix + 401 pp. \$27.50.

Physics of Quantum Electronics. Volume 6. Adaptive Optics and Short Wavelength Sources. Edited by S. F. JACOBS, M. SARGENT, III, and M. O. SCULLY. Addison-Wesley Publishing Co., Inc., Reading, Mass. 1978. xi + 312 pp. \$24.50.

Z80 Programming for Logic Design. By ADAM OSBORNE, JERRY KANE, RUSSELL RECTOR, and SUSANNA JACOBSON. Osborne and Associates, Inc., P.O. Box 2036, Berkeley, Calif. 1978.

Advances in Chemical Engineering. Volume 10. Edited by T. B. BREW, G. R. COKELET, J. W. HOOPEES, JR., and T. VERMEULEN. Academic Press, New York. 1978. xiv + 336 pp. \$35.00.

Contains four chapters: Heat Transfer in Tubular Fluid-Fluid Systems; Balling and Granulation; Pipeline Network Design and Synthesis; Mass-Transfer Measurements by the Limiting-Current Technique.

Ecological Studies. Volume 23. Lessepsian Migration: The Influx of Red Sea Biota into the Mediterranean by Way of the Suez Canal. By FRANCIS DOV POR. Springer-Verlag, New York. 1978. x + 228 pp. \$32.00.

A study of the migration of life forms from the Red Sea through the Suez Canal.

Improvement of Electrical Porcelain Insulators. Final Report, April 1978. Prepared by Gould, Inc., Victor, N.Y. EPRI Reports, Research Reports Center, P.O. Box 10090, Palo Alto, Calif. 1978. xi + 24 pp. \$2.50.

Electrostatic and Electromagnetic Effects of Ultrahigh-Voltage Transmission Lines. Prepared by General Electric Co., Pittsfield, Mass. EPRI Reports, Research Reports Center, P.O. Box 10090, Palo Alto, Calif. 94303. xii + 380 pp. \$12.25.

Fuel Cell Catalyst Sintering Studies. Prepared by Exxon Research and Engineering Company, Linden, N.J. EPRI Reports, Research Reports Center, P.O. Box 10090, Palo Alto, Calif. 1978. xii + 94 pp. \$4.75.

Interim Cost Estimates for Advanced Battery Systems. Prepared by Arthur D. Little, Inc., Cambridge, Mass. EPRI Reports, Research Reports Center, P.O. Box 10090, Palo Alto, Calif. 1978. vii + 22 pp. \$2.50.

Workshop Proceedings: Safety and Environmental Aspects of Deuterium-Tritium Fusion Power Plants. Prepared by Battelle Pacific Northwest Laboratories, Richland, Wash. 1978. EPRI Reports, Research Reports Center, P.O. Box 10090, Palo Alto, Calif. 1978. vii + 42 pp. \$3.25.

Environmental International. A Journal of Science, Technology, Health, Monitoring and Policy. Volume 1, No. 1/2. Pergamon Press, Oxford. 1978. 116 pp. \$30.00 per year.

Applications of Ion Selective Membrane Electrodes in Organic Analysis. By G. E. BAIULESCU and V. V. COSOFRET. Ellis Horwood Series in Analytical Chemistry. Halsted Press, New York. 1977. 250 pp. \$37.50.

Nearly a dozen monographs and edited volumes are presently available on the general topic of Ion Selective Electrodes (ISEs). In addition, there are an equal number of conference and congress proceedings, and books on electroanalytical topics with ISE chapters.

More than half of these book emphasize membrane electrochemical principles, the similarities or differences, and unique features among various compositions and formats. Recipes for chemical analysis are conspicuously absent, although applications are always mentioned and sometimes described. These omissions are understandable because of the wide applicability of ISEs in the fields remote from chemical analysis: solution equilibria measurements, electrophysiology probe applications, continuous clinical monitoring and environmental testing. One book or another is better suited to a particular category of readers and users.

For the chemical analysts, the new book by Baiulescu and Cosofret will be very useful. With the exception of Cammann's book (in German) and Bailey's book, procedures for analysis have not been given before in so much detail. Baiulescu and Cosofret have digested the "applications" literature and given us an excellent source of procedures for analyses of organic compositions using IESs. One will find that the first part of the book, just after the short theory section, resembles the first edition of Siggia's "Organic Functional Group Analysis" and many books on organic elemental analysis. The second half emphasizes those analytical methods which are more nearly unique applications of ISEs: (1) measurements using direct potentiometry of organic cations and anions, and (2) measurements using interposed chemical reactions, usually involving enzymes.

It is well known that ISEs and classical types of potentiometric sensors respond to activities of charged species. Thus, direct potentiometry or potentiometric titrimetry is limited to systems involving ions. This means that direct semimicro organic analysis requires or involves ISEs only in so far as neutral compounds are converted to ions, or react to affect ionic activities, at some point in the procedure. Neutral organics may be decomposed to yield ionic products (e.g., halides) or may affect a sensed species (e.g., NH_3/pH glass or $\text{NH}_3/\text{NH}_4^+$ sensor). Consequently procedures for halogens and sulfur are mainly classical, and ISEs figure only as alternate, and often preferred, sensors for direct potentiometric analysis and end point detection in titrimetry. Many of the examples require no decomposition.

Analysis of positively charged species: quaternary ammonium, quaternary arsonium, and detergents allows an exposition of many usual and unusual liquid and solid membranes including those of Higuchi et al., of Sharp and various tetraphenylborate types. Likewise, liquid anion exchangers, making use of positively charged dyes and aliquats, are described in chapters on carboxylic acid and anionic detergent analysis. Four chapters explain the use of many enzyme-based electrodes and enzyme-based systems using gas-sensing electrodes. Apparently all of the enzyme studies are referenced including those which are amperometric rather than potentiometric.

The authors have done an outstanding job of bringing together the literature on ISEs in organic analysis. They have digressed into fascinating areas (e.g., analysis of the Zhabotinskii oscillating reaction monitored by more than one electrode simultaneously, use of ISEs in kinetic analysis of alcohols via IO_4^- reactions). They have not, however, given complete directions. For example, the Schöniger oxygen flask is mentioned 11 times, but it is not fully described. The title 6.3.1 contains a misspelled word and the equation 4.12, page 36, has "exp" which means, in this case, "to the power of". Also V_B is V_{BO} . Nevertheless, the book is excellent.

Richard P. Buck, *University of North Carolina*

Protein Synthesis. Volume 2. Edited by E. H. MCCONKEY (University of Colorado). Marcel Dekker, Inc., New York. 1976. xiii + 386 pp. \$34.50.

This second volume in a series of reviews on protein biosynthesis emphasizes the molecular biology of eukaryotes. Brandhorst explores the relationship of heterogeneous nuclear RNA to messenger RNA, while Grollman and Huang discuss several dozen inhibitors of eukaryotic protein synthesis. Pederson critically reviews the cellular aspects of histone synthesis. Protein synthesis in chloroplasts and mitochondria are described by Hooper and O'Brien, respectively. Finally, Gallant and Lazzarini deal with the regulation of ribosomal RNA in bacteria. These authors have succeeded in presenting readable and constructively critical accounts of their areas. But the field of protein biosynthesis has made such great strides in the last three years that many of these accounts are more interesting for historical reasons than as current summaries. Nevertheless, this book will be useful to graduate students and researchers in the field.

Bruce W. Erickson, *The Rockefeller University*

Stereochemistry: Fundamentals and Methods. Volumes 1-4. Edited by HENRI B. KAGAN (Université de Paris-Sud, Orsay, France). Georg Thieme Publishers, Stuttgart, W. Germany. 1977. Distributed in U.S.A. by Heyden & Sons, Philadelphia, Pa.

The first four volumes of the long-awaited "latter-day Freudenberg" all deal with the subject of determination of configuration. According to the editor, "the purpose of the series is to furnish the nonspecialist with the fundamentals, principles, methods, and basic references of stereochemistry, the emphasis being on *organic stereochemistry*". It comes as somewhat of a surprise that the first volumes to appear do not deal with such basic topics as symmetry, concepts, and nomenclature. This is so much the more of concern since no additional volume has appeared in the last 18 months and since the four volumes that have appeared (in 1977) were written prior to 1973, being apparently held up four years in production. This delay has no doubt caused damage to the series.

The volumes themselves each contain chapters on individual topics written (in generally excellent English) by experts in their respective fields.

Volume 1. Determination of Configurations by Spectrometric Methods. viii + 246 pp. \$53.00.—This volume contains four chapters: Determination of Configuration by Infrared Spectroscopy, by M. Golfier (Orsay), 43 pp, 310 refs; Determination of Relative Configurations by NMR Spectroscopy, by A. Gaudemer (Orsay), 93 pp, 574 refs; Application of Mass Spectrometry to Stereochemical Problems, by A. Mandelbaum (Technion), 44 pp, 325 refs (including addendum updating refs to 1975); The Determination of Relative and Absolute Configurations of Organic Molecules by X-Ray Diffraction Methods, by R. Parthasarathy (Roswell Park), 54 pp, 219 refs. Except for the lack of currentness of at least three of the chapters, this is an excellent volume. Golfier's chapter on IR is very welcome, being to this reviewer's knowledge the first comprehensive collection of the many applications of IR to the determinations of configuration and conformation. Gaudemer's NMR chapter goes over more trodden ground, but stands out in organization and completeness, ranging from acyclic to heterocyclic compounds, from ^1H to ^{13}C to ^{19}F nuclei, and, among techniques, from chemical shifts and coupling constants to ASIS, LIS, NOE's and the use of chiral solvents and shift reagents. Only dynamic NMR has been given short shrift, being apparently relegated to a promised later (but see below) additional volume on NMR spectroscopy. Mass spectrometry is not a prime technique for solving stereochemical problems, but what can be done with it (and perhaps more) is attractively presented in Mandelbaum's chapter. Parthasarathy in his chapter on X-ray methods tries to give the reader an understanding of the technique, especially as regards the Bijvoet method for determining absolute configuration. This is followed by numerous practical applications. The chapter is, of necessity, quite selective and, more than the other three, suffers from not being up to date, in as much as the recent publications of Dunitz and Bürgi concerned with approaching the stereochemistry of transition states via X-ray crystallography are not even mentioned.

Volume 2. Determination of Configurations by Dipole Moments, CD or ORD. viii + 198 pp. \$43.50.—This volume is dominated by an authoritative, critically written, and very complete chapter by M. Legrand and M. J. Rougier (Roussel-Uclaf) on Application of the Optical Activity to Stereochemical Determinations (151 pp, 1369 refs, including a 1974 addendum). Since virtually all applications of chiroptical methods are in the area of stereochemistry, this chapter is clearly now the leading reference for work (through 1974) on ORD/CD. There is also a short section on (monochromatic) optical rotation and its implications. The much shorter chapter by V. I. Minkin (Rostov-on-Don State University) on Dipole Moments and Stereochemistry of Organic Compounds (32 pp, 233 refs) reminds the reader of the usefulness of this much underused technique in stereochemical determinations. The chapter represents a substantial extension of a slightly earlier one (1970) in a book, "Dipole Moments in Organic Chemistry", coauthored by Minkin.

Volume 3. Determination of Configurations by Chemical Methods. viii + 135 pp. \$29.50.—Determination of Stereochemistry by Chemical Correlation Methods, by J. C. Fiaud and H. B. Kagan (Orsay), 17 pp, 98 refs; Prelog's Method, by J. C. Fiaud (Orsay), 31 pp, 67 refs; Determination of the Configuration of Secondary Alcohols by Partial Resolution, by A. Horeau (Collège de France), 44 pp, 163 refs; Determination of Absolute Configurations of Organic Compounds by Asymmetric Synthesis, by Resolution, and by Enzymatic Methods, by J. C. Fiaud (Orsay), 32 pp, 94 refs. This volume appears

out of balance. The "reliable" methods involving chemical correlation are summarized in a nonexhaustive 17-page chapter which is necessarily written in "Annual Reports" style. The whole remainder of the book (over 100 pp) is given to "black-box" methods, i.e., methods which rest largely on empirical correlations, often not well understood mechanistically. Without disparaging the practical usefulness of these methods and without criticism of individual chapters, I venture to say that there is more in the last three chapters (and less in the first) than the average reader wants to know.

Volume 4. Absolute Configurations of 6000 Selected Compounds with One Asymmetric Carbon Atom. By J. JACQUES (Collège de France), C. GROS, and S. BOURCIER. xxi + 602 pp. \$95.00.—This is the kind of book which bankrupts a publisher, and thus its inclusion among the first four volumes of the series is cause for some surprise. The volume consists of an exhaustive tabulation of all compounds with a single chiral center not within a ring, whose absolute configurations were known by 1972. The compilation of this table must have been a near-superhuman effort and its typesetting a most expensive undertaking. Since the Chemical Abstracts Services data base (which presumably contains all the data included in these tables) is computer-accessible through the subject index file (CASSIA) only as of 1977, perhaps the printing of this table is a worthwhile undertaking. Yet one must wonder whether the information could not have been made available more economically (and, perhaps, in the long run more conveniently) through one of the existing computer networks. The purchase of Volume 4 can be recommended only to the more affluent libraries in institutions where stereochemical research is being (or likely to be) undertaken. Others can make do with the more than adequate Atlas compiled by Klyne and Buckingham, which is easier to survey and not confined to compounds with a single chiral center.

Volumes 1–3, in contrast, are of great import to any student as well as researcher in the area of stereochemistry and are "must" acquisitions for any respectable chemical library.

As this review is being written, news has been received that the publisher has suspended continuation of the series and that the additional five volumes previously announced (and for which chapters had already largely been written) will not now appear. I consider this most unfortunate, to say the least.

Ernest L. Eliel, *University of North Carolina*

Dielectric and Related Molecular Processes. Volume 3 (A Specialist Periodical Report). Senior Reporter: MANSEL DAVIES. The Chemical Society, London. 1977. ix + 259 pp. \$46.00.

With few exceptions the chapters of this report, written by well-known contributors to their fields, are of high quality, for the most part being much more than mere quotations of the literature of the past few years. Indeed, there is sufficient detail that the nonspecialist can obtain a useful introduction to what is now the broad area of molecular motion. In addition the references seem unusually complete.

The wide range of topics covered is indicated by the chapter headings which follow: Correlation and Memory Function Analysis of Molecular Motion in Fluids; Quasielastic Neutron Scattering Studies of Molecular Reorientations; Studies of Molecular Characteristics and Interactions Using Hyperpolarizabilities as a Probe; Some Dielectric Studies of Molecular Association; Dielectric and Related Properties of Polymers in the Solid State; Dielectric Studies of Adsorbed Molecules; The Dielectric Behaviour of Non-crystalline Solids; and, Some Dielectric and Electronic Properties of Biomacromolecules.

In spite of the praise lavished above, the volume is not without fault. This reviewer thinks that the report would be more valuable if some of the authors had been a bit more critical in assessing the merits of some of the work which is quoted. For example, it is now well established that some of the early proposals giving the connection between the complex permittivity and the microscopic correlation function which are cited on pp 118 ff are erroneous. This is not to deprecate the work of these authors because the theory of dielectrics is fraught with subtleties. Indeed, incorrect derivations still appear in the current literature. This reviewer also (in part) disagrees with the statement at the top of page 118: "In the statistical theory of dielectric relaxation, the problem of the relationship between macroscopic and molecular fluctuations has not been solved." The general relationship between the *microscopic* polarization fluctuations and the dielectric constant is known, and progress has been made in elucidating the connection between the orientational correlation functions (or fluctuations) and

these polarization fluctuations. It is true that a general connection between two-body orientational fluctuations and polarization fluctuations is not known. In fact, there probably is not such a connection.

Several of the chapters end with summaries and conclusions. These are well done and are a feature which is to be recommended to all authors of such reviews. In addition many of the authors raise unsolved problems of great interest, adding to the value of this present report. On the whole the volume gives an excellent survey of diverse areas related to dielectric processes. It demonstrates that the field is quite lively in spite of its age.

Robert L. Fulton, *The Florida State University*

Thermal Uses and Properties of Carbohydrates and Lignins. By F. SHAFIZADEH (University of Montana), K. V. SARKANEN (University of Washington), and D. A. TILLMAN (Materials Associates). Academic Press, New York. 1976. xi + 320 pp. \$15.00.

The main thrust of this interesting book aims at efforts to advance the utilization of biomass as an energy source. It contains reports from people working in diverse areas related to conversion of cellulosic products and byproducts into power, primarily by pyrolysis or combustion. These reports come from papers delivered at the September 1976 meeting of the American Chemical Society. Most of the papers in this book contain only limited amounts of new or quantitative data; instead, they tend to emphasize how the various authors see these technological opportunities. Thus, in view of what is actually presented by this book, one might regard the title itself as being a bit "off the mark", but one will find, nevertheless, this volume to be informative reading on an important area. In large measure, the texts of each of the articles are written such that nonspecialists can comprehend what is being described.

Because the raw materials involved in the studies reported in this book originate in nature, they are often difficult to characterize in terms of composition, and they possess a variability akin to what is encountered in the utilization of minerals. These facts limit the sophistication such studies might exhibit, so it is easily understood why detailed investigations are reported by only a few authors in this book. However, one finds several reports on the composition of various cellulosic substances, the possible and documented chemical pathways which operate during pyrolysis or combustion, and the make-up products, both char and gaseous, resulting from such heating steps. Some studies used crude, benchtop equipment; some used standard chemical analytical equipment (e.g., gas chromatographs and mass spectrometers); while some employed pilot-scale facilities. Catalysts for efficient production of heat or useful chemicals are reported. The effects of cellulose crystallinity on char-formation have been studied. Results of investigations into the use of lignin derivatives in redox reactions suitable for electrochemical storage of energy are also contained in this book. Some of this research seems naive or overly primitive to be of much value, but other parts of what is contained in the book provide directions and results that provide direct support for continued evolution of technologies related to utilization of biomass.

Stephen H. Carr, *Northwestern University*

Electrochemistry. Volume 6 (A Specialist Periodical Report). Senior Reporter: H. R. THIRSK (University of Newcastle upon Tyne). The Chemical Society, London. 1978. viii + 247 pp. £19.50 (\$39.00).

This concentrated volume makes four additions to some 36 titles published by the Society in the hope of bringing reports of active research into publication within about 12 months of the period surveyed, in this case up through 1976. Not necessarily "annual" reports, some titles survey a long expanse of time as has I. Morcos' chapter here on the interfacial tension of solid electrodes. Citations extend back into the 19th century and include a number of referenced reviews in closely related areas to avoid duplication, an effort of integration electrochemists will value. He first outlines the theoretical basis, in the equations of Young, Laplace, Gibbs, and others, of the tensions of liquids, and then extends in review the theories to solids. A second section provides insights into experimental work done, e.g., surface stress-potential curve correlations with the cyclic voltammogram, meniscus height-potential curves, etc., bringing under consideration a total of 127 references.

In Chapter 3, Armstrong, Bell, and Metcalf have treated AC impedance of complex electrochemical reactions only as these relate to experiment, since several excellent (referenced) theoretical reviews already exist. From a historical background, roughly the last decade

is considered and various methods are compared, e.g., those of Randles, Sluyters, Sluyters-Rehbach, and Warburg. Generalized one-step reactions, two-step reactions (with an adsorbed and with a soluble intermediate), and adsorption cases (involving neutral molecules and coupled solution reactions) are discussed with examples of complex-plane impedance plots and their mathematical bases and equivalent circuits. Passive behavior of metals and special electrocrystallization effects, e.g., the adatom model and potentiostatic nucleation and growth, are briefly summarized (54 refs).

In Chapter 1, the active area of organic electrochemistry is brought up through 1974 by O. R. Brown, who summarizes that year systematically according to reductions or oxidations under the usual organic subdivisions. Many reactions and structures are detailed in the presentation of over 120 schemes of exemplary reaction types. Included in the 365 references are a number of valuable reviews.

Part I of P. P. Schmidt's review of the theory of electron-transfer reactions in polar media appeared in Volume 5 of this series. The second part, here, occupies nearly one-half of Volume 6 and continues those earlier foundations already laid to construct additions to the simple electron-transfer reaction. Specifically, the linear response theory is used to demonstrate that electron-transfer reaction rate constant derivations from quantum mechanical, and general semiclassical avenues are included in a single general scheme as limiting cases. The degree of adiabaticity and a consideration of real systems is also taken up, especially concerning the means by which activation energy can be seen as originating from intramolecular degrees of freedom. A complexion of hope now exists for analysis of the latter that has not long been possible, e.g., the analysis of vibrational degrees of freedom in molecular radiationless processes that are now being applied to electron-transfer systems. A degree of optimism is expressed for anticipated successes in the application to the electron-transfer system, of the quantum hydrodynamic approach so valuable to atomic nuclear theory, as well as to the ongoing and future development of our understanding of more complex electron-transfer systems that should parallel current improvements of quantum mechanical computations (162 refs).

This volume, with Volume 5 and future volume(s) that we expect will contain additions to Schmidt's review, is an especially welcome addition to the library of any electrochemist concerned with that complex and changing field and is indeed a critically essential acquisition for technical libraries which should hold this entire series.

Bruce B. Graves, *Foundation for Instrument History & Research*

Space Groups for Solid State Scientists. By GERALD BURNS, and A. M. GLAZER. Academic Press, New York. 1978. 278 pp. \$14.50.

The authors intend this book to be a working guide to the aspects of symmetry often encountered by solid state scientists. Using an almost tutorial approach, they proceed to show how to obtain nearly all of the symmetry information found in Volume I of "The International Tables for X-Ray Crystallography"; in fact, the book might be subtitled, "A Guide to The International Tables".

While not the standard crystallographers' approach, most of the book comes off fairly well. The development is logical and thorough, beginning with a very elementary discussion of symmetry elements and operations. Considerable attention is given to careful description of both the Schoenflies and Herman-Mauguin notation. Succeeding chapters discuss the seven crystal systems, lattices (nicely showing the relation between primitive and centered cells), point groups (derived from rotational groups and by crystal system), and space groups. The diagrammatic representation of the International Tables is developed, and nearly an entire chapter is devoted to explanation of typical pages from the International Tables. A final chapter is on selected solid state applications. Nine appendices include some useful material.

The authors presuppose only a knowledge of matrix multiplication; a good bit of group theory is developed and used throughout the book. Each chapter is provided with about five to ten problem exercises. Figures are generally good and clearly drawn.

This reviewer was somewhat surprised that the concept of the reciprocal lattice, so useful in crystallography, is introduced only very

briefly in the applications chapter. It also seems that this final chapter, perhaps because of its sketchiness, is the weakest in the book.

In summary, this book achieves its objective. While not profound or elegant, it should prove quite useful to those with little background in the area, or to those for whom this subject does not come easily.

Richard E. DeSimone, *The University of Michigan*

Science and Civilisation in China. Volume V: Chemistry and Chemical Technology. Part 3: Spagyric Discovery and Invention: Historical Survey, From Cinnabar Elixirs to Synthetic Insulin. By JOSEPH NEEDHAM (Cambridge University) with the collaboration of HO PING-YU (Griffith University) and LU GWEI-DJEN (Cambridge University). Cambridge University Press, New York. 1976. xxxv + 481 pp. \$42.00.

The fifth volume of Dr. Needham's "Science and Civilisation in China" covers the subjects of alchemy, early chemistry, and chemical technology. Part 2 of this volume was the subject of review by this author two years ago. The present part traces the historical development of chemical science in China, through the high times and the declines, up to the coming of modern chemistry. The birth of modern chemistry in China is marked by one of the first syntheses of active insulin in 1965.

Like all of the previous volumes, this chapter is well organized and written. There are 262 pages of main text followed by three bibliographies: Chinese and Japanese books before +1800, Chinese and Japanese books and journal articles since +1800, and books and journal articles in western languages, totaling 180 pages. There is also a 45-page general index at the end of the chapter.

Since the publication of the first volume of "Science and Civilisation in China", Dr. Needham has singlehandedly corrected "the grievously distorted western notion of the Chinese as other worldly, illogical, unscientific, and averse from technical progress" through a mountain of evidence presented in his books. Indeed, the contributions to science and civilization by the Chinese are far reaching and significant. The effort required to document these contributions is enormous and the time committed to such a task is lengthy. No one has attempted an undertaking of this magnitude before and probably no one will ever attempt it in the future. Dr. Needham's unique work is an important monument among human achievements in our modern history.

Hak-Foon Chan, *Rohm and Haas Company*

Organometallic Chemistry Reviews. Annual Surveys: Silicon-Germanium-Tin-Lead. Volume 6. Edited by D. SEYFERTH (MIT) and R. B. KING (University of Georgia). Elsevier Scientific Publishing Co., Amsterdam-New York. 1978. v + 550 pp. \$79.50.

This survey covers the literature for 1976 for silicon, tin, and lead and as such is a continuation of Volume 4 in the series. Two of the three chapters that are devoted to silicon, "Synthesis and Reactivity" (J. Y. Corey) and "Bonding and Structure" (P. R. Jones), as well as the chapters on tin (P. G. Harrison) and lead (J. Wolters), have the same authors as in the previous review, and those who found the earlier articles of use to them will not be disappointed with the current offerings. As previously, the articles are well written and the space given to the use of diagrams is liberal, with the result that the reviews are easy to follow. The section on "Organosilicon-Reaction Mechanisms" (F. G. Cartledge) gives a fairly broad interpretation to the word mechanism, and the author attempts, in several places, to cover the material critically. Two sections on germanium cover the literature for 1975 (B. C. Pant) and 1976 (D. Quane). The contrast in the styles of the two authors is most marked. The presentation in the former review is stiff. On most pages, a series of terse statements is followed by a set of equations so that one feels that a tabulation would have sufficed. However, it is possible to get a general overview of the reactivity of these organogermanium compounds from the series of schemes. By contrast, the review for 1976 is much more comprehensive and fluent in its presentation. Factors such as reaction conditions of importance and conclusions based on spectroscopic evidence are discussed in some detail.

John E. Drake, *University of Windsor*