

Book Reviews*

Computing Methods in Organic Chemistry. By H. H. GREENWOOD (University of Keele). Wiley/Interscience, New York, N.Y. 1972. xi + 213 pp. \$14.95.

The computing methods with which this book is concerned are those for solving problems involving molecular orbital theory applied to π -electron systems. It is intended "to provide a practical guide". About half of the book is devoted to Hückel theory, but the self-consistent field method and a configuration interaction method are also given attention. The book is so designed that it might be used as a text for advanced undergraduate or graduate courses; there are problems at the ends of the chapters. The computer programs that are reproduced are written in a derivative of standard Fortran.

Dimethyl Sulphoxide. By D. MARTIN and H. G. HAUTHAL. Translated by E. S. HALBERSTADT. Wiley/Halsted, New York, N.Y. 1975. xv + 500 pp. \$49.00.

This translation is from a German original published in 1971, for which the writing was finished in 1969. The chapters are in part contributed by other authors. The book attempts to give a coherent account of the chemistry of dimethyl sulfoxide, supplemented by a chapter on technical applications and one on its role in medicine and pharmacology. Preparation, manufacture, physical properties, reactions, analytical chemistry, and the chemistry of derived sulfur ylides are covered in detail, and three chapters are devoted to the remarkable properties of dimethyl sulfoxide as a solvent. The bibliographies are extensive and include the patent literature. There is much information in tables and graphs. A thoughtful feature is an appendix of three and one-half pages listing reviews and general literature. It appears to be a very useful work of reference, so long as the user is aware of the limitation on its timeliness.

Encyclopedia of Polymer Science and Technology. Plastics, Resins, Rubbers, Fibers. Supplement: Volume 1. Edited by N. M. BIKALES and M. BICKFORD. John Wiley & Sons, Inc., New York, N.Y. 1976. xix + 674 pp. \$55.00.

This supplementary volume to the original 15-volume work has been necessitated by the development of new aspects of the subject and significant changes in old ones. As in the main work, it is a collection of contributed articles, which range from "degradation of acrylonitrile polymers" to "vinyl chloride". The recent increase in awareness of environmental problems and industrial response to them have engendered several of the articles, such as "Nonaqueous Dispersions" and "Controlled Photodegradation". The emergence of polymers as useful tools for the synthetic organic chemist is represented by three articles, including one entitled "Polymers as Chemical Reagents". There is an exceptionally detailed index. The volume is very well produced, and the content appears to be authoritative.

Flavins and Flavoproteins. Proceedings of the Fifth International Symposium. Edited by T. P. SINGER. Elsevier Scientific Publishing Co., New York and Amsterdam. 1976. xiii + 813 pp. \$101.95.

Eighty-nine papers given at this 1975 symposium are arranged under fourteen headings and reproduced in their entirety, with figures, tables, and bibliographies. The papers, curiously identified as "chapters" in the book, are reports of original research, in most instances complete with experimental details. They appear all to have been prepared expressly for this volume, but it is not clear whether duplicating journal publication may also be contemplated. The papers are beautifully presented in typeset form, but proofreading is dreadful. One small paragraph alone in the introduction contains three errors, one of which, "flavorproteins", is potentially very misleading. It is a pleasure to find a substantial, detailed index, unusual in a volume of proceedings.

Gmelin Handbuch der Anorganischen Chemie. 8th Edition. System No. 3: Oxygen. Supplementary Volume: Water Desalting. Gmelin Institute

for Inorganic Chemistry. Springer-Verlag, Berlin—Heidelberg—New York. 1975. viii + 339 pp. \$212.20.

This appended volume was made necessary by the marked changes in the subject and growth of its industrial importance in the last 20 years. Almost 14 000 papers published up to mid-1974 have been utilized to prepare this carefully organized treatise. There are many line illustrations, and three striking color photographs of the flash-distillation plant at Porto Torres, Sardinia. The entire text is in English; the table of contents and preface are in English and German. The former is very detailed and serves in lieu of an index.

Handbook of Intermediary Metabolism of Aromatic Compounds. By B. L. GOODWIN (Queen Charlotte's Maternity Hospital). Wiley/Halsted, New York, N.Y. 1976. ix + ca. 600 confusingly numbered pp. \$75.00.

This is a basic reference book. It is divided into two parts: Reactions and Enzymes (138 pp) and Reactions of Individual Compounds. Part I is carefully organized into reaction types, and gives the most pertinent features of the enzymes involved, with selected references. There is a separate index for this part. Part II, the majority of the volume, is an alphabetical classification of the compounds that have been studied (7000 of them) and gives the metabolic products and the references. This part thus requires no index, but it is introduced by three pages of explanatory notes. The literature is covered through 1971, with an extension to 1973 for certain journals.

This is a volume that should have wide reference appeal to chemists concerned with drug action, toxicology, metabolic diseases, etc.

Heteroaromatic Nitrogen Compounds. The Azoles. By K. SCHOFIELD, M. R. GRIMMET, and B. R. T. KEENE. Cambridge University Press, New York, N.Y. 1976. vii + 437 pp. \$49.50.

This book is a companion volume to the one on Pyrroles and Pyridines published in 1967. It gives a unified treatment of the chemistry of pyrazoles, imidazoles, triazoles, and tetrazoles. These substances are covered comprehensively with respect to properties and reactions, but their synthesis is not explicitly treated. Although it would be impossible to be exhaustive in a book of this size, an impressive amount of detail is provided, and 1576 references are cited. The authors have had to adopt great brevity of expression, such that the work is better suited to be a reference book. There is thus little room for critical analysis, other than in the introduction, two very short general chapters, and an appendix on the orientations of 1,3- and 1,5-dimethylpyrazoles.

A most useful feature is an appendix of over 100 pages that lists properties of azoles in tabular form, giving melting and boiling points, reported derivatives, and references. There is also a good subject index. Coverage of the literature extends well into 1974.

Index of Vibrational Spectra of Inorganic and Organometallic Compounds. Volume 2. By N. N. GREENWOOD (University of Leeds) and E. J. F. ROSS (University of Durham). Butterworths, London. 1975. vii + 908 pp. £40.00.

Volume 1 of this work, which covered the subject over the years 1935–60, appeared in 1972. Volume 2 of the three-volume series covers the literature for the much shorter span 1961–63; Volume 3 is projected to cover 1964–66 and will thus connect with the coverage in the "Specialist Periodical Reports". Compounds are listed alphabetically, and the index gives brief details of the spectra reported and the reference to the original literature. This is an obviously useful reference work and aid to searching the literature.

Measurement of Oxygen. Edited by H. DEGN, I. BALSLEV, and R. BROOK. Elsevier, Amsterdam and New York. 1976. ix + 276 pp. \$29.95.

This volume is the proceedings of an interdisciplinary symposium held in Denmark in 1974. It contains 19 papers, which appear all to be accounts of original research, but without the full experimental detail usually found in journal publication. The subject is the mea-

* Unsigned book reviews are by the Book Review Editor.

surement of elemental O₂, gaseous or dissolved, in all sorts of media, from sea water to blood. It includes a wide variety of instrumental approaches. It is a nicely produced book, but it is unfortunate that no index was provided.

Organic Reaction Mechanisms 1974, Edited by A. R. BUTLER and M. J. PERKINS. John Wiley & Sons, Inc., New York, N.Y. 1976. 660 pp. \$63.00.

This is the tenth volume in the series, and the second one edited by the new team. It continues the tradition of providing a general summary of work in the area, rather than a detailed evaluation of selected topics. It covers the literature dated December 1973, through November 1974. Conciseness has been given great attention, but not in the bibliographies, which are the more valuable for their extensiveness.

As in earlier volumes, the subject is treated in 13 chapters by a variety of contributors. The chapters are respectively devoted to such topics as Molecular Rearrangements, Elimination Reactions, Oxidation and Reduction, etc. More specific access to the content is given by an author index, and a 5-year subject index.

Organic Reaction Mechanisms 1974. Reprint Sections A and B. Edited by A. R. BUTLER and M. J. PERKINS. Wiley/Interscience, New York, N.Y. 1976. Reprint A: 67 pp. \$3.95. Reprint B: 222 pp. \$4.95.

The complete volume, recently reviewed here, is rather expensive for individual purchase. With these softbound reprint sections, it is now possible for chemists to obtain the material in the field of their special interest at a fraction of the cost. Reprint A contains the chapters "Reactions of Aldehydes and Ketones and their Derivatives" and "Reactions of Acids and their Derivatives". Reprint B contains "Radical Reactions" and "Oxidation and Reduction".

Physical and Chemical Properties of Water. A Bibliography: 1957-1974. By DONALD T. HAWKINS and FRANK H. STILLINGER (Bell Telephone Laboratories). IFI/Plenum, New York, N.Y. 1976. xiv + 556 pp. \$67.50.

The authors state in the Foreword that research on water has expanded greatly during the last decade, as a result of new tools and techniques, but the feeling is expressed that the rate of production of publications will eventually plummet, "because we will have done it all". The magnitude of this volume is testimony to the great quantity of work that has already been done!

There are two parts: 1957-1968 and 1969-1974. In each, the references are grouped under 27 headings, ranging from equations of state through electrical properties to structure. For each part, there are an author-title index and a permuted title index, a combination that makes the content very conveniently accessible. Part 2 of the bibliography originally appeared in the *Journal of Solution Chemistry*, without the permuted title index.

Residue Reviews. Volumes 60 and 61. Edited by F. A. GUNTHER and J. D. GUNTHER. Springer-Verlag, New York, N.Y. 1976. Vol. 60: vi + 160 pp. \$18.80. Vol. 61: viii + 166 pp. \$16.80.

Volume 60 is devoted to Sumithion (*O,O*-dimethyl *O*-(3-methyl-4-nitrophenyl)phosphorothioate), a broad-spectrum insecticide of low mammalian toxicity, developed by Sumitomo Chemical Co., Ltd., of Japan. In five chapters written by Japanese chemists, the chemistry, analysis, formulation, biological properties, and residue analysis are reviewed.

Volume 60 also includes cumulative subject-title, subject matter, and author indexes to Volumes 51-60, and a cumulative list of these volumes with the chapter titles in each.

Volume 61 contains three chapters on DDT: Metabolism in Microbial Systems, Stability in Foods during Cooking and Processing, and Bioconcentration in the Environment. Two other chapters complete the volume: Bioassay Techniques for Foliar-Applied Herbicides, and Physiological Effects and Metabolism of Gossypol.

Inorganic Chemistry of the Transition Elements. Volume 4. B. F. G. JOHNSON (Cambridge University), Senior Reporter. The Chemical Society, London. 1976. xiv + 536 pp. £27.00.

This latest volume in the Specialist Periodical Report series on transition metal chemistry covers the literature from October 1973 to September 1974. The chapters (and Reporters) are (1) The Early

Transition Metals (sub-groups IV and V by F. L. Bowden, sub-group VI plus Tc and Re by C. D. Garner); (2) Elements of the First Transition Period (Mn and Fe by R. Davis, Co, Ni, and Cu by C. A. McAuliffe and W. Levason); (3) The Noble Metals (Ru, Os, Rh, and Ir by L. A. P. Kane-Maguire, Pd, Pt, Ag, and Au by D. W. Clack); (4) Zinc, Cadmium, and Mercury (by J. Howell and M. Hughes); (5) Scandium, Yttrium, the Lanthanides, and the Actinides (by J. A. McCleverty). This is the same organization used in earlier volumes, except that a separate chapter on sub-group II is included for the first time.

The coverage of the literature by this book is intended to be exhaustive. Three factors which will determine its usefulness to the specialist (to whom it is addressed) are availability, reliability, and organization. The British pound is no longer a constant; the indicated U.S. book price at the time of publication was \$74.25. In any event, the price of Volume 4, triple that of Volume 1, limits acquisition to well-to-do libraries. Printing errors are few. World-wide coverage appears to be thorough. Russian references are sometimes to the original, sometimes to English translations, and sometimes to *Chemical Abstracts*. Organization is the key point. There is no Subject Index, but the Table of Contents is very detailed with a separate entry for every few pages at the most. This will permit the user to make a quick survey of all the publications for the one-year period on a particular topic as long as that topic is organized by the metallic element, e.g., chromium(II) halides with P-donor ligands, but not if the topic is organized differently, e.g., fluorophosphine complexes of the transition elements. The many tables and line drawings of structural formulas are very helpful.

John T. Yoke, Oregon State University

The Hydrolysis of Cations. By CHARLES F. BAES, JR., and ROBERT E. MESMER (Oak Ridge National Laboratory). John Wiley & Sons, Inc., New York, N.Y. 1976. xxi + 489 pp. \$29.95.

This book, dedicated "to L. G. Sillén and the many others", presents in convenient reference form reliable data from the voluminous and sometimes conflicting literature that has appeared during the last quarter century on the identity and stability of the various hydrolysis products formed by hydrolyzing metallic ions. The authors critically evaluate information both on species in solution and solid hydroxides and oxides. Selected values of stability quotients are summarized in numerous tables, mathematical relationships, and graphs illustrating species distribution and solubilities. Deficiencies of present data along with recommendations for future research are given. Trends in terms of charge, metal ion, size, and bond type are surveyed with the position of each metal in the periodic table.

The tripartite volume consists of three general sections: (1) Introduction, Methods of Measurement, Interpretation of Measurements (3 chapters, 73 pp); (2) the metallic elements considered according to periodic table group or row (14 chapters, 324 pp); and (3) Survey of Hydrolysis Behavior (1 chapter, 34 pp). Three appendices and an extensive 31-page bibliography, including references as late as 1974, conclude this well-written book that will be useful to the physical chemist, geochemist, synthetic chemist, basic environment chemist, and engineer.

George B. Kauffman, California State University, Fresno

Principles and Applications of Electrochemistry. By D. R. CROW (The Polytechnic). Wiley/Halsted, New York, N.Y. 1974. x + 228 pp. \$7.75.

This handy paperback answers in part the implied admonition to writers of works on electrochemistry that is contained in the Bockris/Drazic book¹ on electrochemical science: specifically, that something should be done to correct the 50-year setback in Western, practical electrochemical science that occurred as a result of the dominance of thermodynamics and the Nernstian influence. It does this by the grace of the inclusion of its last two chapters, Chapter 7 on interfacial (double layer) phenomena and Chapter 8 on electrode processes. In the former, the electrode double layer and its significance are well described in its various parts as well as topics pertaining to electrocapillarity, electrokinesis, colloids, and membranes. In the latter, nonequilibrium electrode potentials, electrode kinetics, and the mysteries of overvoltage and its component parts are revealed, especially exemplified by the case of the hydrogen electrode, some theories of which are reviewed. This chapter also touches on polarography, mixed potentials, and electrochemical energy sources.

The other chapters deal with the structure of electrochemistry, ionic interaction, ionic equilibria and acid-base theory, conductance, "reversible" potentials, and application of the latter, topics generally felt to comprise classical electrochemistry. What is meant by a "reversible" electrode process, a subject of great confusion among many, is well explained here as it relates to "fast" and "slow" electrode processes.

Generally clarity of expression is high, which it should be in a basic text of this sort, and in this reviewer's opinion, a proper balance has been struck between those items which should and should not be included. The references included for further reading could perhaps have included some of the more recent works, three of which are suggested here,¹⁻³ but aside from these minor details, this reasonably priced volume is a good candidate for chemistry courses taught from collections of paperbacks, for students interested in review or more detail on electrochemistry, or for professionals in need of a handy general reference on the subject.

- (1) J. O'M. Bockris and D. Drazic, "Electrochemical Science", Barnes and Noble, New York, N.Y., 1972.
- (2) J. O'M. Bockris and A. K. N. Reddy, "Modern Electrochemistry", Vol 1 and 2, Plenum Rosetta Editions, Plenum Press, New York, N.Y., 1970.
- (3) J. O'M. Bockris and Ronald A. Fredlein, "A Workbook of Electrochemistry", Plenum Press, New York, N.Y., 1973.

Bruce B. Graves, *Eastern Michigan Univ.*

Modern Aspects of Electrochemistry. No. 11. Edited by B. E. CONWAY (University of Ottawa) and J. O' M. BOCKRIS (The Flinders University). Plenum Press, New York, N.Y. 1975. xii + 320 pp. \$32.50.

This eleventh addition to a now well-known compendium continues in the same noble tradition to provide those critically needed technical summaries of significant current developments as near to the cutting edge thereof as is possible.

The first of six chapters concerns recent improvements on the Debye-Hückel theory of ionic solutions as reviewed by Hans C. Andersen, and he has successfully avoided the temptation of obfuscation through excessive use of mathematical equations, striking a marvelous balance between that and readable text, suggested as required reading for physical chemists. Robert J. Hunter next reviews the electrochemical aspects of colloid chemistry, developing from the theory of the electrical double layer, the charge and potential distribution at particle surfaces, electrokinetic phenomena, colloid stability (DLVO) theory, and van der Waals attraction energy, etc.

In the next chapter, W. Heiland examines with great skill the complex and multifaceted nature of the metal-vacuum interface. Concentrating mainly on low-energy electron diffraction (LEED), ion scattering for observation of surface topography, ion neutralization spectroscopy (INS), and electron spectroscopy, he is careful to define the components of C. B. Duke's "soup of acronyms", to touch on some surface reactions and theoretical aspects, and to suggest care in too quickly generalizing results from supposed pure clean surfaces or single crystals since these surfaces frequently are intrinsically defective or altered by their preparation.

Digby D. Macdonald takes up the high-temperature electrochemistry of metals in aqueous systems in Chapter 4, building from thermodynamic and Debye-Hückel principles a compilation of used and useful high-temperature electrodes with their range of use, potentials, and references, and discusses electrodes of the first and second kind plus concentration cells. A section on nonequilibrium electrode processes follows dealing mostly with iron, nickel, and copper passivation/dissolution and then a section on reference electrodes, most internal ones of which seem less than ideal except perhaps, the Pb (or PbO₂)|PbSO₄ electrode or the $(\alpha + \beta)\text{Pd}|\text{H}$ electrode if anyone would develop it fully. He concludes with several well-chosen suggestions for the future.

Two Australian authors, G. P. Power and I. M. Ritchie, next take up Metal Displacement Reactions, which apparently have never been comprehensively reviewed before. Two sections, one on the deposit itself and the other on kinetics of these heterogeneous reactions, make up the bulk of the chapter. In the former, topics such as composition (normal and anomalous codeposition) and morphology (smooth or particulate) are developed with the aid of numerous graphs and micrographs, while in the latter, several geometries are examined comparing mathematical analysis with results. A summary of studies of temperature dependence here seems to suggest that an E_a over 25 kJ mol⁻¹ indicates chemical rate control although hydrodynamic conditions cannot be ignored.

The hydrogen electrode is probably the most studied one there is, so it is not surprising to find that M. Enyo's chapter "Mechanism of the Hydrogen Electrode Reaction as Studied by Means of Deuterium as a Tracer" contains the largest bulk of references (5 pp) in this volume. Not only are we refreshed on the tracer work that has been done and on the various mechanisms proposed for the hydrogen electrode reaction, but several routes for the exchange reaction are developed mathematically and experimental evidence summarized to show how there is no unique rate-determining step for all-electrode metals. The effects of hydrogen pressure and pH are summarized, and there is a long section on the electrolytic deuterium separation factor discussed mainly in respect to the various hydrogen electrode reaction mechanisms followed by a section on step rate potential dependence.

This volume will, of course, be a standard addition to collections of those libraries serving electrochemical research, but it will also be of great value to professionals in industry or academia concerned with problems of electrometallurgical separations (Chapters 4, 5, and 6). Electrochemists interested in the recent developments in the nature of ions, solutions, or the electrode interface whether for teaching or research may also well consider this book worth acquisition.

Bruce B. Graves, *Eastern Michigan University*

Solid Waste Disposal. Volume 2. Reuse/Recycle and Pyrolysis. By B. BROWN and C. PARKER (Contract Research and Development, Enfield Conn.). Ann Arbor Science Publishers Inc., Ann Arbor, Mich. 1974. \$22.50.

It is increasingly recognized that the wastes resulting from our technological society represent a valuable resource which is currently being under-utilized. In this volume the many problems involved in the recycling of waste material and possible solutions to these problems are explored, including the fundamentally important role of government—local, state, and federal—in solving these problems.

The book consists of six chapters, an appendix, and a subject index. The first chapter is a detailed discussion of the technique of pyrolysis. Chapter Two discusses the use of nonplastic solid waste. Chapter three presents processes employed on solid waste utilization. The reuse, recycle, and reclamation of plastic solid wastes is discussed in Chapter Four. Chapter Five is a highly interesting discussion of the future for solid waste utilization. The final chapter is a comprehensive evaluation of government activity in the field of reuse and recycling of solid waste. The appendix discusses several relatively new disposal methods.

The authors have presented an interesting and thought-provoking examination of the problems and prospects associated with the recycling of solid wastes. All those involved with waste management at local, state, or federal levels, environmentalists, and those concerned with the full utilization of the resources available including "wastes", will find this book worthwhile reading.

Donald F. Logsdon Jr., *McClellan Air Force Base*

Food from Waste. Edited by G. G. BIRCH, K. J. PARKER, and J. T. WORGAN (Reading University). Applied Sciences Publishers, Ltd., London. 1976. xii + 301 pp. £ 16.

In the coming decades, providing adequate food for the ever-increasing population of the world will become a greater and greater problem. Even with effective population control, food supplies will still be critical. Therefore, it is important that no potential source of food be overlooked. In this provocative book, the viewpoints of scientists on the production and salvage of food from waste materials are presented.

The book includes 20 research articles with a discussion after each article, a list of contributors, and an index. The first two papers are on overview of the potential for obtaining food from waste materials.

Papers 3 through 6 discuss the conversion of waste materials to food via the use of microorganisms including bacteria and fungi. The seventh paper presents schemes for the microbial production of oils and fats, while paper 8 discusses important considerations concerning algal protein. In paper 9, the use of an approach combining microbial and chemical treatment to use waste paper as a food source is outlined. Papers 10 and 11 discuss the use of fungi and yeasts as a means to convert waste into food. Papers 12, 13, 14, and 15 describe methods for the production or salvaging of protein from waste materials. Paper 16 is a review of the world food problem. Paper 17 describes a continuous ion-exchange process which allows recovery and concentration

of protein from processing streams. Paper 18 presents methodology for evaluation of the nutritional and toxicological aspects of the novel feeds produced from waste. In paper 19 the socio-economic implications of obtaining food from waste are considered, and in the final paper the concept of the bioplex, or cyclic process from food to waste to food, is presented. A highly valuable feature of the book is the inclusion of the discussions after each paper, which add to and clarify the information presented.

The papers in this book were presented at an industry-university cooperation symposium held at the National College of Food Technology, University of Reading, in 1975, with 25 participants from six countries. Scientists, specialists in food technology, and all those concerned with the problem of producing food to feed the world's millions will find the contents of this book interesting.

Donald F. Logsdon Jr., *McClellan Air Force Base*

Separation Methods in Biochemistry (2nd Edition). By C. J. O. R. MORRIS and P. MORRIS (London Hospital Medical College). Halsted Press, John Wiley & Sons, New York, N.Y. 1976. 1045 pp. \$74.50.

The success of the first edition of this book, published in 1964, has convinced the authors of the need for an up-to-date, single-volume work directed toward all bioscientists whose research requires the purification, isolation, and analysis of biologically important substances from natural sources. Many important advances in separation science have occurred in the intervening years, necessitating a substantial revision of the text. Some techniques given only brief coverage in the original edition, such as thin-layer chromatography, molecular sieve chromatography, and gas chromatography, now require entire chapters. Other new procedures, like affinity chromatography and isoelectric focusing, were not even mentioned in the first edition. Fortunately the authors have balanced the addition of new material with the deletion of older methods that have become obsolete, resulting in only a small increase in the overall size of the volume.

The book begins with an introductory chapter on general principles of separation methods, followed by chapters on the theory of chromatography, the general techniques used in column chromatography, and then individual chapters on the major types of chromatography (adsorption, ion-exchange, partition, molecular-sieve, gas, paper, thin-layer, and counter-current distribution). The last section of the book contains two chapters on electrophoresis, followed by individual chapters on sedimentation, membrane separation methods, differential solubility, and finally a concluding discussion on the choice of separation methods.

One of the most commendable features of this volume is its balanced coverage of theoretical principles and practical information. For each method we are told not just why it works, but how one goes about getting it to work and what its useful applications are. Direct access to the original literature is facilitated by over 2000 references. The text is interspersed with many useful tables containing information assembled from diverse sources. Not only are there the expected tables listing applications of individual methods (with references) or properties of chromatography media, but there are also unique tables listing such items as the various types and manufacturers of pumps, fraction collectors, columns, and so forth.

The only significant fault I can find with this extraordinary volume is that its coverage of sedimentation methods is quite brief (17 pp) in comparison with its handling of chromatography and electrophoresis, and so those concerned with centrifugation methods will need to look elsewhere for an in-depth treatment of the subject. In spite of this shortcoming, "Separation Methods in Biochemistry" is a remarkable accomplishment and deserves a place on the bookshelf of every laboratory concerned with the isolation and characterization of biological molecules. It is unfortunate that because of the high price of this volume, only the more affluent laboratories may be able to obtain a copy.

Lewis J. Kleinsmith, *The University of Michigan*

Electroanalytical Chemistry: A Series of Advances. Volume 8. Edited by ALLEN J. BARD (University of Texas). Marcel Dekker, Inc., New York, N.Y. 1975. x + 380 pp. \$29.50.

This volume consists of a review by J. E. Harrar on controlled potential coulometry (CPC) (167 pp, 683 refs), an analysis by H. H. Bauer of "Streaming Maxima in Polarography" (110 pp, 324 refs), and a treatment by D. Bauer and M. Breant of "Solute Behavior in

Solvents and Melts, A Study by Use of Transfer Activity Coefficients" (67 pp, 183 refs).

Harrar's section, "Techniques, Apparatus, and Analytical Applications of CPC", is thoughtful and carefully structured. The principles and scope of CPC are presented briefly and contrasted with related coulometric techniques (e.g., voltage-scanning coulometry and stripping analysis). A thorough chapter on the design of potentiostat-cell control systems uses the concept of transfer functions to treat closed-loop and open-loop gain, phase compensation, system stability, and typical system response curves. An excellent, authoritative discussion of instrumentation for CPC, with many practical observations, is followed by equally practical chapters on electrolysis cell design and the problems of background corrections and interferences. The final chapter summarizes analytical applications, with emphasis on inorganic determinations (e.g., separate tables for uranium, neptunium, and plutonium methods), but a tabulation of organic applications has over 30 listings of methods for organic compounds or types of compounds. This is an interesting summary for the specialist and a good starting point for anyone seriously contemplating using quantitative determinations by CPC in a new context, as, for example, in biochemical research or kinetic studies.

H. Bauer's presentation on streaming maxima endeavors to systematize the often diverse and semiempirical observations in this field, which has long intrigued polarographers. Much early work is difficult to interpret, because two-electrode circuits with uncompensated resistance were used and precautions may not have been taken to exclude traces of surface-active impurities which can change markedly the current-time curves for individual mercury drops. Bauer shows that "maxima of the first kind", usually characterized as sharp linear (Ohm's law) increases in the current-potential curves, with an abrupt cessation, can have a different, rounded shape when resistance is compensated, using a three-electrode circuit with positive feedback. The origin of these maxima, as well as of smaller, rounded "second kind" maxima, due to convection currents in the drop itself, and of adsorption or "third kind" maxima, are discussed in terms of the forces which promote "streaming" of solution past the drop. Many explanations are convincing, but the impression remains that much more work is needed to explain and quantify streaming maxima.

Bauer and Breant offer a very pragmatic and stimulating approach to correlating solute properties in different solvents, using the *transfer activity coefficient*, γ_t , the ratio of the activity of a solute in water to its activity in another solvent, analogous to a partition coefficient. Extensive tabulations of γ_t values are presented and (using reasonable assumptions) existing data for selected solutes in up to 24 different solvents are correlated for redox, acid-base, and complexation reactions, including the following: comparison of electroactivity ranges and H^+/H_2 potentials (relative to the ferrocene/ferrocinium couple); relative potentials for O_2/O_2^- couple and for hydrocarbons and quinones; development of an "absolute" pH scale for acid-base behavior; relative basicity of nitrogen bases, carboxylate anions, and phenolate anions; and several pX scales for use in complexing media. In spite of several careless errors which detract from the general smoothness of their presentation, the authors have rendered a valuable service in correlating solute properties for these reaction types in so many different solvents. A chapter on experimental methods with useful hints on electrode construction and solvent purity rounds out their contribution.

Bruce McDuffie, *State University of New York at Binghamton*

International Review of Science. Inorganic Chemistry. Series 2. Consulting Editor: H. J. EMELEUS, Butterworth and Co., London. University Park Press, Baltimore, Md. 1975. 10-Volume Series: \$37.50/vol.

The basic concept of this review series is to provide regular authoritative reviews of entire disciplines. The volumes of Series 1 on Inorganic Chemistry were completed in 1972. Those of Series 2 were completed in 1975 and in general cover the literature between 1972 and the time of publication of Series 2. Each volume has an editor who obtained international authorities to prepare the reviews on individual topics in the area of his volume. Some feeling for the general plan can be obtained from a list of the editors and volume titles. These include: Vol. 1, "Main Group Elements, Hydrogen and Groups I to III", M. P. Lappert; Vol. 2, "Main Group Elements, Groups IV and V", D. B. Sowerby; Vol. 3, "Main Group Elements-Groups VI and VII", Viktor Gutmann; Vol. 4, "Organometallic Derivatives of the Main Group Elements", G. J. Aylett; Vol. 5, "Transition Metals-Part I", D. W.

A. Sharp; Vol. 6, "Transition Metals-Part 2", A. G. Maddock; Vol. 9, "Reaction Mechanisms in Inorganic Chemistry", M. L. Tobe; Vol. 10, "Solid State Chemistry", S. E. J. Roberts.

As the above listing shows, the general coverage of the field is excellent, and each editor has done an equally good job in developing his own area of responsibility. For example, Volume 6, edited by M. J. Mays has chapters on: Carbonyl Complexes; Nitrosyl, Dinitrogen, and Dioxygen Complexes; Transition Metal Complexes Containing Group VB or VIB Ligands, Organometallic Complexes Containing Metal-Metal Bonds Between Transition Elements and Main Group Elements; Complexes Containing Metal Carbon- σ Bonds; Allyl Complexes of the Second and Third Row Transition Metals; π -Cyclopentadienyl Complexes; Metal Compounds Containing Six Electron and Seven Electron Organic Ligands; Hydrocarbon-Metal π -Complexes Other Than Allyl, Cyclopentadienyl, and Arene Complexes; Complexes of Transition Metal Ions in the Homogeneous Catalysis of Organic Reactions. The above set of reviews is contained in a 358-page volume. In general, the writing is very good and the literature coverage is exhaustive.

While the price of \$37.50 per volume may well deter all but the most dedicated and affluent scholars, this review series is a *must* for any quality, scientific library. In this reviewer's opinion, Professor Emelius and his colleagues have again made a major contribution to the discipline of inorganic chemistry.

Robert W. Parry, *University of Utah*

Adhesion and the Formulation of Adhesives, By WILLIAM C. WAKE (The City University). Applied Science Publishers Ltd., Barking, Essex, England. 1976. xii + 325 pp. £ 15.00.

This book will interest scientists who want an overview of the theories of adhesion and insight into the commercial polymers that make up adhesives. The first part, eight chapters, is devoted to theoretical discussions of adhesion with ample examples to demonstrate important principles. Of particular interest is a discussion of bonding forces and surface effects in adhesive joints at the molecular level. Other topics are viscoelasticity, adhesion, and tack in pressure-sensitive adhesives. Rigid and flexible adhesive joints and their failure are discussed.

The second part, Chapters 9 through 16, is devoted to commercial polymers used in adhesive applications. Emphasis is given to structural adhesives, sealants, hot-melt adhesives, and textile adhesives in the latter chapters. The author has cited an abundance of references, many of which are recent, throughout the entire text. Chemical and physical properties of the adhesives are stressed, and the practical aspects of adhesive formulation have been left out which makes the book have greater appeal to those seeking an understanding of adhesives in their applications. The book concludes with a chapter on environmental effects on adhesive performance.

Charles D. Rowe, *Daubert Chemical Company*

Photoelectron and Auger Spectroscopy. By THOMAS A. CARLSON (Oak Ridge National Laboratory). Plenum Publishing Corp., New York, N.Y. 1975. xiii + 417 pp. \$32.50.

This book is designed primarily as a reference book for the use of those performing research in electron spectroscopy or of those considering entering the field. However, it would be a useful supplementary text for courses in spectroscopy and quantum chemistry. In general, reference books tend to focus primarily on the specific research interests of the author. This has been the case particularly in the field of electron spectroscopy; several decent books are available which focus entirely on x-ray photoelectron spectroscopy (XPS) or on ultraviolet photoelectron spectroscopy (UPS). On the other hand, Dr. Carlson has been involved in pioneering work in three different areas of electron spectroscopy—XPS, UPS, and Auger electron spectroscopy (AES). Consequently, for the first time we have a single reference book which gives a solid discussion of the three areas. Furthermore, Dr. Carlson has successfully discussed a broad spectrum of research in the three areas, rather than relying only upon his own research.

The book contains six chapters which discuss basic theory of electron spectroscopy, instrumentation, and specific work on a large variety of molecules for each of the three primary areas. The chapter

on instrumentation and sample-handling procedures is particularly informative. Although the book reviews work up to early 1975, the author was able to foresee the direction in which the field would move. For example, nice sections on electron spectroscopy as a tool for studying surfaces and on the synchrotron as an excitation source are included, although these research areas have developed primarily since early 1975. The chapter on Auger theory and applications will be quite helpful for those whose work has been concentrated entirely in XPS or UPS. The sections discussing molecular orbital calculations as applied to electron spectroscopy are a bit abbreviated, but do reference appropriate review articles and publications for the interested reader.

There are several helpful appendices at the end of the book which tabulate a large number of binding energies for elements, XPS chemical shifts for molecules, and acronyms and definitions in current vogue in electron spectroscopy. The references (over 1000) are given by chapter at the end of the book.

In summary, this reviewer believes that this book is comprehensive in three different areas of electron spectroscopy and that it will be a useful addition to the library of anyone working in the field or contemplating doing so.

S. D. Worley, *Auburn University*

Progress in Inorganic Chemistry. Edited by STEPHEN J. LIPPARD (Columbia University). John Wiley & Sons, Inc., New York, N.Y. 1976. 460 pp. \$27.50.

This volume, like others in the series, can be highly recommended to the chemical community as a means of keeping abreast of new and important topics in inorganic chemistry. Although there is inevitable variability in the quality and breadth of appeal of the articles, they generally reflect, in their organization, clarity, and scholarship, the high standards set by the editors.

"One-Dimensional Inorganic Complexes" are discussed in the first article by Joel S. Miller and Arthur J. Epstein. Experimental and theoretical activity in this field, which is currently very intense, stems largely from the observation of one-dimensional metallic conductivity in organic crystals and from recent attempts to demonstrate high-temperature superconductive transitions in "one-dimensional" salts. In their review of such phenomena, the authors provide a condensed and unified theoretical background of electrical properties in the solid state. They discuss the basic features of band and exciton theory, mechanisms of superconductivity, as well as cooperative magnetic phenomena that lead to antiferromagnetism and ferromagnetism in inorganic complexes. After discussing the theoretical basis of the design of one-dimensional conductors, Miller and Epstein present an exhaustive review of the inorganic chemistry of columnar complexes. The article is valuable for its bibliography alone, which contains 581 references to publications through early 1975.

"The Study of Electron Distributions in Inorganic Solids: A Survey of Techniques and Results" by Bruce C. Tofield attempts to provide an overview of different techniques that are sensitive to electron distributions in solids. The scope of this review permits only a cursory development of the theory of each technique and precludes an extensive bibliography of current research. For this reason, the article will be of quite limited value to research workers in the field, but may be helpful to chemists who wish to gain perspective on diverse techniques that reflect different aspects of electronic structure. In the third article, Berta Perlmuter-Hayman has discussed factors responsible for "The Temperature Dependence of E_a ".

A rather broad review of the "Application of Carbon-13 NMR in Inorganic Chemistry" is the subject of the fourth article by M. H. Chisholm and S. Godleski. This review is very timely considering the extremely general utility of NMR in studies of structure and bonding of inorganic complexes. Sufficient care and organization have gone into the systematic compilation of recent carbon-13 data that it is certain to be welcomed as a source reference by many synthetic chemists. This review is much more than a compilation of data, however. Trends in chemical shifts and coupling constants are identified and discussed in a fairly critical spirit in terms of correlations with parameters in the general theory of these quantities. In a subject where the subtleties of observed trends far outstrip the ability of theory to provide a rigorous explanation, this article enhances the practical basis for interpreting carbon-13 spectra of inorganic complexes.

Robert R. Sharp, *University of Michigan*