Several important references were inadvertently omitted from footnote 6. This footnote should include: (f) R. E. Humphrey and J. M. Hawkins, *Anal. Chem.*, **36,** 1812 (1964); (g) R. E. Humphrey, A. L. McCrary, and R. M. Webb, *Talanta*, **12,** 727 (1965); (h) R. E. Humphrey and J. L. Potter, *Anal. Chem.*, **37,** 164 (1965); (i) B. J. Sweetman and J. A. Maclaren, *Aust. J. Chem.*, **19,** 2347 (1966); (j) M. Grayson and C. E. Farley, *Chem. Commun.*, 831 (1967); (k) M. Grayson, *Colloq. Int. C.N.R.S.*, **182,** 275 (1969).

Reactions of π-2-Methallylnickel Bromide with Methylbenzoquinones. Evidence for Electron Transfer [*J. Am. Chem. Soc.*, **96,** 6789 (1974)]. By L. S. HEGEDUS* and E. I. WATERMAN, Department of Chemistry, Colorado State University, Fort Collins, Colorado 80521.

On page 6790, two lines were transposed in the paragraph beginning at the bottom of the left-hand column. The paragraph should read:

Finally, the *site* of alkylation of the various methylbenzoquinones studied corresponds to the *noncarbonyl ring site of highest spin density* in the corresponding quinone radical anion, as measured from esr hyperfine splitting constants and as calculated by Hückel LCAO-MO methods.[5-7] Table I shows this correlation by listing the calculated spin densities for the various quinone radical anions followed by the allyl products obtained from the reactions summarized in eq 1.[8] . . .

A New Ring System. 2,6-Dioxabicyclo[2.2.2]octane, a Highly Reactive Bicyclic Acetal [*J. Am. Chem. Soc.*, **96,** 7265 (1974)]. By H. K. HALL, JR.,* L. J. CARR, R. KELLMAN, and F. DE BLAUWE, Department of Chemistry, University of Arizona, Tucson, Arizona 85721.

"A New Ring System" should be deleted from the title.

In the first sentence of the Abstract, change "of a new ring system" to "of a strained ring system".

In the first sentence of the Discussion (p 7266), change "this ring system" to "this compound".

Diol Dehydrase Model Studies. The Acid Catalyzed Rearrangement of β-Hydroxyisopropylcobaloxime [*J. Am. Chem. Soc.*, **96,** 7681 (1974)]. By KENNETH L. BROWN and LLOYD L. INGRAHAM,* Department of Biochemistry and Biophysics, The University of California, Davis, California 95616.

On page 7684 we state that Schrauzer and Windgassen probably did not obtain pure β-hydroxyisopropylcobaloxime in basic solution from a 2-halo-1-propanol. We have subsequently been informed by Dr. Schrauzer that he did obtain the pure product. The necessary structural proof was obtained but not published with the synthesis. Accordingly, we retract our statement.

Hydroboration. XXXVI. A Direct Route to 9-Borabicyclo[3.3.1]nonane *via* the Cyclic Hydroboration of 1,5-Cyclooctadiene. 9-Borabicyclo[3.3.1]nonane as a Uniquely Selective Reagent for the Hydroboration of Olefins [*J. Am. Chem. Soc.*, **96,** 7765 (1974)]. By HERBERT C. BROWN,* EVORD F. KNIGHTS, and CHARLES G. SCOUTEN, The Richard B. Wetherill Laboratory of Purdue University, West Lafayette, Indiana 47907.

In Table III the products from styrene are 2-phenylethanol, 98.5%; 1-phenylethanol, 1.5%. (The printed prefixes are transposed.)

Synthesis, Characterization, and Bonding of Tetrameric Triphenylphosphine Silver Halide Cluster Systems. Evidence of Dictation of Stereochemistries by van der Waals Interactions [*J. Am. Chem. Soc.*, **97,** 1256 (1975)]. By BOON-KENG TEO,* Bell Laboratories, Murray Hill, New Jersey 07974, and JOSEPH C. CALABRESE, Department of Chemistry, University of Wisconsin, Madison, Wisconsin 53706.

Between the bottom of page 1256 and the top of page 1257, two lines have been omitted. This passage should read "the average Ag-X distances are substantially longer than normal covalent bonds by 0.32 and 0.24 Å in **1** and **2a,** respectively. The observed lengthening of the Ag . . . Ag distances . . . ."

Proton-Exchange Reactions of Acetone and Butanone. Resolution of Steps in Catalysis by Acetoacetate Decarboxylase [*J. Am. Chem. Soc.*, **97,** 1568 (1975)]. By GEORGE HAMMONS, F. H. WESTHEIMER,* KURT NAKAOKA, and RONALD KLUGER,* James Bryant Conant Laboratories, Harvard University, Cambridge, Massachusetts 02138, and the Department of Chemistry, University of Chicago, Chicago, Illinois 60637.

The caption to Figure 3 should read: (a) The 60-MHz spectrum of the protons of the 4 position of butanone after ~55% of the original signal at the 3 position remains, catalyzed by hydroxide; (b) the same except catalyzed by enzyme.

Book Reviews*

NMR of Paramagnetic Molecules—Principles and Applications. Edited by G. N. LA MAR (University of California, Davis), W. DEW. HORROCKS, JR. (Pennsylvania State University), and R. H. HOLM (MIT). Academic Press, New York, N.Y. 1973. XV + 678 pp. $42.00.

This book is a collection of contributed chapters describing theoretical background and the various applications in chemistry and biochemistry of the investigation of paramagnetic molecules by NMR.

It is intended to "serve both as a reference book to active research workers and as an introduction to this subject for a *novice*." However, a level of competence comparable to familiarity with texts such as Ballhausen's "Introduction to Ligand Field Theory" and Carrington and McLachlan's "Introduction to Magnetic Resonance" is assumed. As substantiated by parts of the book, the "novice" has to be someone who has considerable theoretical as well as working knowledge of NMR.

The book is loosely arranged in two parts; the first three chapters present the theoretical background for shift, line width, and the interpretation of NMR parameters in terms of electronic structure. The second part, Chapters 5 to 15, deals with applications in chemistry and biochemistry. Included are descriptions of spin distributions in organic ligands and organometallic compounds; the use of lanthanide shift reagents; four chapters that deal with stereochemistry, solvation, solution structures, and intramolecular rearrangements; and one chapter each on biological applications and organic radicals. An additional chapter was added in proof in order to cover material and developments up to approximately mid-1972. The connections between the two parts are bridged in Chapter 4, which describes the operational aspects of obtaining information from NMR spectra.

As typical of books with contributed chapters, the level of presentation is uneven. It is unfortunate that if one tries to read this book from Chapter I, one gets a very erroneous view of the book. Chapter I contains a heavy dose of complex equations and sketchy derivations. The remaining two theory chapters are much more qualitative and readable. The chapters on various applications in chemistry and biochemistry are in general informative, comprehensive, well referenced (over 1200 references!), and well written and as such are invaluable as a source book as well as introduction for a novice (as defined above) to the applications of NMR of paramagnetic molecules.

It is the reviewers' opinion that with the addition of an introductory chapter on NMR, a qualitative review on the subject of paramagnetic molecules, and an introduction to ligand field theory, the book would be much more comprehensive and self-contained. However, the book as it stands does serve its stated purpose admirably well. Any serious worker and research laboratory in NMR should have a copy of this book, although the rather stiff price will probably be a serious obstacle. At this price, one also would expect the book to have quality binding, but our review copy is starting to fall apart already.

Alfred F. Esser, *Department of Chemistry*
Louis N. Shen, *Department of Physics*
California State University, Fullerton

The Chemisorptive Bond: Basic Concepts. By A. CLARK (University of Oklahoma). Academic Press, New York, N.Y. 1974. ix + 207 pp. $18.00.

The current level of understanding of the chemisorptive bond can be characterized as primitive. Sophisticated techniques for the direct study of surfaces have only recently become available, and it is likely that it will still be a while before the true picture of the chemisorptive bond comes clearly into focus. In the present monograph (No. 32 in a series of monographs in physical chemistry) a brief and candid effort is made to summarize various theoretical models for chemisorption which have evolved both from semiempirical relationships and also from quantum mechanical treatments. Although quantum mechanical approaches to chemisorption are stressed, they are reviewed qualitatively with emphasis on simple physical pictures. References to original works are included at the end of each chapter.

This text consists of ten chapters. Following a short introduction, Chapters 2 and 3 deal with models for chemisorptive bonds based upon analogy with simple covalent and ionic bonds. Chapter 4 is concerned with the band theory of metals and attempts at correlating chemisorption with d-band vacancies. Chapter 5 considers chemisorption on semiconductors. Chapters 6, 7, 8, and 9 present theories for the chemisorptive bond for general lattices and metals and ionic lattices which have been developed from quantum mechanics. Chapter 10 looks at chemisorption from the standpoint of crystal- and ligand-field theory. A central question which is considered throughout this book is whether the chemisorptive bond is better described as a localized or a nonlocalized bond.

The principal value of this publication lies in its simple, qualitative descriptions of some mathematically complex models for the chemisorptive bond. The material presented is reasonably well organized, and the author carefully points out weaknesses in each of the theories reviewed. Although many of these concepts may only be "scratching at the surface" of a true understanding of the chemisorptive bond, they would appear to provide a rational framework from which detailed, quantitative theories may someday be developed.

Steven L. Regen, *Marquette University*

Advances in Corrosion Science and Technology. Volume 4. Edited by M. G. FONTANA and R. W. STAEHLE (Ohio State University). Plenum Press, New York, N.Y. 1974. ix + 331 pp. $27.50.

This book is another addition to the well-known series entitled, "Advances in Corrosion Science and Technology".

The topics covered in this volume are (Chapter 1) The Mechanical Properties and Breakdown of Surface Films at Elevated Temperatures, by P. Hancock and R. C. Hurst; (Chapter 2) the Anodic Dissolution of Metals—Anomalous Valence, by W. J. James; (Chapter 3) Corrosion of Metals in Organic Solvents, by E. Heitz; (Chapter 4) Chromium Depletion and Void Formation in Fe-Ni-Cr Alloys during Molten Salt Corrosion and Related Processes, by J. W. Koger.

The first chapter deals with mechanical properties of protective surface oxide films generated during high-temperature oxidation of metals. The major sources of stresses in these films, as well as the mechanism of breakdown of surface oxide films, are examined. Other topics reviewed in this chapter include methods of measuring internal stresses and mechanical properties of surface scales and the effect of contaminants on the failure of surface films.

The second chapter is a review of the experimental and theoretical aspects of the so-called "anomalous" valence observed experimentally when several metals are dissolved anodically in aqueous and nonaqueous media. Anomalous valence refers to the observation that the weight of metal dissolved anodically is sometimes greater than that calculated from Faraday's law assuming normal oxidation states. Among metals considered in this review are several metals of industrial importance, e.g., Al, Be, Cd, Fe, Pb, Mg, and Zn which have been reported to exhibit this phenomenon.

The third chapter reports on the reactions of solid metals with a large number of different liquid organic compounds. Topics discussed in this chapter include the thermodynamics, kinetics, and mechanisms of the heterogenous chemical reactions of several metals with protic, aprotic, and amphiprotic organic media. Reactions considered include electrochemical processes (charge transfer occurs via an electronic current in the metal phase and ionic current in the liquid phase) as well as "chemical" processes (charge transfer occurs directly between the metal atom in the lattice and the oxidizing species). Other topics briefly discussed are electrochemical acidity functions and electrode and corrosion potentials in organic solvents. The theoretical discussion in the first half of this

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*Unsigned book reviews are by the Book Review Editor.

chapter is supplemented with extensive review of practical case histories of corrosion failures and their prevention in organic liquid media.

The last chapter examines chromium depletion and void formation in Fe-Ni-Cr alloys caused by high-temperature reactions of these alloys with molten salts, liquid metals, and oxidizing atmospheres. Several heat treatment processes causing chromium depletion in the alloy matrix are also discussed. Electrode potential measurements and free energy data are used to explain chromium depletion in terms of preferential reaction of chromium atoms with the environment or impurity elements in the alloy matrix.

In summary, the high standard set in earlier volumes has been maintained. This book will be of use to students, research workers, and technologists who are concerned with the environmental behavior of metallic materials.

Z. A. Foroulis, *Exxon Research & Engineering Company*

Advances in Nuclear Quadrupole Resonance. Volume 1. Edited by J. A. S. SMITH, Heyden and Son, Ltd., London. 1974. xv + 434 pp. $39.50 (Distributed in U.S.A. by Sadtler Research Laboratories, Inc., Philadelphia, Pa. 19104).

This volume consists of papers based largely on work presented at the International Symposium on Nuclear Quadrupole Resonance, September 1972, in London. The increasing level of interest in NQR spectroscopy is reflected in the fact that the Third International Symposium on Nuclear Quadrupole Resonance was held in Tampa, Florida, in April 1975. The growth in this field of spectroscopy is due more than anything else to improvements in instrumentation, which make it possible to obtain spectra for many quadrupolar nuclear systems which were previously not very accessible.

About half of the volume is divided into several parts which are concerned each with work involving a specific nucleus or group of elements: Halogen Resonances; Metal Resonances; Deuteron Quadrupole Coupling Constants; ^{14}N Quadrupole Resonance. The remaining half is concerned with more physical topics and instrumentation: Structure and Molecular Motion; Instruments and New Techniques; Conformational Effects; Lattice Effects. The papers, some 30 in all, vary considerably in quality; there are several really excellent contributions. The chemist working in the field of NQR will find much here to interest and stimulate him. In the aggregate, there are quite a lot of NQR data in the book, made accessible through a comprehensive compound index.

The chemist who takes up the book hoping to learn what NQR can tell about molecular and electronic structure will, I am afraid, not be well rewarded. For that purpose there is too much material on temperature and pressure dependences, and not enough on what NQR data mean in terms of bonding parameters. It is this reviewer's opinion that there is much more of chemical interest to be learned from NQR than one might gather from most of the papers presented in this book. It is to be hoped that future volumes in the series will be of greater value as sources of chemically interesting information.

Theodore L. Brown, *University of Illinois, Urbana*

Homogeneous Hydrogenation. By B. R. JAMES (University of British Columbia). John Wiley & Sons, Inc., New York, N.Y. 1973. xiv + 525 pp. $24.95.

While the field of catalytic hydrogenation of organic compounds is almost 80 years old, the use of soluble metal compounds for hydrogenation has only received serious attention over the past 15 years. As if attempting to make up for this late start, there has been an explosion of literature in this field as evidenced by over 1900 references in this book. Various subsections of the area have been reviewed over the past few years, but this is the first attempt at a comprehensive review of the whole field of the activation of molecular hydrogen in solution. As such it is an invaluable reference work for investigators in the area of homogeneous catalysis. The work is very strongly oriented toward the fundamental processes and mechanisms involved in such reactions and presents an admirable critical analysis of the evidence regarding these facets of the subject.

The book suffers from one weakness which the reader will find serious or trivial depending on his expectations of the work. James has organized the subject matter by metal rather than by the more conventional manner of organic substrate (apart from one incongruous chapter on hydrogenation of unsaturated fats). This of course is excellent for ready comparisons within various rhodium catalysts, for example, but will prove frustrating for someone attempting to use this book to find which homogeneous catalyst to use for a particular application. Thus, as an example, a reader approaching this work from the purely utilitarian viewpoint of attempting to decide which homogeneous catalyst to use for straight-chain olefin hydrogenation will be faced with the somewhat daunting task of leafing through 50 sections of the book. A better cross-indexing system could have overcome this problem. However, the reader can be sure that he will eventually find the information he is looking for in this very thorough work.

Denis Forster, *Monsanto Company*

Analytical Chemistry of Silicon. By L. V. MYSHLYAEVA (Moscow Chemical and Technological Institute) and V. V. KRASNOSHCHEKOV (Moscow State University). Halsted Press, Division of John Wiley & Sons, Inc., New York, N.Y. 1974. viii + 228 pp. $30.00.

This book is part of the extensive "Analytical Chemistry of the Elements" series which is being prepared by the Vernadskii Institute of Geochemistry and Analytical Chemistry under the editorship of A. P. Vinogradov. V. Schmorak of the Israel Program for Scientific Translations has ably translated this book from the Russian and has added some of his own footnotes to clarify any possible ambiguities.

A discussion of the physical and chemical properties of silicon, its oxides, and related compounds begins the book. This is well presented and includes an interesting unit on the properties and structures of silicic acid. Following this are chapters on the qualitative detection of silicon, its separation from accompanying elements, and the preparation of samples for analysis. Each of these units offers a wide variety of methods, and the presentation of each method is replete with references and a concise discussion of the chemistry involved. The quantitative methods covered include gravimetric, titrimetric, photometric, and a wide variety of other instrumental methods. Every analytical procedure is prefaced with a thorough but succinct discussion of the scope and limitations of the procedure. The analysis of natural materials and synthetics including organosilicon compounds is covered.

The authors have dealt with their subject in a thorough manner without being verbose. They have provided a comprehensive index and an ample bibliography (1140 references in all).

Because of the content of this book and the excellent treatment of each subject, this volume should provide a useful reference not only for the analytical chemist but for all who are involved with silicon chemistry.

Jon Howdeshell, *Laramie Chemical Company*

Inorganic Syntheses. Volume XV. Edited by GEORGE PARSHALL (E. I. duPont de Nemours). McGraw-Hill Book Co., New York, N.Y. 1974. xiv + 282 pp. $19.95.

It is just plain hard to review parts of a classic, especially a classic that nearly everybody knows about and either reveres or ignores. Suffice it to say, the fifteenth volume of *Inorganic Syntheses* follows the series' established pattern of presenting tested preparations of research worthy compounds. The volume's editor admits in the Preface that he has naturally assembled contributions largely in his own field, transition-metal compounds useful in homogeneous catalysis. A listing of all the preparations would be inappropriate here, but please don't think that the editor is as parochial as he states—a large number of syntheses will be of interest to researchers in widely differing areas. The chapters are: Metal Complexes of Olefins; Metal Complexes of Dinitrogen and of Hydrogen; Triphenylphosphine Complexes of Transition Metals; Other Transition-Metal Compounds; Boron Compounds; Germanium Hydride Derivatives; Phosphorus Compounds; and Main Group and Actinide Compounds. There are a total of 117 preparations presented under 51 general headings in the above listed eight chapters.

Very often a researcher is frustrated by the minimal instructions, by the lack of references, and by the insufficient reporting of dangers and pitfalls in journal articles reporting new syntheses. Such is definitely not the case in *Inorganic Syntheses*, and every entry is endowed with clarity, completeness, and cautionary notes. The series is a blessing and deserves to be imitated while itself achieving perpetuity.

Robert M. Kren, *University of Michigan—Flint*

The Interpretation and Use of Rate Data: The Rate Concept. By S. W. CHURCHILL (University of Pennsylvania). Scripta Publishing Co., Washington, D.C. 1974. xxvii + 510 pp. $13.95.

Two major topics are covered in this recent book, namely, the generalized rate concept and dimensional analysis of mathematical models. As the author points out, most of the book relies heavily on examples using actual experimental data to illustrate the various engineering concepts.

The unified treatment of the rate concept is a powerful tool for the chemical engineer since he is frequently faced with formulating a differential rate expression from integral data. This material was initially used at the University of Michigan for both the undergraduate and graduate chemical engineering program where I was exposed to it first hand. From my own experience, an extremely complicated reaction network was attacked with the generalized rate concept to successfully demonstrate autocatalytic behavior from an observed maximum in the reaction rate. Integral analysis of the data would never have revealed this strange phenomena.

The dimensional analysis portion of the book puts the formulation of engineering correlations on a more logical and fundamental basis. More specifically, nondimensional groups are directly related to the pertinent mathematical process models for either heat, mass, or momentum transfer. This dimensional analysis technique may also be used to give a minimum description of initial and boundary value problems, frequently giving simplifications such as a partial differential equation reducing to an ordinary differential equation. The book reads well and is an excellent reference for both the student and practicing engineer. The numerous example problems are quite useful for implementing the text material to specific engineering problems.

K. K. Robinson, *Amoco Oil Company*

Synthetic Reagents. Volumes 1 and 2. By J. S. PIZEY (University of Aston in Birmingham). John Wiley & Sons, Inc., New York, N.Y. 1974. Vol. 1: vii + 411 pp. $36.50. Vol. 2: vii + 353 pp. $37.50.

The format in the volumes is to deal with the synthetic uses of specific versatile reagents in organic chemistry. In Volume 1, an in-depth treatment is given to dimethylformamide, lithium aluminum hydride, mercuric oxide, and thionyl chloride. Volume 2 deals with *N*-bromosuccinimide, diazomethane, manganese dioxide, and Raney nickel. These volumes offer a comprehensive review of the reagents with the advantage over a review article of presenting synthetic details. A comprehensive and diversified number of examples of synthetic conversions utilizing these reagents is presented and thereby renders it easy for the reader to locate analogies to his own system. The wealth of examples of the synthetic utility of each reagent coupled with the mechanistic ideas presented allows the reader to make intelligent predictions of how his system should react. Exact experimental details are easily located because of the large number of up-to-date references given.

The books were of immediate use to myself as I am sure they will be to others. These volumes covering the synthetic utility of selected reagents in organic chemistry would be a valuable addition to the library of any research organic chemist.

Anthony J. Sisti, *Adelphi University*

Polymeric Materials for Unusual Service Conditions. Edited by MORTON A. GOLUB and JOHN A. PARKER (Ames Research Center, NASA). Published by John Wiley & Sons, New York, N.Y. 1973. vi + 341 pp. $16.00.

This symposium issue can be broken into six main categories: polymers for aircraft and spacecraft structures, high-temperature resins and composites, elastomers for high-temperature applications, fire-retardant materials, polymers for critical pollution control, and polymers for critical medical use. The articles range from abstracts of presented papers, to original research, to reviews. They are well written with many useful illustrations.

The subjects covered are very specific, and because of this, the overall worth of the book is limited. Many of the articles should have been published elsewhere for greater utility.

Kenneth Abate, *Celanese Coatings & Specialties Company*

Absorption Spectra in the Ultraviolet and Visible Region. Volume XIX. Edited by L. LÁNG (Technical University, Budapest). Academic Press, New York, N.Y. 1974. 428 pp. $33.30.

This volume continues the series of loose-leaf collections of ultraviolet-visible spectra which have been issued under the auspices of the Hungarian Academy of Sciences since 1959 (*J. Am. Chem. Soc.*, **82**, 5768 (1960); **95**, 1351 (1973)). No major changes in style, format, or mode of presentation have been made from the earlier volumes, but inflation has had its effect upon the price.

The present collection contains the absorption spectra of 184 compounds, many of which are presented for a diverse selection of solvents and pH's, as well as several concentrations, and, in some cases, varying path lengths. Included are 112 heterocyclic compounds, of which the most extensively represented ring systems are quinolines and isoquinolines (24), imidazoles and imidazolines (19), oxiranes (18, mostly chalcone oxides), dibenzthiepins (17), and isoflavones and chromones (10). Also included are eight glutardianilides, eight copper(II) bis(benzoylacetanilides), three thiosemicarbazides, 29 compounds having substituted phenyl groups attached to a variety of bivalent functions, and a rather heterogeneous group of mono-, di-, and trisubstituted benzenes.

Even though this volume has 31 contributors, who are affiliated with twelve different institutions in three countries, and although seven different models of instrument were used in obtaining the spectra, the standardization of the previous volumes has been maintained. All of the spectra are presented as plots of log ϵ *vs.* λ in nanometers, with a scale of 20 nanometers to the centimeter. An overlay sheet of clear plastic imprinted with a metric grid is provided as an aid to reading the spectra. On the back of each spectral sheet are presented the experimental data for each spectrum, including the absorbance data at two-nanometer intervals for each set of experimental conditions of concentration, path length, and solvent.

Hungarian contributors predominate, as was the case with the previous volumes; but five Polish and two Czechoslovakian contributors are also named. Of the thirteen journal references cited, six are from middle-European journals of limited distribution.

Some of the compounds whose spectra are presented are probably of extremely limited interest; and the order of presentation appears to be without plan, although spectra of like compounds are generally grouped together. The collection is nevertheless a valuable and useful one, and is well-indexed. The standardization of all the spectra to the same scale, and, particularly, the examination of solvent and pH effects, are features which are better done than in most other current collections of ultraviolet-visible spectral data. This collection will find a useful place in research libraries.

Lyman R. Caswell, *Texas Woman's University*

Hydrogen Bonding. By MELVIN D. JOESTEN and L. J. SCHAAD (Vanderbilt University). Marcel Dekker, Inc., New York, N.Y. 1974. vi + 622 pp. $45.

Professor Joesten has set out to write a book that would cover the developments in hydrogen bonding since the publication of "The Hydrogen Bond" by Pimentel and McClellan in 1959. The resulting book, when used with that of Pimentel and McClellan, will provide an excellent starting point for anyone needing access to the vast literature on hydrogen bonding. The annotated bibliography emphasizes work since 1960 and is complete through 1973.

There are also two extensive tables that should prove useful. The first is a complete, referenced list of thermodynamic properties of hydrogen-bonded systems, including association constants and changes in Gibbs' free energy, enthalpy, and entropy upon hydrogen bond formation. This table also includes shifts in the A-H stretching frequency upon hydrogen bond formation. The other table lists theoretical calculations of hydrogen-bonded systems and includes the method of calculation along with a brief comment on the thrust of the paper in which the calculation occurs.

The chapter written by Professor Schaad on the theory of the hydrogen bond gives a brief review of quantum mechanics and an explanation of the various approximations used in calculations on hydrogen bonding.

Although the book is a photoreproduction of a typewritten manuscript, it is sufficiently well prepared that this is not bothersome.

Robert G. Ford, *Memphis State University*

Natural Chelating Polymers. By R. A. A. MUZZARELLI (University of Bologna). International Series of Monographs in Analytical Chemistry. Volume 55. General Editors: R. Belcher and H. Freiser. Pergamon Press, New York, N.Y. 1973. xii + 254 pp. $15.00.

This is a review of the uses of natural chelating polymers in analytical chemistry. The first chapter deals briefly with recent applications of modified celluloses in inorganic analytical chemistry, providing a range of data on chromatographic separation of both main group and transition metals. However, the greatest part of the book is devoted to alginic acid, a polyuronide, chitin, a polysaccharide, and chitosan, a synthetic, partially deacetylated derivative of chitin. The natural occurrence, physical characteristics, macrostructures and uses of the polymers and their derivatives are outlined. A detailed account of their characteristics in the separation of organic and inorganic species is presented. The final chapter gives a brief account of other chelating polymers including polysaccharide, amino acid (the collagens), and fatty acid (the cutins) derivatives.

The book should prove useful as a review and part of this series of monographs in analytical chemistry but otherwise will probably be of only limited interest.

Robert R. Gagné, *California Institute of Technology*

Chemical and Biochemical Applications of Lasers. Volume 1. Edited by C. BRADLEY MOORE (University of California, Berkeley). Academic Press, New York, N.Y. 1974. xii + 398 pp. $29.50.

The many varied accomplishments of laser applications in chemical research become clear on reading this book. What is even more evident is the future potential which laser applications may bring in chemistry and biochemistry. The editor provides the reader with a series of ten articles by long-time laser chemists. The contributions are intended to "whet the appetites" of the researcher unfamiliar with laser techniques, while at the same time to serve as thorough reviews for the experts in those fields. The introductory chapter is a survey for the nonexpert of available lasers, how they work, and their special characteristics. In addition, the other chapters include detailed reviews of the methods, capabilities, and limitations of the laser experiments featured.

The chapters cover a wide range of interests, from the interactions of lasers with molecular beams to the study of fast reactions in vision. Of particular interest to biochemists and biologists is the structural information which may be obtained from the Raman spectra of biological molecules. A variety of pulsed laser experiments which are applicable to biological systems are described, including the laser temperature jump, fluorescence, and absorption techniques. Some of the most rapid biochemical kinetic phenomena can be interrogated with picosecond pulsed-laser technology.

The results of laser photodetachment studies of negative ions presents one of the most successful applications of laser techniques to ion beams. It provides some of the first reliable measurements of electron affinities, an important thermodynamic property. An intriguing topic discussed in several sections is that of laser-induced chemistry. The importance of such chemical dynamic phenomena as inter- and intramolecular energy transfer, nonradiative decay mechanisms, and lifetimes of electronically excited states are stressed.

With the recent interest in laser-excited chemistry of all types, this book provides timely and welcome reading for researchers in chemistry and biochemistry as well as physics and engineering.

Stephen R. Leone, *University of Southern California*

The Chemistry and Biochemistry of the Sulfhydryl Group in Amino Acids, Peptides and Proteins. By M. FRIEDMAN (Western Regional Laboratory, USDA, Berkeley, Calif.). Pergamon Press, Inc., Oxford, England. 1973. viii + 485 pp. $22.50.

This book is a comprehensive text which superbly combines the chemistry and biochemistry of the sulfhydryl group. The author has managed to present the chemistry of the sulfhydryl moiety in mechanistic terms which should be palatable to the biochemist and pharmacologist. The first nine chapters of the book deal largely with chemical aspects of thiols, ranging from acid-base equilibria to thiolation reactions and peptide syntheses. Most of the first nine chapters are organized along mechanistic lines. The later seven chapters cover a substantial range of biochemical and pharmacological topics as well as some medicinal chemistry.

In reading this book, I have found an interesting blend of organic, inorganic, and analytical chemistry within a biochemical context. The reader should find this text useful as both a primary learning source and a reference work. Perhaps the one shortcoming of this book involves the diagrams and structures. The accuracy, quality, and style of the structures vary substantially throughout the book.

This text should be useful to both undergraduates and graduate students as well as researchers in at least half a dozen different disciplines. Altogether, the author has admirably accomplished the Herculean task of providing a comprehensive text which spans chemistry, biochemistry, and several related fields, all for the very low price of this book. I think this is an indispensable book for anyone involved in the chemistry of thiols or sulfur chemistry in biological systems.

J. P. Marino, *University of Michigan*

Organic Quantum Chemistry Problems. By R. ZAHRADNICK and P. ČARSKY (Czechoslovak Academy of Sciences). Plenum Publishing Corp., New York, N.Y. 1973. x + 222 pp. $5.95.

This small paperback book is concerned with the application of quantum mechanics to structural problems in organic chemistry. It is essentially a workbook designed to supplement any of a number of already available textbooks on organic quantum chemistry and, in this reviewer's opinion, should be quite useful in this regard.

The first part of the book consists of over 100 problems. They range from simple qualitative questions regarding the spatial arrangements of atomic orbitals through much more substantive problems involving, for example, perturbation and self-consistent field methods, secular equations, charge distributions, and a variety of spectral properties. Some of the problems require extensive computations, but could easily be handled with a relatively simple desk calculator. The solutions to all of the problems are given, in considerable detail, in the second part of the book. The third part gives numerical data essential to the solution of some of the problems, and the last part provides a summary of useful definitions, equations, and brief descriptions of computational methods. There is also a glossary and a brief list of references.

Many important topics must, of course, be excluded in a book of this size, but a broad enough selection of problems has been covered to make this a useful book to both organic and physical chemists.

J. E. Mark, *The University of Michigan*

Physical Chemistry. An Advanced Treatise. Volume VIA. Kinetics of Gas Reactions. Edited by WILHELM JOST (Institut für Physikalische Chemie der Universität Göttingen). Academic Press, New York, N.Y. 1974. xx + 507 pp. $43.00.

"Kinetics of Gas Reactions" is Part Six of a fifteen-part "Comprehensive treatment of physical chemistry for advanced students and investigators". Each chapter in Volume VIA is an advanced tutorial on a topic of current interest in chemical dynamics and kinetics: 1. Formal Kinetics, W. Jost, 76 pp (a formal presentation of elementary relations is followed by treatments of the steady state, stability, oscillations, and approach to equilibrium); 2. Survey of Kinetic Theory, C. F. Curtiss (University of Wisconsin), 44 pp (classical and quantum formulation of equations of change, boltzmann equation, and transport properties); 3. Potential Energy Surfaces, H. Eyring (University of Utah) and S. H. Lin (Arizona State University), 66 pp (LEP and LEPS methods, six reaction surfaces from the literature, and a treatment of orbital symmetry in reaction kinetics); 4. Theory of Energy Transfer in Molecular Collisions, E. E. Nikitin (Institute of Chemical Physics, Academy of Sciences of the USSR, Moscow), 40 pp (models for TR, TV, RV, TRV, VV, and TRVE processes are presented); 5. Molecular Beam Scattering Experiments on Elastic, Inelastic, and Reactive

Collisions, J. Peter Toennies (Max-Planck-Institute für Strömungsforchung, Göttingen), 155 pp (encyclopedic review through 1972 and beautifully illustrated); 6. The Dynamics of Bimolecular Reactions, J. C. Polanyi and J. L. Schreiber (University of Toronto), 105 pp (the connection between rate constant and cross section is established, followed by treatments of classical trajectory calculations, empirical potential energy surfaces, connections between the features of surfaces and the dynamical information obtained in "single-collision" experiments, and several simple dynamical models).

The articles are not primarily surveys of the most recent literature in their respective fields, but more, as the title suggests, systematic treatments which succeed in placing the topics in perspective and in presenting the developments of each field as well as supplying a useful bibliography of published work. While the references are extensive, they predate the publishing date of the volume (November 1974) by more than two years (with the exception of Chapter 6). This perhaps unavoidable delay in publishing is a minor criticism, however, and detracts little from the instructional value of this collection of articles.

David L. McFadden, *Boston College*

The Solid State of Polymers. Edited by P. H. GEIL and E. BAER (Case Western Reserve University) and Y. WADA (University of Tokyo). Marcel Dekker, New York, N.Y. 1974. xii + 708 pp. $47.50.

This book contains many of the papers given at a joint U.S.–Japan Seminar on Polymer Solid State which was held in Cleveland in 1972. Although the papers have already been published in the literature, it is convenient to have them compiled into a book. This is an outstanding collection of papers by the leading U.S. and Japanese scientists in the fields of polymer morphology and mechanical properties. Some of the papers are limited to new work, but others are very good review articles. Such a compilation has the disadvantage of not having a single author who systematically covers the entire field. However, there is the advantage of having several points of view of a rapidly advancing and often controversial subject. Emphasis is on crystalline polymers, but amorphous polymers are not entirely neglected. The 33 papers are divided into the following categories: Deformation of Crystalline Polymers, Structure–Property Relationships in Oriented Polymers, Morphology—Crystalline Polymers, Morphology—Amorphous Polymers, Relaxation Behavior, and Fracture, Yield, and Crazing.

This book is recommended to anyone whose research interests are in studying the morphology, mechanical properties, and other physical properties of polymers.

Lawrence E. Nielsen, *Monsanto Company*

Thermoplastics Properties and Design. Edited by R. M. OGORKIEWICZ (Imperial College of Science & Technology). John Wiley & Sons, New York, N.Y. 1974. xi + 248 pp. $18.95.

This book succeeds rather well in presenting to the reader an excellent understanding of thermoplastics. It covers, very succinctly, a large number of topics and surprises me how, in so few pages, so much of importance is covered. Of course, it cannot cover every topic in detail, and if one is interested in the design of processing equipment or in the fundamentals of polymerization techniques, other sources will also have to be used. Excellent discussions of the physical and mechanical properties of thermoplastics and their relationship to chemical structures are provided as well as electrical, thermal, optical, and chemical properties are included. The discussion of the rheology of polymer melts adds to a fundamental understanding of processing and would allow the chemist, engineer, and physicist to successfully attack problems that occur in this field.

Especially useful to the producer and user of thermoplastics is a chapter that discusses principles for using design data in choosing from the myriad of polymers to solve particular problems. Comparison of the behavior of various polymers and a discussion of techniques to predict the long-term performance of plastics are especially helpful. Adequate references are included after each chapter to help the reader obtain more detail information when necessary.

S. L. Reegen, *Polymer Institute, University of Detroit*

Microwave Spectroscopy of Free Radicals. By ALAN CARRINGTON (University of Southampton). Academic Press Inc., London. 1974. xii + 264 pp. $12.50.

In his preface, Professor Carrington states that the purpose of this book is to describe recent and current research in the field of microwave spectroscopy of free radicals in the gaseous phase. He further states that this book is neither a comprehensive review nor a textbook, but rather "an attempt to draw together the threads of a diverse subject" suitable for undergraduate and beginning graduate students. It is the reviewer's opinion that he has succeeded in his objectives and that the book will also prove extremely useful to those currently working in the field as well as those interested in the electronic structure of polyatomic free radicals.

The book is extremely well written, lucid, and easy to understand. For example, Chapter II, which treats experimental techniques, is presented in such a manner as to be useful as a first introduction to beginners in the field of microwave spectroscopy. Another impressive feature of the book is Chapter III, which is devoted to the theory of molecular energy levels. The usual formal treatment of this topic draws heavily on angular momentum and tensor operator techniques which can sometimes make it difficult for the beginner to extract the physical significance of the various terms appearing in the effective Hamitonian. In contrast, Professor Carrington explains the fundamentals of the theory without recourse to the detailed mathematical formalism of quantum mechanical operator techniques. His treatment is in depth and stresses the physical aspects of the subject. In conclusion, anyone interested in the microwave spectroscopy of gas-phase free radicals cannot afford to be unacquainted with this book.

Robert N. Schwartz,
University of Illinois at Chicago Circle

Ion Exchange and Solvent Extraction. Volume 6. Edited by J. A. MARINSKY (State University of New York at Buffalo) and Y. MARCUS (The Hebrew University). Marcel Dekker, Inc., New York, N.Y. 1974. xii + 301 pp. $27.50.

Although the title of this series is "Ion Exchange and Solvent Extraction," Volume 6 is devoted entirely to solvent extraction.

The aim of this book is to bring together scattered information from many sources and review it critically and authoritatively, so that readers, both those expert in the subject matter and those who need to supplement their knowledge on a particular subject, will benefit.

The volume contains four chapters, contributed by authors from academic, industrial, and governmental laboratories. The first chapter is "Isolation of Drugs and Related Organic Compounds by Ion-Pair Extraction" by G. Schill (University of Uppsala), where practical extractive separations of organic compounds and pharmaceuticals are discussed and explained. Chemical engineering problems of solvent extraction are treated in the second chapter entitled "The Dynamics of Liquid-Liquid Extraction Processes" by G. G. Pollock (Chevron Research Corp.) and A. I. Johnson (University of Western Ontario). The third chapter, "Application of the Solubility Concept in Liquid-Liquid Extraction" by H. M. N. H. Irving (University of Leeds) is concerned with the physicochemical aspects of solvent extraction. The fourth chapter, "Solvent Extraction in the Separation of Rare Earths and Trivalent Actinides" by B. Weaver (Oak Ridge National Laboratory) is a thorough review which is restricted entirely to the extraction of elements in the trivalent state.

The book is highly informative, authoritative, and well written and should be of value to any researcher or practicing chemist who is seriously interested in solvent extraction.

Thomas R. Sweet, *Ohio State University*

The Chemistry of Diacetylenes. By M. F. SHOSTAKOVSKII and A. V. BOGDANOVA. Halsted Press, New York, N.Y. 1974. xvii + 493 pp. $45.00.

This book is a translation by the Israel Program for Scientific Translations of the Russian monograph "Khimiya Diatsetilena" (Moscow, 1971). The book is a thorough survey of the literature on diacetylenes through 1970, and is divided into five chapters. Chapter I deals with the synthesis and physical properties of diacetylene and its homologs. Detailed procedures are given for laboratory preparations of these compounds as well as a survey of industrial production of diacetylenes as by-products of acetylene preparation. Naturally occurring polyacetylene compounds and physical methods for the safe handling of diacetylenes are also discussed here. Chapter 2 deals with reactions of diacetylene and its homologs, and is subdivided into reactions of the active hydrogen and reactions involving participation of the triple bonds. Chapter 3 deals with preparation and reactions of functional derivatives of diacetylenes, including diacetylene alcohols, glycols, acids, acetals, aldehydes, ketones, amines, phosphorus-containing derivatives, hetero-organic diacetylenes, etc. Chapter 4 covers the preparation and reactions of ethynylvinyl compounds. Chapter 5 entitled "Aspects of the Practical Application of Synthetic Compounds Based on Diacetylene," is a short (11 pages) survey of areas such as medicine, agriculture, and the chemical industry in which the most clearly defined uses of the diacetylenes have appeared. Obviously, this task could easily be the subject of an entire monograph itself, and the authors make no claim for completeness of coverage in this final chapter. Finally, the monograph contains an appendix of 35 pages containing six tables listing the physical properties of diacetylenes, vinyldiacetylenes, enynes, dienes, allenic compounds, and other diacetylene derivatives. This is followed by a bibliography with 1160 references.

"The Chemistry of Diacetylenes" should be of considerable value as a reference work to those utilizing these compounds or their derivatives. The text is logically organized, and the material is presented clearly and concisely. Sufficient references are given to enable the reader to explore further the experimental details of the procedures which are discussed. Because of the authors' backgrounds, the text provides access to a considerable body of relatively inaccessible literature. The physical data contained in the appendix should be of considerable value to investigators in this field. My only criticism of this monograph is the absence of an index. Even this criticism is, however, mitigated to some extent by the very thorough table of contents with its extensive array of subdivisions.

Thomas N. Wheeler, *Union Carbide Corporation*

Natural Products Chemistry. Volume 1. Edited by K. NAKANISHI (Columbia University), T. GOTO (Nagoya University), S. ITÔ (Tohoku University), S. NATORI (National Institute of Hygienic Sciences, Tokyo), and S. NOZOE (University of Tokyo). Kodansha Ltd., Tokyo; Academic Press, Inc., New York, N.Y. 1974. x + 562 pp. $32.50.

This book (with Volume 2) is designed to fill the gap which the editors feel exists between the organic textbooks and the comprehensive treatises and reviews on natural products and their chemistry. The format is designed for rapid retrieval of information with extensive use of structural formulas. Volume 1 covers the classification of natural products, physicochemical data, mono-, sesqui-, di-, sester-, tri-, and higher terpenoids, and also steroids. Other groups of natural products are covered in Volume 2. The natural products are described and discussed according to the type classifications, and within each group there are brief discussions of history, structure, synthesis, reactions, and biosynthesis. The book is written for nonspecialists with the aim of supplying a reasonable introduction. The topics discussed have been selected from papers published up to early 1973. Within the aims of the editors this book is excellent. Considerable useful data have been collected in this volume, and the format is easy to follow.

The topics (or "lectures") are by necessity selective, but the range of the interesting chemistry associated with this field is well represented. I would recommend this book wholeheartedly to any chemist who is unfamiliar with natural products chemistry and who wishes to obtain an orientation to this fascinating field of chemistry. I particularly liked the lecture-style format of this book. There is a subject index but no author index. Most graduate students and postdoctorals would benefit from reading this excellent book.

Clive A. Henrick, *Zoecon Corporation*

The Chemistry of Synthetic Dyes. Volume VII. Edited by K. VENKATARAMAN (National Chemical Laboratory, Poona, India). Academic Press, New York, N.Y. 1974. xvii + 372 pp. $45.00.

Industrial and academic chemists alike will appreciate the continuation of this most important series. Volume VII, written by eight experts in the areas of dye chemistry covered, brings up to date advances made in those areas during the period since publication of Volumes I and II in 1952.

Topics covered in this volume include: Sulfur Dyes (by D. G. Orton); Bunte Salt Dyes (by C. F. Weston); Physical Chemistry of Dyeing: State of Dye in Dyebath and in Substrate (by E. H. Daruwalla); Physical Chemistry of Dyeing: Kinetics, Equilibrium, Dye-Fiber Affinity, and Mechanisms (by S. R. Sivaraja Iyer); and Applications of Synthetic Dyes to Biological Problems (by E. Gurr, N. Anand, M. K. Unni, and N. R. Ayyangar). There are also an Author Index and a rather abbreviated Subject Index.

The present authors and editor appear to have maintained the high standards of quality set in previous volumes. Coverage of the patent literature is reasonably complete, as is the periodical literature in the theoretical chapters. In addition, some valuable unpublished information on manufacture and application of Sulfur and Bunte salt dyes is included.

The reviewer has found the final chapter to be of particular interest, giving lucid discussions of biological stains, enzyme activity and histochemistry, chemical modification of proteins, dye binding by nucleic acids and nucleoproteins, and the use of dyes as antibacterial and therapeutic agents. One omission, that of salicylazosulfapyridine (Neoprontisil), an azo dye as well as a sulfonamide derivative, was noted. It is possible that the authors did not include this compound because its only use is medicinal; however, pyridium, with similar limited use, has been mentioned!

Certainly any scientist working in the fields of dye chemistry covered will find this volume indispensable and should have access to it. Others, in allied fields, will also find much of interest in it.

James F. Feeman, *Crompton & Knowles Corporation*

Methods in Molecular Orbital Theory. By ALMON G. TURNER (University of Detroit). Prentice-Hall, Inc., Englewood Cliffs, N.J. 1974. xiii + 225 pp. $13.95.

Written for the nontheorist, this book will provide the ambitious student a working knowledge of the theoretical principles, and approximations, involved in performing MO calculations by the various methods commonly in use today. Given the background expected of the users of this book (undergraduate physical chemistry), ample supplementation by the instructor will likely be necessary.

A whirlwind trip through "Quantum Mechanical Background", in which a good feeling for, rather than a rigorous development of, basic principles is strived for, is followed by a description of H_2^+ MO's, the general problem of wave-function interpretation, and a particularly excellent and concise treatment of group theory.

The second half of the book is devoted to a discussion of MO calculation techniques (Hückel, EHT, Hartree-Fock, CNDO). Brief introductions to each of the approximations are followed by detailed descriptions of calculations on inorganic molecules. The input parameters involved in each type of calculation, and the output obtained, are discussed in sufficient detail so that the reader should be prepared to do calculations on his own, given access to computer time and Q.C.P.E. programs. The types of interpretations which can safely be made from such calculations are covered briefly, and more advanced techniques such as CI and localization procedures are discussed sufficiently to make the reader aware of their existence.

Although a number of more complete texts on molecular orbital theory exist, the brevity of this book and its emphasis on a detailed description of a few well-chosen inorganic examples, will give the instructor of a course based on this book wide latitude in his or her presentation.

K. N. Houk,
Louisiana State University—Baton Rouge

William David Coolidge. A Centenarian and His Work. By HERMAN A. LIEBHAFSKY (Texas A&M University). Wiley-Interscience, New York, N.Y. 1974. x + 96 pp. $6.95.

Dr. Coolidge, of the old New England family, joined the General Electric Research Laboratory in 1905 and remained until he retired as its director in 1944. He is famous for his epochal discovery of ductile tungsten, which is still made by the complex Coolidge process, and for the subsequent development of the Coolidge (X-ray) tube. Dr. Coolidge died February 3, 1975 at the age of 101.

Dr. Liebhafsky has written a delightful short book containing only a preface, two chapters, and an epilogue. It deserves to be widely read not just be chemists interested in the history of their profession but by all who would like to know how industrial research has affected our civilization. The first chapter describes Dr. Coolidge's life and work, and, since the author was connected with the General Electric Research Laboratory from 1934 to 1967, he has made this chapter particularly interesting by including many personal anecdotes. The second chapter tells the fascinating story of three law suits involving the basic Coolidge patent on ductile tungsten, which finally resulted in the invalidation of the patent fourteen years after it was issued. This chapter will be useful supplemental reading in the short courses in patent law offered by many colleges and universities.

The frontispiece is a remarkable color photograph of Dr. Coolidge in his ninety-sixth year looking as alert and intelligent as he did in photographs taken more than fifty years previously. The illustrations are well chosen, including one of Dr. Coolidge and his two successors at General Electric at a reception honoring him on his 100th birthday, October 23, 1973.

David H. Kenny, *Michigan Technological University*

Careers in Industrial Research and Development. By J. H. SAUNDERS (Monsanto Textiles Company). Marcel Dekker, Inc., New York, N.Y. 1974 xi + 254 pp. $11.75.

The student who is interested in a career in industry can obtain from this book excellent background information concerning the activity and functions of a formal R&D organization. There are adequate references and a good index. Guidance is given on how to obtain a position and, most important, what to expect when interviewed at the company. The individual will want to know how to evaluate the company he interviews, such as its commitment to R&D and opportunities for professional growth.

The author clearly explains: how R&D is planned and goals are continually reassessed; the way that objectives are established by management and the individual; the manner in which performance is evaluated; and why economics are of critical importance. Presented are topics of interest to those already working in industry, such as statistical design of experiments with consideration of variables, responses, and interactions between variables. The necessary steps are described in carrying out a new research find until it reaches the marketplace through laboratory, pilot plant, product evaluation, plant design, start-up, and production. These stages of planning are described by PERT Charts (program evaluation and review technique) and bar graphs showing time estimates and areas of responsibility. This information serves not only to maintain continuity but also is a communication tool. In addition, there are chapters on creativity, patents, communications, public relations, and personal attitudes. The text should serve as a useful tool, for it presents much more extensive information to inform the student than could normally be provided by university counselors.

V H. Maddox, *Parke, Davis & Company*

Vibrational Spectroscopy of Trapped Species. Edited by H. E. HALLAM (University College of Swansea). John Wiley & Sons, New York, N.Y. 1973. xii + 430 pp. $29.50.

This book is a superb addition to the library of an experimental spectroscopist. There are two excellent chapters on the practical aspects of matrix isolation (MI) spectroscopy, one by Hallam and Scrimshaw on the experimental techniques required for low-temperature infrared MI spectroscopy, and the very up-to-date chapter by G. A. Ozin on laser-Raman MI techniques. The editor (Hallam) acknowledges Ozin's contribution as coming at a late date in the preparation of the book, and in fact written in only a few weeks. Ozin's 42-page chapter on laser-Raman MI is the best aspect of the book.

A 64-page chapter by Hallam provides an excellent review of low-temperature MI infrared spectroscopy, with 170 references pretty well covering the progress in this area over the last two decades. Two more chapters describing low-temperature MI infrared spectroscopy are devoted to the most difficult types of chemical species to work with. Andrews' 23-page chapter reviews the published work on the infrared spectra of free radicals and reaction intermediates trapped in inert matrices and Snelson (40 pp) has contributed a literature review of similar studies on species generated at high temperatures that have been trapped by cocondensation at low temperature in an inert matrix. These two chapters, and a 21-page chapter on clathrates by McKean, suffer from a problem common to review papers. The three authors cite one study after another without regard to providing continuity for the reader. In particular, McKean cites references without telling the reader what he found in the references, and he cites contradictory studies without making some effort to resolve the contradiction.

Fortunately, these are short chapters and the reader can do his own review based upon the bibliographies. Two more chapters are in the book, a voluminous one (110 pp) on the broad subject of both point and molecular impurities in crystals by Wilkinson and Sherman, and a nice chapter by Barnes (46 pp) on the theoretical treatments that one finds in all of the other chapters. Barnes' chapter makes the rest of the book more readable. Wilkinson and Sherman's chapter is a well-organized contribution which is much more thorough and useful than the three chapters mentioned in the previous paragraph.

Infrared spectroscopists should have this volume on their shelves. Actually, it looks as though MI techniques may be more widely adaptable than many molecular spectroscopies ever realized.

James S. Mattson, *University of Miami*

Inorganic Chemistry of the Transition Elements. Volume 3. Senior Reporter: B. F. G. JOHNSON (Cambridge University). The Chemical Society, London. 1974. xiv + 512 pp. £15.00.

This is the third volume of the Specialist Periodical Reports by The Chemical Society covering transition metal chemistry, including the lanthanides and actinides. It is a comprehensive review of the literature published between October 1972 and September 1973. Chapter 1 deals with the Chemistry of the Early Transition Metals, excluding Scandium, Yttrium, and the Lanthanides. The reporter is C. D. Garner. R. Davis reports on The Chemistry of the First Transition Period from Manganese to Copper in Chapter 2. The Chemistry of the Noble Metals (Ru, Os, Rh, Ir, Pd, Pt, Ag, and Au) is reported by L. A. P. Kane-Maguire in Chapter 3. Chapter 4 is a report by J. A. McCleverty on Scandium, Yttrium, the Lanthanides and the Actinides.

The table of contents lists each metal in its various oxidation states, along with ligands in terms of donor atoms. The ligands are not listed by name in the Table of Contents. However, Chapter 2 does contain a table listing ligands for Mn, Fe, Co, Ni, and Cu. Organometallic, cluster and bridged compounds, as well as mixed ligand systems and other categories are also listed under a metal in its appropriate oxidation state in the Table of Contents.

The first three chapters contain lists of other reviews pertinent to the subject matter. (Chapter 2 also contains reviews omitted in Volume 2.) These, and tables of structural data, formation constants, mixed oxide compounds, and thermodynamic values, are among the features that help to make this work invaluable to the coordination chemist.

The salient features of over 2700 papers are condensed to 480 pages; consequently, the text of this book is descriptive. An author index citing approximately 4800 workers attests to the breadth. This book would be an important addition to the library of teachers and researchers in transition metal chemistry.

Lewis E. Nance, *University of North Carolina—Wilmington*

Advances in Chromatography 1974. Edited by A. ZLATKIS and L. S. ETTRE. Elsevier, Amsterdam and New York. 1974. xv + 772 pp. $61.50.

The Ninth International Symposium on this subject was held in November 1974, and it is remarkable that a fully type-set book of proceedings should be published so promptly. However, the contents consist entirely of 61 articles reprinted from Volume 99 of the *Journal of Chromatography* and provided with an index of contributors and a short subject index based on the titles of the articles. The articles are all reports of original research.

Chemical Technology: An Encyclopedic Treatment. Volume VII. Vegetable Food Products and Luxuries. Barnes & Noble Books/ Harper & Row, New York, N.Y. 1975. xxxl + 905 pp.

The latest volume in this series has much to interest chemists. It is divided into eight chapters, which aim to present their subjects in a technically useful manner comprehensible to the informed layman. The chapter on Fertility and Fertilizers is much concerned with soil chemistry, and that on Control of Plant Infestation is largely a survey of pesticides, fungicides, and herbicides. Chapters on Sugars, on Synthetic Sweeteners, and on Alcoholic Fermentation Processes also contain much chemistry. There are the inevitable drafting mistakes in the organic formulas, but the general level of accuracy is high. The blend of technology, science, and economics is nicely managed, and the chapters are pleasantly interesting as well as informative.

The amount of detailed formation in this book is very large, but a good subject index makes it accessible. Among the very many intriguing tables may be mentioned the one on beer consumption. It will scarcely surprise anyone to learn that Germany is far and away the winner, with a *per capita* consumption of 31.8 gallons per year, twice that of the United States, but it is interesting to see that Luxembourg and New Zealand, among others, are close challengers to Germany. No figure is given for the USSR, presumably for strategic reasons.

The Chemistry of the Thiol Group. Edited by S. PATAI (The Hebrew University). Wiley-Interscience, New York, N.Y. 1975. xiv + xiv + 956 pp. $75.00.

This volume in the series "The Chemistry of Functional Groups" appears in two parts, bound separately, with author and subject indexes at the end of the second volume. Four topics of the planned totality of treatment "did not materialize", but they are not crucial to the integrity of the work, and there is so much of value in this important treatise that the gap does not seriously detract (missing subjects: free-radical reactions of thiols; electrochemistry; enethiols; thiol-disulfide interchange).

As in previous volumes in this series, the treatment is selective and critical rather than encyclopedic. The number of references is nevertheless very large. Although unfortunately no termination date for the literature coverage is stated, it appears to be near the end of 1972.

The eighteen chapters are devoted to such subjects as preparation, mass spectra, directing and activating effects, photochemistry, biochemistry, oxidation, etc. Each is written as a self-contained unit, but there appears to be minimal overlapping. Nevertheless, certain matters have been allowed to slip through the net, and it can only be regarded as odd that an outstanding characteristic of thiols, their odor, is nowhere mentioned, not even in the chapter entitled "Detection and Determination of Thiols", and there is no index entry under "odor", "olfactory", or "smell"! It is also not possible to find information on simple physical properties of representative thiols, such as boiling point, solubility, etc. (indeed, the term "solubility" is not in the index, either); the introductory chapter on "General and Theoretical Aspects of the Thiol Group" is essentially theoretical and avoids the specific.

With this volume, the series enters its last third (there are six planned volumes to come). It is indeed an enormous undertaking, and its usefulness and generally high quality will make organic chemists continue to be grateful. It is certainly an essential acquisition for any serious chemical library.

Handbuch der photometrischen Analyse organischer Verbingungen. By B. KAKÁČ and Z. J. VEJDĚLEK (Research Institute for Pharmacy aux Biochemistry, Prague). Verlag Chemie, Weinheim/Bergstr. 1973. viii + 1309 pp (in two volumes). DM 320.

By "photometric analysis" the authors refer to the classical method of quantitative analysis by measuring the absorption of visible light. The two volumes contain a vast array of methods gleaned from the literature through 1971, with some material from 1972. The content is arranged according to functional type, and ranges from unsaturated hydrocarbons to proteins and steroids.

Each method is concisely described under the headings Principle, Specificity, Interferences, and Experimental Method. The specific compounds that have been determined by the method are tabulated, and references are given. The approach is essentially pragmatic rather than critical, and the experimental directions are usually the largest part. The authors do not compare the utility and scope of the various methods, and the reader must judge for himself which of several methods to use for a given type of compound. Considering the great breadth of this work, it would be unrealistic to expect otherwise. This book should be very useful to persons concerned with analytical chemistry in many applied areas, such as pharmaceuticals, biochemistry, chemical manufacturing, etc., in addition to those engaged in academic research. The wide variety of methods that have been successfully based will be eye-opening even to experienced chemists. The quality of the book with respect to paper, binding, and printing is exceptionally high. The 65 pages of index make its content very accessible.

Humic Substances in the Environment. By M. SCHNITZER and S. U. KHAN (Canadian Department of Agriculture). Marcel Dekker, Inc., New York, N.Y. 1972. vii + 327 pp. $19.50.

Humic substances consist of a mixture of products from various stages of decay of plants and animals, and are distinguished from compounds that "exhibit easily recognizable chemical characteristics", such as carbohydrates, proteins, fats, resins, etc. They are amorphous, generally dark colored, and of high molecular weight. They exhibit acidic properties, and are hydrophilic, and have the characteristics of colloidal dispersions. Their importance is that they compose the bulk of the organic matter in soils and natural waters.

This book is an account of identification, structure, and reactions of humic substances. It is photoreproduced from typescript and contains both author and subject indexes.

Subcellular Particles, Structures, and Organelles. Edited by A. I. LASKIN and J. A. LAST. Marcel Dekker, Inc., New York, N.Y. 1974. x + 311 pp. $24.75.

This is a volume in the series "Methods in Molecular Biology". It consists of eight contributed chapters among which are such topics of chemical interest as "The Structure of the Bacterial Ribosome", "Isolation of Plasma Membranes for Cell Surface Membrane Receptor Studies", "Zonal Centrifugation", and "Negative Staining for Electron Microscopy". It is photoreproduced from typescript and is provided with author and subject indexes.

Spectroscopic and Chromatographic Analysis of Mineral Oil. By S. H. KÄGLER, Translated from German by J. SCHMORAK. John Wiley & Sons, Halsted Press, New York and Toronto. 1973. xii + 559 pp $65.00.

Pages 1 to 334 are devoted to spectroscopy and the remainder to chromatography. Sufficient background of the basic scientific foundation of each of the main and sub-topics is presented for following the techniques, applications, and interpretations to petroleum-derived materials. X-Ray fluorescence, uv, visible, infrared, high-frequency, and mass spectroscopies are covered. Absorption and emission methods are discussed as are photometry and colorimetry. High-frequency spectroscopy treats microwave, electron spin-resonance, and nuclear magnetic resonance, but not to the extent of the previous topics. Ir is discussed in greatest detail because of its wide use in petroleum analysis and because the discussion applies to other spectroscopic techniques.

For column chromatography, separation by adsorption, exchange and partition methods, and development by elution, displacement and frontal analysis are discussed. Paper, thin-layer, and gas chromatography are covered, the latter most extensively. Equipment, materials, techniques, and variables are considered for each.

The presentation is easy to follow and would be useful for anyone needing background for analytical work carried out on his own or to follow that by others.

Extensive references are given for more detailed information. Much of these are to foreign books and journals. References to the literature extend through 1966 (the German Edition is dated 1969).

Alex Zletz, *Amoco Oil Company*