

Proceedings of the Fourth Lunar Science Conference. Edited by W. A. GOSE (The Lunar Science Institute, Houston). Pergamon Press Inc., New York, N. Y. 1974. xi + xiv + xii + ii + xii + xvi + 3290 pp. \$100.00.

These three volumes are indicated to be Supplement 4 of *Geochimica et Cosmochimica Acta* and are devoted to the papers presented at the conference held at Houston on March 5-8, 1973. All text is typeset, and there are numerous photographic illustrations, including some in color. Volume 1 covers mineralogy and petrology, Volume 2 covers chemical and isotope analyses and organic chemistry, and Volume 3 covers physical properties. It is thus Volume 2 that is of principal interest to chemists, but apparently the volumes are not available separately. There is much comparative information from the Apollo 11 to 17 missions. It is evident that material from earlier lunar expeditions continues to produce new information as studies progress. There is almost too much information to digest, and the lack of a subject index, although understandable in consideration of the magnitude of the matter, is a handicap. There are, however, author and lunar sample indexes, and the Table of Contents is subdivided in a logical manner. It is altogether a fascinating compendium of information.

The Total Synthesis of Natural Products. Edited by JOHN AP-SIMON (Carleton University, Ottawa). Wiley-Interscience, New York, N. Y. 1973. Volume 1: ix + 603 pp. \$24.95. Volume 2: ix + 754 pp. \$22.50.

These two volumes are a collection of contributed chapters describing selected total syntheses of various classes of natural products. Volume 1 covers Carbohydrates, Prostaglandins, Pyrrole Pigments, Nucleic Acids, Antibiotics, and Oxygen Ring Compounds, and Volume 2 covers Monoterpenes, Sesquiterpenes, Triterpenes, and Aromatic Steroids. The editor states in the preface that a third volume, to cover diterpenes and various alkaloids, is planned, and that suggestions for other areas will be considered.

The chapters are generally quite interestingly written, and graduate students who have browsed in the volumes seem to have found them stimulating. They begin with just the right amount of historical perspective and present the syntheses with many equations and well-chosen interpretive comments. An interesting feature is the inclusion of comparative syntheses—a classical one, followed by more modern variants, or two or more concurrent ones. The synthetic approaches to corrin by Eschenmoser, Woodward, and Cornforth are all presented, for example; in this instance it is particularly good to have them, for much of the material has not appeared in print before.

The fact that the longer of the two volumes is the lower in price might seem puzzling. The explanation lies in the fact that Volume 1 is typeset, whereas Volume 2 is photoreproduced from typescript (there seem to be fewer words in Volume 2, in spite of the larger number of pages). Each volume is separately indexed. They can be recommended for intriguing and stimulating reading and study.

Electron Spin Resonance. Theory and Applications. By N. M. ATHERTON (University of Sheffield). Wiley/Halsted, New York, N. Y. 1973. x + 438 pp. \$35.00.

Ten years ago, a graduate student in physical chemistry wishing to begin a study of electron spin resonance spectroscopy could find no single authoritative source where the theory of the subject was discussed and practical applications illustrated. This gap has now been filled to overflowing by the publication of several monographs on either theoretical or practical magnetic resonance separately and the recent publication of at least three good and allegedly comprehensive texts: those by P. B. Ayscough, J. E. Wertz, and J. R. Bolton, and now N. M. Atherton. These three books have essentially the same title and virtually identical tables of contents, so the student's problem is now which to choose.

Like the others, the subjects covered in the present book are: organic free radicals in solution, radicals trapped in solids, triplets and biradicals, transition metal complexes, and time-dependent phenomena. There are also chapters on ENDOR and ELDOR, and gas-phase electron resonance. What sets this book apart from

the others is that in no sense is it a textbook for a beginner. There are no problems to be worked and precious few practical examples of the interpretation real spectra. In the preface, Atherton envisages an audience for the book of scientists who are already users of esr and who wish to better understand how the spectra can be analyzed. I believe this group will find the book remarkably useful. The language of the book is quantum mechanics, but it starts from the fundamentals of spectroscopy and proceeds in a straightforward way to the mathematical formalisms used in modern research. For example, in discussing lineshapes the standard Bloch equations are mentioned, but then the density matrix formalism is developed in a straightforward and reasonably complete manner so that the student who finishes that chapter is well prepared to read the modern literature.

In summary, the serious student of esr will find this book an excellent place to learn the quantum-mechanical techniques necessary to interpret esr spectra, and as a result research advisors will find it an invaluable book to leave around the lab for their students.

Robert D. Allendoerfer, *State University of New York at Buffalo*

Colloid Science. Volume I. Edited by D. H. EVERETT (University of Bristol). The Chemical Society, London. 1973. viii + 264 pp. £6.50.

This new title in the Chemical Society's "Specialist Periodical Reports" series attempts, in the editor's words, a "critical assessment of new ideas" in colloid chemistry. Within the constraints of a rather short book, Everett has chosen topics which, while perhaps not appealing to every taste, provide a firm basis for a valuable and much-needed new series. Reasonable balance is struck between theoretical and experimental topics. For example, in his report "Absorption at the Solid/Liquid Interface: Non-Aqueous Systems," Everett reviews thermodynamic and statistical mechanical approaches as well as recent applications of Eyring's significant structure theory and the Polanyi potential theory. R. H. Ottewill in "Particulate Dispersions" couples current theoretical ideas with an examination of new experimental procedures for direct measurement of attractive and repulsive forces in disperse systems.

Other reports include: "Absorption at the Gas/Solid Interface" (K. S. W. King); "Polymer Absorption at the Solid/Liquid Interface" (S. G. Ash); "Capillarity and Porous Materials: Equilibrium Properties" (D. H. Everett and J. M. Haynes); and two by B. Vincent, "Emulsions" and "Non-Aqueous Systems."

The extensive bibliographies provide good coverage from late 1969 through 1971 and are augmented with an author index. Unfortunately, the book's reference value is seriously compromised by the absence of a subject index.

The book certainly will be of interest to practicing colloid and surface chemists. If one takes the view that cell-surface processes are (in part) problems in liquid/solid phenomena, then this volume might have an audience among membrane biochemists as well.

Bruce P. Gaber, *The University of Michigan—Dearborn*

Probability and Statistical Inference for Scientists and Engineers. By ISAAC N. GIBRA (Stearns Institute of Technology). Prentice-Hall, Inc., Englewood Cliffs, N. J. 1973. xxii + 596 pp. \$14.00.

Professor Gibra's prime goal was to provide a text attuned to self study by scientists, engineers, and research workers who have a good background in elementary calculus. He has succeeded by combining an informative, but not overly rigorous, treatment of mathematical statistics with numerous examples of application. Over 200 detailed illustrative examples and some 550 problems (about one-fourth with answers) provide the reader with ample opportunity to check his progress.

The book is divided into two parts. Part I covers elements of probability theory, probability functions, distribution of functions of random variables, expectation, and properties of the more important theoretical distributions that occur frequently in practice. Part II, Statistical Inference and Applications, introduces the theory of hypothesis testing and estimation. Subsequent chapters emphasize applications including analysis of variance, linear regression and correlation, goodness-of-fit tests, control charts, acceptance sampling, and some aspects of queuing theory. These chapters contain the material most useful to chemists, and each includes a list of references for the reader who wants more information on

* Unsigned book reviews are by the Book Review Editor.

a given topic. The majority of the illustrative examples and problems are based on real situations arising in the physical, chemical, and engineering sciences.

Gibra's text should appeal most to chemists who have used statistics, are convinced that it is useful for their work, and want both a better background in the subject and a better idea of what more can be done with it.

John W. Gorman, *Amoco Oil Company*

Iron-Sulfur Proteins. Volume I: Biological Properties. Volume II: Molecular Properties. Edited by WALTER LOVENBERG (National Institutes of Health). Academic Press, New York, N. Y. 1973. Volume I: xiii + 385 pp. \$33.00. Volume II: xiii + 343 pp. \$29.00.

The objective of this two-volume treatise is "to present a detailed account by outstanding scientists of the biological importance and the physical and chemical properties of this group of proteins." The treatise certainly achieves this objective.

Volume I contains ten chapters. The first chapter by H. Beinert provides insight into the historical development of the field pointing to the several independent paths taken by different research groups leading to what is now a rather coordinated view of the role and function of iron-sulfur proteins in living matter. The next three chapters deal with the general features of various iron-sulfur proteins including contributions by L. E. Mortenson and G. Nakos on electron transport, R. W. F. Hardy and R. C. Burns on comparative biochemistry and dinitrogen fixation, and C. F. Yocum, J. N. Siedow, and A. San Pietro on photosynthesis. The remaining six chapters deal with the structure, function, and role of particular classes of iron-sulfur proteins. These chapters include contributions by B. B. Buchanan on ferredoxin and carbon assimilation, I. C. Gunsalus and J. D. Lipscomb on putidaredoxin, E. T. Lode and M. J. Coon on rubredoxin, R. W. Estabrook, K. Suzuki, J. I. Mason, J. Baron, W. E. Taylor, E. R. Simpson, J. Purvis, and J. McCarthy on adrenodoxin, T. P. Singer, M. Gutman, and V. Massey on flavoprotein dehydrogenases, and V. Massey on flavo-protein hydroxylases.

Volume II contains eight chapters. Properties of classes of iron-sulfur proteins are treated in chapters by R. Malkin on the chemical properties of ferredoxin, W. A. Eaton and W. Lovenberg on the iron-sulfur complex in rubredoxin, and L. H. Jensen on the crystal and molecular structure of rubredoxin from *Clostridium pasteurianum*. K. T. Yasunobu and M. Tanaka cover the types, distribution in nature, structure-function, and evolutionary data of iron-sulfur proteins, and G. Palmer presents current insights into the active center of spinach ferredoxin and other iron-sulfur proteins. Three chapters dealing with different instrumental approaches used to study iron-sulfur proteins include contributions by W. H. Orme-Johnson and R. H. Sands on epr and endor spectroscopy, A. J. Bearden and W. R. Dunham on Mössbauer spectroscopy, and W. D. Phillips and M. Poe on nmr spectroscopy.

The treatise is clearly and concisely written. Sufficient overlap exists between volumes and chapters to enable the reader to coordinate the subject material and different points of view. Chapters in Volume II discussing the use of epr, endor, Mössbauer, and nmr spectroscopy each begin with good descriptions of the techniques. Each chapter provides a comprehensive review with numerous references up to and including 1972 with scattered citations from 1973. Authors have largely refrained from including heavy citation of their own work.

This treatise is recommended as an excellent reference source for those interested in iron-sulfur proteins. A broad overview of iron-sulfur protein research is presented while individual chapters provide depth in subject treatment.

Fred M. Hawkrige, *University of Southern Mississippi*

Mössbauer Spectroscopy. An Introduction for Inorganic Chemists and Geochemists. By G. M. BANCROFT (University of Western Ontario). McGraw-Hill, London. 1973. xii + 252 pp. \$6.95.

Mössbauer spectroscopy, as the author points out, has found application in a wide variety of scientific usages. However he contends that there has not been a book intended for the inorganic or geochemist. Actually there have been several. What the author has done, however, is to produce a readable introduction to "Mössbauer Spectroscopy" for those inorganic or geochemists with little background in the area. The basic physical principles involved are developed in the simplest possible manner. Problems are provided at the end of each chapter to allow the reader to test his understanding of the preceding material. They make a significant contribution to the text.

The last part of the book is divided into two sections. The first section deals with inorganic chemistry while the second covers geochemistry. Although they are intended to be mutually exclusive, the geochemist will find it necessary to read the inorganic section first. The sections illustrate the types of work that can be done with Mössbauer spectroscopy and are not intended to be reference works.

The book should serve as an excellent introduction to Mössbauer spectroscopy, especially to the geochemist, for one who is not already familiar with the technique. The material is well presented and suitable for teaching purposes.

Jack M. Wilson, *Sam Houston State University*

Enzyme Nomenclature. By the COMMISSION ON BIOCHEMICAL NOMENCLATURE (IUPAC and IUB). American Elsevier, New York, N. Y. 1973. 443 pp.

The recommendations adopted in 1972, which constitute a revision of the 1964 recommendations of the International Union of Biochemistry, are set out in this volume. The six chapters amount to less than one-tenth of the book, the vast bulk of which consists of a list of enzymes, an index thereto, and a bibliography of 2743 references. The importance of a work such as this may not always be fully appreciated, but is illustrated by a statement in the Historical Introduction: "The Enzyme Commission faced many difficulties arising from the uncontrolled naming of the rapidly increasing number of known enzymes. Some of the names in use were definitely misleading; others conveyed little or nothing . . ." It is to be hoped that all who publish on enzymes will contribute to clear communication and reliable retrieval of information by paying due attention to these carefully worked out recommendations.

Organic Electronic Spectral Data. Volume 9. Edited by JOHN P. PHILLIPS, HENRY FEUER, and B. S. THYAGARAJAN. Wiley-Interscience, New York, N. Y. 1973. xiii + 960 pp. \$40.00.

The latest volume of this useful reference series covers material published in 1967. In the Introduction it is noted that the earlier publication schedule of biennial volumes has been changed to annual, but even that may not suffice, in view of the large size of Volume 9. As usual, the content consists entirely of tables of absorption maxima and absorptivities in the ultraviolet-visible range. The compounds are arranged in formula-index order, and references for each entry are cited. An idea of the work involved in compiling this material may be gained from the fact that the bibliography covers 28 pages of closely set type.

Physical Activity: Human Growth and Development. Edited by G. LAWRENCE RARICK. Academic Press, New York, N. Y. 1973. ix + 406 pp. \$18.50.

Although this book is primarily concerned with physiology, growth, and athletics, there are scattered sections dealing with applied biochemistry. There are no chemical structures shown, but there are substantial bibliographies, which could be useful to biochemists concerned with exercise, physical therapy, etc.

Recent Developments in Shock Tube Research. Edited by D. BERSHADER and W. GRIFFITH. Stanford University Press, Stanford, Calif. 1973. xv + 830 pp. \$27.50.

The papers presented at the Ninth International Shock Tube Symposium (1973) are presented in this volume photoreproduced from the authors' typescripts. The papers are mostly accounts of original research, and it is not indicated whether they have already seen or will see journal publication. There is no subject index.

Residue Reviews. Volume 49. Edited by F. A. GUNTHER and J. D. GUNTHER. Springer-Verlag, New York, N. Y. 1973. vii + 158 pp. \$14.80.

The four chapters in this volume are: Pesticide Volatilization; Fate and Effects of Polluting Petroleum in the Marine Environment; Computation Models for the Transport of Pesticides; and Pesticide Legislation in New Zealand. There is a good index.

Rodd's Chemistry of Carbon Compounds. Second Edition. Volume III. Part C—Benzenoid Compounds with More Than One Nitrogen Atom in Substituent Groups. Edited by S. COFFEY. Elsevier, New York, N. Y. 1973. xix + 334 pp. \$32.50.

This volume of the progressively appearing Second Edition emphasizes the growth of chemical information over the last 20 years, for Volume III of the First Edition was encompassed in only two parts rather than three. There is only one chapter in the book in

hand, and it is entirely written by I. G. Laing of the Clayton Aniline Co. Ltd. It is appropriate that a dye chemist should perform this task, for a major part of the subject consists of the chemistry of diazonium and azo compounds and their derivatives. Aromatic nitrosamines, nitramines, triazines, azides, azoxy compounds, and hydrazines are also covered. It is a compendium of a tremendous amount of information succinctly presented, as are previous volumes, and the appearance of such a useful resource is most welcome. Nevertheless, there are some shortcomings that deserve mention.

It is nowhere stated when the author ceased searching the literature, so it is impossible to determine how up to date the coverage is. Surely this simple matter, of such importance to the potential users, need not have been neglected, and the blame must lie upon publisher, editor, and author alike. A spot check reveals that some subjects have been overlooked. A clear example is found in the monaryl diimides (diazenes), which are only mentioned as hypothetical intermediates, notwithstanding Kosower's extensive work on them dating from 1965. The early uncertainty about whether azoxy compounds were cyclic (oxadiaziridines) is discussed, but the more recent characterization of the cyclic isomers is omitted. This situation makes one concerned that there may be other gaps.

Symmetry in Chemical Theory. Edited by JOHN P. FACKLER, JR. (Case Western Reserve University). Dowden, Hutchinson and Ross, Inc., Stroudsburg, Pa. 1973. xv + 508 pp. \$25.00.

This is another book in the series "Benchmark Papers in Inorganic Chemistry;" it is subtitled "The Application of Group Theoretical Techniques to the Solution of Chemical Problems." As in previous volumes, the content consists of photoreproductions of a group of original journal papers selected for their contribution to the development of the subject. They are grouped in the categories Crystal Field Theory, the Covalent Bond-Valence Theory, Molecular Orbital Theory, the Synthesis-Ligand Field Theory, Development and Application of the Bonding Theories; Vibration Spectroscopy, and Chemical Rearrangements and Reactivity. The examples chosen date from the 1929 paper by Hans Bethe on "Fermiaufspaltung in Kristallen" to the mid-1960's selected from theoretical, inorganic, and organic chemistry. It is a nicely produced book.

Vapor-Liquid Equilibrium Bibliography. By I. WICHTERLE, J. LINEK, and E. HALA (Czechoslovak Academy of Science). American Elsevier, New York, N. Y. 1973. 1053 pp. \$47.50.

This volume consists entirely of an enormous table, prepared by computer print-out, and the accompanying references. The objective is "to list all available information on vapor-liquid equilibrium data;" it does not list the data themselves, but only the references. The enormity of the accomplishment may be gauged from the fact that it requires over 4800 references to cover the subject from 1900 through December, 1972. It should be of great help to the "workers in the chemical industry who have to deal with problems of distillation and rectification" for whom it is intended.

Applied Spectroscopy Reviews. Volume 7. Edited by EDWARD G. BRAME, JR. (E. I. du Pont de Nemours and Co.). Marcel Dekker, Inc., New York, N. Y. 1974. xv + 381 pp. \$25.50.

This volume, as do many of the previous volumes of the set, retains its broad coverage and international flavor. It contains eight reviews of widely varied topics.

"Infrared Spectroscopy at Subambient Temperatures" by J. E. Katon and D. B. Phillips. This section deals primarily with intramolecular or internal vibrations in molecular solids with a heavy emphasis on the experimental techniques and methods and numerous reproductions of actual spectra, mostly of complex organic molecules. Literature coverage is selective but adequate, but only through 1971 with a short addendum for papers in 1972.

"Nuclear Magnetic Resonance Studies in Gases" by G. Govil of India covers a seldom employed but perhaps valuable and theoretically important area of nmr spectroscopy. The dual difficulties of sample handling and low signal-to-noise ratio in the gas phase have inhibited extensive prior development in this field. However, the recent and wide availability of Fourier transform and various time-averaging techniques should lead to increased activity in gas-phase nmr. The present review provides a good introduction and literature survey of the subject.

"Atomic Fluorescence Spectrometry" by T. S. West and M. S. Cresser and "Pulsed Source Atomic Fluorescence Spectrometry" by N. Omenetto, L. M. Fraser, and J. D. Winefordner. These two chapters describe the relatively new technique of atomic fluorescence spectrometry, an outgrowth of the more common and traditional atomic absorption spectroscopy. Since these are relatively new methods the authors necessarily deal in greater detail with instrumentation and experimental techniques. It is obvious from these reviews that the great sensitivity of this technique and recent introduction of albeit limited commercial instrumentation coupled with current interests in environmental chemistry and trace metal analysis as well as other useful applications will make AFS a commonly and widely used analytical technique in the future.

"Band Assignment in Ultraviolet Photoelectron Spectroscopy" by R. E. Ballard of Norwich, England. This chapter comes on the heels of recent more detailed reviews and books on photoelectron spectroscopy. It deals specifically with the characterization and assignment of bands observed in PE spectra to molecular orbitals or component atomic orbitals by consideration of the energy, intensity, and structure of the bands as a function of chemical substitution, angular distribution of photoelectrons, etc.

"High Resolution Infrared Spectroscopy" by V. J. Corcoran. Recent advances in laser technology coupled with other factors such as development of infrared semiconductor diodes have made high resolution ($\sim 10^{-5} \text{ cm}^{-1}$ compared to conventional resolution of $\sim 0.1 \text{ cm}^{-1}$) infrared spectroscopy possible. Instrumentation together with brief descriptions of applications to accurate speed-of-light measurements, photochemical reactions, biological systems, astronomy, and air pollution are discussed.

The last two chapters are surprisingly theoretical for a volume on applied spectroscopy. "On Franck-Condon Factor Calculations" by B. Chakraborty and Y. K. Pan deals with and describes the advantages and limitations of the various methods such as the RKR, numerical, distorted wavefunction, steepest descent, Wentzel-Brillouin-Kramers, asymptotic expansion, and quasi-classical method of calculating the important Franck-Condon factor, which is the square of the overlap integral of vibrational wavefunctions and controls the intensity distribution from band to band across a system.

"Molecular Motion and Band Shapes in Liquids" by L. J. Marabella. This chapter deals with the theory and techniques of molecular dynamics and intramolecular forces in liquids as a function of band shapes derived from investigation of translational, rotational, and vibrational transitions by means of infrared and Raman spectroscopy.

In summary, the various reviews are by and large well written, to the point, and useful to the specialist as well as spectroscopists in general having an interest in the various topics covered. It is unfortunate that literature coverage in most cases is only through the early parts of 1972. This renders the volume out of date by the time it reaches the general audience and diminishes its usefulness in areas that are rapidly developing. However, this is undoubtedly more the fault of the publisher and perhaps the editor than the fault of the contributing authors. The volume should certainly be available in libraries and may be recommended for individual use as a reference source for persons with interest in the subjects discussed.

Peter J. Stang, *The University of Utah*