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Book Reviews

The Hydrogen Bond and Other Intermolecular Forces. By J. CLARE SPEAKMAN. The Chemical Society, London. 1975. 33 pp. 60 pence.

A booklet of only 33 pages for such a vast subject as The Hydrogen Bond obviously must be intended for an audience other than the research worker. This publication is one in a series of Monographs for Teachers begun in 1959 by the Royal Institute of Chemistry. As such, its objective is a concise, understandable, introductory presentation of the topic given in the title. This the author has succeeded in doing. Teachers, and students too, should find this monograph easy to read and quite helpful.

Included in the presentation are attractive and repulsive forces, methods of studying hydrogen bonding, geometrical aspects and location of the proton, and examples of hydrogen-bonded systems. Greater emphasis is given to crystallographic aspects and reflect the author's interest. Obviously much is omitted or mentioned only briefly, but there is provided a bibliography of texts and review articles enabling one to delve deeper into the subject if so desired. One pertinent reference, too new to make the list, is "Hydrogen Bonding" by M. D. Joesten and L. J. Schaad, Marcel Dekker, Inc., New York, 1974.

Milton Tamres, *University of Michigan*

Carbenes. Volume II. Edited by R. A. MOSS and M. JONES, JR. John Wiley & Sons, Inc., New York, N.Y. 1975. xiii + 373 pp. $24.95.

This volume begins with the less well-known segment of organic chemistry, the reactions of free carbon atoms. Their generation, as for instance from graphite at 2200°, does not give a single species, but a variable mixture of not only C_3, C_2, and C_1 but also indications of different states of C_1. Their chemistry is complex, characterized by electron deficiency, but showing C–H insertion to some extent. The reactions may be carbene-like but differ somewhat. The second chapter is devoted to unsaturated carbenes about which considerable knowledge has been accumulated. Not only has the Newman nitrosooxazolidine synthesis been discussed, but also α-elimination. Acetylenes tend to form; otherwise typical carbene products are obtained as described in an impressive list of reactions. In the third chapter, the Seyferth organometallic precursors for carbenes are discussed. Phenyltrifluoromethylmercury with sodium iodide is given prominence as precursor for difluorocarbene, as is to be expected if it is one's own discovery. But the questions that arise are not answered here: what is the most economical, quickest, safest, and most convenient method of making difluorocarbene? Sodium chlorodifluoroacetate has been sloughed off as being a poor transfer reagent, yet it has been used recently to make difluorocyclopropanes in the steroid family (*J. Org. Chem.*, **38**, 289 (1973)). Triphenyltrifluoromethylphosphonium bromide has been dismissed by emphasis on the lower yield (21%) in difluorocyclopropanation when in fact a yield of 79% was obtained with the proper catalyst (this volume, p 154, Addendum No. 6). In another example, the phase-transfer method was found to be superior in every respect to the Seyferth method in dichlorocyclopropanation (*Syn. Commun.*, **4**, 341 (1974)).

The fourth chapter discusses the application of CIDNP, ESR, and flash photolysis in the study of carbene intermediates. The discussion of recent CIDNP results is especially useful.

The fifth chapter is devoted to a rather special type of carbenes, those in conjugation with one or more aromatic rings.

The sixth, last, and longest chapter is devoted to an extensive coverage of both theoretical and experimental work dealing with the spin states of carbenes. The first section provides an excellent chronological development of the theoretical treatment of carbenes. The section on experiments dealing with the singlet–triplet question is quite complete and blends the theoretical results nicely into the discussion of the experimental findings.

D. E. Pearson, B. A. Hess, Jr. *Vanderbilt University*

Foundations of Quantum Dynamics. By S. M. BLINDER (University of Michigan). Academic Press, London. 1974. ix + 226 pp. $17.25.

The student of modern physical chemistry, and particularly the aspiring theorist, must now master a formidable amount of quantum mechanics in order to read the current literature with understanding. "Foundations of Quantum Dynamics" by S. M. Blinder provides a clear and concise account of the principles of the quantum theory at a level designed to aid the student in bridging the gap between elementary aspects and the advanced techniques of current applications. Professor Blinder's book can be conveniently divided into four sections. The first gives a survey of classical dynamics (Chapter 1) and electrodynamics (Chapter 2) written at levels corresponding to those found in Goldstein and Panofsky and Phillips, respectively. The survey of quantum-mechanical formalism (Chapter 3) and the description of the principles of quantum dynamics (Chapter 4) which comprise the second section, written at a level similar to that found in Schiff, is in my view superior in many respects to the presentations found in many of the standard textbooks currently used in both physics and chemistry departments. The time evolution of the wave function is treated here with particular clarity. A lengthy but appropriate discussion of the free particle (Chapter 5) à la Bohm, and a very useful introductory treatment of Green's functions (Chapter 6) à la Blinder comprise the third section. Finally, the applications to transition phenomena (Chapter 7) and the interactions between radiation and matter (Chapter 8) given in the last section provide a sound basis for further reading in this area. Students who master Professor Blinder's book, which should be appropriate both for self-study and for an expanded semesters course work, will be well equipped to tackle more specialized and advanced developments in the quantum theory.

Peter W. Langhoff, *Indiana University, Bloomington*

Polymer Chemistry: An Introduction. By MALCOLM P. STEVENS (University of Hartford). Addison-Wesley/W. A. Benjamin, Inc., Reading, Mass. 1975. xv + 458 pp. $25.00 (cloth); $17.50 (paper).

This book is intended by the author to "serve as an introductory text for a course in polymer chemistry at the advanced undergraduate or graduate level." What the author means by polymer chem-

istry is specifically organic-polymer chemistry including polymer synthesis and polymerization mechanisms. That is, except for four introductory chapters on definitions, molecular weight, structure-property relationships, and polymer characterization methods (95 pps), the bulk of the book is devoted to discussions of polymerization reactions and their products. As such the coverage is quite complete but perhaps too descriptive and not sufficiently quantitative for a graduate-level course.

The bulk of the material is divided according to principal structural types rather than reaction mechanisms, and the major categories chosen are "Vinyl Polymers" and "Nonvinyl Polymers." The former include three separate chapters on polymerization by free-radical, ionic and coordination mechanisms and a fourth chapter on reactions of vinyl polymers (110 pp). The latter contains everything else including separate chapters on polyethers, polyesters, polyamides, formaldehyde resins, inorganic-organic polymers, a chapter on miscellaneous organic polymers, and a closing chapter on natural polymers (217 pp).

Given this division of subject material, the book is evenly balanced and well written and should make a good text for an advanced undergraduate course. Certainly this reviewer agrees with the author's statement in the preface that, considering its importance to industry and our daily lives, the study of polymer chemistry should be essential to all chemists. However, knowing the prejudices of university chemistry teachers, particularly academic organic chemists, it is quite likely that his plea will fall on deaf ears.

Robert W. Lenz, *University of Massachusetts*

Photodegradation, Photo-oxidation, and Photostabilization of Polymers. By B. RANBY and J. F. RABEK (Royal Institute of Technology, Teknikringed, Stockholm, Sweden). John Wiley & Sons, Inc., New York, N.Y. 1975. viii + 573 pp. $47.50.

In this age of edited works by multiple authors, it is a delight to review a coherent and comprehensive work by dedicated scientists who are special experts in a particular field. The book, a comprehensive treatise on the subject of photodegradation of polymers, presents a good balance of the organic polymer chemistry of polymer degradation, physical chemistry of photochemical reactions, and the experimental practice of photochemistry and degradation testing of polymeric materials.

Pertaining to the text, in the first three chapters, the fundamental principles of photochemistry and the general mechanisms of polymer oxidative degradation are covered. In Chapter 4, a comprehensive survey of the photolytic and oxidative degradation of specific polymer systems is presented. In the next three chapters, the role of singlet oxygen in various polymer photodegradation reactions is discussed with reference to photosensitized reactions and energy transfer (including chemiluminescence) in polymers. The final six chapters (about half the content of the book) are devoted to the practical aspects of polymer photodegradation. Here, a scientific approach is taken in the interpretation and application of photochemical reaction mechanisms to the solution of practical problems. In these latter sections, the experimental practice of photochemical measurements and techniques for weatherability testing of plastics is presented.

In summary, the book is an overall compilation of theoretical, practical, and experimental information on the special subject of photodegradation. It is well written and well documented (2334 cited references). The work is prefaced by a comprehensive table of contents and is concluded by an adequate word index. This book serves as a good reference work, up to 1973, for advanced chemistry students and researchers who are involved in the field of photochemical degradation and environmental aging of polymers and plastics.

Armand F. Lewis, *Lord Corporation*

Instrumental Analysis. By C. K. MANN, T. J. VICKERS, and W. M. GULICK (Florida State University). Harper and Row Publishers, New York, N.Y. 1974. xiv + 766 pp. $18.95.

This book is excellent in its coverage of much of the fundamental subject matter upon which modern instrumental analytical methods are based. Indeed, on some topics it appears to be the best of the current crop of textbooks. For instance, fully a third of the book (about 250 pp) is devoted to a lucid explanation of basic electronics covering topics from Ohm's law to modern analog and digital circuits. Analytical chemists have always had to be jacks of all trades, and recently the proliferation of more sophisticated instruments has required analytical faculty to take on the teaching of electronics too. This section of the book would serve as a text for a semester course in that subject at either the undergraduate or graduate level if supplemented with some laboratory experiments.

Introductory chapters covering ideas basic to a group of analytical techniques are followed by chapters outlining the individual applications. This approach stresses the fundamental similarities of various methods and aids understanding. Optical spectroscopy is especially well covered.

The book does have several serious weaknesses, however. One is that it completely ignores some commonly used analytical techniques. Among these are: thermal analysis, x-ray fluorescence and absorption, and radiochemical methods. Within the very real time limits often allowed for teaching undergraduate analytical chemistry, it is clear that some topics cannot be covered thoroughly. However, it is desirable to have some discussion of them readily available anyway.

Perhaps more serious, in my estimation, is the lack of a large number of completely solved example problems. There are a few but not enough. The main object of the problems in a textbook should be to develop the student's knowledge, not to test it. The immediate feedback of being able to look up answers and, if necessary, solutions is very helpful to the student.

Darryl D. Siemer, *Marquette University*

The Filamentous Fungi. Volume I. Industrial Mycology. Edited by J. E. SMITH and D. R. BERRY. Halsted Press, John Wiley & Sons, New York, N.Y. 1974. 340 pp. $37.50.

This book is concerned with the filamentous and multicellular fungi and, according to the authors, is directed toward senior undergraduate and graduate students as well as industrial and government personnel involved in the pharmaceutical, chemical, and food industries. It presents a comprehensive review of the field. The first five chapters are devoted to discussions of structure, growth, and metabolism of fungi. These are followed by a brief history of the fermentation industry and four chapters concerned with metabolic products. Included in final chapters are mushroom cultivation, biomass production, oriental food fermentation, industrial exploitation of ergot fungi, biodeterioration and biodegradation by fungi, and mycotoxins. An extensive bibliography completes each chapter.

M. C. W. Smith, *Ann Arbor, Michigan*

Amino-acids, Peptides and Proteins. Volume 6. Senior Reporter: R. C. SHEPPARD (MRC Laboratory of Molecular Biology). The Chemical Society, London. 1975. xiv + 514 pp. £16.50.

This text, one of the series of "Specialist Periodical Reports" published by the Chemical Society, reviews papers published during 1973 relevant to the chemistry of amino acids, peptides, and proteins. (Metal derivatives, CD, ORD, and association-dissociation reactions of proteins are not covered in this volume, but will be covered for both 1973 and 1974 in Volume 7.) The book, which is the work of eighteen different contributors, cites approximately 3000 references, most of which were published in 1973. The text contains many figures, and although no subject index is provided, there is a thorough table of contents and an author index.

The chemistry of amino acids, peptides, and proteins is too broad a topic to allow a complete presentation of work published in 1973. Thus, the volume's usefulness depends to some extent on the success of the eighteen individual contributors in selecting the work they presented. The contributors' success in selection and evaluation varies, but overall a good level of competence is maintained.

The book is divided into five chapters: Amino-acids, Structure Investigation of Peptides and Proteins, Peptide Synthesis, Peptides with Structural Features not Typical of Proteins, and Chemical Structure and Biological Activity. The chapter on Structure Investigations of Peptides and Proteins is by far the longest, occupying nearly half of the book.

As a review of the current state of research on a given problem, this book has limited usefulness. The references are already almost two years old, and most contributors provide only a relatively brief overview of their particular area. The volume is more successful as

a source of information. Included are a very nice section on x-ray studies, compilations of partial and complete amino acid sequences, and lists of peptide syntheses and new synthetic intermediates. The book's primary usefulness, however, is in providing a view of the different kinds of chemical and physical techniques currently in use, and how they are being applied to specific problems. The organization of the chapters provides a clear directory to the various techniques, and what might not pass as a thorough review of a research question is quite satisfactory as a demonstration of a particular technique.

William V. Sweeney, *Hunter College*

Magnetic Resonance in Chemistry and Biology. Edited by J. N. HERAK and K. J. ADAMIĆ (Institute Rudjer Bošković, Zagreb, Yugoslavia). Marcel Dekker, Inc., New York, N.Y. 1975. xii + 551 pp. $34.50.

The application of magnetic resonance spectroscopy to the study of chemistry and biology has produced highly specialized expertise in fields as divergent as the determination of molecular conformations of biopolymers and the study of free radicals in solution. As with most forms of spectroscopy, the formal theoretical treatment is both rigorous and difficult. Nevertheless, significant information can be obtained from experimental results using a less formal approach.

In "Magnetic Resonance in Chemistry and Biology" an attempt is made to provide both basic information to newcomers in the field and to outline important developments in nuclear magnetic resonance (NMR), electron spin resonance (ESR), and dielectric properties of materials. The emphasis is on developing a general understanding of the principles and concepts involved, rather than a rigorous "first principles" treatment. The book is synthesized from a series of lectures given by eighteen experts in the field at the 1971 Ampère International Summer School on Magnetic Resonance. It is divided into three parts covering: (a) basic theory and experimental techniques; (b) applications to molecular systems; (c) topics related to dielectric measurement.

The first section is further divided into eight chapters and concentrates exclusively on basic theoretical and experimental concepts in NMR and ESR. Topics such as spin density distributions in planar radicals, magic angle rotation, and spin lattice relaxation methods are presented as separate chapters in semiquantitative detail. The second section, which is divided into nine chapters, presents and analyzes specific problems of chemical and biological interest. Among the topics covered as separate chapters in this section are applications of ESR to electrochemistry and to radiation-induced processes in nucleic acids, NMR spin-echo techniques, and radio-frequency methods of analysis. The third section is divided into two chapters and presents information on dielectric measurements in strong electric fields and dielectric depolarization spectroscopy.

Individual chapters in each section are either authored or coauthored from among the book's eighteen contributors. The basic format consists of a separate table of contents, figures, and bibliography for each chapter. A special feature of the book is a useful conversion table for SI units from nonrationalized Gaussian units.

However, there is a disturbing lack of continuity between chapters, which hinders the logical development of basic theoretical principles and leads to either a superficial presentation or an omission of basic phenomena. Indeed, there is no mention of several significant experimental developments, such as double resonance methods, chemically induced polarization techniques, and the study of metastable optically excited states. Further, production delays in bringing this book to press have severely hampered its effectiveness. The literature reviews within most chapters contain significant references only through 1970. Because of the rapid growth in the use of magnetic resonance in chemical and biological systems, the experienced researcher may find material that is seriously dated.

Despite serious drawbacks in continuity and scope, "Magnetic Resonance in Chemistry and Biology" provides a useful and needed insight into potential applications of magnetic resonance techniques to biophysical and biochemical problems. Investigators new to the field should find it a useful starting point from which to understand and utilize magnetic resonance phenomena.

Fitzgerald B. Bramwell
Brooklyn College of the City University of New York

Organometallic Chemistry. Volume 3 (A Specialist Periodical Report). Edited by E. W. ABEL (The University of Exeter) and F. G. A. STONE (The University of Bristol). The Chemical Society, London. 1975. xx + 487 pp. £17.50.

This volume reviews the literature of organometallic chemistry for the year 1973. As the editors state in the forward, some chapters include additional references to work not discussed in the chapter. Virtually all branches of organometallic chemistry are included in the eighteen chapters of the book. Organometallic compounds of main group elements as well as those of the transition metals are reviewed. Special chapters deal with specialized subfields such as carboranes (including metallocarboranes), metal carbonyls, metal–metal bonds, carbene and nitrene complexes, metal–carbon σ bonds, three chapters on various types of π-bonded organic groups, oxidative-addition reactions, homogeneous catalysis, and structures of organometallic compounds by diffraction methods. The chapter on carbenes considers only "carbon-carbenes" and not metal-centered carbene-like species, such as "titanocene", but possibly no papers on the subject were published in 1973.

All of the material presented in this volume is useful to some segment of the practitioners of organometallic chemistry. Some of the sections are especially thorough and very well written. Since the work is of English origin and since most of the "reporters" are English, the topics are somewhat slanted toward the interests of chemists in Great Britain, but it is also very widely based and should be useful to organometallic chemists the world over.

The book has an author index, but no subject index (the Table of Contents is fairly full of detail) and may be somewhat difficult to use as a reference for that reason. On the whole this is a valuable addition to the literature of organometallic chemistry and this Reviewer hopes that the project will be continued in subsequent years.

Carl H. Brubaker, Jr., *Michigan State University*

Dynamic Nuclear Magnetic Resonance Spectroscopy. Edited by L. M. JACKMAN (The Pennsylvania State University) and F. A. COTTON (Texas A&M University). Academic Press, New York—San Francisco—London. 1975. 660 pp. $48.00 (£23.05).

Over the past fifteen or twenty years, variable-temperature or "dynamic" nuclear magnetic resonance (DNMR) spectroscopy has been applied with much success to studies of intramolecular stereodynamics and nondestructive intermolecular exchange processes in myriad organic, inorganic, and organometallic systems. The advent of NMR spectrometers capable of observing many different nuclei employing continuous wave and, more recently, Fourier transform techniques complemented by complete DNMR line shape analysis has rendered the DNMR method one of the most powerful approaches available to study nondestructive rate processes which have potential barriers in the range of 5–25 kcal/mol.

In light of the large number of reports utilizing variations of the DNMR method, this book is especially timely and useful as a detailed summary of various experimental and theoretical approaches as well as an extensive compilation of data for a large variety of systems.

In the first three chapters, H. S. Gutowsky, W. G. Klemperer, and G. Binsch present a thorough discussion of the effects of nuclear spin relaxation and chemical exchange processes on DNMR spectra including considerations of molecular symmetry, DNMR differentiable processes, and complete DNMR line-shape analyses. L. W. Reeves is concerned with the application of pulsed NMR methods to diffusion and chemical exchange in Chapter 4, and in Chapter 5, R. Freeman and H. D. W. Hill discuss the determination of spin–spin relaxation times. In Chapters 6, 7, and 14, S. Sternhell, L. M. Jackman, F. A. L. Anet, and R. Anet are concerned with rate processes such as single- and double-bond rotation, inversion, and ring reversal in organic systems. In Chapters 8, 9, 10, 11, and 12, J. P. Jesson, E. L. Muetterties, R. H. Holm, F. A. Cotton, K. Vrieze, and R. D. Adams present extensive and detailed reviews of DNMR studies of exchange processes in organometallic and inorganic compounds. L. Telkowski and M. Saunders discuss carbonium ion rearrangements in Chapter 13. E. Grunwald and E. K. Ralph review proton transfer processes in Chapter 15.

In almost all the chapters above, adequate historical and theoretical backgrounds are presented to enable the reader to benefit

from many of the subsequent detailed discussions of individual experiments. This book will be valuable to those wishing to obtain a sound fundamental introduction to DNMR spectroscopy and the vast compilations of data will be very useful to experienced DNMR researchers.

C. Hackett Bushweller, *Worcester Polytechnic Institute*

The Role of Additives in Plastics. By L. MASCIA (University of Aston in Birmingham). John Wiley & Sons, Inc., New York, N.Y. 1975. vii + 172 pp. $12.50.

The book, divided into seven chapters, provides basic principles and mechanisms of interaction between certain types of additives and polymers. The first chapter deals with general aspects, such as definition and classification of additives, the science of mixing additives in polymers, and a brief comment on the health hazard of additives. The next three chapters deal with the effects of additives on the chemical and physical properties of polymers including surface properties with major emphasis on the physical phenomena. More than one-third of the book is devoted to additives which modify the mechanical properties. Chapters 5 and 6 deal with basic principles of improving the visual appearance of plastics (optical properties) and aging of plastics, respectively. The last chapter contains a brief description on blowing agents for foam and fire retardancy of plastics.

The book is intended for those requiring a fundamental knowledge of the use of additives in plastic materials. Each chapter contains a brief description of principles and fundamental equations sufficient to acquaint the reader with the subject.

A section dealing with reinforcement and composites is more extensive than any other section. However, the theoretical treatment dealing with the mechanical responses of the composites may not be within the grasp of a reader who is getting into the field. The inherent complexities of the subject demand more description of the mathematical steps for easier comprehension.

The book, in general, should serve as a useful guide to those who are associated with plastic technology.

Pronoy K. Chatterjee, *Personal Products Company (Johnson & Johnson)*

Development with Thermosetting Plastics. Edited by A. WHELAN and J. A. BRYDSON (National College of Rubber Technology, London). John Wiley & Sons, Inc., New York, N.Y. 1975. x + 198 pp. $22.50.

The book contains proceedings of the symposium held at the National College of Rubber Technology, Polytechnic of North London. There are eleven papers, which are arranged in the form of chapters. In all the papers, the emphasis is placed on the technological development, in terms of the European market, of different classes of thermosetting plastics which may be used in areas such as molding and laminating materials, cellular form, textile finishing, surface coating, adhesive, and so on. The fundamental chemistry of the thermosetting resins was not the subject of discussion in any of the papers.

The introductory paper on prospects and trends of thermosetting plastics covered development of the resins in the UK until 1973 and a forecast up to 1980. This paper is an excellent review of the production and usage of the thermoplastic resins in the UK. The following five papers are concerned with different classes of thermosetting material, e.g., amino resins, polyesters, Friedel–Crafts resins, furan resins, and polyurethanes. The final five papers are concerned with the processing technology of those materials such as polyurethane foam processing technology, powder coating, Fiberglass reinforced plastic, and injection molding.

All the papers included in the book contain thorough reviews of the respective topics. It should be useful to those industrial chemists who are actively involved in research or development of thermosetting plastics.

Pronoy K. Chatterjee, *Personal Products Company (Johnson & Johnson)*

Solid State Reactions. Revised translation from the German. A volume in the Materials Science and Technology series. By H. SCHMALZRIED (Institut für Theoretische Hüttenkunde und Angewandte Physikalische Chemie der Technischen Universität Clausthal). Verlag Chemie, Weinheim/Bergstr. Academic Press, Inc., New York and London. 1974. x + 214 pp. $21.75.

This concise volume succeeds in providing a firm introduction to the chemistry and physics associated with reactions in the solid state, such that one unfamiliar with the field can acquire the necessary background for reading the current literature. To this end, Schmalzried aids the reader in the first few chapters by introducing the vocabulary of the field (e.g., grain boundary) through basic written definitions and clear diagrams of the term under discussion. The usefulness of a good reference book depends largely upon the scope of the literature reviewed, and this book is no exception as the author supplies at the conclusion of each short chapter extensive general and specific references including articles and related books from both the European and American scientific literature.

Technologically important reactions are often involved with defect centers, and Schmalzried provides substantial information on the description, formation, and reaction of defect centers in solids. The methods of equilibrium chemistry are used to treat such defect reactions. Emphasis throughout this book is on the thermodynamics of point defects and kinetics of solid-state reactions. Phenomenological transport theory is discussed for several general reactions including alloy formation, the tarnishing of metals, and high-temperature sintering processes. Among the other topics treated are defect mechanisms inherent in the photographic process, fast ion transport in crystals and glasses, and solid-state electrochemical devices.

Perhaps one shortcoming of this volume is the absence of any solid-state treatment of organic polymer reactions, i.e., solid-state polymerization. Only inorganic examples are provided for each theoretically discussed reaction, although the application of presented theory is most likely relevant to purely organic reactions as well.

Schmalzried's text comes at a time when there is renewed increased interest in solid-state reactions and mechanisms and hence should be a valuable source book to persons engaged in such research. In addition, "Solid State Reactions" is recommended as a reference text for courses involved with condensed-phase kinetics and mechanisms.

Gregory J. Exarhos, *Harvard University*

Mass Spectrometry. Volume 3 (A Specialist Periodical Report). Senior Reporter: R. A. W. JOHNSTONE (University of Liverpool). The Chemical Society, London. 1975. xiii + 402 pp. £13.50.

This latest volume is the third in a series which has the objective of reviewing the most significant research progress within the field of mass spectrometry over the past two years. In common with the other Reports in this series published by The Chemical Society it has the objective of providing a critical, in-depth account for active specialists within the field. The present volume reviews the literature of mass spectrometry over the period 1 July, 1972 to June 1974 and presents critical reviews arranged under the topics of theory and energetics, structure and mechanism, methods of ion-i)ation, computerized data acquisition and interpretation, inorganic and organometallic compounds, natural products, organics, gas chromatography–mass spectrometry, drug metabolism, and protein and carbohydrate sequence analysis. Thus it provides a critical review in each of the main subject headings of the broad field of mass spectrometry.

The specialists writing in the current volume have succeeded admirably in providing a critical overview of the entire field. This volume is strongly recommended; it is further recommended that each researcher read the entire volume to obtain a thumbnail sketch of truly significant progress that has been made in mass spectrometry over the period covered by this review. The first four chapters are especially recommended as background information for subsequent chapters.

B. N. McMaster's chapter on theory and energetics of mass spectra is particularly comprehensive and valuable. He reviews the very important contributions that have been made by theorists, calculating the structure and energetics of ions using both *ab initio* and semiempirical methods, drawing attention to the limitations of the method, and discussing the reliability (and lack thereof) of conclusions to be drawn from the calculations. This is followed by a discussion of the nature of the ionization process and of unimo-

lecular dissociation of ions. A small quibble is that it would be useful to distinguish between analogies and deductions drawn from neutral systems and conclusions based directly on consideration of ionized species. A good discussion of photoelectron spectroscopy photoionization and charge transfer is included; the omission of a discussion of Penning ionization in the same section is unfortunate.

A useful discussion of charge-transfer ionization and the relationship of this process to photoionization and electron ionization is given. In addition, a detailed discussion of the new areas of study of field ionization kinetics and ion kinetic energy spectroscopy is presented from a rather different viewpoint from that introduced by the original authors. In describing results obtained with these techniques and their interpretation, the possible effect of ion kinetic energy on the interpretation of appearance potentials is discussed. Some very useful reminders are included of several factors which lead to errors in the determination of appearance potentials of fragment ions.

T. W. Bentley's chapter on structure and mechanism in mass spectrometry discusses some of the same topics from a mechanistic viewpoint and provides an equally valuable general overview of the most useful methods now being used to study structure and mechanism in mass spectral decompositions. The role of metastable ions, field ionization kinetics, and collisional activation metastable ion spectra are emphasized in this chapter. Isotopic labeling studies and, in particular, impact of these studies on the interpretation of the famous tropyllium ion $(C_7H_7)^+$ is reviewed. A valuable discussion of the relationship of gas-phase ion decomposition studies in mass spectrometry to the extensive studies of carbonium ion chemistry in solution is presented. A strong criticism of the widely applied concept of charge localization in the interpretation of organic mass spectrometry mechanisms is given. An extensive discussion of implications of recent theoretical calculations of ion structures and energies is included. Only a very brief discussion is presented of the application of orbital symmetry to the discussion of ionic fragmentation mechanisms.

The chapter by J. M. Wilson on alternative methods of ionization and analysis is strongly complementary to the chapters by McMaster and Bentley. Some of these same topics are discussed—including photoionization, field ionization, and field desorption mass spectroscopy. A good review of chemical ionization mass spectrometry in plasma chromatography is presented and a section on ion molecule reactions is included. The relationship of these studies of bimolecular processes to ion energetics, acid–base equilibria in the gas phase, and the reactivity and structure of gaseous ions is emphasized. A useful discussion of various methods used to arrive at an accurate table of proton affinities is included. The chapter closes with a discussion of plasma chromatography and the very high pressure chemical ionization method known as atmospheric pressure ionization. The latter technique has been extensively developed since the closing date of the review.

The remaining chapter of general interest to mass spectrometrists is the review by F. A. Mellon of computerized data acquisition and interpretation. The incorporation of computers as sophisticated data management devices for mass spectrometers has been one of the most important developments in analytical chemistry of the past decade. The very fast data transfer rate in mass spectrometry presents a difficult challenge which has now been successfully accomplished in a number of systems. Accordingly, the major emphasis in the time frame covered by the review has been the application of pattern recognition, library matching, and heuristic approaches to the interpretation of mass spectral data. Significant progress has been made, and it is clear that in the foreseeable future chemists will be relieved of a great deal of the burden associated with examining mass spectral data and interpreting the results in terms of chemical structures.

Additional chapters in this volume provide coverage of organometallic, coordination and inorganic compounds (T. R. Spalding, 80 pp), natural products (D. E. Games, 37 pp), reactions of organic functional group (J. H. Bowie, 33 pp), gas chromatography–mass spectrometry (C. J. W. Brooks and B. S. Middleditch, 42 pp), plus a brief coverage of drug metabolism (B. J. Millard, 22 pp) and protein and carbohydrates sequencing (H. R. Morris and A. Dell, 14 pp). These critical reviews of these specialized topics will be of considerable interest to workers in the field.

Jean H. Futrell, *University of Utah*

The Identification of Functional Groups in Organophosphorus Compounds. By L. C. THOMAS (Ministry of Defence, U.K.). Academic Press, London. 1974. x + 121 pp. $10.00.

This volume consists mainly of a tabulation and discussion of infrared absorption frequencies observed in various organophosphorus compounds. NMR, both ^1H and ^{31}P, spectral data are incorporated to a lesser extent, and mass spectral data are almost totally ignored. Most references are from 1970 or before. The lack of a subject index will cause few problems since the format of the book is such that various functional groups (e.g., P=O, P—C, P—N, P—H, P=S, etc.) are discussed in turn, and an adequate table of contents can quickly lead the reader to the section of interest. No attempt has been made to be encyclopedic; instead, frequency ranges of various vibrations for a class of compounds are tabulated and discussed. Chemical shifts and pertinent coupling constants are included for several functional groups. In a few rare instances chemical analyses for a particular functional group are mentioned. A brief but useful review of nomenclature of organophosphorus compounds is included in the introductory remarks. This book will be useful to workers in the field wishing to analyze infrared spectra of organophosphorus compounds in order to determine what functional groups are attached.

J. H. Hargis, *Auburn University*

Optical Activity of Proteins and Other Macromolecules. By B. JIRGENSONS (The University of Texas). Springer-Verlag, New York–Heidelberg–Berlin. 1973. ix + 199 pp. $23.10.

In this revised and enlarged second edition of a book originally published in 1969, B. Jirgensons mainly writes about the applications of circular dichroism (CD) and the closely related optical rotatory dispersion (ORD) to studies of proteins. These spectroscopic methods are extensively used to look at conformation and various conformational transitions of proteins in solution. The book contains 12 short chapters. The first three are introductory—they include remarks on the general structural features of proteins, some theoretical considerations on optical activity, and rather detailed sections on instruments and experimental methods. In the remainder of the book, B. Jirgensons puts forth results and their interpretation. Dispersion constants and CD band data for a large number of proteins and related substances are tabulated, and a new classification of proteins according to their conformation is proposed. Examples discussed include enzymes, immunoglobulins, nucleoproteins, glycoproteins, lipoproteins, structural proteins, small polypeptide hormones, and membranes.

B. Jirgensons' main purpose is to introduce the reader to the applications of CD to various problems involving the conformation of proteins. This is carried out primarily by giving illustrative examples. Most of these involve the secondary structure of proteins. Some readers will find that certain systems (i.e., small polypeptide hormones, nucleic acids, viruses, membranes) as well as certain general areas (i.e., the optical activity due to groups other than the peptide group) are given too brief treatment. My main criticism of the book is that the approach used does not result in a cohesive development of the origins of protein optical activity. On the other hand, I find the book very useful because it brings together and discusses a large amount of information.

In sum, the book gives a clearly written, fully referenced account of the major results of over 500 studies involving the optical activity of proteins and other macromolecules. It neatly tabulates or gives in figures a very large amount of useful information and points out important general trends. These features make the book an important guide and reference for all researchers interested in the optical activity of proteins and certain related substances.

Robert W. Henkens, *Duke University*

Topics in Current Chemistry. Volume 53. Gas Phase Electron Diffraction. By A. HAALAND, L. VILKOV, L. S. KHAIKIN, A. YOKOZEKI, and S. H. BAUER. Springer-Verlag, Berlin–Heidelberg–New York. 1975. 119 pp. $18.10.

This volume like others in this series fulfills the ever increasing need for comprehensive reviews in selected chemical areas of timely interest. The contents are divided into three currently popular research areas which employ gas-phase electron diffraction as the primary experimental technique.

In the first of these three articles, A. Haaland discusses current

research activity in the area of organometallic chemistry. The structures of beryllium, magnesium, boron, and aluminum compounds are discussed in terms of simple molecular orbital theory and the valence shell electron repulsion theory. Also included in this discussion are the cyclopentadienyl derivatives of the main group elements as well as ferrocene and other biscyclopentadienyl derivatives of the transition elements. This review includes 114 key references to both the structural and theoretical literature in this interesting area of chemistry.

The second review is by L. Vilkov and L. S. Khaikin. This review is divided into eight sections covering all possible combinations of bonding between the elements Si, P, S, and Cl and the elements N and O. The numerous structures in this large class of molecules are discussed in terms of departures from the Schomaker–Stevenson equation resulting from higher partial bond orders and substituent effects. This review contains 234 references to structural and theoretical literature in the area.

The third review, by A. Yokozeki and S. H. Bauer, covers the geometric and dynamic structures of fluorocarbons and related compounds. This review is probably the most comprehensive compilation to date on the novel characteristics of the carbon–fluorine bond. Numerous trends related to fluorine substitution effents are elucidated and beautifully illustrated by a variety of tables and graphs. The 313 references included in this review form the basis for a challenging test of any existing theory of molecular bonding which purports to describe the nature of the carbon–fluorine bond.

One outstanding feature of these three reviews is that the authors, aside from their common specialty of gas-phase electron diffraction, are also individually specialists in the particular areas of their reviews. For the most part each review is dominated by current research activity of the authors themselves.

Richard L. Hilderbrandt, *North Dakota State University*

Liquid State Physics—A Statistical Mechanical Introduction. By C. A. Croxton (University of Cambridge). Cambridge University Press, London. 1974. x + 421 pp. $28.50.

This book deals mainly with the classical statistical mechanics of the so-called "simple liquids". There are also brief introductions to quantum fluids and to liquid water. The opening chapters on equilibrium properties cover the expected ground of imperfect gas theory, integral equations for the correlation functions, and the numerical solutions of the integral equations. These are followed by the two most interesting and unusual chapters which deal with surface properties and with the methods and results of computer studies by the molecular dynamics and Monte Carlo methods. The final chapter provides a highly condensed survey of transport theory directed to self-diffusion, viscosity, and thermal conductivity. The Fokker-Planck method of Kirkwood and later workers is outlined. A brief introduction to linear response theory is followed by a more detailed account of the velocity autocorrelation function. Finally a brief introduction to Prigogine's formulation of irreversible processes, as described in his 1961 monograph, is given.

The text generally manages to convey very well the essence of many of the different theoretical techniques and what has been accomplished through them. Coupled with the unusually extensive and wide-ranging set of references, it would therefore be useful to graduate students entering the field. It is not a book from which to learn the technical details of the methods such as diagram theory, functional differentiation, etc., which are outlined, but it is a useful introductory survey of the kinds of statistical mechanical theory which have been studied.

Alan R. Allnatt, *University of Western Ontario*

Introduction to Liquid State Physics. By CLIVE CROXTON (Cambridge University). John Wiley & Sons, New York, N.Y. 1975. xii + 283 pp. $26.50.

Liquid theory had developed more slowly than the theories of gases and solids because of the fact that neither a system of independent molecules nor a perfectly ordered molecular array can be used as a starting approximation for liquid theory. Nevertheless, as Croxton points out, the theory of liquids has now progressed enough that there is a need for a short, general book on liquid theory for nonspecialists. Croxton has succeeded quite well in providing this kind of book, which could be more accurately entitled "Introduction to the *Theory* of Liquid State Physics".

The material is presented at a level understandable by advanced physics graduate students. As no attempt is made to develop results from first principles, readers should have some knowledge of statistical physics and thermodynamics.

As Croxton explains in the preface, he does not give detailed references for the material he presents. For these references and for further details, Croxton refers the reader to his "Liquid State Physics—A Statistical Mechanical Introduction" (Cambridge University Press, 1974). The sources of the figures are not given in the text or in the figure captions but instead are included with the acknowledgments on page viii. About three general references are listed at the end of each chapter. These references are usually books or review articles, and there are no suggestions about where to look for references to specific topics. I found this lack of detailed references rather frustrating when I wanted to learn more about a point which I did not understand or which was of special interest to me.

Chapters 7, 8, and 9 contain some references as recent as 1974. In the other chapters, there are almost no references or figures later than 1970. The chapter on the critical point describes the situation as of at least five years ago. I expect that except for Chapters 7, 8, and 9, Croxton describes the state of liquid theory in 1970. I therefore suggest that readers check other sources when they are interested in developments after 1970.

A very minor objection is that in Chapter 1, in the section on structure determinations; Croxton says that "fast" neutrons are used in studies of liquid structure. While the neutrons employed in these diffraction investigations certainly have higher energies than some of the neutrons employed in studies of liquids, I think that calling thermal neutrons "fast" may confuse many readers.

Croxton considers only "simple" fluids with spherical, pairwise intermolecular interactions. Diatomic homonuclear molecules and polar molecules are not discussed.

After an introductory chapter reviewing the liquid state and defining the scope of the book, Croxton devotes two long chapters to the theory of imperfect gases and the theory of dense fluids, basing his description of the latter topic on the pair correlation function. Chapter 4 discusses numerical solutions of some integral equations important in fluid theory. Phase transitions are considered in Chapter 5, and Chapter 6 deals with the critical point. Chapters 7, 8, and 9 are devoted to the liquid surface, liquid metals, and liquid crystals, respectively. Chapter 10 reviews molecular dynamics and Monte Carlo techniques for numerical calculations of the equation of state and other properties of liquids. Transport phenomena and reversibility are discussed in Chapters 11 and 12. There is a fairly detailed index.

Each chapter begins with a short introductory section reviewing and defining the topics to be dealt with. I found these introductory sections especially helpful.

The book is pleasant, easy reading. The first half of the book stimulated my interest so much that I found myself reading some of the later, more specialized chapters which I first thought I would not have time to look at.

"Introduction to Liquid State Physics" can be recommended as a quick, convenient survey of the state of the theory of liquids in the early 1970's.

Paul W. Schmidt, *University of Missouri—Columbia*

Introduction to Organic Chemistry. Second Edition. By C. H. DEPUY (University of Colorado) and K. L. RINEHART, JR. (University of Illinois). John Wiley & Sons, Inc., New York, N.Y., 1975. viii + 323 pp. $12.50.

In the new edition of this familiar text, the principles of organic chemistry are introduced and applied to examples from petroleum chemistry, polymer chemistry, biochemistry, and other areas. Quick entry into applications should successfully catch the attention of the student who needs the fundamentals but is primarily interested in their use in other scientific areas. Designed for a one semester brief introduction to organic chemistry, the new edition has been extensively rewritten. A new chapter on nucleic acids and additional sections on ir and uv spectroscopy are included. The number of problems at the end of each chapter has been greatly increased. Answers to a portion of these problems and those to be found within the chapters are located in the back of the book. As in the first edition, the three-dimensional aspects of organic chemis-

try are emphasized. Synthesis is not stressed. Biochemical pathways, particularly protein biosynthesis and the metabolism of carbohydrates, lipids, and amino acids, are discussed fully. Text material is presented with clarity. In the figures, a bright red color is used to emphasize the groups undergoing change in a reaction. Combination of all of these features has produced an excellent text for a brief introduction to organic chemistry.

Richard A. Bartsch, *Texas Tech University*

Boron Hydride Chemistry. Edited by EARL L. MUETTERTIES (Cornell University). Academic Press, Inc., New York, N.Y. 1975. xii + 532 pp. $49.50.

Research in certain selected areas of boron chemistry, such as the synthesis of new types of heteroatom borane cage molecules, has been particularly active in the past few years. This volume presents a series of very adequate although not comprehensive reviews of these more active research areas. The book serves an an update of some but not all the topics of an earlier volume edited by Earl Muetterties entitled "The Chemistry of Boron and Its Compounds" (John Wiley & Sons, Inc.) which was published in 1967. A supplementary note to Chapter 2 indicates that publication of the present volume was somewhat delayed. In most chapters an attempt was made to add in literature references which appeared during the delay period. However, the literature coverage of late 1973 and early 1974 is not as complete as it could be.

The text does provide an up-to-date view of the state of the art in several specific areas of boron hydride chemistry. It should be quite useful to the specialist and for a graduate level special topics course concerning boron chemistry.

Lee J. Todd, *Indiana University*

Advances in Organometallic Chemistry. Volume 13. Edited by F. G. A. STONE (University of Bristol) and R. WEST (University of Wisconsin). Academic Press, New York, N.Y. 1975. ix + 562 pp. $44.50.

The latest volume in this continuing series maintains the quality of previous volumes. One of the finer points of this series has been the coverage of personal and historical aspects of organometallic chemistry. This volume continues in that vein. The first article, "Organometallic Chemistry: A Historical Perspective", by John S. Thayer provides a concise look at the development of organometallic chemistry as an independent discipline. Although the article does not cover subjects in detail, it is easy to read and presents an accurate overview of the area. Many of the chemical milestones in organometallic chemistry are highlighted which helps to make ideal reading for those (students especially) interested in organometallic chemistry.

The final article, "Organometallic Chemistry of Main Group Elements: A Guide to the Literature", by J. D. Smith and D. R. M. Walton complements the first chapter. Together they constitute an effective introduction to organometallic chemistry. This chapter offers a fairly complete listing of the textbooks, reviews, and registers available to those interested in organometallic chemistry. There is a short section on books covering syntheses utilizing organometallic reagents. The article includes an appendix offering over 600 references to the primary literature.

The volume contains four additional articles covering specific aspects of organometallic chemistry. The article entitled "Arene Transition Metal Chemistry" by W. E. Silverthorn covers transition metals π-bonded to six-membered aromatic hydrocarbon rings. The syntheses and structure determinations of a wide variety of compounds are covered in detail. There are nearly 500 references and coverage appears to be quite complete. The article entitled "Organometallic Benzheterocycles" by Joyce Y. Corey covers heterocyclic compounds containing metal and metalloidal heteroatoms. It offers extensive coverage of the syntheses, reactions, and structural characteristics of unsaturated heterocycles containing a single metal atom from groups III, IV, V, and VI. There is an extensive compilation of the heterocycles prepared to date.

The article entitled "Organometallic Reactions Involving Hydro-Nickel, -Palladium, and -Platinum Complexes" by D. Max Roundhill summarizes the chemistry and syntheses of the hydro complexes of the nickel triad. The article is not comprehensive, but it offers fairly complete coverage of the area. An attempt is made to show involvement of the hydro complexes in isomerization, oligomerization, hydrosilylation, and hydrogenation of unsaturated hydrocarbons. "Palladium-Catalyzed Organic Reactions" by Patrick M. Henry encompasses recent advances on the mechanistic aspects of homogeneous catalysis involving palladium. The article covers various reactions of alkenes, dienes, and acetylenes with palladium reagents which were reported between 1971 and 1973. The article is not comprehensive but the topics are treated in detail.

George W. Kabalka, *University of Tennessee*

Cationic Polymerization of Olefins: A Critical Inventory. By JOSEPH P. KENNEDY. Wiley-Interscience, New York, N.Y. 1975. 337 pp. $22.50.

From the flyleaf: "This book is a comprehensive inventory of essentially all cationically polymerizable or oligomerizable olefins described in the scientific literature up to 1973. It includes a system of cationically polymerizable olefins and discussion of their polymerization behavior; a description, if available, of the physical properties of the polymers or oligomers; a phenomenology of cationic monomers; and a critical evaluation of prior work in the field."

Professor Kennedy has done for the field of cationic olefin polymerization what Beilstein and his colleagues did for organic chemistry. He has collected and systematized a vast incoherent mass of data into a usable and concise form. Along with all the available information on the cationic polymerization and copolymerization of each olefin, he has provided a critical discussion of the mechanistic aspects of the polymerization of each monomer, and a brief description of the physical properties of each polymer. Further, Professor Kennedy has provided an illuminating history of the field, a present-status report, and an indication of new directions.

The author alludes to the generality of cationic polymerization in that it encompasses more monomer classes than other heterolytic processes. However, although occasional mention is made of vinyl ethers, acetals, etc., their polymerizations are not the thrust of this book.

As befits a leader in the field, Professor Kennedy is not hesitant to introduce new and modify existing terminology. He recommends (p 5) that, where both reagents are used simultaneously, Friedel-Crafts catalysts be called the "coinitiator" and the Bronsted acid (or cationogen) the "initiator". The use of the term "carbenium ion" is stressed throughout.

Not the least of the book's merits is the graceful and interesting style in which it is presented. Many will read this for general information, and not only in the polymer field. The physical organic chemist who is versed in *carbenium* ion chemistry will find many aspects of this work stimulating and challenging.

By virtue of his industrial and academic backgrounds and his contributions to the field of cationic polymerization, Professor Kennedy is uniquely qualified to write this book. For the information it contains, the book is a bargain and will soon be found on every polymer chemist's bookshelf. It will unquestionably provoke much more research in this area.

H. K. Hall, Jr., *University of Arizona*

Nuclear Magnetic Resonance in Biochemistry. By THOMAS L. JAMES (University of California, San Francisco). Academic Press, New York, N.Y. 1975. xii + 413 pp. $26.50.

As stated in the preface this "text is intended primarily for biochemists, biophysicists and molecular biologists". A little less than half of the book serves as an introduction to the principles of nuclear magnetic resonance and experimental methods. The treatment in this half of the book is qualitative; equations are discussed but not derived. Extensive references to the literature and other texts are given at the end of each chapter, and these should prove useful to the reader desiring a more adequate treatment of a particular subject.

Chemists and physicists well versed in NMR can skip the first five chapters and concentrate on the last three chapters which survey the application of nuclear magnetic resonance techniques to biochemical problems. Since this reviewer has not been concerned with biochemical problems, I cannot judge the completeness of this survey, but it is well written, full of figures and tables, and replete with extensive literature references. Judging from the sparcity of 1974 dates in the references it would seem the survey covers the period up to and including 1973.

The book should prove valuable to both those working in biochemical areas who wish to learn how NMR can be used in their research and to chemists and physicists who wish to learn what advances have been made in using NMR to study the complex biochemical systems. The book is fairly free of major errors.

Bruce R. McGarvey, *University of Windsor*

Automatic Chemical Analysis. By JAMES K. FOREMAN and PETER B. STOCKWELL (Laboratory of the Government Chemist, London). Wiley/Halsted, New York, N.Y. 1975. xi + 346 pp. $36.50.

During the last decade or so, instrumentation for chemical analysis has been dramatically changed by a variety of semiconductor electronic devices which make measurement or control functions simpler, faster, or more sensitive. The constantly shrinking size and cost of computer systems is adding new sophistication to the acquisition and manipulation of chemical data. In the face of such progress it is easy to forget that most chemical measurements require many mechanical operations such as dilution, reagent mixing, heating, and sample delivery to the elegant measurement system. Automation of these operations requires skill, ingenuity, and high technology materials even though some of the basic principles were known to Archimedes.

Foreman and Stockwell have written the first volume in many years devoted to the automation of the mechanical aspects of chemical analysis. The book is arranged by final measurement technique (automated potentiometric titrators, spectrophotometers, atomic absorption spectrometers, chromatographs, etc.). There is extensive discussion of existing instruments, including many commonly available commercial devices, mostly of British or American manufacture. The chapters vary widely in their quality and timeliness.

The chapter devoted to colorimetric methods is quite comprehensive. Most of the major commercial devices are described in adequate detail. The chapter includes good discussion of the sources of error in automated analyzers, with emphasis on the problem inherent in the widely used Auto Analyzer.

Three chapters are devoted to chromatographic methods, with a nice discussion of sample introduction methods for gas chromatographs. Surprisingly, there is no discussion of high-pressure liquid chromatography, although an entire chapter is devoted to thin layer and paper chromatography and another to ion exchange chromatography.

Other chapters are devoted to electrochemical methods (voltammetry and potentiometry), spectroscopic methods (largely flame), thermal techniques, radiochemical and x-ray methods, and miscellaneous techniques. A final chapter presents a brief overview of computer applications. Mass spectrometry is not mentioned, except in passing in the computer section.

The major drawback to this book is that it is a bit dated. None of the references are later than 1972, and most of the discussion concerns developments of the 1960's. Progress in mechanical automation may be more gradual than in some other areas. Nonetheless, at over ten cents per page, one expects to find out about the latest models.

Michael D. Morris, *University of Michigan*

Introduction to Infrared and Raman Spectroscopy. Second Edition. By NORMAN B. COLTHUP (American Cyanamid Co.), LAWRENCE H. DALY (State University of New York, Albany), and STEPHEN E. WIBERLEY (Rensselaer Polytechnic Institute). Academic Press, New York, N.Y. 1975. xii + 523 pp. $24.00.

Vibrational spectroscopy remains one of the standard tools for organic structural elucidation. Therefore there is a need for clear, authoritative introductions to that topic. This book, an updated version of a standard text, largely fills that need.

About half the text is devoted to a theoretical introduction to vibrational spectra. The treatment is largely conventional, but it is a clearly written version and should be very useful. The lone chapter on experimental techniques is deliberately general and is not a guide to practice. This reviewer finds only two major faults here. First, the page devoted to Fourier transform techniques gives no hint of the very high resolution routinely available. Second, the section on Raman spectroscopy dwells too long on the Toronto arc and under-emphasizes the argon ion laser.

The remainder of the book is devoted to a systematic treatment of group frequencies. In addition to being quite comprehensive, these chapters are well referenced, usually to the primary literature. Most of the references are from the 1950's and 1960's, but a few are from the early 1970's. Eight chapters are devoted to cataloging characteristic frequencies by functional group. Another chapter summarizes this information by spectral region and presents the familiar correlation charts and many representative infrared and Raman spectra. The emphasis throughout is on infrared spectra. For the most part, Raman scattering is mentioned only where the corresponding infrared absorption is weak or absent. Even in these cases, the treatment of Raman scattering is confined to generalities, without the detailed descriptions and literature citations given to infrared correlations.

The shortcomings of this book are minor compared to its strengths. In its second edition, this book remains a good introduction to organic infrared spectroscopy. Chemists who need a book on the topic would do well to consider this one.

Michael D. Morris, *University of Michigan*

Enzymes: Physical Principles. By H. GUTFREUND (University of Bristol). John Wiley & Sons, New York, N.Y. 1975. xi + 242 pp. $8.95.

This is a reissue, in paperback or hardcover, of the 1972 edition of "Enzymes: Physical Principles", and differs from that edition by the insertion of a few corrections. The book gives a short and lucid treatment of the physical chemistry and kinetics of enzymes. The treatment is suitable for advanced undergraduate or for graduate courses in enzymology, or for the scientist who wishes an introduction to these subjects. The discussions of ionic equilibria and the reactivities of ionic groups in enzymes are excellent. In general the book suffers little from being written three or four years ago. However, it is a pity that the chapter on ligand binding has not been revised or expanded to include more recent work on subunit interactions and cooperativity in oligomeric proteins and developments in our understanding of the structural bases for cooperative interactions. This reviewer also feels that revision of the discussion of mechanisms of flavoprotein catalysis in the chapter on Transients and Relaxations would be desirable in view of the very considerable developments in that field since 1971. Strong points in the sections on enzyme kinetics and rapid reaction mechanisms include discussions of practical techniques which assist the enzymologist in interpreting kinetic data, and considerations of the pitfalls inherent in both measuring and interpreting such data.

Rowena Matthews, *Veterans Administration Hospital and University of Michigan, Ann Arbor*

Techniques and Applications of Plasma Chemistry. By J. R. HOLLAHAN (Tegal Corp.) and ALEXIS T. BELL (University of California, Berkeley). John Wiley & Sons, New York, N.Y. 1974. vii + 403 pp. $22.50.

The editors of this volume have presented a timely introduction and review of applications of nonequilibrium low-energy plasmas in a variety of laboratory and industrial processes. The book is carefully written to appeal to both the nonspecialist interested in using plasma technology and the well-initiated plasma scientist. There are ten chapters and an appendix. Chapter 1 outlines the theoretical foundations of low-energy plasmas and provides a framework for the remaining chapters. The appendix contains a short description of how to build your own plasma rf generator. The chapters in between contain a wealth of practical application information. There are chapters dealing with plasmas in organic chemistry, plasma treatment of solid materials and natural materials, synthesis of organic polymers and membranes, plasmas in analysis schemes, plasmas in microscopy and semiconductor sample preparations and plasma economics. Every application is described with more experimental detail than might normally be expected in such a text. This should be considered to be an asset.

The text has been edited with care and is easily read. The reviewer is disappointed only in the insufficient treatment of inorganic synthetic plasma chemistry. This book is recommended for purchase for anyone using or considering the use of low-temperature plasmas in synthesis, sample preparations, or analytical procedures.

Robert R. Paine, Jr., *University of New Mexico*