unselective with MCPBA, but conditions were finally found (1.0 equiv of *t*-BuOOH/2.5 mol% of $Mo(CO)_6$, 0.7 M benzene solution, 75 °C, 1.5 h) that gave **28** in 89% yield (44% conversion). The ^1H NMR of **28** clearly showed the C_{13}–C_{14} olefin (δ 5.93 (ddd, J = 1.5, 10, 15 Hz) and 5.28 (ddd, J = 3.5, 9.5, 15 Hz)), and the ^{13}C NMR showed the required 32 signals. Deacetylation (K_2CO_3 in methanol; 86%) and desilylation (tetrabutylammonium fluoride, THF; 75%) gave cytochalasin F (**3**) as an amorphous solid, $[\alpha]^{23}$ −33.1° (*c* 0.90), which was homogeneous on HPLC analysis, and showed a ^1H NMR spectrum in satisfactory agreement with that reported for the natural product.

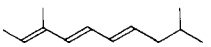
The identity of our synthetic material was confirmed, and the synthetic route to cytochalasin B was completed by the conversion, in 74% overall yield, of its immediate precursor **28** into cytochalasin B (**4**) upon refluxing with aluminum isopropoxide in xylene for 8 h,[11] followed by deacetylation and desilylation. The synthetic cytochalasin B, thus obtained as fine needles, was shown to correspond to the natural product by ^1H NMR, IR, and EI/MS. The melting point of the natural substance was not depressed after admixture with the synthetic material.

The reasonably simple construction of the cytochalasin system that we are reporting here should especially be valuable for the synthesis of simple analogues.

Acknowledgment. We thank the National Institutes of Health and the National Science Foundation for financial support of this work. We also thank Dr. W. G. Greenlee of Merck Sharp and Dohme for the high-pressure experiment (ref 10), Dr. M. Nakatani for some HPLC analyses, and Dr. W. B. Turner of ICI for making available to us the spectra of cytochalasin F and of the endocyclic olefinic isomer of cytochalasin B.

Supplementary Material Available: Experimental details and spectra (33 pages). Ordering information is given on any current masthead page.

(10) The yield in the earlier[1a] intermolecular cycloaddition was somewhat higher (~40%) than that from the present intramolecular process, but the latter avoids the rather inefficient lactonization of our earlier route. An attempt to improve the endo–exo ratio by carrying out the *intermolecular* cycloaddition between **8** and the model triene i at very high pressure (9.2 × 10^3 bars) led to the observation of a much faster reaction (30% yield after 20 h at 80 °C) than at ordinary pressure,[1a] but the endo–exo ratio remained unchanged (4:1). The minor exo isomer was incorrectly stated to be a regioisomer in our earlier report.



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(11) Cf.: Terao, S.; Kato, K.; Shiraishi, M.; Morimoto, H. *J. Org. Chem.* **1979**, *44*, 1979.

*Book Reviews**

Progress in Analytical Atomic Spectroscopy. Volume 2. Edited by C. L. Chakrabarti. Pergamon Press, New York. 1981. 386 pp. $60.00.

The first section of this book, by N. Omenetto and J. D. Winefordner, covers the basic principles and applications of atomic fluorescence spectroscopy. The authors' stated intent, "...to cover in an exhaustive manner the theory and practice of atomic fluorescence spectroscopy..." is indeed accomplished in eight chapters and two Appendices covering 184 pages. The material ranges from highly mathematical treatments of the fundamental processes to a candid assessment of the future of AFS. They feel that diagnostic studies of flames and plasmas will be the principal use and that atomic emission and absorption methods will continue to dominate in practical analysis.

The next section is on Trace Element Analysis of Food and Beverages by Atomic Absorption Spectroscopy, by F. L. Fricke, W. B. Robbins, and J. A. Caruso. Each element (Al, SB, As, B, Cd, Ca, Cr, Co, C, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Na, Sn, and Zn) is treated separately with a rapid overview of methods, references for that element, and a table of reported values in various foods. The approach leads to considerable redundancy which is hardly justified when only one analytical method is considered. Grouping similar elements would have been better. Methods descriptions are too brief to be followed but ready access to the original literature is provided.

A section on Determination of Trace Metals in Ultrapure Water, by K. S. Subramanian and C. L. Chakrabarti, covers contamination and its control, techniques and methodology, data reliability evaluation, and definitions of purity and ultrapurity. Problems associated with the various steps of water analyses are identified and references to detailed solutions provided. A general Comparison of Methods is given which presents atomic spectroscopic methods too favorably in comparison to other techniques. For example, proponents of neutron activation analysis and spark source mass spectrometry are unlikely to agree that their method may be 100 000 times poorer in absolute sensitivity than furnace atomic absorption.

In the next section, I. Rubeska and J. Musil discuss interferences in flame spectrometry from the perspective of the underlying processes which lead to inaccurate analytical results as opposed to a tabulation of observed effects and solutions. The coverage is thorough and in sufficient depth to be of great value to the serious student of flame spectroscopy.

The last section is on emission spectroscopy of cool flames by E. Henden, N. Pourreza, and A. Townshend. Emphasis is on molecular cavity emission analysis using methods in which analyte vapor is generated externally and transported to a metal cavity held in a hydrogen diffusion flame. Methods are given for the analysis of boron (BO_2 emission from methyl borate), arsenic, antimony, tin selenium, tellurium, sulfur, and carbon compounds.

The contributing authors are among the world's leading authorities in atomic spectroscopy; yet, this reviewer must question what was accomplished by publishing the book. It lacks coherence, depth of coverage ranges from very thorough (atomic fluorescence) to quite superficial, and much of the material is too old to truly represent "Progress". With the possible exception of atomic fluorescence, better reference sources exist for each of the topics.

S. R. Koirtyohann, *University of Missouri*

Computer Calculations for Multicomponent Vapor-Liquid and Liquid-Liquid Equilibria. By J. M. Prausnitz (University of California), T. F. Anderson (University of California), E. A. Grens (University of California), C. A. Eckert (University of Illinois), R. Hsieh (University of Illinois), and J. P. O'Connell (University of Florida). Prentice Hall, Inc., Englewood Cliffs, New Jersey. XIII + 353 pp.

This book is aimed primarily at design engineers and scientists in the chemical process industries. It provides a detailed approach to the estimation of multicomponent vapor–liquid and liquid–liquid equilibria at low or moderate pressures using computerized iterative techniques based on experimental data. It supersedes an earlier (1967) book "Computer Calculations for Multicomponent Vapor-Liquid Equilibria". However, it not only updates this earlier work but also extends it to liquid–liquid equilibria and expands it to include generalized iterative techniques for equilibrium calculations. The focus is on nonelectrolytes and some inorganic fluids (e.g., water and carbon dioxide). The main text consists of seven chapters and is about one-third of the length of the book. The rest of the book is comprised of ten appendices providing details on the computer programs involved.

The set of simultaneous thermodynamic equations on which the calculation of vapor and liquid fugacities in multicomponent systems is based is presented in the first two chapters which go briefly through activity coefficients, symmetric and unsymmetric conventions for normalization, the Gibbs-Duhem equation, and standard state fugacities for condensable and noncondensable components.

The third chapter discusses the calculation of fugacity coefficients for the vapor phase, the virial equation, and strongly interacting substances. The fourth chapter discusses the methods for calculating the fugacity of a component in a liquid mixture, data reduction, adjusted activity coefficients for noncondensable components, fugacity of the pure liquid, Henry's constant, and ternary and quaternary systems. The fifth chapter is devoted to the calculation of enthalpies in vapor-phase and liquid-phase

*Unsigned book reviews are by the Book Review Editor.

mixtures including liquid mixtures containing noncondensable components. The sixth chapter addresses the problem of adjustable parameters and their estimation. Maximum likelihood analysis is used and the algorithm employed in the estimation process is applied to parameter estimation from VLE Data. The chapter concludes with a discussion of parameter significance, uniqueness and error, analysis of residuals, estimated variances, systematic error, and model selection. The last chapter deals with equilibrium separation calculations, iterative calculation procedures, and their applications to bubble and dew-point computations, VLE separations, and liquid–liquid separations.

The first two appendices delve into vapor-phase nonideality calculations and standard-state fugacities at zero pressure, respectively. The third appendix presents properties and parameters for 92 pure fluids and characteristic binary-mixture parameters for 150 binary pairs. The final seven appendices are devoted to the description and listings of the computer programs for the calculation of thermodynamic properties. These include a binary-parameter-estimation program, subroutines for vapor–liquid and liquid–liquid equilibrium separations, and subroutines for loading and changing parameters.

Obviously, as the authors mention, it is unlikely that experimental vapor–liquid and liquid–liquid equilibria will ever be available for a significant fraction of the possible number of liquid and vapor mixtures in technological processes which is incredibly large. Therefore, reliable methods for calculating phase equilibria for multicomponent mixtures from a minimum of experimental information are of considerable importance. Thus, although this book is aimed at a rather specialized segment of the scientific and engineering community, for these specialists it is essential. The bibliography is fairly comprehensive but more attention could have been paid to alternative approaches to such computations. Finally, although the techniques presented in this book do reflect the current state-of-the-art, the pace of progress in computer science, and also in molecular thermodynamics, is such that I would expect a new update to be necessary within a very few years.

Isaac Eliezer, *Oakland University*

Polyatomic Molecules. Results of *ab initio* Calculations. By R. S. Mulliken (University of Chicago) and W. C. Ermler (Stevens Institute of Technology). Academic Press, London. 1981. xvi + 431 pp. $49.00.

"Polyatomic Molecules" with its companion volume "Diatomic Molecules" puts a complete survey and discussion of ab initio calculations at our disposal, a welcome development.

"Polyatomic Molecules" starts with an indepth discussion of the various methods (SCF, configuration mixing, MCSCF, electron pair methods) available for obtaining the electronic properties of molecules. Without going into the mathematical details, the authors make accessible the various advantages of each method. The rest of the book is devoted to a discussion of numerous molecules. They are arranged according to their size and symmetry. The authors start with triatomic molecules and also discuss reaction surfaces for triatomic. Then they go to tetrahedral and octahedral organic and inorganic molecules. Larger compounds with less symmetry or larger size such as aromatic compounds and nucleic acids are also included. The book ends on a discussion of molecular complexes and hydrogen bonding.

This book is not as compilation of the results of calculations, and is, therefore, not another bibliography of ab initio functions. Mulliken and Ermler have chosen to discuss the theoretical results and to compare them critically with the experimental results when available. Therefore, though a comprehensive overview of the literature is not given, the discussions guide the reader through the large body of methods and results now available in quantum chemistry. The book is therefore of great value to anybody who is interested in doing calculations or who is trying to use the results of theoretical calculations.

O. Eisenstein, *University of Michigan*

High Resolution Spectroscopy. By J. Michael Hollas (University of Reading). Butterworths Inc., Woburn, Mass., and London. 1982. xv + 639 pp. $115.00.

Although high resolution spectroscopy itself is a very specialized field, the subject has such far reaching implications that a knowledge of what is going on in this field is important to teachers and research workers in Physics and Physical Chemistry. The book under review gives an overview of the whole field of high resolution spectroscopy. It contains a wealth of information presented at a very understandable level.

The book attempts to cover the theory, experimental methods, and recent results of most branches of spectroscopy. The emphasis is on high resolution spectra of small molecules in the gas phase, but several sections include material more appropriate to the lower resolution obtainable with condensed phase samples. Obviously a comprehensive treatment of such a wide ranging subject as high resolution spectroscopy cannot be expected even in a book of over 600 pages. However, the author has brought together the various branches of the subject in a satisfactory way. There are many references to books and review articles as well as references to the original literature. Numerous useful footnotes clarifying notation, units, and spectroscopic conventions are found throughout the book.

The first two chapters cover the historical development of the quantum theory and the theory of absorption and emission of electromagnetic radiation. A useful discussion of line widths of transitions is included. Chapter 3 covers experimental methods and concentrates on some areas not normally covered in books on spectroscopy, such as millimeter wave techniques and Lamb dip spectroscopy. The operation of diffraction gratings and interferometers (both Fabry-Perot and Michelson) is explained here. Chapter 4 covers the theory and results of pure rotational spectroscopy (infrared, millimeter wave, microwave, and Raman). There are numerous examples, including detection of interstellar molecules, structure determination, and studies of van der Waals' molecules.

Group vibrational frequencies and vibration–rotation spectroscopy (infrared and Raman) are covered in the fifth chapter. Group theory and the Wilson FG matrix method for determination of normal modes of vibration are included together with theory and experimental observations of vibration–rotation bands of linear, symmetric, spherical, and asymmetric rotor molecules. Sections on anharmonicity and vibrational potential complete this chapter. Electronic spectroscopy of atoms and diatomic and polyatomic molecules is reviewed in Chapter 6. Both theoretical aspects and experimental results are covered in a fairly comprehensive way in this chapter.

A whole chapter is devoted to photoelectron spectroscopy, which is certainly not a high resolution technique, but has been included because it is closely related to electronic spectroscopy. The final chapter alone is probably worth the price of the book. It provides an excellent review of lasers and laser spectroscopy. Basic principles are explained including topics such as Q switching and mode locking. Brief descriptions of gas phase (atom, ion, molecule, excimer, and chemical), solid state (ruby, Nd/YAG, diode, etc.), and liquid (dye) lasers are given. Recent applications of lasers to nonlinear Raman, laser Zeeman, laser Stark, and fluorescence spectroscopy are described. Saturation, level crossing and anticrossing, quantum beat, and double resonance spectroscopy are also covered, together with a section on multiphoton absorption and its application to isotope separation.

In summary, "High Resolution Spectroscopy" will be a useful reference work for both teachers and students of spectroscopy. The book provides an introduction to most techniques and then directs the reader to more detailed treatments in specialized books and review articles. Finally, it is most gratifying to this (Canadian) reviewer to note the extensive references to the work of Canadian spectroscopists such as Herzberg, Bernstein, Costain, Oka, Douglas, Johns, Ramsay, Stoicheff, and many others.

H. F. Shurvell, *Queen's University*

Inorganic Energetics, an Introduction. 2nd Edition. By W. E. Dasent (Victoria University of Wellington). Cambridge University Press, New York. 1982. xii + 185 pp. $19.95 hardbound; $9.95 paperbound.

Once upon a time, not too many years ago, small monographs on special topics were quite common. The best among these treated really new things, or gave totally fresh approaches to older themes: the worst were no more than a few existing textbook chapters slapped together with an apt title, as though the format, and not the content, were the attraction. Happily, the latter forms do not crop up much anymore, because most textbooks treat the usual subjects in sufficient depth that pretenders are no longer necessary.

Now, let us look at "Inorganic Energetics", a pleasant enough little book that bridges two areas by symbiosis: thermodynamics is reinforced through contemporary examples, and aspects of inorganic chemistry are deeply explored to show their wonder. The approach is straightforward, and although a background in thermodynamics is assumed, there is quite a bit of derivation and discussion to help set the course of study firmly. The extensive tables of data, all in SI units, are up to date and handy to have around, but I had some problem with references—there are plenty, all given in an appendix, but many tables do not refer to their source(s) (the author admits "...documentation is not exhaustive".), a handicap for those of us who need more.

Lots of facts, and molecular-level interpretations, happily appear, to reinforce important quantum-mechanical and/or kinetic considerations, lest they be too eagerly sacrificed at the altars of Helmholtz and Gibbs. But I was disappointed that no problem sets were included, which makes the book's choice as a text a cautious proposition. Maybe the best way to sum up my feelings overall is to say that the intent is noble and the coverage is thorough, but widespread adoption is doubtful, not merely because no problems appear, but rather because the coverage is narrowly enough defined that not a lot of matching courses are taught. All in all,

this a valuable reference, and a good addition to libraries and individual collections.

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

Surface and Colloid Science. Volume 12. Edited by Egon Matijevic (Clarkson College of Technology). Plenum Press, New York and London. 1982. XI + 473 pp. $55.00.

This volume of this treatise consists of five chapters: (1) Polymers at Interfaces and in Desperse Systems by B. Vincent and S. G. Whittington of Bristol and Toronto Universities, respectively, (2) Characterization of Aqueous Colloids by Their Electrical Double-Layer and Intrinsic Surface Chemical Properties, by Robert O. James and George A. Parks of Eastman Kodak Research Laboratories, Rochester and Stanford University, respectively, (3) Selective Flotation and Its Surface Chemical Characteristics, and D. Hornsby and J. Leja, University of British Columbia, (4) Interfacial Chemistry of Mineral Processing Separations, by B. Laskowski, Wroclaw Technical University, and (5) The Suspension Effect by Yu. M. Chernoberezhokii, Leningrad University.

The topics vary in length from 118 pages (including references) to 44 pages and in treatment from almost purely theoretical (Chaper 1) to almost purely practical (Chapter 3). The Editor warned us in his Preface to Volume 1 that such would be the case, i.e., that unevenness of style, treatment depth, and level of theory was to be expected and also some overlap. There is overlap, of course, and generally it is useful, the greatest overlap being between Chapters 3 and 4. But despite similar Table of Contents headings, different purposes are served. Chapter 3 gives practical apparatus diagrams, flow sheets for separation systems, and also purely academic laboratory results, while Chapter 4 is more theoretical and addresses both floculation and flotation.

The book would benefit by a short but very specific description of how some techniques are adapted to Surface Science. Such a technique is potentiometric titration, mentioned in at least three chapters but never stepwise described. Most of those now in this field had their training in other subdisciplines of science and may benefit in speed of comprehension and adoption of some techniques with a modicum of help.

The first two chapters give a view of the firming thermodynamic and kinetic basis for at least parts of the discipline such as to suggest it may be time to include some of the contents in undergraduate Physical Chemistry courses concerned with thermodynamics and Statistical Mechanics. Other more specific comments are, it is remarkably free from typographical errors and has only a little awkward English in the last two chapters. Chapters 1 and 3 give in the first few pages the previous books and reviews and their dates, whereas the other chapters give this information less conveniently. All chapters are very well referenced with a total of over 1300 cited.

The series is so broad in a constantly broadening field that although it may seem picayune to put such a point forward when such a fine job has been done, publication in each volume as it appears of the contents of the previous volumes would be very welcome. At the price the book sells for (and the price of others in the series) no researcher is likely to buy all the volumes and so must choose judiciously. This volume belongs on a good percentage of surface scientists's shelves.

Robert N. O'Brien, *University of Victoria*

Topics in Stereochemistry. Volume 13. Edited by Norman L. Allinger (University of Georgia), Ernest L. Eliel (University of North Carolina), and Samuel H. Wilen (City College, City University of New York). John Wiley and Sons, New York. 1982. X + 489 pp. $85.00.

This is another excellent addition to an informative and useful series.

The first chapter is entitled Stereoselective Aldol Condensations, by D. A. Evans, J. V. Nelson, and T. R. Taber. One of the important bond-making processes in biosyntheses and one of the oldest known reactions in organic chemistry is the aldol condensation. Recent interest in the biomimetic syntheses of macrolide and ionophore antibiotics has generated research in the stereochemical aspects of the aldol condensation. This well-written chapter deals with stereochemical assignments of the aldol products, thermodynamic and kinetic control of diastereoselection, and the consequences of metal enolate geometry. The authors also treat asymmetric induction in the instance of chiral aldehydes reacting with achiral enolates and also the case of chiral enolates reacting with aldehydes. There is an abundance of useful tables of data and references.

The second chapter is entitled Application of Molecular Mechanics Calculations to Organic Chemistry, by E. Ōsawa and H. Musso. Molecular mechanics or empirical force field calculations are becoming increasingly useful as a complement to experimental studies of molecular geometry, barriers to internal motion, vibrational frequencies, heats of formation, and reaction mechanisms. This chapter is a practical guide to the literature for current and potential users of the molecular mechanics (MM) method. The authors discuss the scope and limitations of the MM method and present a survey of current force field models. Applications of the MM method to the conformational analysis of simple and polycyclic alkanes, alkenes, aromatics, ethers, alcohols, carbonyl compounds, and natural products are presented. One section is devoted to reaction mechanisms, i.e., transition states, and another section to miscellaneous applications. This is a timely review with more than 333 references and will be useful to current and future users of the MM method.

Chiral Monolayers at the Air-Water Interface, by M. V. Stewart and E. M. Arnett, is a chapter which treats energy changes in surfactant monolayers at the air–water interface as a function of changes in orientations of the surfactant molecules. This research is a blend of interfacial chemistry and stereochemistry; methodology related to both areas is reviewed. This work is potentially important to the study of bilayer membranes which are composed in large part of chiral components. A review of mono-layer characteristics and techniques involving enantiomer or diastereomer discrimination for studying subtle changes in mono-layer properties are presented. There are many clearly rendered graphs and pictures, and over 122 references.

The fourth chapter, entitled NMR Chiral Solvating Agents, by W. H. Pirkle and D. J. Hoover, is concerned with the chiral recognition of enantiomers by diamagnetic, optically active solvating agents and the resultant effect on the NMR signals for the enantiomeric solute molecules. This phenomenon allows a nondestructive, direct determination of optical purity of a chiral solute and a means of studying the nature of the diastereomeric solvent–solute interactions. This chapter reviews the various types of diamagnetic chiral solvating agents (CSA) and the origins of the NMR nonequivalence in terms of solvent, temperature, concentration, and structure of the CSA. The authors also discuss the correlation of absolute configuration with NMR data, present models for these correlations, and give many examples. A comparison of diamagnetic CSA systems with paramagnetic chiral lanthanide shift reagents is also presented. There are over 111 references. This review will be very useful to researchers concerned with the theory and practical applications of diamagnetic CSA systems.

The last chapter in this volume, Chiral Organosulfur Compounds, by M. Mikolajczyk and J. Drabowicz, is an impressive, thorough review of the title compounds. The chapter is well-organized and deals with four major areas: (1) syntheses of chiral sulfur compounds, (2) determination of absolute configuration and optical purity, (3) dynamic stereochemistry, and (4) use of chiral organosulfur compounds in asymmetric syntheses. Twenty different types of compounds are discussed including sulfoxides, sulfinates, sulfinyl chlorides, sulfites, sulfonium salts, sulfuranes, and others. There are 326 references given with this very informative chapter.

C. Hackett Bushweller, *University of Vermont*

Thermodynamics—A Rigorous Postulatory Approach. By S. H. Chue (University of Malaya). John Wiley and Sons, New York. 1977. xii + 274 pp. $27.50.

According to the author, this text is designed to provide a rigorous postulatory introduction to thermodynamics at the undergraduate level suitable for engineers, physicists, and chemists. Unfortunately, it accomplishes none of these objectives.

To begin with, it is not clear what is meant by a "postulatory approach", but the word "rigorous" is most inappropriate. In fact, this text is replete with misleading, incomplete and sometimes incorrect statements. A few cases illustrate the point.

1. The Zeroth Law (page 11) is stated after *first* tacitly assuming all systems are at the same temperature. In this context, the author is right in concluding the law to be "rather trivial".

2. The Third Law statement (page 28) is similarly misleading. The statement that S is zero at zero Kelvin is not a law, but rather a convention and it is not attributable to Nernst, but rather to Planck. Furthermore, the Unattainability Theorem is not equivalent to the Nernst Statement. Most seriously, there are no indications as to how the Third Law is to be used apart from the statement that it permits the determination of the absolute entropy of every substance.

3. In chapter nine, dealing with the "Properties of Ideal Solutions", there is much confusion as to the distinction between ideal solutions and real dilute solutions. For example, without having introduced the notion of a real solution, the author derives Henry's Law for the solute via the Duhem-Margules equation and then concludes (page 193) that Raoult's and Henry's Laws simultaneously apply to ideal solutions. Yet on page 189, it was correctly stated that Raoult's Law holds for all components in these systems. To further hedge, we are also told on page 190 that Henry's Law constant is not necessarily equal to P_{sat} in Raoult's Law.

I hope that I will not be accused of nitpicking. Imprecise language particularly is anathema in thermodynamics, where bewilderment and a subsequent distaste for the subject are only too common.

As a case in point, Maxwell's definition of temperature (page 5), i.e., "temperature is the thermal state of a system considered with reference

to its power of communicating heat to other systems." is itself a masterpiece of obfuscation, and to state, as the author does, that the Zeroth Law follows directly from this definition is not very meaningful.

Furthermore, to treat thermodynamics, as this book does, as independent of its laboratory heritage implies neither "rigor" nor serves the best interests of the beginning student.

Quite aside, however, from the book's annoying imprecision of language, the real failure lies with its pedogogy. Again, some examples: 1. In 264 pages of text, there are only 34 examples to illustrate 75 broad topics. Furthermore, a number of those examples require engineering tables that are not included in the text. In fact, this book contains no tables of any kind. 2. There are no answers to the problems given in the book. While this is unfortunately not so unusual, it is, in this reviewer's opinion, a significant defect in an introductory text. 3. There are no literature citations or references to other books or journals. 4. There are no explanations as to the purpose of many important derived relationships. For example, the phase rule is quasiderived on page 156 and then dropped without a hint as to its use. The foundation stone for Heterogeneous Equilibria is not as unimportant as that.

As for the appropriateness of this text for chemists, it is perhaps best illustrated by the author's assertions that: page xii, "...all experimentally observed laws in physical chemistry can be deduced as a consequence of a basic definition of an ideal solution,..."; and again, page 194, "...most, if not all, of the experimentally observed laws in physical chemistry hold for perfect solutions only".

It would appear that the author is an engineer (hence extensive chapters on Flow Processes and Heat Engines) writing from the stated assumption that the "rigor" of the exposition would somehow "cut across compartmentalized areas of specialization".

On a positive note, the book contains an elementary chapter on irreversible thermodynamics, a topic I was pleased to see included in an introductory text, and a chapter dealing with surface effects, fuel cells, and radiation.

In summary then, I am afraid that I cannot recommend this text for chemists or physicists, and I would be so presumptuous as to include engineers. While the needs of this latter group are distinctly different, they are certainly no less entitled to sound scholarship, and that, unfortunately, is exactly what this book fails to deliver.

D. W. McClure, *Portland State University*

Bioorganic Chemistry. A Chemical Approach to Enzyme Action. By Herman Dugas (Université de Montréal) and Christopher Penney (Connaught Research Institute). Springer-Verlag, New York. 1981. xii + 508 pp. $29.80.

During the last two decades a number of texts have appeared which underscore the proposition that biochemistry is at its center a chemical science. Notable among these works is Jencks' fundamental and scholarly "Catalysis in Chemistry and Enzymology" (McGraw Hill, New York, 1969) and Walsh's more recent "Enzyme Reaction Mechanisms" (W. H. Freeman, San Francisco, 1979). Like some others of the species, both books offer a comprehensive treatment of specific areas germane to the field which is coming to be called bioorganic chemistry. But neither pretends to be the textbook for the discipline. In fact, the word "bioorganic" has not even appeared in the title of a text since Bruice and Benkovic gave us "Bioorganic Mechanisms" (W. A. Benjamin, New York, 1966) nearly 17 years ago. So, the recent offering of Dugas and Penney is in many respects a welcome and long overdue volume.

It is difficult to know, perhaps because the field is still developing, just which aspects of the scientific enterprise ought to be listed under the bioorganic heading. The authors of this book have chosen to present a collection, in most respects nicely balanced, of biological processes amenable to elucidation by analysis of the cognate reactions in organic chemistry. This approach, of course, gives the field a kind of definition.

Chapter two is especially successful in this regard. It includes a lucid summary of the several strategies available to the synthetic chemist for formation of the peptide bond. This is preceded by a rendering of the events in ribosomal protein biosynthesis. The total effect is to focus the student's attention on the fact that the chemical problem in peptide synthesis, faced by both the bench chemist and the cell, is activation of the carboxylate group. The impact of this simplifying insight could have been strengthened by the reverse order of presentation; but that judgement is probably informed by a personal sense of the dramatic.

Collected here are a section on biomimetic chemistry and a brief outline of the potential utility of enzymes in organic synthesis. Included also is the not unexpected story of the serine proteases, used to illustrate the process by which the concept of an enzymatic mechanism develops from experiment.

Perhaps the most satisfying section—relating to the proteases and consistent with the goals of the text—is that which describes the chemistry of the tetrahedral intermediate and the charge-transfer reaction in model organic systems. Perhaps the least satisfactory section for the student is that which discusses the stereoelectronic control of ester and amide hydrolysis. These arguments will doubtlessly require some explication by the instructor.

In a brief account, the reader is led to suspect that all toxins are "naturally-occurring, irreversible enzyme inhibitors". This unfortunate definition is likely to surprise those who believe that, for example, tetrodotoxin blocks the sodium channels of excitable membranes or that aflatoxin alkylates DNA.

It is even more regrettable that a textbook should provide a source for confusion, as this one does in making the unhappy distinction between "the active center or catalytic cavity" and the "active site" of an enzyme. The former is said to involve those "...amino acid residues implicated in the mode of binding and the specificity of the substrate". The latter "...is composed *only* (italics added) of the side chains of the amino acids which are directly implicated in the catalytic process". This separation of functions seems neither helpful nor illuminating. Further, it leaves the impression that specific binding is *not* a part of the "catalytic process". Other authors have argued, of course, that the specificity of the reaction catalyzed is a more characteristic feature of enzyme catalysts than is the rate acceleration obtained in specific chemical steps. Leaving aside, however, the issue of which "features" make enzymes unique, it seems totally arbitrary to give one name to that cluster of functional groups responsible for physical binding of substrates and another to those whose role is to effect chemical-bond rearrangements. It is misleading to suggest that a sharp distinction can be made between the two processes for most enzymes.

Finally, one regrets especially the admittedly minor historical error which ascribes the "lock-and-key" theory of enzyme specificity to Hans Fisher. The latter, I believe, was a porphyrin chemist active several decades after this thoughtful, if now somewhat overworked, analogy was actually entered into the record by Emil Fischer in 1894 (*Ber. Dtsch. Chem. Ges. 27*, 2985). Practicing scientists are not, of course, particularly attentive to the history of their fields—with the notable exception that they are very fussy about the place of their own work in the chronology of events. Textbook writers ought to be more careful of such details.

These criticisms noted, it remains that this is a good book for those who wish to see a number of topics relevant to the current research in bioorganic chemistry collected together in one place. As a complement to a well-taught course, the volume will be quite useful. It is not, however, the careful piece of scholarship one might have hoped for.

Michael Johnston, *University of Chicago*

The Botany and Chemistry of Hallucinogens. Second Edition. By R. E. Schultes (Harvard University) and A. Hofmann. Charles C. Thomas Publishers, Springfield, IL. 1980. xxv + 437 pp. $29.75.

Plants of the Gods: Origins of Hallucinogenic Use. By R. E. Schultes and A. Hofmann. McGraw-Hill Book Co., New York, NY. 1979. 192 pp. $34.95.

"From the beginning of our knowledge of man, we find him consuming substances of no nutritive value but taken for the sole purpose of producing for a certain time a feeling of contentment, ease, and comfort...".

This statement made by a leading pharmacologist almost 60 years ago underscores the significance, both past and future, of hallucinogens to the development of human culture. Except for researchers involved directly in the field, the significance is poorly appreciated, especially by recent generations, who tend to view the use and abuse of these substances to be of the same vintage as the silicon chip.

These two exquisitely produced volumes will quickly dispel such notions. They are definitive works on the origin, botany, chemistry, and psychoactivity of plant hallucinogens, engagingly written by a botanist (Schultes) and chemist (Hofmann) with lifetimes of contributions to these areas of research. The first book is a must for the specialist researcher/educator; the second is highly recommended to the intelligent reader; that is not to say that the specialist will be able to resist it.

The publication of a second edition of "The Botany and Chemistry" after only 7 years is easily justified: botanical and especially chemical aspects of hallucinogens have advanced significantly and the historical and ethnopharmacological base has been expanded. The volume is therefore heftier (40%) with further subdivision. After presenting the definition, botanical distribution, and chemical classification of hallucinogens, the authors discuss in detail (284 pp) each plant species giving its botanical description, history, chemical constituents, and physchoactive effects. In these pages abound delightful pictures of botanists and chemists, original sketches of plant species, first-hand accounts of "healing sessions", transcriptions of recipes for hallucinogenic potions, and photos of religious and ceremonial rites. For the chemist, organic structures are liberally provided although the synthetic work appears not to have been updated. The long section on *Cannabis* reflects a substantial

increase of research which includes the discovery of new species and natural products, and investigations of structure–activity relationships. Terminal chapters on plants of suspected and alleged hallucinogenic effects will serve as a stimulus for further research. A comprehensive bibliography and excellent index conclude this scholarly work.

What the above work is to the scholar, the "Plants of the Gods" will be to the receptive general reader. It is, in fact, a highly successful distillation of the former into a definitive sourcebook for the concerned public. Beautiful layout and many multicolored photographs and drawings, some printed for the first time, are interspersed with informative writings. The visual is accenturated especially in maps showing hallucinogenic plant distribution and usage, a lexicon (29 pp) with color illustrations of 91 plants compiled according to genus, and a reference chart (15 pp) containing concise information on their usage, preparation, chemical constituents, and effects. The longest section considers 14 major hallucinogenic plants and their cultural significance in chapters invitingly named, for example, The Hexing Herbs (Henbane), St. Anthony's Fire (Ergot), and The Tracks of the Little Deer (Peyote). The chemical structures and use of hallucinogens are presented with high visual content and a selected bibliography and good index are provided.

Reader beware: casual reading of "Plants of the Gods" is conducive to absorbed reading. The book is affordable; recommend it to your doctor or dentist in whose reception rooms it will serve its worth many times over. It is an undeniably palatable source of information on the roots of a contraversial topic.

In the footsteps of von Bibra, Hartwich, and Lewin, great interdisciplinary scientists of the past, Schultes and Hofmann have contributed two valuable works which will be indispensible guides to further understanding and research on plant hallucinogens.

V. Snieckus, *University of Waterloo*

Free Radicals in Biology. Edited by W. A. Pryor (Louisiana State University). Academic Press, New York. 1982. xx + 283 pp. $48.00.

This volume is the fifth in a series edited by William Pryor. The first two volumes were published in 1976 with subsequent volumes appearing about every 2 years. Volume V continues the high standard of quality set by the previous four volumes. Each of the authors has admirably accomplished the original goal of the series which was to present both a brief introduction and also an up-to-date survey of each area. Many of the chapters have a clinical orientation that attests to the increasing recognition of the importance of free radicals in the biology of the cell.

The first chapter, by S. D. Aust and B. A. Svingen, describes several mechanisms by which iron can promote free-radical generation during lipid peroxidation in microsomal systems. J. F. G. Vliegenthart and G. A. Veldnik discuss the biochemistry and biology of lipoxygenases. In chapter three, H. J. Forman and A. Boveris review the production of hydrogen peroxide and superoxide in mitochondria and then they discuss the biological role of these species.

Chapter four, by R. L. Baehner, L. A. Boxer, and L. M. Ingraham, details the production of reduced oxygen species in white blood cells during phagocytosis. In Chapter five, D. Chiu, B. Lubin, and S. B. Shohet review the effects of peroxidation reactions in red blood cells, natural protective systems against peroxidation, and the relationship between peroxidative reactions and red cell disorders.

In Chapter 6, R. P. Mason reviews the production of free radicals during the metabolism of a large number of organic molecules, the subsequent reactions of these radicals, and the toxological consequences of these reactions. In Chapter 7, L. Flohe gives a broad review of gluthathione peroxidase including its enzymology and biological function. In the final chapter, D. Harman reviews some gerontological principles as well as the evidence that antioxidants affect aging. He then discusses a number of diseases in which free radicals may be involved.

This volume is highly recommended for both the novice and expert in free-radical biology. Both chemists and biologists will find it extremely interesting.

Donald R. Paulson, *California State University, Los Angeles*

Lasers and Chemical Change. By A. Ben-Shaul, Y. Haas, and R. D. Levine (The Hebrew University of Jerusalem) and K. L. Kompa (Max-Planck-Institut für Laserforschung). Springer-Verlag, Berlin, Heidelberg, and New York. 1981. xii + 497 pp. $48.00.

This book, Volume 10 in the "Springer Series in Chemical Physics", is according to the authors an introduction to "the study of radiation and molecules in disequilibrium". This is first accomplished in survey form in an introductory chapter. A more detailed theoretical analysis of disequilibrium, including surprisal analysis, molecular reaction dynamics, state-to-state processes, and a thermodynamic approach is presented in the second chapter. A semiclassical approach to the interaction of radiation fields with molecules follows in chapter three along with introductory material on laser physics and atomic and molecular spectroscopy. Three laser sources commonly used by chemists (exciplex, dye, and CO_2 lasers) are also briefly described. A rather comprehensive review of existing chemical lasers is presented in chapter four while the final chapter presents a more limited but representative set of case studies in the field of laser chemistry. Only low-pressure gas-phase work is emphasized throughout the book.

The book is directed to chemists in its approach and explanations. While the treatment is occasionally uneven, it is on the whole well-written and instructive. A large number of examples are included throughout with numerous (~250) illustrative figures typically adapted from the original literature. It also includes an extensive bibliography with references up through 1980.

This book provides valuable background information for both the novice and the expert in the field of laser chemistry and chemical lasers. Although not set up as a formal textbook, it would serve as a useful introduction to the advanced undergraduate or beginning graduate student interested in this field. While not intended to be comprehensive, it does, in my view, include in one volume a rather extensive and successful introductory survey of this area.

Gary W. Scott, *University of California, Riverside*

Fourier, Hadamard, and Hilbert Transforms in Chemistry. Edited by Alan G. Marshall (The Ohio State University). Plenum Press, New York, NY. 1982. xii + 562 pp. $65.00.

This book begins, quite appropriately, with two general, introductory chapters, one on Transforms in Chemistry and the second on Hadamard and Other Discrete Transforms in Spectroscopy. They are well written and present a clear overview of the rapidly growing field of "transform spectroscopy". They include good discussions of the advantages, disadvantages, and complementarity of dispersive spectroscopy and the new transform techniques.

There are contributions in the book from 16 different research groups and they cover most of the areas of modern experimental transform spectroscopy. The book complements very well an earlier companion volume "Transforms in Chemistry", edited by Peter Griffiths. The areas covered are Fourier Transform (FT), NMR, Ion Cyclotron (Mass Spec), Nuclear Quadrupole Resonance, Dielectric, Microwave, Electron Spin Resonance, Muon Spin Rotation, Infrared, UV-Visible, and Faradic Admittance Spectroscopy. Fourier Transforms in Spectro-electro chemistry are also covered.

The chapter on FT-Mass Spectroscopy is well done, easy to read, and very timely considering the increasing number of FT-Mass Spectrometers now being sold by commercial firms. The chapter on two-dimensional NMR is one of the best and most lucid presentations of this powerful and rapidly growing technique that I have seen. There is a most interesting chapter on FT-UV-Visible spectroscopy which should stimulate the imaginations of a good many chemists. Although the Fellgett advantage is lost, there are many other advantages to FT-UV-Visible which are discussed in detail.

All of the chapters contain a good, complete, and accurately documented list of references for those readers who are interested in learning more. Some of the research areas included, such as Fourier Transform Muon Spin Resonance, will be of interest to only a small group of specialists. The chapters are all well done, clearly written by authorities in their various fields, and should provide easy, stimulating, and informative reading even for beginning graduate students. I recommend the book as an excellent reference for every chemist's bookshelf.

Thomas C. Farrar, *University of Wisconsin—Madison*

Synthetic Reagents. Volume 4. Edited by J. S. Pizey. Ellis Horwood Ltd., Chichester, and John Wiley and Sons, New York. 1982. 426 pp. $117.95.

The title of this series can be misleading; it is about reagents for organic synthesis, rather than reagents that are synthetic. Three reagents are reviewed in this volume: mercuric acetate (by R. N. Butler); periodic acid (by A. J. Fatiadi), and sulfuryl chloride (by J. Tabushi and H. Kitaguchi). It is curious that the preface attributes the first review to a "C. F. Lane", whose name cannot be found elsewhere in the book.

Each reagent is first presented for itself, with information on its physical properties, structure, and preparation. Thereafter comes a detailed exposition of its reactions "to provide a full understanding of their synthetic utility". Depending on the contributor, the expositions vary from a dry recitation of facts, reminiscent of some volumes of the Royal Society of Chemistry's "Specialist Periodic Reports", to a more engaging and didactive interpretive approach. In all cases, equations abound, and the bibliographies are large (992 references in the periodic acid chapter, for example). Small tables are to be found giving comparative results from related substrates although large, comprehensive tables of the type typical of the series "Organic Reactions" are absent.

Nomenclature is quite generally sound, a fact that makes occasional

misnomers stand out. One in particular is "mercurinium" for the cation of a three-membered ring containing one mercury atom ("mercurin" is the Hantzsch-Widman name for a *six*-membered ring containing mercury analogous to "dioxin", whereas "mercurirane" is the name for the C_2Hg ring); either "mercuronium" or "mercuriranium" would be consistent with what was meant.

There is a suspicion that reactions that are not synthetically useful may have been omitted; for example, under "tertiary amines", the review on mercuric acetate starts out "Treatment of cyclic tertiary amines...", without mentioning noncyclic ones (or primary or secondary amines) or explaining their absence. This is a pity, because knowledge of all types of reactions is important for understanding the scope and potential interferences. Nevertheless, the reviews in this series are a highly useful resource for the organic chemist, and will probably be consulted heavily for many years. The index is satisfyingly thorough. Libraries serving chemists should not be without these volumes, and it is only the price that forstalls a recommendation for private purchase. It is to be hoped that continuing volumes will appear in due course.

Essentials of Nuclear Chemistry. By H. J. Arnikar (University of Poona, India). John Wiley and Sons, Inc., New York. 1982. xii + 335 pp. $17.95.

This book was written as an introductory textbook for advanced undergraduates and graduate students. At the end of each chapter are a few problems, with answers. However, the book offers very few worked-out examples. There is a good bibliography and an author index.

The nine chapters of the book are the following: The Atomic Nucleus, Properties of Nucleons and Nuclei, Nuclear Models, Radioactivity, Nuclear Reactions, Nuclear Fission, Nuclear Reactors, Applications of Radioactivity, and Elements of Radiation Chemistry. Quantum numbers are discussed in detail. The reader will find familiarity with electronic quantum numbers helpful here. Nuclear magnetic resonance and its importance to chemists are discussed briefly. The chapter on applications covers many examples and provides quite interesting reading. Nuclear models are covered in detail, and the strengths and weaknesses of each are pointed out.

The book has very little material on detectors and particle accelerators. The breeder reactor and the current state of controlled fusion reaction receive only brief mention. Although the author has included a few historical details in the book, in some sections, such as the one on nuclear reactors, a little more history and a few good-quality photographs would have made the reading more interesting.

An errata sheet is included at the end of the book. I noticed that on page four, the definition of atomic mass uses the word "ratio" in a manner apt to cause confusion. Since this is a book for advanced students, I found several oversimplified statements (e.g., "...the entire mass of the atom is in the nucleus...") to be a bit bothersome.

On the whole, this is a good textbook that should be considered for nuclear chemistry courses or for self-study by anyone interested in learning more about this subject.

David T. Farrar, *Tennessee Technological University*

Diffraction Studies on Non-Crystalline Substances. Edited by Istvân Hargittai and W. J. Orville-Thomas. Elsevier Scientific Publishing Company, Amsterdam, and Akadêmiai Kiadô, Budapest. 1981. 896 pp. $109.75.

In the summer of 1978 the Diffraction Group of the Hungarian Roland Eötvös Physical Society organized an international summer school on the subject comprising the title of this book. The book itself consists of 21 chapters authored by many of the lecturers at the summer school. The material of these chapters deals with the subjects of the lectures, but is in many cases a fuller statement than was presented at the meeting. The material has been grouped into five sections, which, though untitled, may be loosely characterized as gas diffraction; liquids and solutions; states of intermediate, polymorphic, and other character; polymers; and amorphous solids. The section on gas diffraction provides a very good overview of the field as well as an insight into the difficult problems of current interest; so, too, does the part on liquids and solutions. The topics of the third and fourth sections are less homogeneous than those of the first two. The last section has a chapter on thin films, one on microscopy, and several on metal alloys. Many of the chapters have lengthy lists of references.

The book reflects its origins in the summer school, in that each chapter is intended to convey a sense of a subject to those not familiar with that subject. It is successful in this endeavor, but experts in a particular field will probably find little that is unknown to them in the discussion of that field.

Although the authorship is international, the quality of the writing is uniformly good. The book is photographically reproduced from double-spaced typewritten copy submitted by the authors and hence the amount of material is only about half that of the same number of pages printed from typeset copy. The price of the book seems high in view of these circumstances.

Kenneth Hedberg, *Oregon State University*

Enzyme Kinetics: The Steady State Approach. Second Edition. By Paul C. Engel. Chapman & Hall, London & New York. 1982. 96 pp. $5.95.

This book treats the subject of enzyme kinetics purely in the steady state perspective. The subjects of mechanism of enzyme action and rapid reaction kinetics are not included. Subjects covered are one-substrate kinetics, inhibitors, activators and inactivators, pH effects, bisubstrate kinetics, the King and Altman method, and the concepts of allosteric regulation. The book is exceptionally well written and should prove a valuable aid to either an advanced undergraduate or beginning graduate student who has a need for understanding simple steady state kinetics. The book would be a valuable supplement to the larger standard textbooks normally used in either two-semester undergraduate biochemistry courses or similar service courses for beginning graduate students in disciplines other than biochemistry.

Eugene G. Sander, *Texas A&M University*

Inorganic Chemistry, A Modern Introduction. By Therald Moeller (Arizona State University). John Wiley and Sons, New York. 1982. viii + 846 pp. $34.95.

Therald Moeller has done it again—he has written another very readable treatise on the development of numerous principles considered essential to modern inorganic chemistry. Unlike his 1952 text which was organized as half principle and half "fact", to use his term for textbook descriptive material, this book is limited to principles.

After a short philosophical introduction to the scope of inorganic chemistry (Chapter 1), an extensive chapter discusses the conceptual developments of atomic structure (nuclear, electronic, size, electron gain and loss, and magnetism). Chapter 3 presents the development of the periodic table and periodic graphic tabulations of the size and the electron attraction properties mentioned in Chapter 2.

Chapters 4, 5, and 8 describe principles of chemical bonding applied to a wide variety of inorganic species. Chapter 4 delineates ionic and metallic bonding; then Chapter 5 discusses simple (diatomic and triatomic) covalent bonding, hydrogen bonding, and inclusion compounds. Eight-five pages on conceptual approaches and observed representative element stereochemistry, including symmetry point groups and diffraction and spectroscopic structural tools (Chapter 6), and one hundred pages of coordination chemistry principles (Chapter 7) separate the third bonding chapter on coordination compounds from the other two. Overall, the bonding treatments are fairly standard ones with the bulk of the figures coming from other textbooks.

Inorganic chemical reactions provide the theme for the final three chapters (9–11). Reaction principles are introduced with a brief review of thermodynamics and kinetics, an explanation of electron potential use including pH/potential diagrams (with a too brief glimpse at the Pourbaix diagrams), volt-equivalent oxidation-state diagrams, and an enumeration of oxidation state stabilization. A section on redox mechanisms is followed by a broad coverage of acid–base theories from Arrhenius to Usanovich, protonic acid strengths in water, and hard-soft acid–base usage. Chapter 10 describes reactions in a wide variety of nonaqueous inorganic media from ammonia, sulfur dioxide, and bromine trifluoride (gases at room temperature) to molten salts and solid–solid reactions at elevated temperatures. The final chapter is divided into a brief stability constant section, followed by a large ligand substitution reaction section with almost exclusive emphasis on platinum(II) and cobalt(III) and an electron-transfer or redox reaction section. The text concludes with a disappointingly brief synthetic applications subsection.

Appendices encompass inorganic literature, inorganic nomenclature, discovery of the elements, and standard potentials (acidic and basic aqueous values). Extensive indices are also provided.

The extensive tabulations throughout the text, the various exercises at the end of each chapter, the readability, and the principles included should make this book a strong contender as a text for theoretically oriented advanced inorganic chemistry courses. However, this reviewer feels that periodicity relationships, which would help students remember some inorganic facts, are not stressed sufficiently after the early parts of the volume, even though Professor Moeller states on page 123 that "the periodic table remains as the single most powerful tool available to use for understanding and systematizing inorganic chemistry". The tables and figures presented in the text will allow a good teacher to overcome this shortcoming.

As anticipated in a text of this size, some misinformation creeps in, e.g., the idea that *cis* isomers are almost always in a higher energy state than *trans* isomers (p 416) is blatantly wrong—the *trans* ion discussed in detail is precipitated in aqueous HCl as a double salt or as the *cis* ion

when HCl is lost (solubility, not stability, determines the isomer obtained); black P is not literally a 2-dimensional polymer (p 678) if the structure shown on p 288 is correct; if quartz catalyzes racemization (pp. 439-40) it would not leave an optically active solution from an initial racemate unless it *also* preferentially absorbs one isomer; the four polymer reaction types (p 683) do not necessarily form four types of polymers; etc.

In conclusion, provided the student is given sufficient descriptive inorganic material elsewhere in the curriculum, this book is a solid, readable text for any advanced undergraduate or beginning graduate student principles-oriented course. Moeller's first inorganic book convinced me to be an inorganic chemist, and this one should do the same for many in the current generation.

Ronald D. Archer, *University of Massachusetts/Amherst*

The Pyridine Nucleotide Coenzymes. Edited by J. Everse (Texas Tech.), B. Anderson (Virginia Polytechnic Institute), and K.-S. You (Duke University). Academic Press, New York. 1982. xxxv + 389 pp. $46.00.

This book is a collection of reviews written by former students and associates of Dr. Nathan Kaplan and dedicated to this pioneer in pyridine nucleotide research on his 65th birthday. Introductory tributes from Drs. Kamen, Lipmann, and McElroy are followed by a short chapter by Sidney Colowick which details some of Dr. Kaplan's many contributions to our knowledge of the pyridine nucleotides. The ten reviews which follow each present an in-depth look at current research in one aspect of the chemistry, biochemistry, or biology of the pyridine nucleotides.

The first short, thought-provoking chapter (H. B. White, III) ably defends the thesis that modern enzymes and coenzymes have both evolved from primitive RNA catalysts. The second chapter (J. B. A. Ross, S. Subramanian, and L. Brand) reviews spectroscopic investigations of the properties of pyridine nucleotides as studied by absorption, circular dichroism, fluorescence, phosphorescence, and the new technique of optically detected magnetic resonance. With the exception of the ODMR studies most of the work reviewed is focused on enzyme–coenzyme interactions. The third chapter (N. J. Oppenheimer) deals with the chemistry and solution conformation of the pyridine coenzymes and discusses their acid and base-catalyzed chemical reactions and the significance of the pyridine nucleotides.

Chapter 4 (B. M. Anderson) provides an excellent review of the chemical and enzymatic methods used in the preparation of a wide spectrum of pyridine nucleotide analogues, the properties of these compounds, and the applications of these analogues in biological and biochemical studies. The fifth chapter (U. M. Gross) deals with the three-dimensional structures of pyridine nucleotide binding enzymes as determined by X-ray crystallography and other methods, with emphasis on coenzyme–protein interactions as they impact on catalysis.

Chapter 6 (C.-Y. Lee and A. F. Chen) provides a useful and current review of methods for preparation of immobilized adenine and pyridine coenzymes and their use in enzyme purification and in enzyme reactors. The seventh chapter (H. B. White, III) is an up-to-date comprehensive and critical review of research on the de novo and salvage pathways for the biosynthesis of the pyridine nucleotides.

Chapter 8 (M. B. Grisham and J. Everse) discusses the role of the reduced pyridine nucleotide oxidases and related enzymes in the process of phagocytosis. Chapter 9 (R. R. Fisher and S. R. Earle) is an extensive review of current advances in the study of AB-specific pyridine nucleotide transhydrogenases. Chapter 10 (P. H. Pekala and B. M. Anderson) reviews the extensive recent literature on the non-oxidation–reduction reactions of pyridine nucleotides, ADP-ribosylations, and NAD glycohydrolase reactions.

These reviews are in general very well written by investigators who are actively engaged in the area of research described. They are well illustrated with figures and graphs and the literature reviewed is up-to-date (through late 1981 to early 1982). This volume is "must" reading for those scientists who are actively engaged in pyridine nucleotide research, and should be a valuable reference work for others. It is a fitting tribute to the outstanding contributions of Nathan Kaplan to pyridine nucleotide research.

Robert K. Gholson, *Oklahoma State University*

Thermal Characterization of Polymeric Materials. Edited by E. A. Turi. Academic Press, New York. 1981. 972 pp. $98.00.

The importance of thermal analysis for the characterization of polymeric materials has been belied by lack of suitable introductory and reference texts. As hostage to the historical development of the subject, however, polymeric materials have not been given the coverage they deserve in texts and manuscripts on thermal analysis. This text should fill this void.

In the first chapter, on instrumentation, Wendlandt and Gallagher provide a lucid overview of the state of the art. The experienced practitioner in this field is well served by this chapter, for the authors describe the components of instrumentation in a fashion that enables the user of these techniques to realize their complexity and subtlety. It is also to the credit of the authors that the newcomer to this field is provided an unbiased discussion of the merits and shortcomings of the many commercial instruments now available. Much of the discussion centers on the more mature areas of thermal analysis: thermogravimetry (TG), differential thermal analysis (DTA), differential scanning calorimetry (DSC), and evolved gas detection and analysis (EGD and EGA). However, the instrumentation for dynamic mechanical analysis (DMA) should have been more fully discussed. Only sketchy accounts of the newer and perhaps more limited techniques such as thermosonimetry, thermoacoustimetry, thermoanalytical microscopy, etc., are given.

The second chapter is a self-contained description of the theoretical basis of thermal analysis. The introductory account of the microscopic and macroscopic structure of macromolecules should be particularly useful to the engineer or non-chemist who needs an understanding of the applications of thermal analysis to polymers but lacks adequate knowledge about the structural chemistry of macromolecules.

The gap between theory and application that exists in thermal analysis has been bothersome, especially to those who want to use it as a theoretical tool. In assigning melting and other transition temperatures to polymers, one labors to apply thermodynamic language to events that are time-dependent and in some cases irreversible. By references to experimental data, and the theories based on them that have been formulated by many investigators, Wunderlich attempts to give the reader a sense that a synthesis of the theoretical basis of thermal analysis could be achieved. This is done for one-component and then for multi-component systems. The discussion is brilliant and easily understandable, and even if the reader is left with an uneasy feeling that a consistent theory may not yet exist, Wunderlich's exposition may be the starting point for a more rigorous formulation of the basics of thermal analysis.

Shalaby gives a comprehensive discussion of applications to thermoplastics in chapter three. Chapter four, by Shalaby and Bair, is really an extension of the treatment of multicomponent systems given in chapter three except that the special features of block copolymers and polyblends are discussed. In chapter five, Bruce Prime discusses the application of thermal analysis to thermosetting resins in regards to the curing process, the properties of cured materials, and stability. The correlation and interpretation of experimental data are good since texts on thermosets give only limited treatment of applications of thermal analysis to these systems. The chapter on elastomers, by Maurer, is comprehensive in its coverage and points out many useful points of departure for the application of thermal analysis techniques in the research and development of these important materials. In the chapter on fibers, Jaffe gives a concise and original discussion of the applicability of thermal analysis to fibers.

In the chapter on flammability, Pearce, Khanna, and Raucher introduce the basics of polymer flammability and flame retardation, and then discuss how thermal analysis is used in flammability evaluation with respect to mechanism, synergistic effects, selection of additives, and condensed-phase processes. Information about the flammability characteristics of specific polymer types is also included.

In the chapter on additives, Bair discusses how DSC and TG have become important tools in studying the chemical and physical properties of many additives.

What this reviewer found most impressive about this text is the smooth flow and coordination from chapter to chapter, no doubt a result of the excellent editing abilities and knowledge of the editor. I recommend this text to scientists, engineers, and academic researchers in the polymer field not only because of the useful information it provides about thermal analysis per se but also because of the painstaking effort by the authors to ensure that the presentation is clear and straightforward.

K. Bimpong-Bota, *Atlanta University*

Winning the Games Scientists Play. By C. J. Sindermann. Plenum Press, New York and London. 1982. xii + 290 pp. $15.95.

This book is not about chemistry, and it is not by a chemist, but it nevertheless belongs among the books reviewed here, and is highly recommended for reading by all those who are planning a career in chemistry or are in the midst of one. Many books have been written about how to do scientific research, but this book is not one of them, instead, it is how to make the most of one's career. With engaging humor glazing penetrating insight, Sindermann describes how to write and publish papers, and how to react when one is rejected. He tells of the important social side of scientific meetings, and how to consort onesself so as to get the most out of them. If more chairmen of meetings and organizers of conferences would follow his precepts, the scientific world would be much improved.

Sindermann views a scientist's activities as stepping stones to power,

and not only describes how to achieve power, influence, and prestige in the scientific world but also explains the advantages that will accompany them, along with the obligations. He takes us through the major types of careers right through to retirement, setting out with refreshing frankness the stages that can be expected, the major branching points that one can generally expect, and the most critical times for making major decisions. Most of what he writes can be called common sense, but that is not meant to denigrate it. We can nearly always benefit from being reminded of common sense, and if we have not thought about a subject before, it can be extremely helpful to have the basic common sense about it brought to our attention.

Even though the messages in this book are valuable to contemplate, the book is great fun to read, from the very beginning, where "game playing" is defined as "the ability and willingness not only to govern your actions by a set of rules, but to have the rules work in your favor", to the end, where "scientific streetwalking" is described. It would be a shame to miss it.

Organo-Metallics in Organic Synthesis. Volume 1. By Ei-ichi Negishi (Purdue University). John Wiley and Sons, New York. 1980. ix + 532 pp. $25.00.

This book is the first volume of an intended two-volume series whose stated objective is to provide in concise form a current overall picture of the chemistry of organometallics in organic synthesis. The first volume covers the main group elements and appears to be intended to be primarily a textbook or supplementary resource for intermediate-level students.

This volume is divided into two parts: General Discussions and Organometallics of Main Group Metals in Organic Synthesis. Chapter 1 briefly discusses the general principles relating to bonding and structure. Most of the topics are covered only very briefly, although the reader is always directed to a more complete coverage of the topic. In some cases, however, the scant coverage is hardly worth the bother; aromaticity, for example, is covered in two sentences. The remaining two chapters of the first section deal with general preparation methods and general patterns of reactions. In addition to actual examples, there is an extensive use of generalized formulas, which may be of limited value to newcomers.

The major portion of the book is composed of chapters which discuss the various related groups of elements—the lion's share being devoted to Li, Na, K, Mg, Zn, and Cd in Chapter 4 (195 pages). Each of the elements is adequately discussed, complete with examples of synthetic transformations and, again, a healthy sprinkling of generalized equations. There are several very useful tables, such as one which outlines methods for the preparation of ketones from carboxylic acid derivatives and several which list primarily α-hetero lithium reagents. This chapter rapidly drifts into what might be called standard organic chemistry, however, complete with discussions of Cram's rules, umpolung, olefination, cyclopropanation, and enolate chemistry. The novelty of discussing the aldol condensation under the banner of organopotassium chemistry will probably be lost on the intended audience. The remaining chapters adequately cover the chemistry of boron and aluminum (Chapter 5, 108 pages), silicon and tin (Chapter 6, 61 pages), and mercury, thallium, and lead (Chapter 7, 45 pages).

All in all, the author has succeeded in presenting a reasonable amount of modern introductory organometallic and organic chemistry and this book should be of value to intermediate level students, especially as a source of supplementary reading.

Manning P. Cooke, Jr., *Washington State University*

Positrons in Solids. Edited by P. Hautojärvi (Helsinki University of Technology). Springer-Verlag, Berlin, Heidelberg, and New York. 1979. xiii + 255 pp. $31.40.

"Positrons in Solids" is a collection of five review articles that describe the use of positron annihilation in determining electron momentum distributions in solids. The first article (Chapter 1) is a tutorial on the technique, describing the three forms of annihilation measurements (lifetime, line shape, and angular correlation). It also reviews, in an abbreviated form, the types of phenomena that can be studied with the technique. The subsequent articles review in much greater detail some of the applications described in the first chapter. Chapter 2 covers the measurement of electron momentum densities in pure metals and alloys, Chapters 3 and 4 cover the experimental and theoretical aspects of positron trapping at defects in metallic lattices, and Chapter 5 treats the unique characteristics of annihilation in ionic lattices (where the formation of positronium is significant). Each chapter is written by one or more internationally recognized experts in positron annihilation and all chapters are informative, up-to-date, and well-written. Included in the text are 66 figures, many taken from original research papers, and 24 data tables. The chapters have an average of 180 references each and an additional list of 60 references (through February 1979) is included at the end of the book.

In short, this is an excellent survey of positron annihilation research in solids. The large number of references alone make the book essential reading for someone interested in learning about the field.

Robert C. Reno, *University of Maryland Baltimore County*

Field Theoretical Methods in Chemical Physics. By R. Paul (University of Calgary). Elsevier Scientific Publishing Co., Amsterdam, Oxford, and New York. 1982. vii + 414 pp. $107.00.

This treatise, Volume 19 in the series Studies in Physical and Theoretical Chemistry, attempts to bring together under one cover the foundations upon which the many and varied applications of field theoretical methods in chemical physics are based. The result of this ambitious undertaking is very mixed. On the one hand the author introduces some pedagogically novel and interesting ways of presenting this often demanding material, and on the other he too frequently insists on using a massive amount of quite elementary but awkward mathematical detail that tends to osbcure the overview of this most beautiful subject.

The obligatory chapters on the introduction of field operators and their use suffer from several errors ranging from annoying misprints to bothersome misconceptions. For example, the relation $\hat{A}f_i = f_j$ for a general operator $\hat{A}$ and two elements f_i and f_j of its domain is said to imply the relation $\hat{A}^\dagger f^*_i = f^*_j$ for the adjoint of $\hat{A}$ and the complex conjugates of f_i and f_j. This mixup of dual vs. complex conjugate relationships leads to erroneous statements later in the text which must be confusing for the novice, even if they are of little consequence for the main theme. The consideration of a general n-molecule system and the comments of Bose on Fermi statistics, without any discussion of whether the molecules are indistinguishable or not, seems incomplete. Many texts exist which give considerably more accessible accounts of second quantization at either a deeper and mathematically more stringent level or at a more intuitive level.

The bulk of the text (five of eight chapters) deals with Green's functions (and related concepts as response functions and correlation functions) and their application. The perturbation theory treatment including diagrams receives much attention and is presented in considerable detail. Again, the obsession with particulars hides the overview of this topic and the beginning student will have a difficult time separating the wheat from the chaff. The chapter on linear response might be quite useful as a first introduciton to the subject, but should be quickly supplemented with a more rigorous treatment, in particular of the superoperator formulation.

The "applications" to atomic and molecular structure and to spectroscopy presented in the two last chapters give considerable algebraic details but address no specific, quantitative, physical, or chemical problems. This part of the book might be of value in connection with the study of some of the references dealing with actual computational results using Green's function methods.

In spite of the fact that this text has been written with a lot of attention to pedagogical detail, it fails in giving a clear and for the beginner readily accessible account of field theoretical methods. This is due largely to unwieldy notation and to an unfortunate mixture of elementary details and sketchy introductions of advanced concepts. The author, for instance, goes to much trouble to show that operators in general do not commute, while the concept of a vacuum state first is mentioned in the title of an appendix. Another shortcoming of the book is the grossly incomplete list of references. The value of the presented material would have been increased manyfold if the reader had been given more references to the many excellent texts where the same topics have been treated from a similar or a different point of view.

Just from a quick glance at the two and a third pages of referencs, I note the absence of such titles as "Methods of Quantum Field Theory in Statistical Physics", by Abrikosov, Gorkov, and Dzyaloshinski, Prentice Hall, 1963; "Quantum Statistical Mechanics", by Kadanoff and Baym, W. A. Benjamin, 1962; *Adv. Chem. Phys.*, **36**, 205 (1977), by Cederbaum and Domcke; "Propagators in Quantum Chemistry", by Linderberg and Öhrn, Academic Press, 1973; "Second Quantized-Based Methods in Quantum Chemistry", by Jørgensen and Simons, Academic Press, 1981; *Adv. Quantum Chem.*, **11**, 275 (1978), by Oddershede, and many more.

Yngve Öhrn, *University of Florida*

Surface Enhanced Raman Scattering. Edited by R. K. Chang (Yale University) and T. E. Furtak (Rensselaer Polytechnic Institute). Plenum Press, New York. 1982. vii + 423 pp. $49.50.

Surface-enhanced Raman scattering (SERS), with enhancements of up to $\sim 10^6$, has been found for many molecules on the surfaces of a number of metals. There is general agreement that a necessary condition for observing this phenomenon is microscopic surface "roughness", whether produced by electrochemical cycling of an electrode, high-vacuum vapor deposition of a metal film, or a colloidal suspension of metal

particles. There is less general agreement as to the origin of SERS, especially the relative contributions made in particular systems by electromagnetic enhancement mechanisms (associated with "geometrically defined surface optical resonance" effects) and chemical enhancement mechanisms (associated with specific molecule–surface interaction effects).

The 20 review articles in this volume, split about equally between Theory and Experiment, span the gamut of ideas and studies that have emerged in recent years to characterize SERS. The range of the former is indicated by chapters on the image field effect (G. A. Schatz), coupled excitation model (T. K. Lee and J. L. Birman), role of surface roughness (E. Burstein, S. Lundqvist, and D. L. Mills), spheroidal model (J. I. Gersten and A. Nitzan), colloidal particle SERS (M. Kerker, D.-S. Wang, H. Chew, O. Siiman, and L. A. Bumm), excitation of surface plasmon polaritons (S. S. Jha), "adatom" model (A. Otto, I. Pockrand, J. Billmann, and C. Pettenkofer), and induced resonance model (H. Ueba). Experimental chapters deal with coverage dependence (P. N. Sanda, J. E. Demuth, J. C. Tsang, and J. M. Warlamount), separation dependence (C. A. Murray), tunnel junction structures (J. R. Kirtley, J. C. Tsang, and T. N. Theis), vapor deposited metal systems (M. Moskovits and D. P. Di Lella), electrochemical effects (M. Fleischmann and I. R. Hill), species at Ag, Cu, and Au electrodes (B. Pettinger and H. Wetzel), metal colloids (J. A. Creighton), inelastic Mie scattering (D. A. Weitz, T. J. Gramila, and A. Z. Genack), SERS and luminescence on metal island films (G. Ritchie and C. Y. Chen), microlithographically prepared Ag surface structures (P. F. Liao), and nonliner optical effects (J. P. Heritage and A. M. Glass).

The reader interested in SERS, and indeed in the study of metal surfaces and their interactions with molecules, will get a good flavor of this field from the present volume. If the meal, as indicated by the conclusion of the initial survey article (H. Metiu), is not fully satisfying ("It seems to me that the only unqualified general conclusion I can subscribe to, at this time, is that we need further theoretical and experimental work; the story of SERS is not yet concluded."), it should at least whet the appetite for furher interesting developments.

S. Krimm, *University of Michigan*

Preparation, Properties and Industrial Applications of Organofluorine Compounds. Edited by R. E. Banks (University of Manchester Institute of Science and Technology). Ellis Horwood Ltd., Publishers, Chichester, U.K. 1982. 352 pp. $84.95.

This book may be considered a continuation of "Organofluorine Chemicals and Their Industrial Applications" prepared by the same editor and published in 1979. It partly fills the gaps, and partly updates topics which were included in its predecessor. It mirrors the present interest and applications within fluorine chemistry.

A solid third of the book is devoted to applications in medicine. The chapter Inhalation anesthetics (36 pages) (W. G. M. Jones, ICI) is an update of the similar topic discussed in the preceding volume. It compares advantages and disadvantages of the two leading anesthetics, Halothane and Methoxyflurane, with two newly emerging (and considerably more expensive) compounds, Enflurane and Isoflurane. The chapter "Artificial Blood Substitutes" (56 pages) (M. LeBlanc, J. G. Riess) is a survey of the *dernier cri* in fluorine chemistry, emulsions of perfluorinated compounds which dissolve large amounts of oxygen and can be (and indeed are) used for temporary partial replacement of blood *in lieu* of blood transfusions. Similar physiological fluids are perfluoroalkyl bromides used as Radiopaque Fluorocarbons (18 pages) (D. M. Long et al.). High solubility of oxygen in these compounds makes them eminently suitable for bronchography. Chemical as well as medicinal aspects of both chapters are discussed and documented by pictures and graphs. The "calm after a storm" in ozone-chlorofluorocarbon controversy is reflected in the brevity of the chapter on this topic (8 pages) (C. R. Patrick).

A large section of the book deals with polymers. Non-TFE-based Fluoroplastics (34 pages) is a short (too short) review of preparation and applications of polymers and copolymers of vinyl fluoride, vinylidene fluoride, chlorotrifluoroethylene, and others. Much more thorough is the treatment of Fluoroelastomers (60 pages) (S. Smith), which encompasses theoretical background as well as practical application of copolymers of vinylidene fluoride, hexafluoropropylene, and especially tetrafluoroethylene and perfluoro(methylvinyl ether), probably the most heat-resistant fluoroelastomer to date.

The rest of the book consists of chapters on Electrochemical Fluorination (Simons Process) (28 pages) (T. Abe, S. Nagase), describing manufacture of perfluorocarboxylic acids, perfluorosulfonic acids, perfluoro ethers, and perfluoro amines, on Fluorocarbon Fluids for use in the Electronic Industry (38 pages) (D. S. L. Slinn, S. W. Green), on Graphite Fluoride (26 pages) (N. Watanabe, T. Nakajima), showing properties and uses of graphite fluorides in lithium batteries and greases, and on Mixing and Solution Properties of Organofluorine Compounds (20 pages) (C. R. Patrick).

Most contributors are directly involved in research and development in the fields they are reviewing, and have provided a great number of interesting and important data. The book reads very well, and would read even better had some authors refrained from excessive use of abbreviations, which are tiresome and somehow disrupt the continuity of the text. Also, a more thorough subject index would be of additional help.

All told, the book, although not as well balanced as its predecessor, is a very useful monograph and deserves its place in the library on fluorine chemistry.

Milos Hudlicky, *Virginia Polytechnic Institute and State University*

Surface Chemistry of Froth Flotation. By Jan Leja (University of British Columbia). Plenum Press, New York. 1982. xxi + 758 pp. $69.50.

This advanced monograph is organized into ten chapters, with the introductory chapter providing a brief overview of the flotation field, its applications, and some recent developments. A useful addition to this chapter is a 10-page section on the flotation literature that serves as a guide to those interested in obtaining further information on specialized topics in this field. Chapter Two [Chemical and Molecular Bonding. Interfacial Energetics] provides a description of the basic concepts of bonding as they pertain to flotation processes. This is followed by a survey of the crystallographic structures of solid minerals in Chapter Three. Chapter Four outlines the structure and the properties of water and aqueous solutions. A concise description of the different classes of surfactants employed in froth flotation is given in Chapter Five. Chapter Six [Physical Chemistry of Surfaces and Interfaces] considers the basic aspects of the structural features and heterogeneous nature of solid interfaces, and the basics of electrical charge distribution across interfaces are treated in Chapter Seven [Electrical Characteristics of Interfaces. Electrical Double Layer and Zeta Potential]. Chapter Eight reviews and discusses adsorption mechanisms in flotation. The kinetics and theory of foam formation and flotation as well as thinning mechanisms of liquid films are considered in Chapter Nine. Finally, a summary of the different classes of additives and their effect on floatability is presented in Chapter Ten [Inorganic Regulating Agents, Activators, Depressants].

Following Chapter Ten is a compilation of the 1300 + primary references referred to in the monograph. In addition, a highly useful list of selected reading references and a compilation of papers presented at recent national and international symposia are given at the end of each specific chapter. These provide adequate references to the literature for those who want to explore some aspect of froth flotation more extensively. The work is, in general, up to date. There are a few instances, however, in which the information presented is out of date. For example, the section on micelle structure (pp 286–288) makes no mention of any of the current models concerning the structure of aqueous micellar systems.

This book is a well organized, concisely written, and technically well produced monograph. The text is well supported by numerous figures, graphs, and tables, which are of excellent quality. While the table of contents is excellent, the subject index is barely adequate for a book of this size. All in all, Professor Leja has done an admirable job of reviewing the basic concepts of surface chemistry along with the pertinent aspects of physical, organic, and inorganic chemistry that are necessary to the understanding and control of froth flotation processes. As is pointed out in the preface, the book strives to update basic information in this field and serves to complement other books that deal with the more practical applied aspects of this field. The book meets the need for a comprehensive source of basic information on froth flotation. As such, it will be most useful to researchers working in the field as well as to students and those interested in this separation technique. It could also serve nicely as an advanced text on this topic.

Willie L. Hinze, *Wake Forest University*

Vibrational Spectra and Structure. Volumes 10 and 11. Edited by James R. Durig. Elsevier Scientific Publishing Co., Amsterdam and New York. 1981 and 1982. Volume 10: xvi + 498 pp. $121.25. Volume 11: xvi + 362 pp. $114.00.

Some years ago, vibrational spectroscopy was being described as a mature technique which would continue to be applied, but which was rather dead for research opportunities. As so often happens in science, this prediction was incorrect. A combination of experimental and theoretical advances has brought about one of the most exciting periods for infrared and Raman spectroscopy in several decades. These two volumes in this established series deal with several of the "hot" areas. As such, they contain material not brought together in any other place, and will be of great use to those entering the field.

Volume 10 contains six articles, three of which primarily deal with acquisition of data, and three with models or theories for interpreting the data. All of the articles are in areas of interest and importance. Volume

11 is much more oriented to experiments and techniques, with considerable space devoted to data on specific compounds. To this reviewer, such articles are less appropriate in a series of this sort.

In Volume 10, R. S. McDowell has an excellent review of use of tunable lasers in vibrational spectroscopy. This is a major contribution to the literature, with almost 600 references. L. A. Nafie has, more than anyone else, improved experimental techniques for observing vibrational optical activity. He reviews this field, which is just now ready to provide good data. Tunable laser vibrational spectroscopy has led to increased study of high overtones of vibrational modes, and this in turn to a recognition of the need for a rather different approach to spectroscopic interpretation in this region. This approach, the "Local Mode Model", is reviewed by B. R. Henry. Because so much of the use of lasers to do chemical reactions involves multiple excitation of vibrational modes, and the intramolecular redistribution of such energy, this work is likely to be of broad interest. Volume 10 also contains reviews of the Raman microprobe, Jahn-Teller vibronic spectra of solids, and sum rules for vibration–rotation interaction coefficients.

In Volume 11, Weinberg provides a brief introduction to inelastic electron-tunneling spectroscopy, focussing on its application to a series of surface interactions. This will be useful to those who have been following progress in IETS and want a look at the quality of data now available. Lynch and Brown review applied work on use of infrared and Raman spectroscopy for environmental problems. They have pioneered this field and offer a good perspective on accomplishments to date. Time-resolved Fourier transform infrared spectroscopy (TRS) has provoked considerable interest, and the paper by Honigs, Hammaker, Fateley, and Koenig gives a clear introduction to this technique, and mentions some of the dangers in interpretation of data. E. Bernstein surveys recent trends in vibrational spectra of molecular solids. This article highlights interesting spectroscopic work, but also does a good job of explaining advances in phase transition theory to spectroscopists. Two articles in Volume 11, on gas phase hydrogen bonding and on metal sandwich complexes, will be of limited interest.

The price of these volumes is high. The text is not typeset, but rather is retyped double-spaced. This increases the size of the volumes and, at least to this reviewer, is not as pleasing to read as a typeset book. Both volumes, however, contain much material of great current interest, and will be valuable for some years to come.

Bernard J. Bulkin, *Polytechnic Institute of New York*

X-ray Diffraction by Disordered and Ordered Systems. By David W. L. Hukins (University of Manchester). Pergamon Press Inc., Elmsford, N.Y. 1981. ix + 160 pp. $28.75.

This book is intended for the advanced undergraduate or beginning research student. The author presents the material in an elementary but concise way, beginning with two chapters on the fundamentals of X-ray scattering, one on the principles of structure determination, and one on diffraction geometry. He then considers diffraction by atoms and molecules, ideal gases and solutions, liquids and amorphous solids, one-dimensional crystals, helices and liquid crystals, three-dimensional crystals, and crystalline powders and fibers. A final chapter on microscopy relates the methods of analysis which the author has developed to those used with optical and electron microscopes. This chapter provides important insights, as do comparisons with optical diffraction given elsewhere in the book.

The author has met his stated objectives well; the background required is limited to elementary physics and calculus. As an introduction to the subject, this treatment has the advantage of moving from the least to the most restrictive cases; three-dimensional diffraction is treated near the end of the book, as it logically should be. In addition to meeting the needs of the beginner, this book will give a general but concise overview to persons trained specifically in three-dimensional diffraction; it will be a useful addition to the bookshelf.

Daniel S. Jones, *University of North Carolina at Charlotte*

Adhesion of Dust and Powder. By Anatolii D. Zimon (All-Union Scientific Research Institute of the Food Industry). Consultants Bureau, New York, NY. 1982. xi + 438 pp. $55.00.

This is the second edition of "Adhesion of Dust and Powders" which originally appeared some 20 years ago. This edition updates the original coverage of the literature to around 1975. The book deals with a complex phenomenon with many important applications arising in such diverse areas as filtration and electrostatic precipitation, fouling of heat transfer surfaces by particulate matter, wind and water erosion, detergency, xerography, etc. Particle adhesion is covered in a systematic manner, beginning with fundamental principles of adhesive forces and experimental methods for their measurement. This is followed by discussions of adhesion in gaseous and liquid media and the effect of particle shape and surface properties. Finally, the science and art of adhesion in various applications are covered. This book provides a useful treatment of a complex and specialist subject. With its 352 references, many probably not available to western scientists, the book would be a good starting point for the study of this field, although one would need to seek additional sources for more recent developments.

J. R. Brock, *University of Texas*

The Alkaloids. Volume XX. Edited by R. G. A. Rodrigo (Wilfred Laurier University). Academic Press, New York. 1982. xvi + 341 pp. $59.50.

This volume, the continuation of an excellent series, is devoted largely to the bisindole alkaloids and includes all alkaloids which contain tryptophan-derived nuclei. The volume is divided into two chapters. The lengthy first chapter (G. A. Cordell and J. E. Saxton) reviews nearly all structural types, whereas the smaller second chapter (W. Döpke) reviews the eburnamine-vincamine group of indole alkaloids.

Cordell and Saxton give an excellent overview of bisindole alkaloids starting with the simplest tryptophan-derived alkaloids. These are followed by the group of alkaloids that are formed from monoterpenoid indole alkaloids and tryptophan, and finally by the alkaloids formed through the union of two monoterpenoid alkaloid types arranged biogenetically. The authors present an up-to-date and thorough (456 references) picture of a fairly diverse topic. The chapter reads easily and should provide useful information for those with even an ancillary interest. An appendix with references is also included.

In the second chapter, Döpke summarizes many of the important developments that have taken place since the eburnamine-vincamine alkaloids were last reviewed in Volume VIII. After a brief description of the alkaloids and their occurrence, a nice discussion of the synthesis and chemistry of the family is presented. A small section covers the mass spectrometry of eburnamine-type alkaloids. The chapter concludes with a discussion of the absolute configuration of vincamine and some related alkaloids.

In summary, this volume is a must for every library and professional who works in the field.

W. E. Billups, *William Marsh Rice University*

Intercalation Chemistry. By M. Stanley Whittingham. Academic Press Inc., New York. 1982. XVI + 595 pp. $87.50.

The subject of "Intercalation Chemistry" was certainly most appropriate for a review. For the most part the various authors selected to discuss different aspects of the field have worked and published substantially in the respective areas. It did appear to me that someone from the laboratory of Jean Rouxel, who is referenced in several of the chapters a total of more than 20 times, could have been asked to contribute to the review. This could have only increased the value of this already very worthwhile text.

I will make a few specific comments concerning the eighth chapter, Intercalation Chemistry of Metal Phosphorous trichalcogenides. The author selected to write this particular review has not published substantially in the area. On page 276, there are no references cited for the discussions of conductivity or magnetic measurements. In fact, it is not indicated that the "magnetic measurements" being discussed were susceptibility measurements. On the preceding page (275), reference 25 is incorrect; it deals only with NMR measurements, and not optical measurements. Otherwise this rather difficult subject was adequately handled.

In Chapter 18, Physical Properties of Intercalation Compounds, I have not been able to explain the elusive references 76–83, perhaps something was left out of the "note added to proof".

D. M. Schleich, *Polytechnic Institute of New York*

Inorganic Chemistry. By C. Chambers (Bolton School) and A. K. Holliday (The University of Liverpool). Butterworths, London and Woburn, MA. 1982. xi + 397 pp. $12.95.

This book is one of a new series of Butterworths Intermediate Chemistry books and it is intended to be a successor to the authors' previous book "Modern Inorganic Chemistry". This inorganic text seeks a balance between a short readable book and a longer more detailed text which can be used for reference purposes. The first four chapters treat the theoretical concepts found in the periodic table, structure and bonding, energetics, and acid–base and redox reactions. Considering that the book is designed for a first year tertiary level chemistry course in the English university system, I feel that the authors have accomplished their purpose. It covers a number of optics in these chapters that one would expect to be taught in our first year general chemistry courses for chemistry majors.

The next nine chapters treat descriptive chemistry of the main group elements followed by two chapters on the chemistry of the first row transition elements and the group 1B and 2B transition elements. These

descriptive chemistry chapters provide the student with a brief description of the element, its occurrence, and extraction, followed by characteristic reactions of compounds of the element. Within each of these chapters the theoretical concepts developed earlier are utilized. Each chapter also contains some important industrial applications and the qualitative analysis of the element. A short summary is given at the end of all the chapters followed by a series of questions taken from various English Examination Boards papers and the University of Liverpool examination papers.

My only problem with this book is that I have trouble trying to place it in an American university undergraduate program for chemistry majors. At the first year level it would be a poor substitute for some of our better general chemistry texts, and as a junior–senior inorganic text it does not provide the in-depth approach to the topics normally covered at this level. However, at either level and since the price is right this book might be considered as a paperback supplement for its comprehensive introduction to descripitive chemistry. An index is included.

Daniel T. Haworth, *Marquette University*

Organometallic Chemistry Reviews; Annual Surveys: Silicon–Germanium–Tin–Lead. Edited by D. Seyferth and R. B. King. Elsevier Scientific Publishing Co., Amsterdam and New York. 1982. vi + 700 pp. $149.00.

This book consists of eight chapters, five of which are devoted to silicon chemistry. They survey the chemistry published in 1980, except for the germanium chapter, which is for 1979. Each chapter begins with an introductory paragraph and a section on recently published reviews, a most helpful feature. There follows a highly condensed presentation of published research, which is not unlike the treatment found in the Specialist Periodic Reports of the Royal Society of Chemistry, although there seem to be more structures and equations. There are many tables and extensive lists of references, but there are unfortunately no running heads on the pages to orient the reader. The table of contents for the book as a whole and those for each chapter are quite brief, a feature that would not be of much concern if there were an adequate subject index. A book of this length is unduly hard to use without a better means of information retrieval than just the author index that is provided. Nevertheless, the specialist will want to have access to this work as a help in keeping abreast of new research.

Chemical Dynamics via Molecular Beam and Laser Techniques. By R. B. Bernstein (Columbia University and Occidental Research Corp.). The Clarendon Press; Oxford University Press, New York. 1982. viii + 262 pp. $49.00 (hardbound); $24.95 (paper).

The use of molecular beam techniques to investigate the microscopic dynamics of elementary chemical reactions and molecular energy transfer began more than 2 decades ago. Initially confined to experiments with alkali metal atoms and alkali halides, molecular beam experiments are now carried out on a very broad range of chemical systems and phenomena. The essential features which distinguish molecular beam experiments from other methods of chemical kinetics are that molecular beam experiments are sensitive to the outcome of single bimolecular collisions, and they make possible the direct control or measurement of important dynamical variables of the collision, such as kinetic energy or scattering angle. In recent years there has been an enormous leap forward in the power and versatility of molecular beam experiments, due largely to the increased availability of high-power, high-resolution, and high-reliability lasers. The addition of laser spectroscopic techniques to molecular beam experiments adds the possibility of selecting or measuring the internal quantum states of the reactants or products in single collision experiments with exquisitely high resolution and sensitivity. In this book, Richard Bernstein surveys previous accomplishments and the present state of the art in the use of molecular beam and laser techniques for the study of molecular collisions, both separately and in conjunction with each other. He is eminently qualified to do so. He was one of the earliest pioneers in this field, and has remained among its most innovative and inspiring leaders ever since.

Adapted from the Hinshelwood Lectures which he delivered at Oxford University in 1980, this book contains an extensive bibliography of review literature which has been updated through 1981. It summarizes in a remarkably brief and readable account the present status of our understanding of elastic, inelastic, and reactive molecular collisions, placed in historical perspective. The emphasis throughout the book is on state-to-state chemistry, with individual chapters devoted to the preparation of reactants in selected states, the analysis of product state distributions, and the relative roles which vibrational, rotational, and translational energy play in determining the outcome of a collision. The introductory chapter on the relationship between the microscopic state-to-state cross section and the macroscopic rate coefficent for a bimolecular reaction would serve as an excellent supplement to a traditional kinetics course, and it forms an ideal bridge to the remainder of the book for those readers who have no previous familiarity with microscopic dynamics. Other chapters are devoted to the determination of adiabatic potential energy surfaces for molecular collisions and the role which the shape of the potential plays in the reaction dynamics. Electronically nonadiabatic collisions are treated in a separate chapter, as is the use of information theory to analyze data on product state distributions. The intriguing final chapter suggests likely directions for future progress, including the use of lasers to modify the outcome of a collision by direct interaction with the transient intermediate.

Although this book is said to be directed to the advanced undergraduate student in chemistry, it is not really a replacement for the previous text "Molecular Reaction Dynamics", by R. D. Levine and R. B. Bernstein (Oxford University Press, 1974), which is more elementary, though less up-to-date. I suspect that the present work will have its greatest value as an introduction to the field for beginning graduate students and others who are preparing to undertake research in gas-phase chemical dynamics. For this group, I can think of no better way to begin than by reading this book.

W. Ronald Gentry, *University of Minnesota*

Comprehensive Treatise of Electrochemistry. Volume 4. Electrochemical Materials Science. Edited by J. O'M. Bockris, B. E. Conway, E. Yeager, and R. E. White. Plenum Press, New York. 1981. XXII + 563 pp. $55.

This is the fourth volume of the "Electrochemical Cantos" and is aimed to cover the areas slanting toward the science of materials. The Editors seem to have defined the scope of the subject in a rather narrow sense, and they focus mainly on the electrochemical "degradation of materials", i.e., corrosion, passivation, oxide growth, hydrogen in metals, and some related matters.

An opening chapter on the thermodynamics of corrosion (J. Van Muylder) follows the standard format of the famous Belgian school with plenty of potential–pH diagrams and extensive references to the valuable internal reports of CEBELCOR—the institute founded by Marcel Pourbaix in Brussels. W. H. Smyrl then presents a tutorial type of introduction to the kinetics of electrochemical corrosion, with a great deal of space devoted to copper dissolution in sulfuric acid; since this system gives soluble corrosion products, it appears suitable for an experimental verification of equations derived for "clean" cases where no surface films participate in the kinetics. The next chapter (I. Epelboin, C. Gabrielli, M. Keddam, and H. Takenouti) expounds, yet another time, the study of passivation by electrode impedance analysis, so effectively used by Epelboin and his colleagues. A chapter on some general aspects of electrochemical passivation of metals (N. Sato and G. Okamoto) is followed by M. J. Dignam's critical essay on a subject to which he has contributed very significantly, namely, the kinetics of anodic oxide growth on metals. The topics of corrosion inhibition (R. N. Parkins), stress corrosion cracking (G. P. Cherepanov), and electrochemical aspects of hydrogen in metals (P. K. Subramanyan) comprise Chapter, 6, 7, and 8, respectively. These are all important problems and have been handled very well by the various authors who are well known for their contributions in the areas they have undertaken to review.

A concise, quantitative exposition of triboelectrochemistry ("the study of friction with applied electrochemical potential") by V. Guruswamy and J. O'M. Bockris gives a refreshing pause for reflection on this rather abstruse topic, so different from the relatively standard fare of the previous chapters. The final chapter, by J. P. Randin (who is my former collaborator, I am proud to add), on nonmetallic electrodes is perhaps the most valuable since it is a remarkably condensed, and yet complete and clear, discussion of fundamental theory and industrial applications of electrodes such as graphite, carbides, borides, nitrides, phosphides, sulfides, perovskite oxides, sodium–tungsten bronzes, and a variety of other mixed oxides. It is mildly amusing, however, that this author overlooked the most extensive survey of nonmetallic electrodes published to-date, namely, the book by the present reviewer entitled: "Electrochemistry of Metals and Semiconductors", Dekker (1973).

The main criticism of the book is that it does not include some of the most exciting frontiers of electrochemical materials science, such as electrochemistry of semiconductors (e.g., Ge, Si, GaAs, GaP, etc.), photoelectrochemical materials, solid electrolytes, anodic dissolution and electropolishing, polymeric metallic electrodes and ionic polymeric electrolytes, corrosion of film-covered metallic electrodes, and the electrochemical materials science bearing on geophysics, biological materials, applied physics and electrical engineering, etc. We would, thus, assume this volume to be the first installment on electrochemical materials science and we urge the renowned Editors to deliver the full story in the subsequent volumes.

Aside from the minor criticism of the scope of the book, the contents are a valuable source of definitive information on the electrochemical

degradation of materials. The theme emphasizes, correctly, the paramount importance of the electrochemical stability of materials. The volume can be recommended, without any hesitation, to those seeking to advance their understanding of corrosion, oxidation, and other forms of electrochemical degradation of metals.

Ashok K. Vijh, *Institut de recherche d'Hydro-Québec*

Metal Vapours in Flames. By C. Th. J. Alkemade, Tj. Hollander, W. Snelleman, and P. J. Th. Zeegers (Rijksuniversiteit Utrecht, The Netherlands). Pergamon Press, Oxford and New York. 1982. xxii + 1033 pp. $95.00.

This book provides a comprehensive treatment of the use of flame techniques in the study of the properties of metal species in the vapor phase. The authors' stated intention is to provide a text which is both an experimental manual and a reference source. The balance of material, combined with the extensive bibliography and subject index, ensure that both goals are achieved.

The subject matter is divided basically into three sections. The first deals with the theoretical bases of the methodology, ranging from the structure and spectra of atoms and molecules, through kinetic considerations and finishing with the intensities of radiative transitions. This material is to be found in many other books but, in view of the authors' desire to create a self-contained text, it is totally appropriate here and is presented clearly and in a logical way. The second section covers instrumental and experimental methods and again the emphasis is on completeness. This chapter describes the generation of flames, the preparation of metal vapors through to the detection of the species by emission, absorption or fluorescence spectroscopy. The third section comprises approximately half of the book and presents results from the majority of studies in the field. The material is well-presented, covering the literature up to early 1980, and provides thorough discussion of topics such as the determination of metal concentration, dissociation energies of metal compounds, physical/chemical excitation and quenching, atomic line broadening, and the reaction of metal species within the flame. This work is considered in the light of other techniques and thus presents a balanced view of the (dis)advantages of the method.

Overall this is an interesting and important book which should be a valuable compendium for researchers concerned with the investigation and quantitative determination of metal-containing species.

Colin G. Francis, *University of Southern California*

Terpenoids and Steroids. Volume 11. Edited by J. R. Hanson (University of Sussex). Royal Society of Chemistry, Burlington House, London. 1982. xi + 243 pp. $45.00.

This volume continues the specialist periodical reports (annual reviews of the literature) for the period of September 1979 through August 1980. It includes an index of authors. Six reporters cover the topics of sesqui-, di-, tri-, and polyterpenoids (but no monoterpenoids), quinones, carotenoids, and steroids. Areas covered are isolation, structures, laboratory syntheses, reactions, physical methods of structural determination, biosyntheses, and metabolism. A random sampling of some 50 references (from nearly 1300 presented) showed no typographical errors and only a few minor inconsistencies with the original papers. In general, the reporting is clear and factual. Limited interpretive correlations are also given in the sections on physical methods. For libraries and for specialists in terpenoid and steroid chemistry, this volume is highly recommended as a guide to the recent literature.

LeRoy H. Klemm, *University of Oregon*

The Handbook of Environmental Chemistry. Volume 3. Part B. Edited by O. Hutzinger (University of Amsterdam). Springer-Verlag, Berlin. 1982. xvii + 210 pp. $54.00.

Increasing industrialization and a growing world population will lead to a mobilization of toxic synthetic and natural chemical species on an unprecedented scale which may seriously perturb the global biosphere. Already, industrialized countries are having to deal with the consequences of wide-spread dissemination of toxic substances. A knowledge of the chemistry of toxic substances in the environment is a requisite for an intelligent resolution of these difficulties. The stated purpose of the series, "*The Handbook of Environmental Chemistry*", is to present various aspects of the chemistry of the environment. Previous volumes in this series have dealt with the natural environment, biogeochemical cycles, and environmental reactions and physicochemical processes. The present volume discusses environmental reaction and transport and biological effects of specific classes of chemical species. These are: lead; arsenic, beryllium, selenium, vanadium; C_1 and C_2 halocarbons; halogenated aromatics; volatile aromatics; surfactants. The contributions dealing with each of these classes are of a uniformly high quality. The toxic effects of certain of these classes are controversial, but the authors manage to present a balanced view. Anyone who has tried to encapsulate the environment in a university course realizes the vast, interdisciplinary nature of the subject. The goal of this series is, therefore, very ambitious, but the editor and contributors have made a good beginning. This volume and the others in the series should be useful both to researchers and to students of this field.

J. R. Brock, *University of Texas*

Second-Quantization-Based Methods in Quantum Chemistry. By P. Jørgensen (Aarhus University) and J. Simons (University of Utah). Academic Press, New York. 1981. ix + 172 pp. $29.50.

Modern Quantum Chemistry. Introduction to Advanced Electronic Structure. By A. Szabo (National Institutes of Health) and N. S. Ostlund (University of Waterloo). Macmillan Publishing Co., New York. 1982. xvi + 446 pp. $39.95.

Since the early 1970's, the systematic treatment of electron correlation in atoms and molecules has become a resurgent area of interest to quantum chemists. This progress has been, of course, largely abetted by the computer revolution, whereby large-scale configuration–interaction procedures have become feasible. However, the capacity of even the biggest and fastest machine is eventually exceeded for large enough molecules, the magnitude of CI computations growing precipitously with the number of basis functions. Accordingly, theoretical research has centered on the optimal selection of configurations and related approaches such as cluster expansions of the wave function. A concurrent development has been the adaptation for atoms and molecules of diagrammatic perturbation and Green's function techniques borrowed from quantum electrodynamics and statistical physics. As is inevitable in any research area in such a state of flux, some approaches to electron correlation are destined to be discarded while others will be radically refined. The rough edges are still there. The two volumes reviewed here are addressed to the considerable gap in the quantum-chemistry textbook literature as regards coverage of modern developments beyond the Hartree-Fock approximation. The Jørgensen–Simons monograph is a compact account of CI, perturbation theory, coupled-cluster, and Green's function methods expressed in the language of second quantization. Pure formalism is stressed with no specific computational examples. Each chapter does, however, conclude with a selection of problems with solutions, including numerical exercises. The Szabo–Ostlund work is in the format of an advanced graduate textbook. The first half reviews the fundamental theory of many-electron wave functions, with a highly detailed account of the Hartree–Fock method. The remainder of the book is addressed to the newer techniques. Extensive numerical results from the literature are cited and discussed. The H_2 and HeH^+ systems are repeatedly cited to illustrate various levels of computational technique. Exercises are interspersed throughout the text and a good bibliography, including comments, follows each chapter. Second quantization is briefly introduced, but not actually used. The presentation of diagrammatic perturbation theory is especially lucid.

S. M. Blinder, *University of Michigan*

Synthetic Peptides. Volume 6. By George R. Petitt (Arizona State University). Elsevier Scientific Publishing Company, Amsterdam and New York. 1972. viii + 511 pp. $167.50.

Dr. Petitt continues his valuable series cataloging peptide synthesis for the peptide chemistry community. The format is that of the previous volumes. There is a short summary of new advances in the field published in the time period from January 1977 to January 1979, but the heart of the book is in the tables of peptides and amino acid derivatives whose syntheses were reported in the literature available between January 1976 and the first week of January 1978. These tables list the products by length, then in alphabetical order by amino acid sequence. There are separate tables for cyclopeptides, depsipeptides, and mixed species such as steroidal, chromo-, and nucleopeptides. Not only are the structures of the products given but also the blocking groups, coupling methods, reaction solvents, chromatographic techniques used, recrystallization solvents, and various physical properties such as melting point and optical rotation are listed. Also, of particular utility are the comprehensive listings of protecting groups, coupling methods, and thin-layer chromatography elution systems.

The method of tabulating the peptides proves irksome in use. There is no cross-indexing to peptide common names and only occasionally is the name of a peptide given where its sequence is listed. Fragments are never identified. For example, there are three different peptides listed under tetradecapeptides with N-terminal arginine, these being C-terminal sequences of VIP and secretin and an N-terminal sequence of pancreatic trypsin inhibitor. A researcher interested in the native peptides would have great difficulty finding these relevant fragments. On the other hand it is convenient to find such information as sequences containing N-terminal pyroglutamate or preparations of cysteine-containing peptides.

Some comparison should be drawn with relevant chapters of the

Specialist Periodic Reports on Amino-acids, Peptides, and Proteins published by The Chemical Society. Examination of Volume 10 (a review of 1977 literature) shows this latter to contain a somewhat more comprehensive review of new synthetic chemistry and much more written text. There are also tables of synthetic peptides listed by common name but giving no detail—not even sequence, giving only literature references. This series is also more current, Volume 12 (through 1979) is already available. Neither list is totally complete so neither is a peptide "Beilstein", a shame considering the availability of excellent abstracting, keyword, and citation services as well as the rather high prices being exacted, especially for the Petitt book.

Toby M. Chapman, *University of Pittsburgh*

Quantum Dynamics of Molecules. The New Experimental Challenge to Theorists. Edited by R. G. Woolley (University of Cambridge). Plenum Press, New York and London, 1980. xiv + 557 pp. $59.50.

This volume contains the texts of 12 lecture series presented at the NATO Advanced Study Institute on Quantum Dynamics of Molecules, held at the University of Cambridge, September 15–29, 1979. The institute was motivated by recent advances in both theoretical and experimental aspects of molecular dynamics which probe beyond the traditional models of molecules as near-rigid assemblies of atoms. R. G. Woolley is himself a notable proponent of new theoretical interpretations of molecular structure (or the nonexistence thereof), as set forth in a series of intriguing articles published in 1976–1978. Following is a brief listing of the individual contributions: H. Primas on the logical and algebraic foundations of quantum chemistry; B. T. Sutcliffe on critical exposition of the Eckart Hamiltonian; Van Leuven and Lathouwers on the generator coordinate method; S. A. Rice on intramolecular energy transfer; R. S. Berry on floppy molecular clusters; E. B. Davies on dynamics of open systems; Combes and Seiler on spectral properties of atom and molecular systems; R. A. Harris on parity violations in atoms and molecules; P. G. Burke on electron–molecule collisions; D. H. Levy on supersonic molecular beams; W. Demtröder on laser spectroscopy.

S. M. Blinder, *University of Michigan*

Molecular Vibrational–Rotational Spectra. Theory and Applications of High Resolution Infrared, Microwave and Raman Spectroscopy of Polyatomic Molecules. By D. Papoušek (Czechoslovak Academy of Sciences) and M. R. Aliev (Academy of Sciences of the USSR). Elsevier Scientific Publishing Co; New York and Amsterdam. 1982. 323 pp. $90.75.

The contents of this book are divided into a total of 36 chapters with 26 of them in four main parts and the rest in appendices. The vibrational–rotational Hamiltonian of semirigid molecules, the symmetry classification of the energy levels for rigid as well as nonrigid molecules, the higher order effects in vibrational–rotational spectra of semirigid molecules, and finally the vibrational–rotational states of molecules with large amplitude motions are the four main classifications. The authors believe that this book will be useful to researchers in vibrational–rotational spectroscopy, chemically oriented infrared and Raman spectroscopists, and undergraduate and graduate students.

The first part contains six chapters, of which the first three are of introductory nature, giving the introduction to rovibrational spectroscopy, the basic approach to the treatment of molecular vibrations and rotations, and a concise treatment of the normal vibrational coordinates. The fourth chapter develops the vibration–rotational Hamiltonian for semirigid molecules with subsections for nonlinear and linear molecules. Two subsequent chapters consider harmonic oscillator and rigid rotor approximations and discuss the energy levels of degenerate harmonic oscillators, and of the linear, spherical, symmetric, and asymmetric top molecules. The second part of the book is devoted to the symmetry classification and selection rules introducing the concept of molecular symmetry in terms of permutation inversion groups. There are eight chapters in the second part with separate chapters for symmetry of normal vibrations, symmetry classification of the energy levels of linear, spherical, symmetric, and asymmetric top molecules, selection rules in vibrational–rotational Raman spectra, and statistical weights of energy levels.

The last two parts present the rigorous treatment of the vibrational–rotational problem. The expansion of the inverse of the moment of inertia tensor in normal coordinates with use of Watson's formulation, the concept of contact transformation, and the procedure for determining the transformation function are well presented. The expressions for the important vibrational–rotational interaction terms are also given by using the contact transformation procedure. There are four chapters which deal separately with the vibrational–rotational energy of linear, spherical, symmetric, and asymmetric top molecules. The effects of centrifugal distortion for asymmetric top molecules and κ-type and l-type splittings for symmetric top molecules are considered in detail. The irreducible tensor formalism, which is explained in one of the appendices, is introduced in the treatment of spherical top molecules and the theory is presented for XY_4-type spherical molecules. Separate chapters on the calculation of Coriolis interaction and centrifugal distortion constants and of anharmonic force-field calculations are also included. The vibrational–inversional–rotational Hamiltonian and the vibrational–torsional–rotational Hamiltonian are considered in detail in the chapters associated with the last part on nonrigid molecules.

This book is unique in presenting the details of vibrational–rotational spectroscopy, due to a comprehensive and systematic treatment of the subject. As a result, this book will be useful not only for researchers but also for teachers of an advanced level graduate course for theoretically oriented students.

P. L. Polavarapu, *Vanderbilt University*

Thermodynamics. Studies in Modern Thermodynamics. Volume 4. By J. M. Honig (Purdue University). Elsevier Scientific Publishing Company, Amsterdam and New York. 1982. x + 441 pp. $111.50.

This book is an outgrowth of the author's lecture notes for a 1-year graduate course at Purdue University. Consequently, the book is not intended to serve as a first exposure to the subject. The text consists of essentially six chapters, which take the reader through the standard range of topics in chemical thermodynamics, and in addition, offers sections or chapters on external fields, adsorption thermodynamics, and irreversible processes.

The word that best describes this text is "complete", in the sense that practically every conceivable relationship is derived for a given topic. Unfortunately, the resulting exhaustive (and exhausting) collection of equations, often with little or no guidance as to their use or importance, coupled with literally no examples and few illustrations, frequently makes the book, while undoubtedly of practical value, difficult to read. Furthermore, for a modern book, the writing seems curiously dated at times. For example, the use of F for the Helmholtz energy, opposing sign conventions for heat and work, and the definition of the joule in terms of the 1929 I.T. or steam calorie are annoying throwbacks. The book also contains very few references and literally none to the modern literature. Apart from these matters, however, no major errors were detected.

The book does contain an extensive collection of interesting problems, unfortunately without answers. This is a significant defect and again contrasts with other modern graduate level texts such as Munster, Landsberg, Bazarov, and Denbigh where detailed solutions, in addition to answers, are included.

Finally then, the question that I kept asking myself is, if Honig's text were reasonably priced, would I recommend it to students and aficionados of the subject? The answer is a definite "yes", because, my comments notwithstanding, it really is a book worth owning. But the fact is that this book, which is not even typeset, costs over $100—a reality that is hard to ignore. Happily, I got mine free!

D. W. McClure, *Portland State University*

Iron Porphyrins. Parts 1 and 2 (Physical Bioinorganic Chemistry Series. Volumes 1 and 2). Edited by A. B. P. Lever and H. G. Gray. Addison-Wesley Publishing Company, Reading, Massachusetts. 1983. Volume 1: xiv + 286 pp. $38.95. Volume 2: xiv + 254 pp. $37.95.

These are the first two volumes in a series entitled "Physical Bioinorganic Chemistry Series", and they deal with the physical chemistry of hemoproteins and synthetic iron porphyrins. The study of the roles and functions of oxidation–reduction proteins requires a thorough understanding of biology, chemistry, and physics. This series was planned to fulfill such a purpose.

In the first chapter of part 1, Theoretical Investigations of Iron Porphyrins, G. H. Loew discusses molecular orbital theory and its relevance to heme structures. Chapter 2, by W. R. Scheidt and M. Gouterman, reviews the Ligands, Spin State, and Geometry in Hemes and Related Metalloporphyrins. This chapter deals with iron porphyrins as well as related manganese and chromium porphyrins. Chapter 3, by M. W. Makinen and A. K. Churg, on Structural and Analytical Aspects of the Electronic Spectra of Hemoproteins, is concerned mainly with the polarized electronic spectra of hemoproteins in single crystals. Chapter 4, by H. M. Goff, Nuclear Magnetic Resonance of Iron Porphyrins, discusses the practical analysis of proton and carbon-13 NMR spectra of paramagnetic iron porphyrins and also includes the recent applications of NMR to the study of peroxobridged iron porphyrins and oxidized peroxidase compounds.

The first chapter of Part 2, by S. Mitra, is entitled Magnetic Susceptibility of Iron Porphyrins. Following the theoretical foundation, the author discusses the utility of magnetic susceptibility measurements study to the electronic structures of the iron porphyrins. Chapter 2, by G. Palmer, is a review of Electron Paramagnetic Resonance of Hemoproteins. Chapter 3, by T. G. Spiro, on The Resonance Raman Spec-

troscopy of Metalloporphyrins and Heme Proteins, discusses resonance enhncement, vibrational assignments, structure correlations, and protein effects. Furthermore, the author reviews the application of time-resolved resonance Raman spectroscopy. Chapter 4 is a long (89 pp) and excellent review of The Electrochemistry of Iron Porphyrins in Nonaqueous Media, by K. M. Kadishi. The author describes the techniques of electrochemistry and the recent results which include ligation equibria and solvent effects which affect redox processes.

There are two main features in these volumes. First, each author reviews how physical properties such as spin states, electronic structures, ligand geometries, and oxidation states of the iron in these hemes can be determined systematically by particular physical measurements. Second, each article reviews the recent literature up to and including 1980. Three of the articles include reference through 1982. A weakness of these volumes is that Mössbauer spectroscopy, infrared spectroscopy, and magnetic circular dichroism of both hemoproteins and iron porphyrins are not discussed. They are, however, already well reviewed in "The Porphyrins", edited by D. Dolphin.

These well-organized books should prove to be a very useful reference.

Yoshihito Watanabe, *University of Michigan*

Annual Reports on the Progress of Chemistry. Volume 77. 1980. Section C, Physical Chemistry. The Royal Society of Chemistry, London, U.K. 1981. v + 216 pp. $22.00.

This second Volume of "Annual Reports on Physical Chemistry" covers Electronic Structures of Molecules (G. Doggett), Solid State Chemistry (J. O. Williams), Thermodynamics of Liquid Mixtures (K. N. Marsh), Nuclear Magnetic Resonance Spectroscopy (G. A. Webb), Radiation Chemistry (A. J. Swallow), and Laser-induced Chemistry and Gas-phase Kinetics (H. M. Gillespie and R. J. Donovan). As Doggett points out, "The continuing development... of on-line literature retrieval facilities is... forcing a change in the nature and form of literature reviews", with which thought in mind his approach is to write in "the form of a commentary." Gratifyingly, most of the other articles are presented from a similar standpoint, with the result that each provides a readable account of most recent developments in the area, of particular value to the nonspecialist.

Those readers not familiar with this series should note that each of the listed topics is not reported every year. The Editor (M. C. R. Symons), however, plans repetitive reviews of harrd-core topics (e.g., Electronic Structure and N. M. R. Spectroscopy), while others will be revisited less frequently.

Annual Reports C promises to provide a most valuable general update for physical chemists if these first two volumes are in indication of what is to follow. The time lag is unfortunately unavoidable but is less serious than the title implies—thus, 1980 refers to the coverage year, not the year of publication (1981)—and the specialist will in any case have his/her own updating system in his/her area.

This reviewer recommends this series unreservedly to researchers and particularly teachers at the graduate level and suggests that they at least peruse a library copy with a view to subscribing to the series.

Brian Stevens, *University of South Florida*

Physical Chemistry. Second Edition. By P. W. Atkins (Oxford University). W. H. Freeman and Company, San Francisco, CA. 1982. xvii + 1081 pp. $29.95.

During the last 2 decades, the teaching of physical chemistry at the undergraduate level has become much more challenging, largely because many traditional topics are now discussed in terms of quantum theory, group theory, and other modern concepts. Older physical chemistry textbooks have been revised to include such approaches, and newly written books emphasize this new material to varying degrees. Students often consider physical chemistry to be the most difficult subject in the undergraduate chemistry program; the subject tends to intimidate students, perhaps because its topics are a combination of chemistry, physics, and mathematics. Although mathematics is used purely as a tool to solve chemical problems, the mere display of mathematical symbols and equations overwhelms students.

The author of this book has made special efforts to overcome such barriers by specifying learning objectives at the beginning of each chapter, summarizing mathematical relations in boxes, and using examples which are worked out in detail. Each chapter begins with a list of key learning objectives, which provides students with a brief overview of the chapter material before they actually start the chapter. It also serves as a check in their retention of key ideas after completing the chapter. The selection of topics, examples, and problems in each chapter is extensive, exhaustive, and evenly done. The book contains a well-chosen set of problems illustrating the concepts presented in the chapter, and each chapter presents several problems which are continuations of the earlier ones, thus making them long and challenging. These features should be especially useful in the tranining of advanced students.

The author has tried to provide balanced coverage of many important topics in physical chemistry, although material on quantum theory and its application to the studies of molecular structure is presented in more depth than the others. Part Two on Structure is especially well presented. Three chapters on the determination of molecular structure (Chapters 17–19) are clear expositions of the application of quantum mechanical principles to structural elucidations. Discussions of the subtle problems which arise in explaining laser action and photoelectron spectroscopy, for example, are well described.

The book contains 30 chapters with an extensive treatment of both traditional and modern topics of physical chemistry. Two chapters concern the First Law (one on concepts and the other on machinery); similarly presented are the Second Law and Statistical Thermodynamics, which are also presented in two chapters each. A total of four chapters is devoted to the Changes of State in Part One, with a chapter on the general situation of phase equilibria at the end. Some of these topics may be either deleted or condensed in a standard 1-year physical chemistry program. Thorough coverage of the entire book may take three semesters, with one semester devoted to each part.

Some notations in Part One are confusing and clumsy. Standard thermodynamic functions are denoted by the superscript "⊖"; e.g., $\Delta H^{\ominus}$. The bond dissociation enthalpy is represented by $DH_m^{\ominus}$ and the bond enthalpy by $EH_m^{\ominus}$ (see Chapter 4). Standard thermodynamic functions of biological processes are represented by the superscript "⊕" (see page 277). There are several instances in the book where clarity appears to be sacrificed for the sake of extended coverage; e.g., thermodynamics of ATP and respiration in Chapter 9, membrane potentials in Chapter 11, and acid–base titrations in Chapter 12. The descriptions of the first two topics are too condensed to be of value to students who are unfamiliar with biochemistry. Perhaps a biochemistry book such as "Biochemistry" by L. Stryer may be included in the list of further reading. The topic of acid–base titrations is normally covered in a course of analytical chemistry.

In summary, the author is to be commended for his efforts in presenting a difficult subject in such a way as to stimulate students' learning objectives. Of the numerous books published on this subject, this book is clearly one of the best in so far as the coverage of topics, clarity of presentation, and selection of problems. The serious student of chemistry should find this book both challenging and highly valuable in learning physical chemistry.

H. K. Shin, *University of Nevada, Reno*

The Alkaloids. Volume 11. A Specialist Periodical Report. Senior Reporter: M. F. Grundon. The Royal Society of Chemistry, Burlington House, London. 1981. vii + 259 pp. £50.00.

The current references, excellent stereochemical drawings, and heavy attention to synthesis and biosynthesis make this volume a must for anyone working in the area. The book is divided into the classical alkaloid divisions with an excellent first chapter on overall biosynthesis of alkaloids. There is even a short mention of alkaloids from plants of the Peoples Republic of China.

The senior reporter, Grundon, and 16 other regulars reviewed "the whole of the alkaloid literature for the year and a two-year coverage of *Erythina* alkaloids is included." New results on the biosynthesis of quinolizidine alkaloids, the first synthesis of an eleven-membered macrocyclic pyrrolizidine diester, and the synthesis of *Poranthera* alkaloids are three of the author's choices for highlights in alkaloid research in the period covered by this volume (July 1979–June 1980).

There are 16 chapters divided into detailed sections and subsections. An author index refers to those who are referenced in the text. It would have been a lot of work and very time consuming but a subject index in addition to the author index would have been nice, although the table of contents is quite detailed.

There are 700 references on the isolation and chemistry of alkaloids with half devoted to synthesis and biosynthesis. Even though there are many reporters, the chapters are all consistently well-written.

Ronald W. Woodard, *University of Michigan*

Electronic Structure and Magnetism of Inorganic Compounds. Volume 7. Senior Reporter: P. Day (University of Oxford). The Royal Society of Chemistry, London. 1982. ix + 207 pp. £41.00.

This is a specialist periodical report and contains reviews of recent advances in the fields of Gas Phase Photoelectron Spectroscopy and Related Techniques, by R. G. Egdell (134 pp, 987 references), and Magnetic Susceptibility Measurements, by P. D. W. Boyd and K. S. Murray (73 pp, 589 references).

The two chapters provide critical and comprehensive surveys of the recent literature. Both topics have been reviewed in previous volumes of this series. Egdell's review of gas-phase photoelectron spectroscopy covers

the literature between 1977 and 1980. It provides an excellent summary of the major experimental and theoretical advances in this period. In addition to conventional photoelectron studies Egdell gives an extensive presentation of related measurements and concepts dealing with electronic structure. Bibliographies of both UV and X-ray PES studies of inorganic compounds are included. Boyd and Murray's review of magnetic susceptibility measurements covers the literature between 1977 and 1979. As with Egdell's review, the emphasis is on a critical discussion of the most significant papers in this period rather than coverage of all work in the area. More than half the work discussed in this chapter deals with exchange interactions between paramagnetic ions.

Although somewhat dated, both reviews are very useful in providing a balanced perspective of the topic to the active specialist. The selective and critical nature of the reviews make them valuable to the interested nonspecialist as well. This volume exemplifies the traditional high quality of the Royal Society specialist periodical reports.

Adam P. Hitchcock, *McMaster University*

Rodd's Chemistry of Carbon Compounds. 2nd Edition. Supplement to Volume III. Aromatic Compounds. Part A. Edited by M. F. Ansell (University of London). Elsevier Scientific Publishing Co., Amsterdam and New York. 1983. xvi + 438 pp. $110.75.

This supplement covers Chapters 1 through 7 of the original volume: General Introduction; Mononuclear Hydrocarbons; Halogen Derivatives; Nuclear Hydroxy Derivatives; Thiophenols; Sulfides, etc.; Sulphonic Acids, Sulphinic Acids and Sulphenyl Compounds, and Mononuclear Hydrocarbons Carrying Nuclear Substituents Containing Selenium or Tellurium. The purpose of this Supplement is to ensure that "this major work of reference does not become out of date". It appears to meet this goal reasonably adequately, but it is unfortunate that neither the preface nor the individual chapters tell the reader at what date the survey of the literature ceased. One cannot, therefore, easily judge how up to date this Supplement actually is.

Like earlier supplements, this one is reproduced from typescripts. That may not be unacceptable in principle, but it is a pity that a better effort was not made to secure more nearly uniform typefaces; the variations are unnecessarily jarring. Furthermore, the structural formulas are drawn with even more variation from one chapter to another, and many are hand lettered, with sloppily drawn bonds. These are, of course, only aesthetic distractions, and one should not allow them unduly to take attention away from the underlying quality of the content and its usefulness in keeping this important reference work alive.

The table of contents and the subject index (very thorough) are set in type. Unfortunately, they seem to have escaped proofreading, and are unnecessarily beset with errors. In spite of its shortcomings, this book belongs in all libraries serving chemists.

Index of Reviews in Organic Chemistry. 1981 Supplement. Compiled by D. A. Lewis. The Royal Society of Chemistry, London. 1981. Ca. 150 pp. £9.00.

This supplement is a bibliography of about 2800 reviews published in the period January 1979 to November 1980. They are arranged in three sections: individual compounds or classes; name reactions; specific chemical processes or phenomena.

Dyes and Their Intermediates. Second Edition. By E. N. Abrahart. Chemical Publishing Co., New York. 1977. 255 pp. $27.50.

In order to keep abreast of advances, "extensive amendments and additions" have been made to the sections on Direct dyes, Basic dyes, Azo-metal complexes, Reactive dyes, and Pigments, and a separate chapter on Disperse dyes has been added.

Electroanalytical Chemistry. A Series of Advances. Volume 12. Edited by A. J. Bard (University of Texas at Austin). Marcel Dekker, Inc., New York and Basel. 1982. xi + 251 pp. $57 ($47.50 in the U.S. and Canada).

The volume consists of three chapters: Flow Electrolysis with Extended-Surface Electrodes, by Roman E. Sioda (Institute of Industrial Chemistry, Warsaw) and Kenneth B. Keating (Du Pont); Voltammetric Methods for the Study of Adsorbed Species, by Etienne Laviron (University of Dijon, France); and Coulostatic Pulse Techniques by Herman P. van Leeuwen (Agricultural University, The Netherlands). Coverage of the relevant literature is less complete and current than in the reviews published annually by *Analytical Chemistry*. The level of helpfulness of the discussion typically falls below that of other series such as *Accounts of Chemical Research* or *Critical Reviews of Analytical Chemistry*. Electrochemical science is enjoying a renaissance of powerful new methods, exciting results, and valuable applications, a trend not made evident by this volume.

The brief chapter on porous electrodes presents and describes iterative evaluation of numerous equations by mass and electron transfer, but stops short of demonstrating appropriateness or predictive value.

Description of voltammetric methods for studying adsorption likewise begins with numerous equations, including the usual catalog of isotherms, without discussing applicability. Neglect of methods for decoupling mass transport considerations from adsorption phenomena gives the subject an unduly intractable flavor. Various other methodologies were also omitted for no particular reason. Molecular aspects of adsorption, one distinctively chemical topic of potential interest to readers of the Journal, are ignored, aspects which might invalidate the voltammetric measurements. No mention is made of a growing realization by electrochemists that investigation of adsorption by voltammetric methods alone tends to be a risky and inconclusive business.

The final chapter, on coulostatics, is perhaps the most artful, although as luck would have it this is the subject area in which the fewest triumphs can be cited. The author devotes a few pages to noting that, in the words of Alan Bond, "the methods have apparently yet to be used on many real analytical problems".

Arthur Hubbard, *University of California, Santa Barbara*

Annual Review of Physical Chemistry. Volume 33. Edited by B. S. Rabinowitch, J. M. Schurr, and H. L. Strauss. Annual Reviews, Inc., Palo Alto. 1982. 597 pp. $22.00.

Like its predecessors, the current volume answers the obvious question: why is there an annual review of physical chemistry and not of organic or inorganic or theoretical chemistry? Physical chemistry overlaps these areas and more—consider the following chapters: Molecular Features of Metal Cluster Reactions (Muetterties, Burch, Stolzenberg), Polyelectrolyte Theories and Their Application to DNA (Anderson and Record), Hydrocarbon Bond Dissociation Energies (McMillen and Golden), Complex Coordinates in the Theory of Atomic and Molecular Structure and Dynamics (Reinhardt). These are but four of the 21 chapters in only one volume of this series. The editors and authors are to be complimented for both the quality and quantity of reviews in this volume and the publisher for keeping the price down to be affordable to both researchers and students alike. The reviewer thanks all of these individuals and eagerly awaits next year's volume.

Joel F. Liebman, *University of Maryland Baltimore County*

Current Aspects of Quantum Chemistry 1981. Studies in Physical and Theoretical Chemistry. Volume 21. Edited by R. Carbó. Elsevier Scientific Publishing Co., Amsterdam and New York. 1982. xii + 463 pp. $116.25.

This edited volume constitutes selected papers from two conferences in Barcelona Spain in late 1981: The XII Congress of Theoretical Chemists of Latin Expression and Current Aspects of Quantum Chemistry. There are 26 chapters, most of which deal with computational methods and mathematical formalisms for the understanding of many-electron species that more conventional chemists call atoms and molecules. Few chapters will aid the chemist who "merely" wants to use a canned program from the Quantum Chemistry Program Exchange, such as GAUSSIAN 70, as opposed to the practicing theoretical chemist who wishes to know the state-of-the-art methodologies. Yet even for the first class of readers, a brief exposure to this book is useful, as it shows the seemingly inherent mathematical complexity of chemical phenomena.

Joel F. Liebman, *University of Maryland Baltimore County*

The Elements of Polymer Science and Engineering. By A. Rudin (University of Waterloo). Academic Press, New York, N.Y. 1982. XV + 485 pp. $29.95.

This is a good introductory (2-semester sequence) text and covers the traditional topics for such a course. A very useful set of numerical problems follows each chapter. As the author points out, the fundamentals of molecular weight statistics, polymerization reaction engineering, a chapter on polymer mixtures based on statistical thermodynamics *and* technology, and a critical analysis of free radical copolymerization are among the unusual features of this book.

Eli M. Pearce, *Polytechnic Institute of New York*

Transmutation. By T. J. Trenn (Max Planck Institute, Munich). Heyden, London. 1982. xv + 128 pp. $13.50 softbound; $29 hardbound.

This book is one of a series of historical monographs on Nobel Prize Topics in Chemistry in which a Nobel Laureate's most significant work is reprinted, discussed, and placed within the context of the history of science. In this volume, the work of three groups of Nobel Prize winners (Rutherford and Soddy, Curie and Joliot, and Hahn and Strassmann) is discussed within the general unifying theme of "transmutation" of the elements. The book contains reprints of the Rutherford and Soddy paper on Radioactive Change (1903), Curie and Joliot's paper on artificial radioactivity (1934), and Hahn and Strassmann's paper on the discovery

of nuclear fission (1939). Also included is a history of alchemy, a discussion of the general scientific background of the aforementioned papers, a discussion of nuclear reactors and nuclear bombs and their operation, a (pro-nuclear) polemic on nuclear energy, and some general philosophical observations on the subject material. The level of the scientific discussion is that of a junior high-school textbook.

The reprinting of these famous papers in English is an important positive feature of the book. However, beyond this feature I see little to recommend this book. The reader would be better advised to read the books by Romer ("Radiochemistry and the Discovery of Isotopes" and "The Discovery of Radioactivity and Transmutation) and Segre ("From X-Rays to Quarks") to understand the general scientific significance of the work under discussion. The general idea of tying together the works of these three groups of Nobel Laureates through the theme of "transmutation" seems artificial and misleading. In my understanding this research was not motivated by the alchemical goal of transmuting the elements nor was it a factor in determining the importance of this work (except for part of the work of Rutherford and Soddy). The discussions of the later chapters of this book which depict fusion and fission reactors as "transmutation" devices seem strangely stilted. A further disappointment to chemists is that the important role played by chemical techniques and radiochemists in many of these developments is barely mentioned or ignored.

Walter Loveland, *Oregon State University*

The Biosynthesis of Aromatic Compounds. By U. Weiss (National Institutes of Health) and J. M. Edwards (University of Connecticut, Storrs). Wiley-Interscience, New York, N.Y. 1980. xii + 727 pp. $29.50.

The authors' stated intention, to provide a comprehensive review of the chemical processes and substances involved in the formation of benzenoid rings by living organisms, is artfully achieved in this volume. Written from an organic chemical perspective, the book is divided into three main sections dealing with shikimic acid, acetic acid, and mevalonic acid metabolism, plus an introductory chapter defining the biochemical, enzymatic, and microbial genetic techniques used in biosynthetic investigations.

The first 16 chapters (325 pp) describe the shikimate pathway and offer timely, expanded sections on chorismic acid, prephenic acid, and other cyclohexadienols important in the biochemical transformations of aromatic rings. Shorter treatises on tryptophan, *p*-aminobenzoic acid, and ubiquinone are also included. This book will constitute a valuable acquisition for those specialists in search of a supplement to Haslam's 1974 book entitled "The Shikimate Pathway".

The authors note in their second section that the subject of polyketide biosynthesis (5 chapters, 1976 pp) was last reviewed comprehensively in 1971. Although their treatment is thorough and all-inclusive, a fairly critical look at the cited literature uncovered only a few references to work appearing since 1971 or 1972, which is perhaps more a reflection of shifting research interests. Part 3, on the subject of mevalonate-derived aromatics (3 chapters, 187 pp), features several useful schemes tabulating annotated structures of the aromatic terpenoids, carotenoids, and metabolites of mixed biosynthetic origin.

The book is well written and profusely illustrated with helpful structures, schemes, and diagrams. It will be of interest to both specialists and students alike.

Bruce Ganem, *Cornell University*

The Chemical Scythe. By A. Hay (University of Leeds). Plenum Press, New York. 1982. xi + 264 pp. $27.50.

The adverse effects of human exposure to 2,4,5-trichlorophenol (TCP) reaction mixtures have been known for over 30 years, mainly as a result of numerous industrial explosions and exposures involving over 2000 workers. In the words of chemist Hay: "The history of 2,4,5-trichlorophenol and 2,4,5-T can with some justification be described as appalling."

Almost one-third of the book is devoted to the chemistry, toxicology, and occurrence of the dioxin by-products from TCP synthesis, especially 2,3,7,8-TCDD. The 1976 factory explosion in Seveso, Italy, produced for the first time substantial public exposures to dioxins. The use of 2,4,5-T (in Agent Orange) during the Vietnam War resulted in widespread low-level dioxin exposure. Hay performs a valuable service by providing scientifically detailed descriptions of these and other episodes and their effects, in spite of encountering secrecy, conflicting information, and protective postures of those involved. The technical accounts of the historical events are extensively documented, although there are few references since 1980. A knowledge of toxicology by the reader is assumed; the subjects are not presented for a lay audience.

The book is claimed to be the first of a series entitled "disaster research in practice". The promotion by the publisher and the message of the series editor's Foreword suggest a problem-solving and disaster avoidance content. However, this text does not address implied topics such as a perspective on disasters or drawing lessions from unique events. Little guidance is provided about incident avoidance or emergency response through proper education, training, industrial hygiene, and engineering; or about sharing health, safety, and accident information among competitors. The book does not delineate manufacturer's responsibilities such as product stewardship, quality control, or benefit-risk analyses for products.

Within the more limited scope of an historical analysis, the information is carefully presented, the topics are well-organized, and the entire work reflects an obvious enthusiasm of the author for his subject.

Paul Tomboulian, *Oakland University*

Electrophoresis: Theory, Techniques and Biochemical and Clinical Applications. By A. T. Andrews (Shinfield). The Clarendon Press; Oxford University Press, New York, N.Y. 1982. xii + 336 pp. $59.00.

In the recent past, electrophoresis was a confined, low-resolution tool utilized strictly by protein chemists and physical biochemists. In this treatise, we are given a thorough introduction, many useful explanations, and direct applications for all researchers interested in separating A from B or identifying C. This manual is easy to read for those just beginning to use electrophoresis or for the veterans who wish to escalate their present attack on a specific problem. The contents are complete on the use of slab gel electrophoresis: gradient gels, peptide mapping, isoelectric focusing, and isotachophoresis among others are fully explained from theory down to exact receipes and recommended product sources. The insertion of a chapter on nucleic acid separation and sequencing techniques is also useful for the novice in the burgeoning field of molecular biology. The chapter on immunological applications is especially useful, very current, and should allow one to take advantage of these sensitive techniques without referring to the primary sources. In addition, the appendices dealing with methods for radiolabeling proteins and nucleic acids are complete in every detail and especially useful for immunological and analytical approaches. The author has taken great pains to include an extensive bibliography and index list which makes this text a very useful reference book.

In summary, Dr. Andrews has been able to bring together an ever-expanding methodology in a readable and useful form; his manual is a must for biochemists, immunologists, microbiologists, and any scientist interested in modern separation science.

Michael T. DiMuzio, *University of Alabama in Birmingham*

The Biochemistry of Alkaloids. Second Edition. By Trevor Robinson (University of Massachusetts). Springer-Verlag, New York. 1981. viii + 225 pp. $36.00.

The author notes that alkaloids are of importance to mankind and of great interest to chemists; however, alkaloid biochemistry is a less developed subject as are the aspects of function or activity and pathways of degradation. The author has limited his consideration "to those alkaloids for which there is experimental information", except in a few cases. Since the first edition, 13 years ago, details in knowledge have been filled in and work with cell-free systems and "a few highly purified enzymes" has been done. The author predicts that "the next likely advance will come as regulatory mechanisms are discovered using these isolated systems".

There are 15 chapters which include an Introduction, General Theories of Alkaloid Biosynthesis, Simple Amino Acid Derivatives and Protoalkaloids, 10 chapters on the usual classes of alkaloids, Metabolism of Exogenous Alkaloids, and Biochemical Effects of Alkaloids. The last two chapters are the more unique among standard books on the subject of alkaloids. There are 14 pages of index and 1600 references from every possible source through June of 1980 with a few later references.

The author uses appropriate quotes about alkaloids from historical literature to introduce each chapter and has some interesting views in many of the chapters concerning the future direction of research in that area. Although the book is written by only one author it is rather authoritative. Overall, the book is eloquently written.

Ronald W. Woodard, *University of Michigan*

Silane Coupling Agents. By Edwin P. Plueddemann (Dow Corning Corporation). Plenum Press Publishers, New York. 1982. ix + 235 pp. $37.50.

One of the useful properties of organofunctional silanes is their ability to act as a coupling agent across an organic–inorganic interface, e.g., in bonding organic polymers to glass, fiberglass, or silica gel. This volume combines practical technology with fundamental science in discussing the chemistry, composition, and applications of many silane coupling agents as well as the surface chemistry of silanes at the interface and the nature of adhesion through these compounds. Among the interesting applications covered are reverse-phase chromatography involving C_8 and C_{18}

silanes, treatment of soil with silanes for "water harvesting" by increasing precipitation runoff and converting soil into a water repellant mulch, chemical bonding of enzymes or transition-metal complexes to inert surfaces to produce novel heterogeneous catalysts, attachment of chelating agents to silica gel allowing commercial recovery of metal ions from dilute solutions (such as uranium from sea water), coupling antimicrobial agents to surfaces to provide biological active surfaces which maintain activity despite repeated washing, and preparation of water-resistant laminates for use in manufacture of printed circuits.

This book is up to date with more than 300 references including many to patents, conference reports, and proceedings and specialty journals which might not be available in most university libraries. Also included are recipes taken from patents for the preparation of primers. The book contains extensive discussion of the chemistry of both organic and inorganic silicon compounds, theories of adhesion, and analytical methods for the study of surfaces. Eight electron micrographs are given. This book should be a valuable resource for those directly concerned with the areas referred to above and for organosilicon chemists seeking new applications for their research.

Eric Block, *State University of New York at Albany*

Copper Proteins. Edited by T. G. Spiro (Princeton University). John Wiley & Sons, New York. 1981. 363 pp. $54.50.

This is the third volume in the series "Metal Ions in Biology" and like the other volumes is composed of independent chapters written by leading experimentalists in the field. The chapters are all written to reflect the present state of knowledge about each copper-containing protein and tend to emphasize the points of contention more than some of the many reviews that have appeared on copper proteins in recent years. The literature is reviewed through 1980, which fact already makes it somewhat out of date. The volume also covers much of the same material as Volume 13 of "Metal Ions in Biological Systems" (edited by H. Sigel, Marcel-Dekker).

Three of the eight chapters discuss aspects of "blue" copper proteins. In Chapter 1, Gray and Solomon discuss, in a very readable article, spectroscopic properties of Type 1 copper centers. This includes an explanation of the basic theoretical principles. Solomon then reviews results for proteins which have binuclear copper active sites by taking one mollusc hemocyanin as a prototype and comparing results of other proteins to this. The chapter does not discuss results of experiments with simple model compounds which have in this reviewer's opinion made the interpretation of the protein results more firmly based. Reinhammer and Malmstrom describe the structures and functional properties of the blue oxidases and Farver and Pecht discuss electron transfer in blue copper proteins including the blue oxidases. Cytochrome oxidase has been excluded from this volume as it was included in Volume 2 of the series. In the remaining chapters, Hamilton, and Ettinger and Kosman present two interpretations of the results for Galactose Oxidase, Villafranca reviews Dopamine-β-Hydroxylase, and Valentine and Pantoliano discuss Superoxide Dismutase with emphasis on the chemical aspects of the active site, and with a summary of the controversy over the biochemical function of these copper–zinc proteins.

The chief virtue of this volume is that the reviews are generally rather selective, a feature that makes them mostly very readable. With an average of 100 references per chapter, they provide an extensive rather than exhaustive review of the literature. Furthermore, the chapters are well organized and written at a level readily understood by beginning graduate students and workers not in the immediate field, and there is some explanation of relevant theory, a valuable asset in this day of multidisciplinary research.

Frederick T. Greenaway, *Clark University*

Inorganic Biochemistry. Volume 3. Edited by H. A. O. Hill (University of Oxford). The Royal Society of Chemistry, London. 1982. xv + 397 pp. $56.00.

This "Specialist Perodical Report" covers the bioinorganic literature for 1979 with a smattering of earlier references. The subject headings reviewed are Inorganic Analogues of Biological Molecules (C. A. McAuliffe), Storage, Transport, and Function of the Cations of Groups IA and IIA (M. N. Hughes), Transport and Storage of Transition Metals (R. R. Crichton and J.-C. Mareschal), Oxygen Transport Proteins (M. Brunori, B. Giardina, and H. A. Kiuper), Oxidases and Reductases (A. E. G. Cass), Zinc Metalloenzymes (A. Galdes), Manganese Metalloproteins and Manganese-Activated Enzymes (A. R. McEuen), Trace Elements in Animal Nutrition (J. R. Arthur, I. Bremner, and J. K. Chesters), and Inorganic Elements in Biology and Medicine (N. J. Birch and P. J. Sadler).

With 3433 individual literature citations (an average of 8.7 per page), the style is necessarily terse and there is room for little or no critical comment or analysis. This volume does, however, provide a fairly comprehensive directory to the bioinorganic literature for the time window covered. Libraries and insomniacs will want to own a copy.

William DeW. Horrocks, Jr., *The Pennsylvania State University*

The Biosynthesis of Secondary Metabolites. By Richard B. Herbert (University of Leeds). Chapman and Hall, London and New York. 1981. ix + 178 pp. $13.95 paperbound; $29.95 hardbound.

The stated purpose of this book is to provide "an introduction to the biosynthesis of secondary metabolites" and "to make the book as comprehensive as possible". Both these goals are admirably accomplished. This book combines both significant and recent references (through 1979) along with an adequate index.

The author has organized the information into seven sections, Introduction, Techniques for Biosynthesis, Polyketides, Terpenes and Steroids, The Shikimic Acid Pathway, Alkaloids, and Microbial Metabolites Containing Nitrogen. The introductory section gives an overview of secondary metabolism including biosynthesis, stereochemistry, and generally important reactions. Sections two through seven each have an introduction for each topic and subtopic. The longest section (44 pages) deals with alkaloids.

The author advises that those readers who wish to acquire only a general introduction to certain of the topics avoid the paragraphs marked by a dagger (†). I believe that for the novice a few more daggers would have been appropriate.

The introduction is both current and good. In an otherwise excellent chapter two ^{17}O NMR is not mentioned, yet it, too, has been utilized recently to answer some unique biosynthetic questions. Perhaps more on the use of mutants and some mention of the use of protoplast would have made the chapter more complete. The author does reference a recent caution on the use of ^{15}N–^{13}C coupling in the study of secondary metabolites.

The structures, schemes, and isotopic labeling are all extremely well done even down to the helpful use of broken lines to clarify fragmentation and use of arrows to show the direction of electron movement.

This book is very comprehensive and quite condensed. In fact every paragraph and sometimes each sentence represents several entire manuscripts. The classical division of chapters is wise and the chapter on microbial metabolites containing nitrogen is very interesting.

This book could be used as a text or reference book, and I highly recommend it to anyone with an interest in biosynthesis of secondary metabolites.

Ronald W. Woodard, *The University of Michigan*

New Journals

Journal of Photoacoustics. Volume I. Edited by Allen Rosencwaig. Marcell Dekker, Inc., New York. 1982. Quarterly. Annual subscription $51.00 ($25.50 to individual professionals).

Plastics and Rubber Processing and Applications. Volume I. Edited by P. L. Clegg. Applied Science Publishers, Ltd., Barking, Essex. 1981. Quarterly. Subscription price not stated.

Polymer Engineering Reviews. Volume 1. Edited by J. L. White. Elsevier Sequoia S. A., Lausanne. 1981. Quarterly. Annual subscription SF 180.00.

Reactive Polymers. Volume 1. Edited by F. G. Helfferich. Elsevier Scientific Publishing Co., Amsterdam and New York. 1982. Quarterly. Annual subscription $76.00.

Aerosol Science and Technology. Volume 1. Edited by Y. H. Liu, D. T. Shaw, and D. S. Ensor. Elsevier Scientific Publishing Co., Amsterdam and New York. 1982. Quarterly. Annual subscription $90.00.

Journal of Carbohydrate Chemistry. Volume 1. Edited by D. E. Kiely. Marcell Dekker Journals, P.O. Box 11305, Church St. Station, New York. 1982. Three times a year. Annual subscription $75.00 ($37.50 for individuals).

Nucleosides and Nucleotides. Edited by J. A. Secrist III. Marcel Dekker Journals, P.O. Box 11305, Church St. Station, New York. 1982. Three times a year. Annual subscription $75.00 ($37.50 for individuals).

Cellular Polymers. Volume 1. Edited by J. M. Buist. Applied Science Publishers, Barking, Essex, England. Three issues per year. Subscription £54.40. (Succeeds *European Journal of Cellular Plastics.*)