Book Reviews*

Methods of Biochemical Analysis. Volume 27. Edited by D. Glick (Stanford University). John Wiley and Sons, Inc., New York. 1981. vi + 537 pp. $42.50.

This volume contains the usual mixture of recent results in quantitative analysis and new developments in its use for physical and mechanistic biochemistry.

Amino acid analysis by gas–liquid chromatography during the last 10 years is reviewed in great depth. Conditions for single and multiple derivatization of protein amino acids and specific amino acids are discussed. The practical aspects of sample preparation, derivatization, and chromatography are presented.

The second article involves the use of non-charged amphiphilic gels for hydrophobic interaction chromatography of proteins, nucleic acids, viruses, and cells. The preparation of these glycidyl ether gels and the practical conditions for fractionating and classifying biological materials are discussed.

Immunological techniques for studying the biogenesis of mitochondrial membrane proteins are reviewed. This section contains detailed experimental conditions for researchers in this new area.

The fourth article describes thermodynamic flow methods of colorimetry, densitometry, and dilatometry. These non-specific physical techniques are used for evaluation of thermodynamic quantities associated with processes such as solvation, binding, and conformational changes.

NMR studies of ion binding in biological systems are described in the last article. Following an introduction to NMR principles and relaxation processes, new types of NMR such as Fourier Transform and Pulse NMR are described. Experimental applications include complexation, anion–protein interactions, cation–protein interactions, polyelectrolytes, and ion binding to membranes.

Joe A. Vinson, *University of Scranton*

Topics in Antibiotic Chemistry. Volume 6. Edited by Peter G. Sammes (University of Leeds). John Wiley & Sons, New York. 1982. 345 pp. $74.95.

Volume 6 comprises three reviews and follows the same principles governing earlier volumes in this series. The subject matter has been interpreted as widely as possible and has not been restricted to antibacterial agents or just natural products.

The first review, by George Ellames, is devoted to the recent studies on antifungal agents, concentrating on the imidazole reagents most popularly prescribed for such infections. It also includes a useful section on synthetic approaches to novel antifungal agents. The remainder of the review discusses topics such as the possible mode of action of these compounds, the screening processes involved in the search for novel compounds displaying antifungal activity, and a survey of the range of imidazole-based structures displaying such activity. In addition, a discussion of the compounds, notably ketoconazole, from which it is hoped will come the next generation of imidazole-based antifungal agents, is presented.

The other two reviews concentrate on the nucleoside antibiotics. Interest on these agents is focused not only on their antibiotic properties but also on their potential use in cancer chemotherapy. The first is written by John Goodchild and deals with the general principles and background information necessary to understand how these compounds work. Furthermore, it covers the biochemical role of such agents. Dr. Goodchild clearly presents modern thinking on the possible and preferred sites for attack and cases where selectivity of action may be anticipated.

The final review, by Grant Buchanan and Richard Wightman, focuses on the chemical studies of the nucleoside antibiotics and on naturally occurring analogues.

In spite of the few typographical errors, the book is lucidly written by experts currently engaged in research in the area under review, and thus continues the high standards set by this series through the years. Moreover, the reviewers succeed in reporting the most recent advances being made on the role antibiotics play in the nature and the mechanisms by which they act against various microorganisms. The reviews appear informative, thorough, and well documented with abundant references up to 1981 (1253 references). The volume is a useful and important reference and is highly recommended for chemists, biochemists, pharmacologists, molecular biologists, analytical chemists, medical practitioners, and all researchers related to these fields.

Hanafi H. Zoorob, *El-Mansoura University, Egypt*

Basic Physical Chemistry. By Walter J. Moore (University of Sydney). Prentice-Hall, Inc., New Jersey. 1983. xx + 711 pp. $32.95.

Basic Physical Chemistry (BPC) is a reorganization and trimming of Moore's classic text "Physical Chemistry" (PC, currently in the fourth edition which dates back to 1972). The content is directed toward "... science and engineering students who need to understand the basic foundations of physical chemistry". PC has been a very popular book; comparisons with the new BPC may be suitable and of interest.

Although BPC contains 25% fewer pages, it appears to cover the same material as does PC but in a more compact format. The number of end-of-chapter problems has increased from 475 to 583. An impressive new feature of BPC is the introduction of worked-out example problems within the body of each chapter. This is a format which has been popular in chemistry texts since the 1970's and appears to have considerable pedagogic value.

The first seven chapters deal with the Laws of thermodynamics and their applications to ideal gases. Other applications of the Laws (solutions, phase equilibria, real gases, statistical thermodynamics) are found in Chapters 8–13. Topics generally classified as chemical dynamics (kinetics, catalysis, electrochemistry, surface chemistry, colloids) are in Chapters 14–19. The remaining chapters (20–30) deal with atomic structure, quantum theory, bonding, spectroscopy, electric and magnetic properties, the solid state, and the liquid state. Some new material of recent interest has been introduced which is not covered in PC. This includes a discussion of new energy sources, fuel cells, photoelectron spectroscopy, and the application of Fourier transforms in spectroscopy. SI units are used exclusively throughout the book. A minor criticism of BPC would be the lack of an author index, a useful feature found in PC.

A new edition of PC was long overdue. While BPC is not a new edition, it is a suitable reworking and modification of PC which should prove satisfactory to all instructors who appreciate Moore's style.

Robert Desiderato, *North Texas State University*

Alkaloids: Chemical and Biological Perspectives. Volume One. Edited by S. William Pelletier (University of Georgia). John Wiley and Sons, New York, NY. 1983. xi + 398 pp. $60.00.

This book opens with an interesting and provocative chapter by its editor in which an effort is made at a redefinition of the term "alkaloid". Proceeding in a systematic fashion, the author readily demonstrates how the classical description of an alkaloid is no longer tenable, for alkaloids are neutral if they come in the form of salts, amides, or N-oxides, and they need not be necessarily of plant origin since similar or closely related compounds also occur among animals, and even bacteria.

Professor Pelletier justifiably feels that structure and not biogenetic origin should determine whether a compound is an alkaloid, and offers the definition: "An alkaloid is a cyclic organic compound containing nitrogen in a negative oxidation state, which is of limited distribution among living organisms". A corollary of this definition is that: "The aristolochic acids, all of which contain a nitro rather than an amino group, should not be classified as alkaloids".

In the opinion of the reviewer, this rational definition could be even further generalized, since the concept of a "negative oxidation state" is a purely didactic device in organic chemistry. The definition could then simply read: "an alkaloid is a cyclic organic compound which contains nitrogen, and which is of limited distribution among living organisms".

The revised definition would reinstate among the alkaloids the aristolochic acids, which are very often accompanied by the corresponding aristolactams in plants of the family Aristolochiaceae.

Chapter Two, by Professors Tappey H. Jones and Murray S. Blum, offers an intelligent discussion of arthropod alkaloids. This is, in fact, the first comprehensive review of this subject. The authors point out that the arthropods will continue to be an outstanding source of new nitrogenous compounds which can act both as pheromones and as predator repellents. Thus, in the world of arthropods, it is often true that alkaloids make life possible in a hostile world.

The presentation in Chapter Two is, however, slightly marred by small and unnecessary errors. On page 44, for example, we read about "carbon-skeleton chromatography", a technique unknown to the reviewer. The UV data on page 48 are given as "λ_{max} = 269,260 nm", which is confusing, and the Polonovski reaction is referred to as the Polonouski reaction. On page 62, the name cotton as in Cotton effect should be

*Unsigned book reviews are by the Book Review Editor.

capitalized. A compound is not "produced" in the venom of ants, but is found there (page 43).

Chapter Three is a masterful presentation of the controversial subject biosynthesis and metabolism of the tobacco alkaloids. Professor Edward Leete has here made an effort to present objectively all of the data presently available. He discusses current problems related to the biogenesis of nicotinic acid in higher plants and the Rapoport data concerning the formation of the *N*-methylpyrrolidine ring. At times, he gets carried away by his enthusiasm, as when a paragraph starts on page 131 and does not close until two pages later. But this feature is relieved by a good sense of humor as brought to the fore when he discloses the bizarre suggestion that anabasine is formed by ring expansion of nicotine!

The toxicology and pharmacology of the diterpenoidal alkaloids (aconitine, delphinine, atisine, veatchine, and others) are successfully discussed in Chapter Four by Professors M. H. Benn and John M. Jacyno. The overview of structure/activity relationships is particularly useful since recent reviews on the subject are not readily available.

Chapter Five, the last chapter of this book, by Professors Volkan Kisakurek, Anthony Leeuwenberg, and Manfred Hesse, is a chemotaxonomic investigation of the plant families *Apocynaceae*, *Loganaceae*, and *Rubiaceae*. This is an encyclopedic study which comprises over 40% of the total length of the book, and one in which the biogenetic and chemotaxonomic relationships among some 1200 indole alkaloids are considered. The presentation should remain for a long time to come the standard work on the subject.

Overall, this book is an outstanding presentation of a variety of modern aspects of alkaloid chemistry, biology, and pharmacology. Each of the review chapters stands for the best that has been written so far on that specific subject. We can only look forward to the second installment; Professor Pelletier is undoubtedly the right man to inspire and direct this all-encompassing series.

Maurice Shamma, *The Pennsylvania State University*

Introduction to Atomic and Molecular Collisions. By R. E. Johnson (University of Virginia). Plenum Press, New York. 1982. xiii + 288 pp. $32.50.

Since the early sixties and before, a major effort in chemical physics research has been directed to the detailed study of single-collision phenomena and of the underlying intermolecular forces governing collision dynamics. This effort has been characterized by a rich interplay between experimentalists and theorists, and many excellent technical reviews on both sides exist. There has been a need, however, for an introductory text on atomic and molecular collision theory, because many nontheorists, students and researchers alike, require some theoretical understanding of collision phenomena but not a knowledge of formal scattering theory. Often, their need is to be able to describe experimental results using relatively simple theoretical models. Professor Johnson has addressed that need with the present volume, and in my opinion has succeeded. His aim is to present and develop those classical and semiclassical methods and approximations employed frequently in the literature.

After a primarily descriptive first chapter which considers some problem areas that require an understanding of atomic and molecular collisions, the next three chapters develop the basic theoretical methods. The approach is mathematical throughout, but detailed derivations are either presented as exercises for the reader or, in more important cases, placed in one of the ten appendixes. This is done to keep the text short and to maintain the interest and involvement of the reader.

Chapter 2 presents a standard classical mechanical treatment of collisions beginning with careful definitions of total and differential cross sections and followed by discussions of rate constants, collision kinematics, the classical deflection function, and inelastic cross sections.

Chapter 3 presents the wave mechanical description of collisions. The theory of plane wave scattering is developed, the scattering amplitude is introduced, and expressions are obtained for the angular differential scattering cross section using both the semiclassical and Born approximations.

Calculation of the angular differential cross section requires a description of the interaction potential for the colliding system, and Chapter 4 begins by showing how to obtain the potential, assuming known initial charge distributions. Next, transition probabilities between internal states of the system are estimated as a function of speed with use of the impact parameter method (transition probabilities in the Born approximation are also discussed). And finally, the semiclassical inelastic cross section is calculated from the transition probabilities.

Chapter 5 presents a selection of experimental results for cross sections and rate constants with emphasis on how these results relate to the cross section models and potentials developed in the earlier chapters.

In the concluding chapter, the concepts developed for describing cross sections and rate constants are applied to some of the problems introduced in Chapter 1, reemphasizing the usefulness of these theoretical models.

Each chapter ends with 10–15 exercises for the reader and an extensive list of suggested readings. Subject, author, and collision system indexes are included at the end of the book. This text is well suited to a one-semester special topics course for graduate students or advanced undergraduates and should also be of interest to anyone who desires a better grasp of the mathematical description of collision related phenomena.

David L. McFadden, *Boston College*

Chemistry of Glasses. By A. Paul (Indian Institute of Technology, Kharagpur). Chapman and Hall, New York. 1982. ix + 293 pp. $40.

Chemical reactions occur during melting of glasses and influence many of their important properties. Optical absorption in glass fibers for transmission of light signals and the durability of glasses for encapsulating radioactive wastes are examples of properties involving chemical processes. Thus the subject of this book is timely and practical.

The most interesting and original chapters discuss chemical durability, oxidation–reduction reactions, acid–base concepts, and color in glass. There are also chapters on glass formation, phase separation and crystallization of glasses, selected properties, and polymeric (mainly phosphate) glasses. The glass compositions considered are chiefly commercial silicates, binary and ternary silicates, and simple borates. Thermodynamics is used extensively to elucidate chemical durability and oxidation–reduction and acid–base equilibria.

The preface and back of the book state that it should prove useful as both a text and reference, and therefore it is so judged. As a text, the level of treatment is quite uneven. Some sections are elementary and descriptive; others require a strong knowledge of thermodynamics, and the chapter on colored glasses introduces quantum mechanics briefly and goes on to a detailed application of it in ligand field theory. In American universities, the book would be suitable as a text only for a specialized graduate course.

As a reference the book has serious deficiencies. The discussions are highly selective, and many important papers and ideas are not considered. For example, the pioneering work at Corning Glass Works on photosensitive and photochromic glasses is not mentioned in discussions of these phenomena. There are only three references in the book to articles published after 1975, and in the chapter on properties there is no reference after 1967. Apparently much of the book was written many years ago and not brought up to date. The omission of much recent and much important work in several areas (phase transformations and chemical durability especially) renders these discussions of little value. Persons wishing balanced, up to data, and authoritative treatments of chemical durability, phase separation, crystallization, and optical properties of glasses should consult recently published monographs and review articles on these subjects.

Robert H. Doremus, *Rensselaer Polytechnic Institute*

Bioactive Carbohydrates: In Chemistry, Biochemistry and Biology. By J. F. Kennedy (University of Birmingham) and C. A. White (Vincent Kennedy Ltd.). John Wiley & Sons, New York. 1983. xiv + 331 pp. $79.50.

This book was described by the authors as a text designed for undergraduate students that would cover the whole range of interests from chemistry through biochemistry to biology of all aspects of carbohydrates. Considerable attention is devoted to nomenclature and stereochemistry in the introductory chapters. These topics are emphasized by use throughout the text of nomenclature most recently recommended by the IUPAC and the IUB, and the use of conformational rather than planar ring structures. It is obvious that much work and pedagogical experience went into the writing of this book. It is a well-written, up-to-date text having a wide range of topics geared at a depth suitable for college upperclassmen well grounded in organic chemistry. A positive feature is the usual inclusion of references after each topic, in which the subject matter is covered in greater depth. This serves the motivated student, and in addition, it makes the book a valuable reference source for any one interested in carbohydrates. Obviously it would be impossible to cover all aspects of carbohydrates, so choices were made. Many aspects of carbohydrate biosynthesis could have been covered but a major allotment was devoted to describing the synthesis of condroitin 4-sulfate proteoglycan. This focus was justified in that it served the secondary purpose of introducing the reader to the many heterooligosaccharides met later on in the truly outstanding chapters on the metabolism of the proteoglycans and glycolipids. Two criticisms are noted, both of which may result from the prejudices of a biochemist. The title "Bioactive Carbohydrates" seems inappropriate because it connotes to the reviewer

a much narrower range of compounds than are actually covered in the book. Secondly, the stress of nomenclature may have been carried too far in the repeated use throughout the text of the systematically derived name "5-acetamido-3,5-*dideoxy*-D-*glycero*-α-D-*galacto*-2-nonulopyranoic acid" rather than "*N*-acetylneuraminic acid", a name accepted as standard nomenclature by biochemists. In conclusion, this book is highly recommended both as text and as a reference book for anyone interested in carbohydrates. A less expensive paperback edition would better fit the budget of the college student.

Frank W. Fales, *Emory University*

Environmental Chemical Analysis. By I. L. Marr and M. S. Cresser (University of Aberdeen). International Textbook Company, Glasgow. Distributed by Methuen, Inc., New York. 1983. XII + 258 pp. $39.95.

This interesting, utilitarian book provides an overview with occasional detail of the philosophy of environmental analysis, sampling strategies and data reduction, and methods applied to most significant environmental analytical problems. Following a very straightforward presentation of statistical evaluation of data, the authors describe general aspects of sampling and sample preparation. They continue by describing environmental analysis of the Atmosphere (Chapter 3), Hydrosphere (Chapter 4), Lithosphere (Chapter 5), Biosphere, e.g., plant and animal tissues (Chapter 6), and Food, Chapter 7. The concluding chapter, titled Competitive Analytical Chemistry, examines a number of case studies in which interlaboratory comparisons were made on various samples (e.g., lunar rocks, fly ash) and significant differences were found between published data on the same samples. The authors suggest the sources of error. This chapter sensitizes the reader to the importance of reproducibility. Each Chapter is followed by 25–70 useful and up-to-date references.

This book is most useful for students majoring in environmental science having relatively superficial chemical background (the book introduces chromatography, spectroscopy, and separation techniques at a very elementary level), as well as Civil Engineering students. It is useful for the non-specialist managing environmental control. The utility of the book to specialists in environmental analysis is limited.

Arthur Greenberg, *New Jersey Institute of Technology*

Cyclodextrins and their Inclusion Complexes. By J. Szejtli (Chinon Research Center, Budapest, Hungary). Akademiai Kiado, Budapest. Distributed by Heyden & Son, Inc., Philadelphia, Pa. 1982. 296 pp. $35.00.

Cyclodextrins are doughnut-shaped molecules consisting of six or more glucose units arranged in a circle. They can complex small molecules in their central cavities and are probably best known for their use as enzyme models. This book, however, focuses on other applications of these fascinating substances, which are detailed in the final third of the text in chapters on Cyclodextrins and Drugs, Cyclodextrin Complexes in the Food Industry, and Potential Applications of Cyclodextrins in the Chemical Industry. A practical, application-minded approach also characterizes the preceding chapters on Chemistry and Preparation of Cyclodextrins; Cyclodextrin Derivatives; Types, Formation, and Structures of Inclusion Complexes; and Inclusion Complexation Effects in Solution.

Although this book contains much information, its survey of the literature is hardly current: it seems to be an English version of a monograph first published in Hungarian about 1978 and then translated some 3 or 4 years later with essentially no updating. This book also contains factual inconsistencies; for example, different values for the solubility of β-cyclodextrin in water are given in tables on successive pages (pages 33 and 34), and the number of water molecules taken up into the cavity of α-cyclodextrin is indicated to be two in a Figure on page 27 and the accompanying text but is listed as six in a table on page 34. These features detract from the usefulness of this book.

A. J. Kresge, *University of Toronto*

Annual Reports on NMR Spectroscopy. Volume 12. By G. A. Webb (University of Surrey). Academic Press, London and New York. 1982. x + 302 pp. $66.00.

This particular volume in a continuing series contains four reviews. Chapter one (R. E. Wasylishen and C. A. Fyfe) deals with "high-resolution nmr of solids" and covers such areas as nuclear spin interactions in solids, experimental techniques involved in high-resolution NMR of solids, and application of multinuclear (C-13, Si-29, P-31, Cd-113) solid-state NMR. There are over 450 references with literature coverage through early 1982. Chapter two (J. Kowalewski) treats "calculations of nuclear spin–spin couplings" and is essentially an update and follow-up of a previous review from 1977 by the same author. Both basic theory as well as computational methods are discussed along with applications to a variety of nuclear–nuclear couplings. There are over 320 references, but only through part of 1980. Chapter three (A. R. Siedle) covers "boron-11 nmr spectroscopy" and deals with a multitude of boron substances from simple one-boron compounds through decaborane derivatives, numerous metalloboranes, heteroatom boranes, and borate glasses. There are 167 references including a few through early 1981. The final chapter (B. E. Mann) is a brief one on "dynamic nmr spectroscopy in inorganic and organometallic chemistry" and deals with some special challenges of dynamic properties in selected organometallic systems. There are 47 selected literature references, mostly through 1979.

It is evident from this volume that such regularly continuing series as this one in a broad area like NMR provide a useful introduction to particular topics in the field to novices and generalists, but are usually less valuable to experts by virtue of their limited coverage and generally outdated references.

Peter J. Stang, *The University of Utah*

Advances in Chemical Physics. Volume 48. Edited by I. Prigogine and Stuart A. Rice. Wiley-Interscience, New York. 1981. viii + 549 pp. $65.00.

This volume continues the series' traditions of excellence in the presentation of important results in the field of chemical physics. In this volume, Herman, Freed, and Yeager discuss the use of the equations of motion method in the calculation of electron ionization potentials and electron affinities. Kapral reviews recent results on the description of chemical reaction rates, including the consequences of describing the solvent on a molecular rather than a continuum level. Steel, Patey, and Hoye discuss the calculation of the dielectric constants of fluids. While nominally a review, many of their results are actually new, and not available elsewhere. Vrij, Joosten, and Fijnaut discuss the intensity and quasi-elastic spectrum of light scattered by thin films, and their interpretation in terms of surface tensions, shear viscosities, and other properties of the materials. Angell, Clarke, and Woodcock discuss the relation between glass formation and the interatomic potentials. The primary emphasis is on computer experiments, in which the cooling rates used to induce glass formation are of necessity very high. Finally, Grest and Cohen discuss experiment and theory on glass transitions in terms of a free volume model.

George D. J. Phillies, *University of Michigan*

ACS Symposium Series. Volume 119. Stereochemistry of Optically Active Transition Metal Compounds. Edited by B. E. Douglas (University of Pittsburgh) and Y. Saito (University of Tokyo). American Chemical Society, Washington, DC. 1980. x + 446 pp. $38.50.

The first joint ACS/CSJ Chemical Congress held in Hawaii in 1979 provided the opportunity for scientists from the Pacific region to meet in a number of specialist symposia. Considering the major contributions that have been made to Inorganic Stereochemistry by researchers from the USA, Japan, and Australia, it was appropriate that this subject should have been chosen as one of these symposia. Professors Douglas and Saito, who initiated and organized the symposium, are to be congratulated for successfully bringing to print the papers that were presented.

John C. Bailar, Jr., a pioneer in the field who was honored at the Congress in observance of his 75th birthday, has contributed a personal account of his research in the area over nearly 50 years. It provides a valuable insight into the development of the field, and especially into the aspects of Bailar's own work that gave him most pleasure.

The study of the absolute configuration of octahedral coordination compounds has advanced rapidly over the past 2 decades, owing largely to the application of X-ray diffraction and circular dichroism spectroscopy. The successful applications of the second technique have relied to a large degree on the results of the X-ray structural studies by Yoshihiko Saito, and his students and colleagues from Japan. Saito, who was the first to apply anomalous scattering of X-rays to the determination of the absolute configuration of a transition metal complex in 1954, summarizes in Chapter 2 the results of the X-ray studies for metetal–amine complexes with special emphasis on the conformations of chelate rings and interprets the circular dichroism spectra of the complexes in terms of the observed structures. This is a particularly valuable contribution to the field. Toward the end of Chapter 2 he reports on his new areas of interest, the electron-density distribution in D_3 complexes, and a structural study of asymmetric hydrogenation.

The applications of circular dichroism to inorganic stereochemistry have been severely handicapped by the lack of a theoretical model that has been at the same time sufficiently rigorous to yield meaningful results and sufficiently well presented to be intelligible to the practicing stereochemist. In recent years two theoreticians have been particularly successful in overcoming this problem and both have contributed chapters in this volume: Fred Richardson on Circular Dichroic Intensities in the Vibronic Transitions of Chiral Metal Complexes, and Eddie Schipper on

Stereochemical Correlations on the Circular Dichroism of d-d and Charge-Transfer Transitions: Applications to Tris(bidentate) Complexes.

There are two chapters dealing with olefin complexes; one includes a discussion of stereoselective olefin exchange and the other is on asymmetric hydrogenation. Sargeson has contributed a fascinating chapter on chirality induction in reactions of cobalt(III) complexes, and Saburi and co-workers describe the stereoselective synthesis of quadridentate ligands. Two further chapters on chiral interactions discuss the Pfeiffer Effect and the resolution of some neutral complexes.

There are a number of papers on the circular dichroism spectra of cobalt(III) complexes including a description of the circular dichroism induced by the chiral arrangement of unidentate ligands and a report on the effect of solvent on the spectra. There are also two particularly interesting papers on bioinorganic topics: The Stereochemistry of Microbial Iron Transport Compounds and Circular Dichroism as a Probe of Metal Ion Interaction with Azoproteins. The book is completed by chapters on the tris(diimine)iron(II)/cyanide inversion reaction, photoacoustic detection of natural circular dichroism, and steroechemical description and notation.

This is certainly an important collection of papers for the inorganic stereochemist. However, because of the general importance of some of the topics covered, the book should also be of interest to a wider audience.

Clifford J. Hawkins, *University of Queensland*

An Introduction to Atomic Absorption Spectroscopy—A Self-Teaching Approach. By L. Ebdon (Plymouth Polytechnic). John Wiley & Sons, Inc., New York. 1981. xiii + 138 pp. $21.95.

Since its introduction as an analytical technique in the mid-1950's by Alan Walsh in Australia and, independently, by C. Th. J. Alkemade in the Netherlands, atomic absorption spectroscopy (AAS) has become one of the preferred routine methods of trace analysis. The advent of AAS has led to a resurgence of research interest in atomic spectroscopic methods of analysis in general, and has ultimately led to the development of a variety of complementary trace analytical methods including atomic fluorescence, atomic emission with the induction-coupled plasma, and atomic absorption by electrothermal atomization. As a consequence of these developments, a substantial research literature has arisen around this area. Being rather specialized, it is often difficult for the nonspecialist interested in applying atomic spectroscopy to a particular problem to gain sufficient background in the area in a short time to be able to read the original literature.

This short paperback text is based on the author's successful teaching program in the United Kingdom, and is designed as a self-teaching approach to gaining a practical and theoretical appreciation for the most recent developments in analytical atomic spectroscopy (not just atomic absorption). Because little prior knowledge is assumed, the book is ideal as an introduction for undergraduate students and laboratory personnel in industrial settings who might wish to use analytical atomic spectroscopy for problem solving. Review questions are included at the end of each section to aid the student in mastering the material. At the end of the book, there is a selected bibliography for further reading, a set of comprehensive review questions, and a series of laboratory exercises designed to provide the student with actual laboratory experience. The text is well written in a succinct style and is free of serious technical errors. It can easily be read over a weekend.

Kenneth W. Busch, *Baylor University*

Advances in X-Ray Spectroscopy. Edited by C. Bonnelle (Universite' Pierre et Marie Curie) and C. Mande (Nagpur University). Pergamon Press, Inc., New York. 1982. XIV + 466 pp. $80.

X-ray spectroscopy experienced something of a resurgence in the seventies, leading, with the increasing availability of synchrotron sources, to a blossoming in the eighties. This volume, then, is a timely contribution. It consists of 24 articles divided into four parts: the study of atomic structure, the determination of the electronic structure of solids, methods of obtaining new types of information from X-ray spectroscopy, and spectroscopy techniques. The articles, all in English, are generally of a very high standard, consisting of both traditional and review articles, with a smaller number of expanded original contributions.

X-ray spectroscopy overlaps areas in atomic, molecular, solid-state, and nuclear physics. The articles in the book reflect this overlap well. The field is defined by the experiment, and for the diverse experiments that are carried out there exists a range of spectrometers and other X-ray optical devices. Partly because of this there has not been an influx of commercially made spectrometers into the field, and experimentalists tend to be instrument oriented. Again, the contents of the book reflect this feature of the field. In mirroring the field the volume ably serves the purpose of the contributors, to honor Professor Y. Cauchois, who for 50 years has been a leader in X-ray spectroscopy.

For readers currently in this field I recommend the book. It provides a clear window to most aspects of the field, and is an excellent source, containing about 1000 references. The book may be profitable reading to people outside of the field, also. With synchrotron sources come UV and X-ray spectrometers, available to an ever increasing number of researchers. The once formidable barrier of instrumentation is being removed. If you are involved with structure determinations, or adsorption, or catalysis the chapter on EXAFS would be of particular interest. Likewise, if you study the electronic structure of gases or solids, X-ray spectroscopy has something to say to you. In these areas the chapters of the book serve as timely introductions.

P. E. Best, *University of Connecticut*

Nucleotide Analogs: Synthesis and Biological Function. By K. H. Scheit (Max-Planck-Institute for Biophysical Chemistry, Göttingen). John Wiley & Sons, New York, NY. 1980. xi + 288 pp. $29.50.

This book is a comprehensive treatment on the chemistry, synthesis, and application of nucleotide analogs in the study of biological systems. Both biochemists and bio-roganic chemists working in the field of nucleic acid chemistry will discover this book an indispensable desk reference for new insights into their research objectives. While biochemists would benefit from the data that contribute to the understanding of structure–activity relationships of nucleotide analogs, the organic chemists should appreciate the rationale behind the synthesis of such analogs.

The treatment is largely descriptive and occasionally critical. The organization is well-balanced and the presentation is uniformly succinct. The book is divided into seven chapters: Chemical Structure of Nucleotides, which describes the electronic structure of heterocyclic bases and the conformation of nucleosides; Nucleotides with Modified Heterocyclic Substituents, which describes topics such as substitution at ring-nitrogen atoms and exocyclic functional groups, introduction of exocyclic substituents, ring analogs of purine, and pyrimidine nucleotides; Nucleotides with Uncommon Glycosidic Bonds, which describes abnormal molecules such as *N*(3)-phosphoribosyl adenines and C(5)-phosphoribosyl uracils; Nucleotides with Modified Phosphate Groups, which describes the nucleotides with altered P–O–P and P–O–C bonds, thiophosphate analogs, nucleoside phosphites, and phosphonates; Nucleotides and Altered Sugar Parts, which describeds analogs such as arabino-, xylo-, and lyxonucleotides, unnatural enantiomeric and anomeric forms, substitution of ribose moieties, and aliphatic analogs of nucleotides; Methods of Phosphorylation, which provides useful reference on the phosphorylation procedures developed after the comprehensive reviews on this subject by Khorana and Michelson in the early 60's (this chapter is subdivided into Synthesis of Phosphate Esters and Synthesis of Nucleoside Phosphates); the final chapter is titled Reactived Derivatives of Nucleotides, and reviews the chemical procedures employed in the preparation of reactive nucleotide derivatives, the chemical reactions which those species can undergo, and their application.

The major drawback of this book is its unusually large number of typographical errors which, in some cases, may even lead to misinterpretations. For example, the structures of theophyllin (**256**) and its corresponding ribotide (**257**) (page 71) are erroneous: the two methyl groups should be attached to the ring nitrogens instead of carbons. On page 72, lines 7, 11, and 14, the word "cyanoethylene" should read "cyanoacetylene". On page 42, line 12, the word "ester" should read "ortho ester". On page 27, the structures **58** and **64** should follow structures **55**, **56**, **57** → **58**, **59**, **60** and **42** → **63**. On page 56, line 2 the phrase "hydrolysis of **194**" should read "hydrolysis of **193**". On page viii, line 7 from bottom, "N. N. Leonard" should read "N. J. Leonard". On page 20, third paragraph, and page 216, the corresponding reference number 26, the word "Pollack" has been spelled two different ways. Also, throughout the entire book, the letter "J" has been employed for the letter "I", and a lot of structures have their single and double bonds missing.

In all, except for the large number of typographical errors, this is a good book with an urging appeal for any organic and biochemists working in the field of nucleic acid chemistry.

Ramachandra S. Hosmane, *University of Maryland Baltimore County*

Multifunctional Proteins. Edited by H. Bisswanger and E. Schmincke-Ott (Universität Tübingen). John Wiley and Sons, New York. 1980. x + 333 pp. $33.50.

The editors definition of a multifunctional protein is one that carries "on one polypeptide chain two or more virtually autonomous functions that in principle are measurable or occur independently of one another". They have assembled 11 chapters contributed by themselves and 16 collaborators. The subjects are mostly related to enzymes, but include toxins, antibodies, etc. The chapter by the editors is an introduction and review, and includes a tabular list of multifunctional proteins that is 8 pages long; the fused functions for each are identified, and references are given. There is also a smaller list of proteins with gene duplications. A

pocket on the back cover contains two large, folded charts of complementation patterns of *fas* mutants, belonging to the chapter on Fatty Acid Synthetase Complexes. The book is adequately indexed. References as late as 1979 are cited.

Handbooks and Tables in Science and Technology. Second Edition. Edited by R. H. Powell. Oryx Press, Phoenix, AZ. 1983. 297 pp. $55.00.

This is a compilation of information about handbooks designed to help the reader select those that best meet his needs. It includes entries on 3403 handbooks in the fundamental sciences and in engineering and medicine. The handbooks are arranged in alphabetical order, with full bibliographical details, including published price, and a descriptive paragraph. To facilitate finding the right handbook, there are three indexes. One is a subject index that is described as "an enriched keyword index"; it is extensive and has many cross references. There are also indexes of authors/editors and of publishers; the latter includes full mailing addresses. The overwhelming majority of handbooks listed are in English, but some are in German, French, or Russian. Handbooks published by universities and government agencies are included. The libraries that acquire this book are likely to receive a rush of requests to order new handbooks that the library users were originally unaware of.

The Natural Geochemistry of Our Environment. By D. H. Speidel (City University of New York) and A. F. Agnew (Congressional Research Service). Westview Press, Boulder, CO. 1982. xv + 214 pp. $25.00.

The purpose of this volume is to provide an overview of natural biogeochemical cycles at the earth's surface. The authors have synthesized a review of an impressive amount of literature through 1980. Emphasis is placed on natural fluxes and reservoirs of materials, as a prerequisite for a proper understanding of man-made perturbations.

Organization of the book is into sections on Water, Geochemical Movement, the Soil Reservoir, the Ocean Reservoir, Biota and the Biosphere, and Geochemical Cycles Revisited. The accent is on distributions and fluxes of elements in and among the major environments, rather than mechanisms of geochemical reactions. Welcome emphases are placed on the flow of water, as the principal agent for geochemical flux, and the intensity of biological activities, as extremely important agents for geochemical transformations. Fundamentals of the sciences underlying each of the sections are presented in a manner which integrates nicely with the theme of the book.

In a book of this size, it is obviously unreasonable to expect detailed coverage of each subject discussed, but the authors have done a fine job of presenting major principles in a manner which will be understandable to nonspecialists and yet useful to workers in the field. The book is readily accessible to chemists, ecologists, engineers, and others, and will provide a useful entry to the literature for those not familiar with it. The book might well also serve in an undergraduate survey course in geochemistry or biogeochemistry.

Lawrence M. Mayer, *University of Maine at Orono*

Biodegradation of Pesticides. Edited by Fumio Matsumura (Michigan State University) and C. R. Krishna Murti (Industrial Toxicology Research Centre, Lucknow, India). Plenum Publishing Corp., New York, NY. 1982. xiv + 312 pp. $39.50.

The purpose of this text, which also refers to herbicides and fungicides, is stated in the preface:

"Since the subject of pesticide degradation is complex ... we have attempted to summarize current knowledge of ... pesticide degradation, presenting scientific principles as well as describing their practical applications. Our intended audience comprises those who develop new pesticides, who assess their environmental hazards, or who regulate their use."

However, the text is introductory in nature, and therefore would have limited utility for those who develop new pesticides. Instead, I would add to their intended audience those who use these compounds (e.g., those in governmental agencies, particularly at a local level) and have some background in organic chemistry and biology, but who are new to the field of biocide application.

The text is divided into two parts. Part I introduces principles and mechanisms of biodegradation in three chapters on metabolism in animals, plants, and microorganisms. However, biodegradation by microoranisms can itself be the subject of an entire text. A chapter of 18 pages can only provide the briefest introduction to this subject, as the author clearly states. Part II (consisting of seven additional chapters) presents largely empirical information on biodegradation related to the application of pesticides, herbicides, and fungicides to agriculture, forestry, disease control, and preservation of food stores. Separation of these two parts is not always distinct, as might be expected.

As with any collection of papers, the quality of individual chapters depends heavily on their respective authors, and some have done a more thorough job than others. Nevertheless, the chapters are generally well written, and contain fairly extensive reference lists.

Gordon Lewandowski, *New Jersey Institute of Technology*

The Force Concept in Chemistry. Edited by B. M. Deb (Indian Institute of Technology). Van Nostrand-Reinhold, New York. 1981. xv + 502 pp. $35.00.

Before starting this review, it is perhaps necessary to tell the reader that this book only breifly deals with intermolecular forces and does not deal with pushing atoms, molecules, or even arrows. Rather, it deals almost exclusively with the concept of electrostatic forces in and on atoms and molecules as a manifestation of the Hellmann–Feynman theorem:

$$\frac{\partial E}{\partial \sigma} = \frac{\langle \psi | \partial \hat{H} / \partial \sigma | \psi \rangle}{\langle \psi | \psi \rangle}$$

Should the reader not understand the aforementioned expression, then this book is not for him/her despite the importance of the contents to the general chemical community. Proceeding now for those that are "adequately" knowledgable in current chemical theory, this book is a collection of nine highly documented chapters written by international experts. Both formal theory (e.g., perturbation theory and density matrices) and more qualitative models (e.g., for the prediction of molecular structure and reactivity) are included. As such, this book is highly recommended reading and, indeed, could be profitably used as a textbook in a second graduate course in quantum chemistry.

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

Crown Compounds, Their Characteristics and Applications. Studies in Organic Chemistry. Volume 12. By Michio Hiraoka (Nippon Soda Co., Ltd.). Elsevier Scientific Publishing Co., Amsterdam and New York. 1982. xi + 275 pp. $83.75.

Dr. Hiraoka's book on crowns and crown compounds was first published in Japanese in 1978, and this current effort is both a translation and an updating of that volume. The updating is minimal, and only a very small portion of the extensive documentation comes from post-1977 publications. The contents are nonetheless quite engaging, and Dr. Hiraoka is to be congratulated for this important addition to the literature of crowns and crown compounds.

After a brief introductory chapter (16 pages, 50 references), we come upon chapters about synthesis and properties of crown compounds (50 pages, 187 references), characteristics of crown compounds (84 pages, 297 references), applications of crown compounds (63 pages, 290 references), optically active crown compounds (25 pages, 71 references), polymeric crown compounds and immobilized crown compounds (24 pages, 64 references), and toxicity of crown compounds and handling precautions (8 pages, 16 references). A goodly number of the references are work originally reported in Japanese, much of which is unique and hithertofore unincorporated in reviews in English. The text includes not only wide-ranging compilations of data but also interpretation and comparison of sets of findings. A rather strange system is used for numbering compounds for easier reference, with constant backpedalling to Figure 1.3 becoming necessary.

I am really bubbling with ideas after reading the book, and Chapter 4 ("applications") is noteworthy as especially stimulating to me. I do have one small suggestion, though: can we all agree to call the free crowns "crowns", and their reaction products with viz. salts "crown compounds"? Such usage just might avoid some small amount of confusion.

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

Modern Quantum Chemistry: Introduction to Advanced Electronic Structure Theory. By Attila Szabo (Laboratory of Chemical Physics, National Institutes of Health) and Neil S. Ostlund (Department of Computer Science, University of Waterloo). MacMillan Co., New York. 1982. xvi + 446 pp. $39.95.

This is a graduate textbook concentrating exclusively and in depth on the topic indicated by the subtitle. The text, carefully constructed and clearly written, offers an excellent entrance to the subject. The focus of this book is purposefully narrow, treating molecular electronic structure within the Born–Oppenheimer approximation by the use of basis set expansion methods. The necessary equations and integrals are not shirked; we see them in full glory. After a fast-paced mathematical review of matrix properties, the formalism for electronic wave functions is developed. This is followed by a detailed (>120 pages) development of the Hartree–Fock approximation, through to the unrestricted open-shell case. An introduction to CI is presented beginning from an elementary level, with due regard for the computational limitations. The final three chapters discuss other approaches to the correlation problem:

pair theories, many-body perturbation theories, and Green's function approaches.

Since there is no discussion of formal quantum mechanical principles, a previous course providing a strong background is essential. Among the strengths of the text are the many exercises embedded in each chapter and a consistent notation. Also, two examples, H_2 and HeH^+, are treated throughout; this technique should help students in developing an ability to assess the strengths and weaknesses of different approaches. Second quantization and diagrammatic techniques are developed in optional sections in a manner which makes them accessible. More extensive references would have added to the value of the book; for example, though Slater determinants are well presented, no reference to any of his work is given. And granting the narrow focus, some further cognizance of alternate approaches to and especially applications of molecular electronic structures would be beneficial. Although not a review, the book is sufficiently detailed and encompassing to prove valuable to workers interested in the field of structure calculations. As a text, it serves well to fill a long-standing gap for an advanced text.

S. K. Knudson, *College of William and Mary*

Wilson and Wilson's Comprehensive Analytical Chemistry. Volume XVI. Chemical Microscopy. By H.-H. Emons (Bergakademie Freiberg) and H. Keune and H.-H. Seyfarth (Pädagogische Hochschule "Dr. Theodor Neubauer"); **Thermomicroscopy of Organic Compounds.** By M. Kuhnert-Brandstatter (Institut fur Pharmakognosie der Universität, Innsbruck). Series editor: G. Svehla. Elsevier Scientific Publishing Co., Amsterdam and New York. 1982. 513 pp. $151.00.

Chemical microscopy is a technique which has been somewhat neglected in the arsenal of analytical instrumentation. Many chemists have had so little exposure to this technique that its application to the solution of many and varied problems is seldom considered. Only when an intractable problem such as the identification of specific crystalline forms of asbestos in a mixture of other fibers arises is microscopy used. The fact that microscopy requires a considerable amount of practice to develop facility may be part of the problem.

This book is a compendium which should enable the analyst to determine whether chemical microscopy is a useful tool in the solution of the problem at hand. The first section begins with a glossary of microscopical terms, and a brief introduction of the fundamentals of crystal optics. Following chapters include a survey of available instrumentation, sample preparation methods, and the measurement of such physical properties as refractive index, birefringence, and optical activity, as well as grain size and shape.

The applications of microscopy to the characterization of polymeric films and fibers, to defects in crystals, and to epitaxial growth of crystals are of interest to the material scientist. The second section of the book treats these topics as well as the use of hot and cold stages to determine melting points, molecular weights, and phase diagrams of organic materials. The microscopic examination of liquid crystals is also covered.

While the methods discussed are generalized for applicability to many situations, there are extensive references to the literature for those who wish to find more details. The majority of references are in German journals, reflecting the German-speaking authors, but, with approximately 200 references at the end of each chapter, finding further information on any particular technique should not be a problem.

Barbara B. Kebbekus, *New Jersey Institute of Technology*

Wilson and Wilson's Comprehensive Analytical Chemistry. Volume XVII. Gas and Liquid Analyzers. By Jaroslav Vana (Research Institute for Organic Syntheses, Pardubice, Czechoslovakia). Series editor: G. Svehla. Elsevier Scientific Publishing Co., Amsterdam and New York. 1982. 742 pp. $170.25.

The demands of modern industry for continuous information on the composition of a variety of feed, product, and waste streams has stimulated the development of automated analytical instruments. This book covers, in detail, the theory and practical applications of a wide variety of such analyzers. Unfortunately, many of the instruments discussed will be unfamiliar to American readers, since most are of Eastern European manufacture.

The methods covered range from density, refractive index, and thermal conductivity measurements to more complex chromatographic and spectroscopic instruments. The theoretical background needed to understand each method is covered thoroughly, but an inordinate amount of space is given to methods and instruments which are clearly outdated. The field of instrumental analysis has moved so fast in the past decade that a chapter on chromatography, for example, in which most of the references date from the mid-1970's and earlier, is bound to be less than state-of-the-art. Mechanical signal integrators are described in detail, while digital electronic integrators are mentioned in a sentence.

Calibration systems for gas analyzers are discussed, as are the errors which are likely to arise in the use of these instruments. The application of automated analyzers to environmental measurements is also covered.

This book should serve as a useful reference for those interested in the history, principles, and applications of automatic analyzers, if the limitations noted here are kept in mind.

Barbara B. Kebbekus, *New Jersey Institute of Technology*

Books on Biological or Medical Subjects of Interest to Chemists

Human Subjects Research. Edited by Robert A. Greenwald, Mary Kay Ryan, and James E. Mulvihill. Plenum Press, New York and London. 1982. xxiv + 291 pp. $49.50.

Subtitled "A Handbook for Institutional Review Boards". Contains 16 contributed chapters, appendices, and a brief subject index.

Adverse Effects of Foods. Edited by E. F. Patrice Jelliffe and Derrick B. Jelliffe. Plenum Press, New York and London. 1982. xv + 614 pp. $65.00.

Contains 46 contributed chapters, an Overview by the editors, and a subject index.

Cancer Epidemiology and Prevention. Edited by David Shottenfeld and Joseph F. Fraumeni, Jr. W. B. Saunders Company, Philadelphia. 1982. xxiv + 1173 pp. $98.00.

Consists of seventy chapters by a large number of contributors.

Critical Issues in Setting Radiation Dose Limits. NCRP Publications, Bethesda, MD. 1982. 287 pp. $15.00.

Proceedings of a symposium held in 1981 at the National Academy of Sciences.

Texts on Introductory Chemistry

An Introduction to Organic Chemistry. By Hugh J. Williams. John Wiley and Sons, New York. 1982. xiv + 302 pp. $22.95.

General, Organic, and Biological Chemistry; Foundations of Life. By Dorothy M. Feigl and John W. Hill. Burgess Publishing Co., Minneapolis. 1983. xiv + 383 pp. $21.95.

Qualitative Inorganic Analysis. By Theodore L. Brown and H. Eugene LeMay, Jr. Prentice-Hall, Inc., Englewood Cliffs, N.J. 1983. x + 144 pp. $4.95.

Chemistry for Health-Related Sciences: Concepts and Correlations. Second Edition. By Curtis T. Sears and Conrad L. Stanitski. Prentice-Hall, Inc., Englewood Cliffs, N.J. 1983. xix + 540 pp. $26.95.

Fundamentals of Organic Chemistry. By Herman G. Richey, Jr. Prentice-Hall, Inc., Englewood Cliffs, N.J. 1983. xvi + 408 pp.

Chemistry and Our Changing World. By Alan Sherman and Sharon J. Sherman. Prentice-Hall, Inc., Englewood Cliffs, N.J. 1983. xxiii + 568 pp. $23.95.