Book Reviews*

Molecular Biophysics of the Extracellular Matrix. Edited by S. Arnott (Purdue University), D. A. Rees (National Institute for Medical Research, London), and E. R. Morris (National Institute for Medical Research, London). The Humana Press, Inc.: Clifton, NJ. 1984. xii + 189 pp. $39.50. ISBN 0-89603-051-2.

The extracellular matrix is a field that has attracted scientists from a broad range of disciplines. This book addresses one extreme of this broad range, dealing only with the glycosaminoglycans and their proteoglycans and focusing on the information derived from physical chemical measurements on the conformations and interactions of these macromolecules. It is an aspect that those of us who are less physically inclined can ill afford to overlook, especially since some of these glycosaminoglycans appear to be emerging as structures which play more than a structural role in cell–cell interactions and development. Basically, this book shows that hyaluronic acid, the chondroitin sulfates, dermatan sulfate, and heparan sulfate assume monomeric and aggregate conformations that can, in part, be rationalized in terms of their monosaccharide conformations, their sites and degrees of sulfation, and the compositions (metal ions, collagen, etc.) of their surroundings. A critical view of the current state of the art in the use of X-ray diffraction, NMR, light scattering, viscosity, etc., in the studies of these polymers is also presented.

In the first chapter, Hardingham presents the structures of proteoglycans found in cartilage and a survey of the present knowledge concerning secretion and aggregation of these molecules, setting the stage for some of the later discussions of the conformations and biological roles of these polymers. In Chapter 2 Phelps discusses the dilute solution properties of glycosaminoglycans and proteoglycans and attempts to correlate their hydrodynamic properties, measured at the concentrations in which they are found in tissues, with their biological roles. It is a delightful chapter, which describes the current state of the art while lamenting the shortcomings of the methodlogy and the meager information yield for the effort that has been expended. The primary emphasis is on hyaluronate, the simplest of the glycosaminoglycans, which at extreme dilution appears to be a free-coiling molecule with some restraints on total freedom of rotation. A survey of the data concerning heparin and cartilage proteoglycans is also presented, but the conclusion here is that, although some conformation information is obtained, there are many obstacles that must be addressed by both old and new methodology in order to obtain data that can yield molecular size and structure information.

Chapter 3, by Arnott and Mitra, describes more encouraging results from the X-ray diffraction analyses of GAG's. Of the methods described in this book, this one has generated more data of potential biological importance than the others. The procedures, validity, and limitations of X-ray diffraction, and the polymorphic helical conformations deduced for fibrous forms of hyaluronic acid, the chondroitin sulfates, dermatan sulfate, and keratan sulfate are discussed, along with the factors that control the stabilities of their mono- and divalent salt conformations. In Chapter 4, Casu discusses the applications of spectroscopic methods, with emphasis on ^1H and ^{13}C NMR, the most informative of these methods, in the assignments of ring conformations. The methodologies are described and illustrated. Primary, but not exclusive, emphasis is placed on the L-iduronic acid containing polymers and the effects of sulfation, salt forms, and carboxyl ionization on the ring conformations of these residues. Fransson, Cöster, Nieduzynski, Phelps, and Sheehan in Chapter 5 describe studies which show the self-association of glycosaminoglycan chains. The theme of this chapter is that self-association is a property of dermatan sulfate and heparan sulfate chains in which there are alternating blocks of sequences enriched first in iduronic acid and then in glucuronic acid. The most compelling data showing aggregate formation are the light scattering data, which, to date, are relatively limited. The chapter does not deal with validity and limitations of the methodology, and the available data do not yield any physical picture of the aggregated structures. The last 5 pages of this chapter describe some preliminary data on proteodermatan sulfate which are incomplete and which contribute nothing to the theme of this chapter.

The last full chapter, by Preston, Laurent, and Comper, deals with transport of molecules through solutions of connective tissue polysaccharide solutions. This chapter is largely a theoretical treatment of data derived from model systems involving dextran solutions. It deals with questions of great importance for biologists, but few physical pictures emerge for the non-theoretist. As the authors note, "there is a paucity of data concerning the transport properties of connective tissues polysaccharides". There is an interesting discussion of a newly discovered microscopic convective flow of polymers in solutions of different densities, but there is no evidence, as yet, that this type of transport occurs in vivo. In the final short chapter, Rees summarizes and attempts to integrate the data on the physical properties of connective tissue polysaccharides and discusses the prospects for the future in this area. This book is a valuable contribution for all scientists interested in the conformations, the interactions, and the flow of proteoglycans in tissues. There are large gaps in the information available because there are too many glycosaminoglycans and not enough workers to address all of the questions that may be formulated concerning their physical properties. However, this book gives a good view of the current state of the field, and it whets the appetite for the further information that will be garnered in the future.

H. E. Conrad, *University of Illinois*

Sources and Applications of Ultraviolet Radiation. By Roger Phillips (Metal Box plc, Research and Development Division). Academic Press Inc.: London. 1983. xvi + 440 pp. $60.00. ISBN 0-12-553880-4.

As stated in the preface, this book is intended for those involved in "the design, construction, purchase or operation of the "hardware" associated with applied photochemistry". "Photochemical engineering" also seems an appropriate description. The author has assembled a large collection of material primarily on conventional ultraviolet light sources and their practical uses in laboratory or industrial processes. Numerous references are given to the primary literature (through 1982), and the text is replete with figures and tables.

Chapter 1 is an overview of the applications of ultraviolet light, especially from an industrial viewpoint (i.e., photoresists, polymerization, sterilization, medical applications). This is followed by a brief chapter on fundamental physics of light and a more lengthy chapter (55 pages) on photochemistry, with a strong emphasis on photoinitiators and photopolymerization. Chapter 4 is a summary of radiometric methods, which includes chemical actinometers. This is succeeded by general chapters on incandescent and gas-discharge sources, and more detailed sections on low- and medium-pressure mercury lamps, metal halide lamps, electrodeless lamps, continuous and flashed xenon lamps, and lasers. Subsequent chapters concern miscellaneous sources (solar radiation, carbon arc, and deuterium lamps) and ultraviolet irradiators for driers, photolithography, and synthesis. An extensive list of references to design of photoreactors is given. The final chapter is a discussion on health hazards of ultraviolet light.

Depth of coverage necessarily varies with topic, but there always are many references to the primary literature. The chapter on lasers provides only a brief introduction, while those on technical aspects of mercury and xenon lamps are highly detailed, with information on lamp construction, circuit requirements, and spectral output. Throughout, industrial applications, especially photopolymerization, are stressed, and this book shall be most useful to those in this field. However, anyone who uses photochemistry in other than a very ordinary fashion may expect this to be a valuable reference. Academic photochemists (such as this reviewer) also will find it a good overview of how industry uses photochemical reactions.

Richard P. Johnson, *Iowa State University*

Microprocessor Programming and Applications for Scientists and Engineers. By R. R. Smardzewski (Surface Chemistry Branch, Naval Research Laboratory). Elsevier Science Publishers: Amsterdam and New York. 1984. xiv + 354 pp. $37.75. ISBN 0-444-42407-5.

This is a book which addresses a need for the fundamentals of microprocessors. The target microprocessor is the Mostek 6502, with the book more specifically utilizing the Aim 65 manufactured by Rockwell International as its teaching tool. The author also makes reference to the ability of using other popular microcomputers which utilize the 6502 microprocessor as their main CPU.

I generally found the book to be well written, it provides many well thought out and comprehensive examples as a teaching technique. I felt that the examples were exceedingly easy to follow and generally could be performed by anyone with the ability to read instructions. Additionally, the author provided the actual listing that would occur on the particular microcomputer and an explanation of the experiment with reference to the particular point that was being made. After the brief

*Unsigned book reviews are by the Book Review Editor.

introduction, the book is quite comprehensive in explaining the Aim 65 and its microprocessor.

I do have three minor criticisms of the text, and I wish to discuss them below.

(1) I believe that the introduction is much too brief. The author states that the person utilizing this book requires no prior background in computer science or programming; however, it does introduce many terms in the first and second chapters. Although they are generally well explained, a first-time user may have trouble with the terminology. I believe this suggestion should be tempered with several observations. There are introductory texts which more than adequately cover this subject. I, additionally, feel that this may not be an important point, since most people do have a familiarity with the language of the computer environment.

(2) I have one other small comment. This is in regards to the use of the off-print sheets from Rockwell beginning on page 283. I do not see where they are specifically addressed with either a trademark or copyright, and I am wondering if that is necessary.

(3) The final criticism I have is that poor printing detracts somewhat from the excellent organization and presentation of this text. There is, in my copy, a marked variability in the actual print of the text. Some pages appear quite light while others are quite dark. This is annoying, and in some areas the actual print is quite easy to see from the subsequent page. One of the worst pages in my text is on page 47 where a collector is demonstrated, and on this page the ink is so dark the actual terms cannot be easily read. I do not known if this is a solvable problem, but it unfortunately does detract from an easy-to-understand book.

I feel that this is an excellent text and would be a useful book for a syllabus in a beginning microprocessor course.

P. R. Foulis, *Huron Road Hospital, Cleveland*

The Biochemical Mode of Action of Pesticides. Second Edition. By J. R. Corbett, K. Wright, and A. C. Baillie (FBC Limited, Chesterford Park Research Station). Academic Press Inc.: London. 1984. ix + 382 pp. $59/£35. ISBN 0-12-187860-0.

The earlier edition of this text proved its worth in both classroom and laboratory settings. The present edition should be of equal importance and is as up to date as any text can be in such a fast-moving field. In spite of the proliferation of knowledge in pesticide mode of action, the second edition is only about 20 percent longer, illustrating the careful job the authors have done in selecting important information. Even in areas which have not changed significantly since the first edition, such as the chapter on compounds interfering with respiration, the text has been extensively revised and streamlined.

Chapters are arranged based upon the proposed mechanism of action. Thus, the herbicides disrupting cellulose synthesis, the polyoxin fungicides, and the acyl urea insecticides are treated together as pesticides interfering with polysaccharide synthesis. This arrangement is very logical for a biochemist, and a thorough subject index makes the text useful for quick reference to compound structures and properties as well. Each section briefly treats the major properties and uses of a compound class, although this is not the major purpose of the book. The authors attempt to cover all commercial compounds and provide lead references and occasionally an opinion even when the mechanism of action of a class of pesticides is not known. The surprisingly current bibliography appears carefully designed to reference classic papers, meaningful reviews, and recent manuscripts on important topics.

The book is coherent and easy to read, a feature which is all too uncommon in multiauthored volumes. Treatment of a subject in the text seems well balanced with available information on the mechanism of action of the compounds. This treatment in turn is usually associated with the economic importance of the pesticide, although the authors point out that such a balance was not a primary goal.

The solid treatment of acetylcholinesterase inhibitors was one of the strengths of the previous edition, and chapter 3 has been updated to provide an excellent presentation of this often confusing subject. The emphasis given this subject is warranted as a detailed knowledge of enzymology becomes of greater utility in understanding the biochemical mode of action of many compound classes.

I found the greatly expanded concluding chapter the most interesting and probably of the greatest value to students of pesticide toxicology. Here the authors present a glimpse of how new compounds are discovered now, possible paradigms to be applied in the future, as well as approaches to the elucidation of biochemical mechanisms of action. The authors conclude that to date no compound has been developed based exclusively upon knowledge of a biochemical process. It will be interesting to see if the increasing number of interdisciplinary teams now at work in the field can alter this observation by the time the third edition is published. The intensity of effort now directed at elucidating and exploiting new targets for pesticide development indicates that this concise review of the biochemical mode of action of pesticides as well as the research approaches and philosophies presented in this text will be valuable and hopefully an inspiration to the scientists involved. Possibly the research approaches reviewed here will aid in the development of new compound classes based upon knowledge of a biochemical mode of action.

Bruce D. Hammock, *University of California, Davis*

Macromolecular Chemistry. A Specialist Periodical Report. Volume 3. Edited by A. D. Jenkins (University of Sussex) and J. F. Kennedy (University of Birmingham). The Royal Society of Chemistry: London. 1984. xix + 452 pp. £98.00. ISBN 0-85186-876-2.

In the present volume of this ongoing series, 32 Reporters and the 2 Senior Reporters designated above, experts all, summarize recent progress in a vast array of topics comprising polymerization; natural polymers and inorganic polymers; chain configuration; application of NMR, neutron scattering, classical physicochemical, and computer techniques; crystallization; thermodynamics; polymer reaction and polymer degradation; engineering, technological, and biomedical applications; and photochemistry. These topics are well organized into 19 separate chapters, some of which are appropriately divided into more or less independent subsections. The period covered is the calendar years 1981 and 1982.

As in previous volumes, the aim is to cover a vast literature and to select and collate rather than to evaluate or criticize. However, selection is, of course, inherently evaluative. On the whole, the searches have been done thoroughly. A given chapter, even in one's own subspecialty, is almost certain to turn up a reference one has missed. A real service has thus been performed. The initial part of most articles includes a characterization of recent review articles in that subspecialty, so a naive reader can find guidance on where to begin to acquire an insider's grasp. There are also many source tables of relevant data and even cited sources of source tables, which will be of great help to practitioners in these fields. The coverage of polymerization is particularly thorough, constituting almost a fourth of the volume.

Of course, reviewers need to look gift horses in the mouth. Three points might be made. Firstly, readers whose primary interest is in biopolymers may feel slighted. Only two chapters, Polysaccharides & Glycoproteins and Nucleic Acids, are included, occupying a mere 10% of the total space. Furthermore, it might justly be argued that a biennial report can ill afford to omit the subject of proteins in any given volume; the subject is too large, too significant, and too fast-moving. After all, by the time it is in the reader's hands, a report may deal with work as many as 4 years old, even if a subject is reviewed in every issue.

Secondly it is, of course, impossible to summarize complex work, sometimes in a single sentence, without erring in some finitie fraction of cases. It is only natural to assay success by examination of the citations for papers the reviewer has already read closely. In the present case, this subset of citations came from a variety of chapters. The upshot from that sample is that the fraction of papers that have been misleadingly epitomized or even totally misconstrued is disquietingly large. It may be time for senior staff members to take a hard look at their methods of quality control.

Thirdly, although most of the volume is tightly organized, Chapter 13 is a bit of a muddle. This chapter is entitled Engineering and Technology and is in three parts, called respectively, I. Rheology, II. Engineering and Technology, and III. Electrical Properties. As if that were not enough, Part II contains a subsection called Rheology. Only devotees of Russell's Paradox will be amused.

Alfred Holtzer, *Washington University (St. Louis)*

Quantum Chemistry—The Development of *Ab Initio* Methods in Molecular Electronic Structure Theory. By Henry F. Schaeffer III. Clarendon Press: Oxford. University Press: Oxford and New York. 1984. vii + 144 pp. $29.95. ISBN 0-19-855183-5.

At first glance, this slim volume reminded me of the annotated lists of references found at the ends of chapters in certain physics texts. In his book, H. F. Schaefer, a leading researcher in quantum chemistry, has provided us with a bibliography of ab initio methods in molecular electronic structure theory which in his view represents the most important work in that field since 1928. As such, I was prepared to dislike this book, which appeared to consist of nothing more than references to 149 papers. However, despite its form and the obvious temptation to find fault with the author's choice of landmark papers, I did find the book fascinating and his selections "on target".

The term ab initio, which has come to mean that no approximations (such as neglect of certain integrals or the inclusion of experimental data) are used in determining a wave function which minimizes the total energy, first appeared in a paper coauthored by R. G. Parr with D. P. Craig and I. G. Ross (*J. Chem. Phys.*, **18**, 1561 (1950)). Here they were merely indicating that each group had done its calculations separately

and independently from the beginning. Schaefer points out that this kind of careful work on many-electron atoms and molecules had been going on since 1928, when D. R. Hartree introduced the self-consistent-field (SCF) equations and gave numerical solutions for certain atomic species. The same year E. A. Hylleraas introduced the idea of configuration interaction (CI), and in 1934 J. Frenkel has already included the notion of a multiconfigurational self-consistent-field (MCSCF) calculation in his text book on wave mechanics. The quantum version of perturbation theory was invented by Edwin Schrödinger in 1926 and reformulated into more convenient forms for many-particle systems by C. Moller and M. S. Plesset in 1934 and K. A. Breuckner in 1955. The book makes it clear that nothing fundamentally new in approach beyond these methods has been as well developed since those times. What has been new in the last 30 years has been the development of larger and/or more powerful computing machinery and the introduction of technically brilliant innovations aimed at increasing the speed of computation of integrals, retrieval of lists, and diagonalization of very large matrices. To say that Schaefer's book is a collection of brief essays concerning the discovery and implementation of these computational methods would not, however, do it justice. In addition, the book chronicles the rise and sometimes the fall of new computational ideas. For example, one is held in suspense about the ultimate fate of the independent electron pair approximation (IEPA) through a series of papers spanning ten years from its inception to its ultimate demise as a quantitative method. Other matters such as the linearity or nonlinearity of the methylene radical or the usefulness of SCF calculations in computing potential barriers to internal rotation are documented with their various twists and turns.

According to the author, the book is intended for graduate and postdoctoral students in quantum chemistry and also experimental chemists who use theory on occasion. Despite this, I felt at times that Schaefer had lost sight of his audience in that some of the essays give little hint to the novice about the contents of the paper being discussed. These occur mainly in the last quarter of the book and fortunately are in the minority. Perhaps a more serious criticism is his failure to make a stronger case in situ for the impact of ab initio calculations on discoveries in experimental chemistry. These are alluded to but never developed within the essays.

The book is "must" reading for students of molecular quantum theory. Although incomplete it is an excellent starting point for additional reading in the field. Experimentalists may find it less immediately useful but interesting none the less.

Bernard J. Laurenzi, *State University of New York at Albany*

Inorganic Syntheses. Volume 22. Edited by Smith L. Holt, Jr. (Oklahoma State University). John Wiley and Sons: New York. 1983. xviii + 278 pp. $42.50. ISBN 0-471-88887-7.

This volume of the annual series has a strong emphasis on the solid state. Included is an extensive section on the halides of the lanthanides and the early transition metals. Syntheses of a number of important oxides are reported, including a useful section of the preparation of zeolite molecular sieves. Two interesting contributions focus on techniques: the use of tantalum as a high-temperature container and skull melting methodology. Shorter chapters discuss syntheses of transition-metal complexes, various nontransition compounds, and organometallics. Noteworthy preparations would include the B_4^{2-} anion, the polymer $(SN)_x$, and the metal vapor synthesis of divanadium, V_2. The final chapter is on the compounds of boron and presents new or improved syntheses of a number of key boron compounds, including a simple synthesis of decaborane.

Joseph W. Lauher, *State University of New York*

Targets for the Design of Antiviral Agents. Edited by E. De Clercq (Catholic University of Leuven) and R. T. Walker (The University of Birmingham). Plenum Press: New York and London. 1984. xii + 378 pp. $57.50. ISBN 0-306-41618-2.

This book contains the review lectures presented at a joint NATO Advanced Study Institute and FEBS Advanced Study Course held at Les Arcs, France, June–July 1983. The editors stated that the aim of this course was for eminent virologists to identify possible targets of various classes of viruses against which the chemists could design suitable therapeutic agents.

Under the introduction section, Prusoff et al. give an extensive overview of the possible targets for viral chemotherapy. Specific examples of some 11 targets for which antiviral drugs have been demonstrated to exert an effect, or are potential targets for future drug development, are discussed. Under the Viral Targets section, the major classes of viruses responsible for a number of clinically important infections are covered by various authors who are experts in the subject matters. The virus classes covered include herpesviruses (HSV-1, HSV-2), picronaviruses and togaviruses, negative strand RNA viruses (excluding ortho- and paramyxoviruses), orthomyxoviruses, and unconventional viruses characterized by incubation periods of up to 10 or more years.

In the Antiviral Compounds section, several clinically used drugs and those showing promise under investigation are thoroughly discussed. The titles include the following: anti influenza virus activity of amantadine, rimantadine and analogs, by Oxford; antiviral action of 2-(α-hydroxybenzyl)benzimidazole, by Eggers; antirhinovirus drugs, by Tyrrell; pyrimidine nucleoside analogs, by De Clercq; purine nucleoside analogs, by Drach; oligonucleotides, by Torrence et al.; oligopeptides, by Choppin et al.; and virus associated DNA polymerizing activities: their role in designing antiviral and antitumor agents, by Chandra et al.

The Conclusion, subtitled Antiviral agents: why not a penicillin for viral infections?, is by Galasso. Strategies for antiviral agent development as well as FDA requirements for various phases of study from preclinical testing to IND and NDA are discussed.

This book serves as a source of very valuable information on the subject matters; therefore, it is highly recommended for any chemist or biologist involved in the research and development of antiviral agents. It is also a very useful key reference for any graduate student in biomedical disciplines interested in the biochemical mechanisms of viral replication, infection, and their control by various agents. Each review lecture is thoroughly referenced up to 1983.

Eric J. Lien, *University of Southern California*

Synthetic Membrane Processes. Fundamentals and Water Applications. Edited by Georges Belfort (Rensselaer Polytechnic Institute). Academic Press, Inc.: Orlando, FL. 1984. xiii + 552 pp. $72.50. ISBN 0-12-085480-5.

This 13-chapter volume by 14 contributing authors provides a comprehensive treatment of the chemical engineering aspects of membrane processes for the separation of aqueous systems. Each chapter is well written and well documented, with little repetition of material from chapter to chapter. The editor has done a fine job of unifying the style of presentation and more importantly the nomenclature and symbolism. The scope of the book has wisely been limited by omitting in-depth treatment of subjects, such as membrane material science, which have been dealt with recently elsewhere (*ACS Symp. Ser.* **No. 269**). Following a brief introductory chapter by the editor, chapters two through four provide detailed discussions of water structure in and near the membrane, membrane stability, and polarization in reverse osmosis, ultrafiltration, and electrodialysis. Chapter five deals with the mathematical modelling of fluid flow and solute distribution in membrane modules. Chapter six discusses electrodialysis membranes and mass transport within such membranes. A similar treatment of mass transport in reverse osmosis and ultrafiltration membranes would have been a welcome addition to the book. Following these more fundamental chapters, the next three chapters summarize practical experiences at large-scale installations in America, Europe, and Japan. The contents of these three chapters demonstrate the wide applicability of membrane separation processes. The design, operation, and maintenance of reverse osmosis, ultrafiltration, and electrodialysis plants for wastewater reclamation and desalting are discussed in Chapters 10 and 11. The economics of desalting and wastewater treatment are discussed separately in the final two chapters. It is nice to see that a number of chapters have dealt with the subject of pretreatment of the feed stream to the membrane module. This topic is usually neglected, and yet it plays a vital role in determining the economics and performance of the membrane separation plant as well as the service life of the membrane. Overall the book is well written and gives the most comprehensive, up-to-date treatment available of the chemical engineering aspects of these membrane processes. In general, the book has been designed to appeal to the chemical engineer (not the chemist) and succeeds in doing so. The book is highly recommended for both the newcomer to the field and the longtime membrane researcher.

Douglas R. Lloyd, *University of Texas at Austin*

Coal Combustion Chemistry: Correlational Aspects. By Elmer J. Badin (Mitre Corporation). Elsevier Science Publishers: Amsterdam and New York. 1984. xii + 260 pp. $61.50. ISBN 0-444-43218-4.

Dr. Elmer J. Badin's book is a valuable contribution to understanding the complex processes of coal utilization and should be added to the library of those concerned with use of coal. The book cites most of the important references on coal use and includes the author's brief summary to many of these references. It is worth the price for this alone. In addition, the book outlines the conditions under which equilibrium calculations can be used to estimate the performance of coals and mineral matter during combustion. The author presents many new correlations of physical, chemical, and thermodynamic behavior of coal and mineral matter with characteristics of the atoms comprising these materials.

The book is written in a manner somewhat difficult to follow. However, the difficulty is largely overcome by an introduction and a summary

to each chapter.

The first portion of this book is well researched and presented using the thermodynamic properties of coal and mineral matter. The formation, characteristics, and reactions of coal and mineral matter are described from the literature and explained by using thermodynamic correlations.

As with any book, some aspects could be improved. In particular, the reader should use the literature references to review other interpretations of radiant heat transfer in boilers, validity of calculated indices, rates of combustion of chars, and sensitivity of the correlations. A brief summary of points which should be considered by the reader follow.

The latest information on the radiant properties of fly ash and deposits comes from work done at the University of Newcastle, Australia. These were apparently unavailable to the author during composition of the book. The results from the University of Newcastle indicate that spectral wall emissivities and absorptivity are not equal in boilers, the absorptivity of the mineral matter of the fly ash is similar for the Australian coals tested, and the major contribution to absorptivity of the fly ash is unburned carbon. Other work indicates that mie scattering by the fly ash can significantly alter heat flux distribution in boilers which have high ash loadings.

Correlations were developed for the standard indices used to estimate slagging, fouling, and corrosion. However, recent information shows that these indices do not accurately correlate the performance in boilers. This may be, in part, due to boiler design which is not considered in this book.

The rates of combustion of coals were correlated with the slagging, fouling, and radiant properties of coals. These parameters, if accurately correlated, will influence the time–temperature history of char in boilers and hence char burnout. The author discussed the acceleration of coal combustion by catalysis at low temperatures and the inhibition of coal combustion at high temperatures by metals. A clear distinction was not made between acceleration of heterogeneous char combustion and inhibition of homogeneous volatile combustion. In addition, statements about the slow rate of soot combustion were confusing. Experimental evidence shows rapid soot combustion and supports similar chemical rates of combustion of carbonaceous substances: Differences can be mostly explained by differences in the surface areas and effectiveness factors. The different controlling mechanisms yield an apparent activation energy for soot twice that for some chars.

Some of the correlations presented should be verified. Many correlations were based on the results of a few coals fired largely in TVA plants. These coals are mostly from the Appalachian and Interior providences. The correlations need to be verified for a large range of coals from wider geographical areas. In addition, many of the correlating parameters used are dependent. For instance, the slagging factor, R_s ($B/A \times S$), is correlated in the book with B/A. The dependence and sensitivity of the correlation to changes in the independent parameters should be determined.

Finally, this book provides a useful compilation of recent information on coal use and introduces the uses of thermodynamic correlations to describe coal combustion. The benefits far outweigh the minor concerns over interpretation or application of the data to practical systems.

John H. Pohl, *Energy and Environmental Research Corporation*

Drugs and the Pharmaceutical Sciences Series. Volume 11. Pharmaceutical Analysis: Modern Methods. Part B. Edited by James W. Munson (The Upjohn Company). Marcel Dekker, Inc.: New York. 1984. xi + 496 pp. $79.75. ISBN 0-8247-7251-2.

In his Preface the Editor and principal author of this volume states that the premise of this work "has been to provide coverage of important analytical methods at a level intermediate between basic textbooks and primary journal articles". He is not clear whether these "basic textbooks" are in quantitative analysis or instrumental analysis.

Chapter 1 gives an overview of the problems connected with the collection and storage of biological samples for analysis. Although this material is much more thoroughly covered in basic texts on Clinical Chemistry, for the neophyte in the field there are some important cautions mentioned. Of particular note are the problems associated with hemolysis and the possible interactions between certain drugs and the plasticizers in the sample containers.

The second chapter deals with high-performance liquid chromatography (HPLC). After a rather terse exposition of the theory, the author discusses mobile phases, column packings, and instrumentation for HPLC. This is followed by an extremely useful 50-page table listing applications alphabetically by the compound being detected. The chapter concludes with over 500 references, most of which are from the 1980's.

Quantitative thin-layer chromatography is the subject of Chapter 3. Because of the emphasis on quantitation only high-performance thin-layer chromatography (HPTLC) is discussed. No theory is reviewed, but the reader is referred to two books on the subject. The small theoretical discussion found in this chapter is reserved for densitometry measurements on the TLC plates. There are brief sections on instrumentation and applications.

Chapter 4 is titled Functional Group Analysis: Pharmaceutical Applications. As the author points out, drugs from "varying therapeutic categories can be analyzed by a similar method if they all contain the same functional group". Furthermore, since drug metabolites may contain the same functionality as the parent drug, quantitation of a drug in the presence of its metabolites may be impossible without some prior separation. Nevertheless, the author describes methods for the quantitation of the amino, hydroxyl, carboxyl, and carbonyl groups giving applications for each method described. Of the 147 references at the end of this chapter less than 10 come from the 1980's, an indication that perhaps this is not such an important, modern analytical method for pharmaceutical analysis.

Flow-injection analysis (FIA) is well treated in the next chapter. After a brief description of flow characteristics down a narrow tube and their relationship to detector response, the author tackles such practical considerations as system design and optimization and manifold configuration. Instrumentation is discussed and finally a table of pharmaceutical and clinical applications is presented.

Chapter 6 is a very good general review of electroanalytical methods. A large number of methods is discussed and the pertinent equations are presented. The chapter ends with a long section on liquid chromatography with electrochemical detection. Unfortunately there is a paucity of applications to pharmaceutical analysis which perhaps explains how a chapter on electroanalytical methods in pharmaceutical analysis can be written with only one reference to the work of M. A. Brooks.

The book ends with two useful chapters on atomic spectroscopy and electronic absorption spectroscopy in the near-ultraviolet and visible. Both contain an adequate theoretical treatment, discuss instrumentation, and give pharmaceutical applications. The last chapter also contains an important section on errors in absorption spectrophotometry, a topic not often covered in books of this sort.

By its very nature a volume of collected chapters is often uneven. Such is the case with this book. The last three chapters could have been written for almost any general review of modern analytical methods, not necessarily one dealing specifically with pharmaceutical analysis. Furthermore, in Chapter 5 there are more FIA applications to Clinical Chemistry than to pharmaceutical analysis. Even with the stated premise of this volume, the reader will find almost half the chapters completely devoid of theory. It is hard for this reviewer to imagine an audience to which this volume will appeal.

William C. Purdy, *McGill University*

Alkaloids: Chemical and Biological Perspectives. Volume 2. Edited by S. William Pelletier (University of Georgia). John Wiley and Sons: New York. 1984. xi + 490 pp. $59.95. ISBN 0-471-89299-8.

This second volume in Pelletier's series on the alkaloids continues the tradition of the first volume by providing thorough reviews on diverse aspects of alkaloid chemistry, with five chapters by respected research workers ranging from X-ray diffraction to C_{19}-diterpenoid alkaloids.

The first chapter, by Janet Finer-Moore, Edward Arnold, and John Clardy, describes some uses of X-ray diffraction in alkaloid chemistry. Although the examples are chosen from alkaloids, this chapter could serve as a useful introduction to anyone interested in X-ray studies of complex organic compounds. The discussion is necessarily brief, but it is adequate to meet the needs of a nonspecialist who seeks to know enough about the technique to evaluate published data.

The next chapter, by Richard Hill, covers the imidazole alkaloids. At the time of preparation of this chapter, this group of alkaloids had last been reviewed in 1953, and a new review was thus timely. Since nature does not seem to employ histidine as a major source of alkaloids, the entire group, including alkaloids derived from fungal and marine sources as well as the more traditional higher plant sources, is well reviewed in 55 pages. The third chapter, by Douglas Kinghorn and Manuel Balandrin, describes structural types, analysis, chemotaxonomy, and biological activities of quinolizidine alkaloids of the leguminosae. Although many aspects of the quinolidizine alkaloids have been discussed in other reviews, this is the first work to provide extensive coverage of those aspects indicated above, and as such it provides a valuable complement to other works.

Chapter four, by Cecil Smith, Jr., and Richard Powell, discusses the chemistry and pharmacology of the maytansinoid alkaloids. These alkaloids were once thought to have great potential as anticancer agents, but the clinical studies outlined in this chapter regrettably failed to show sufficient activity for further development. The chapter nevertheless provides a valuable summary of the structures, spectra, and biological properties of both natural and semisynthetic maytansinoid alkaloids, and it also includes a fairly detailed discussion of three different synthetic

routes to maytansine.

The final chapter, by William Pelletier, Naresh Mody, Balawant Joshi, and Lee Schramm, occupies over half the volume and provides a detailed tabulation of ^{13}C and proton NMR assignments and physical constants for C_{19}-diterpenoid alkaloids. After some introductory tables, including one of the occurrence of C_{19}-diterpenoid alkaloids in plant species, the bulk of the chapter consists of a tabulation of ^{13}C and ^{1}H NMR spectra and physical constants for over 200 alkaloids, one alkaloid to a page. This chapter will prove very valuable to anyone working in the diterpene alkaloid area, as it brings together a large amount of information that was previously scattered in the literature.

In summary, this volume lives up to the standards of the first one in the series. It is an ironic and somewhat unfortunate coincidence that three chapters (those on the imidazole alkaloids, on X-ray diffraction, and on the maytansinoids) are duplicated by similar chapters in Volumes 22 or 23 of "The Alkaloids", but nevertheless this volume contains sufficient new material to be of benefit to all workers in alkaloid chemistry.

David G. I. Kingston, *Virginia Polytechnic Institute & State University*

Specialist Periodical Reports. Volume 7. Mass Spectrometry. Senior Reporter: R. A. W. Johnstone. Royal Society of Chemistry: London. 1984. xii + 427 pp. £51.50. ISBN 0-85186-318-3.

Like the speaker who needs no introduction, the seventh volume of this series may be said to need no review. Aside from some delay and differences in format resulting from a new style of production, this review of the two years ending June 1982 maintains the standard of previous volumes. This volume is made up of ten chapters: Ionization Processes and Ion Dynamics (I. Powis), Structures and Dynamics of Gas-phase Ions—A Theoretical Approach (J. C. Lorquet), Ion/Molecular Beams Chemistry (S. A. Safron), Structures and Reactions of Gas-phase Organic Ions (I. Howe), Reactions of Negative Ions in the Gas Phase (J. H. Bowie), Developments and Trends in Instrumentation (T. R. Kemp), Gas chromatography–Mass Spectrometry and High-performance Liquid Chromatography–Mass Spectrometry (M. E. Rose), The Use of Mass Spectrometry in Pharmacokinetic and Drug-metabolism Studies (D. J. Harvey), Natural Products (D. E. Games), and Organometallic, Co-ordination, and Inorganic Compounds Investigated by Mass Spectrometry (R. H. Cragg). While the chapter headings are little changed from previous volumes, a number of contributors are new to this series.

Almost one-quarter of the review is devoted to GC/MS and LC/MS, a proportion which is no doubt justified by the volume of work in this field. A brief subsection on metastable-ion techniques in chromatography, described by the reviewer as "an answer awaiting questions", adds to the interest of this section.

The introduction of FAB during the period under review is duly noted in the instrumentation chapter and mentioned briefly in several other places. This is one area where the delay in production of the review has dated the material rather badly.

Overall, these reviews provide an introduction for new workers to an area, along with a second exposure, stimulating editorial comments, and a re-evaluation of contributions for the regulars.

Gordon Wood, *University of Windsor*

Mössbauer Spectroscopy Applied to Inorganic Chemistry. Volume 1. Edited by G. J. Long (University of Missouri). Plenum Press: New York. 1984. xviii + 667 pp. $92.50. ISBN 0-306-416476.

In the last 25 years, Mössbauer spectroscopy has become a very useful spectroscopic technique in many scientific disciplines, including inorganic chemistry and related areas such as catalysis, ceramics, silicate mineralogy, and bioinorganic chemistry. A book summarizing the Mössbauer work in these areas is long overdue; and the high quality of this multiauthored volume makes it particularly valuable to both the specialist and nonspecialist.

The first four chapters are extremely useful for introducing the novice to both the history and basic concepts of Mössbauer spectroscopy, as well as instrumental and computational aspects. The next four chapters then introduce, and elaborate on, the most important effects that can be extracted from Mössbauer spectra: the isomer shift, quadrupole parameters, magnetic parameters, and relaxation effects. As is often the case with such a multiauthored volume, the level of presentation in these four chapters differs a great deal. Three of these chapters are short and very readable for the nontheoretician; but the quadrupole splitting chapter is very theoretical, and considerably longer than the other three chapters combined.

After the above introduction to the technique, ten chapters summarize lucidly some of the Mössbauer work in inorganic chemistry and related areas: Surface studies, paramagnetic and magnetic iron compounds, high spin–low spin transitions in iron compounds; Fe (and I) biochemical studies, heterogeneous catalysis, silicate minerals, ceramics and archaeological materials, tin compounds, gold compounds, and one-dimensional magnetism. The two chapters of greatest interest to this reviewer—silicate minerals and tin compounds— are very well written and will be invaluable to anyone working in these areas.

This book should be very valuable to any inorganic chemist who wants to learn quickly about the importance of Mössbauer spectroscopy in the above areas: unfortunately, the rather high price (not unusual these days) may limit most sales to libraries.

G. M. Bancroft, *University of Western Ontario*

Chemical Mössbauer Spectroscopy. Edited by R. H. Herber (Rutgers University). Plenum Press: New York. 1984. xii + 378 pp. $59.50. ISBN 0-306-418-851.

Over the past 25 years, Mössbauer spectroscopy has become an important tool for the chemist in determining the answers to some major chemical problems. To observe this 25th anniversary, a special symposium was held at the 187th meeting of the American Chemical society in St. Louis, Missouri in April 1984. This volume is a collection of 15 papers which were presented at the symposium by invited speakers. Each paper shows a unique chemical application of Mössbauer spectroscopy. Five of the papers treated exclusively certain aspects of ^{57}Fe Mössbauer spectroscopy: organoiron compounds (B. A. Sosinsky), spin transitions in iron compounds (P. Gutlich), magnetic ordering phenomena (W. M. Reiff), L-type ferrimagnets (G. J. Long), and biomineralization of Fe_3O_4 in bacteria (R. B. Frankel and G. C. Papaefthymiou). Five dealt with broad topics, using both iron and tin compounds, but mostly iron, as illustrative examples: intercalation compounds (R. H. Herber and H. Eckert), hot-atom chemistry (H. Sano), lattice dynamics (R. H. Herber), soils and sediment (L. H. Bowen and S. B. Weed), and liquid crystals (D. L. Ulrich). The last group of papers dealt with specific types of Mössbauer spectroscopy: organotin (J. J. Zuckerman), iodine (H. de Waard), antimony (J. F. Stevens), rare earths (G. K. Shenoy), and neptunium (D. L. Karraker).

The majority of these papers are well-written and very informative, covering material which has not been reviewed in recent years. As expected for a symposum of this type, many of the papers speculate on the future directions of their respective areas. It is good to see such a volume appear within a year of the date of presentation.

The task of selecting, from the many different areas of chemical applications of Mössbauer spectroscopy, the topics to feature in this volume was a difficult one. Unfortunately some topics had to be left out, but overall the coverage is good.

James C. Fanning, *Clemson University*

Clinical Biochemistry: Contemporary Theories and Techniques. Volume 3. Edited by Herbert E. Spiegel (Department of Clinical Laboratory Research, Hoffmann-La Roche, Inc., of Nutley, New Jersey). Academic Press, Inc.: Orlando, FL. 1984. xviii + 271 pp. $42.00. ISBN 0-12-657103-1.

The book continues the tradition of excellence with a series of three volumes providing basic but well-written review articles. It deals with special topics in clinical chemistry that pertain to the understanding, diagnosis, therapy of disease, and the assessment of health. The reviews generally maintain a refreshing balance between the chemical principles, as applied to the clinical laboratories, as well as both the interpretive and correlative analysis on the subjects. Advances in techniques, summaries of recent findings, speculations, and interpretations are all components of the reviews. An apparent effort was made throughout the volume to cover the literature up to 1983.

The organization of this volume is as follows: Chapter 1, by E. H. Cooper and M. Bowen, deals with biochemical monitoring of cancer. The subject of tumor markers is divided into two main areas: tumor-derived products and tumor-associated changes. Chapter 2 examines the use of chemical and physiochemical approaches for detecting and identifying the etiological agents in clinical specimens. In Chapter 3, P. C. Kung, T. W. Chang, and W. R. Zurawski discuss the timely topics of the production and clinical utilization of monoclonal antibodies. Chapter 4 deals with bacterial and viral serology which also touches briefly the transplantation immunology. Chapter 5 provides a historical review on the development of clinical laboratory instrumentation in conjunction with the current trend to include highly sophisticated data collection, reduction, and robotics in the instrument design. Chapter 6 presents laboratory methodologies for the identification of hemoglobinopathies. Though each chapter contains adequate and compact information on the subject, I consider Chapters 1 and 3 to have the strongest approach as well as contents. The book also has a good consolidated index.

This book, along with other volumes in the series, should not be considered as a text. It should serve well to accommodate students with a varied curricula such as clinical chemistry, clinical pathology, and medical technology, as supplemental reading material. For students in a more

traditional chemistry discipline, this volume will certainly broaden their scope as to how chemistry can be applied to clinical medicine. For those working in the field, it is an excellent reference source.

Philip K. Li, *State University of New York at Buffalo and Children's Hospital of Buffalo*

Understanding DNA and Gene Cloning, a Guide for the Curious. By K. Drlica (University of Rochester). John Wiley and Sons: New York. 1984. xiii + 205 pp. $11.95. IBSN 0-471-87942-8.

The first question that arises about a book with a title like this one is, is it aimed at nonscientists or scientists who are not versed in molecular biology? Drlica's short review is clearly more instructive and thoughtful than a popular journalistic treatment but moves much too fast to be rigorous. By necessity the book must include a short course in what could be called traditional molecular biology: how information is transferred and reproduced within a living cell. However, the approach assumes that one can understand the molecular mechanisms of information transfer with almost no idea of the chemistry involved. This approach may be necessary for a book aimed at a nonscientific audience. It is probably alright for chemists too, since they will have no trouble filling in the necessary blanks.

The primary focus of this book is on logic behind the methodology of isolating and manipulating genes. This is clearly a topic that will be of great interest to many scientifically versed readers. Unfortunately, this focus comes at the expense of a flowing treatment of some of the exciting findings that have come out of this kind of work. Only the last chapter (Recent Surprises) deals explicitly with some exciting topics such as transposable elements and the generation of antibody diversity. To be sure, many other findings are mentioned in the chapters on cloning techniques, but they are generally taken out of their biological context and used as justifications for the fancy "moves" of genetic engineering.

The book contains a glossary of terms that a newcomer to molecular biology will find useful in reading and reviewing the text. It also contains a short list of additional references, mostly from *Scientific American*, for the reader who wants to go further. There are of course alternative books in this vein that should be considered. A curious chemist desiring a somewhat more rigorous treatment might also be advised to look at a copy of "Recombinant DNA: a Short Course" by Watson, Tooze, and Kurtz. However, "Understanding DNA and Gene Cloning" can be recommended as a fast primer for those who would like to know how to isolate genes and move them from one organism to another.

Thomas D. Fox, *Cornell University*

Mammalian Semiochemistry: The Investigation of Chemical Signals Between Mammals. By E. S. Albone (University of Bristol) with a contribution from S. G. Shirley (University of Warwick). John Wiley and Sons: New York. 1984. xii + 360 pp. $57.00.

In "Mammalian Semiochemistry" (Gr. semeion = signal), Dr. Albone discusses problems faced by chemists who attempt to isolate and identify biologically active compounds from mammalian sources. The popularized term "pheromone" is one of several types of semiochemicals used in interactions of organisms (communications in the broad sense) with one another. This is a relatively new field for chemists.

The chemist on entering a new field develops a construct and assesses his chances of success with the tools available. After he becomes involved in the field, he inevitably finds that his initial construct is simplistic and that he faces complexity and diversity for which his training, current theory, and available tools may be inadequate. If his timing is good, new theories and new tools evolve to deal with the emerging problems.

Chemists entered the developing field of chemical communication among insects in the early 1960's following the spectacular isolation and identification by Butenandt of a single compound that served as the "sex pheromone" of the silkworm moth. The "magic bullet" construct—a single component evoking a specific response—motivated most chemists and biologists throughout the 1960's. However, during the latter part of that period, there were several descriptions of multicomponent pheromones in which the component effects were synergistic. Most insect pheromones are now generally accepted as being multicomponent, but chemists and biologists have been remarkably successful in dealing with the complexities since the tools of chromatography and spectrometry and theories of insect behavior were rapidly developed. The general approach has been to collect the biologically active material from a gland, whole body, body part, or excreta and fractionate chromatographically, monitoring each fraction and combinations thereof with an appropriate bioassay. In the case of moths where the pheromone components usually consist of several isomers of defined structures, these can quickly be identified by capillary GC/MS, and the synthesized compounds, perhaps as many as six or seven, can be tested in various combinations.

With a few exceptions, the fractionation *cum* bioassay approach has not, however, been successful with mammals. The typical, frustrating experience is partial loss of bioassay activity at each step of the fractionation. Dr. Erich Albone immediately comes to grips with this problem, and others, in his first two chapters: Mammalian semiochemistry and Chemistry's contribution. He indicates that the "response guided strategy", appropriate when the insect gives a clearly defined response, may not be appropriate for most mammalian studies because the behavioral patterns of mammals are more complex than those of insects. The chemical stimulus is integrated with other stimuli; context, internal physiological state, and experience are all involved. Rarely does a single compound or a mixture of a few compounds elicit a defined response. Rather, the mammal perceives a "chemical image", and the analogy to a wine or coffee taster comes to mind. As Albone remarks, the "chemical image strategy (for defining the complex pheromone in chemical terms) has its own problems... and is a recipe for a far more complicated life...." In a "caricature of interdisciplinarity", the biologist tells the chemist, "I want a complete chemical analysis of this 10 μL of solution." The chemist demands, "Tell me by next week which of these hundred components are biologically active." The flavor chemist and technologist have faced similar problems. In several sections, Albone discusses the provocative issue of human pheromones and the complicating factors of cultural constraints.

The remaining chapters are headed as follows: The skin, Scent glands, Microorganisms in mammalian semiochemistry, Urine, Secretions of the reproductive tract, Breath, saliva, and the pig, and Mammalian chemoreception (contributed by Stephen G. Shirley). The Appendix briefly describes Key chemical methods. The chapters can be read profitably by both chemists and biologists, whereas the appendix seems designed to acquaint biologists with modern tools available to the chemist.

The book throughout is well organized and written in a lively, engaging style. The coverage is broad rather than exhaustive, but the references (approximately 1000) provide depth for the reader interested in a particular area. The index is thorough. This integrated account is required reading for any team of chemists and biologists who propose to study chemical signals used by mammals.

Robert M. Silverstein, *SUNY College of Environmental Science and Forestry*

ACS Symposium Series. No. 267. Environmental Sampling for Hazardous Wastes. Edited by G. E. Schweitzer and J. A. Santolucito. Editors. American Chemical Society: Washington, D.C. 1984. x + 133 pp. $34.95. ISBN 0-8412-0884-0.

The primary strengths of this book are in the area of the statistics of soil sampling for environmental contaminants. Neither the book title nor the titles of the chapters do justice to the wealth of information on that subject. Particularly informative are Chapters 6, 9, 10, 12, and 13. These chapters cover the areas of geostatistics and the use of kriging estimates, basic considerations in the use of statistical methods in environmental sampling and analysis, quality assurance and exploratory studies, methods of estimating error, and the proper use of background measurements. The figures and references for these chapters are excellent. Interestingly enough, the references given for chapter 6 point to the fact that many of these statistical techniques have been in use by ore mining engineers for many years.

Several chapters in this book are more general and may be lacking in references and/or a hard, quantitative treatment of the subject, but they still may be useful as introductory material. Chapters 2, 4, and 11 are examples of this category.

Unfortunately, there are also a number of rather weak chapters in the book. In addition, the book index is very weak.

In summary, this book, which could be more accurately named "Statistics for Environmental Contaminant Sampling", is highly recommended because of the strengths of the chapters aimed at that subject. The preparation and editing, and the contribution to several chapters, by personnel from the U.S. EPA-EMSL (Las Vegas) laboratory cements the position of that laboratory as one of the primary sources of information for the subject of statistics and quality assurance in the assessment of hazardous waste and environmental contamination.

Steven P. Levine, *The University of Michigan*

Russian–English Translator's Dictionary. A Guide to Scientific and Technical Usage. Second Edition. By Mikhail Zimmerman. John Wiley and Sons: New York. 1984. x + 544 pp. $59.95. ISBN 0-471-90218-7.

This is a dictionary primarily of phrases as they are used in scientific terminology. They are "defined" by showing their proper use in context. The result is a work that leads the translator (or reader) of a Russian Scientific text fairly efficiently to the scientifically idiomatic English counterpart, avoiding the awkward phraseology that so often arises from word-for-word translation. This is a distinct aid to understanding, and it serves the nontranslator whose need is accurate comprehension as well as the professional translator.