

Book Reviews*

Water: A Comprehensive Treatise. Volume 7. Water and Aqueous Solutions at Subzero Temperatures. Edited by Felix Franks. Plenum Press, New York and London. 1982. xiii + 484 pp. \$49.50.

The knowledge that water can be held in the liquid state at temperatures as low as $-40\text{ }^{\circ}\text{C}$ if it is finely divided has become widespread only in the last 2 decades, but already this whole new field for investigation has produced the more than 700 research papers treated in this seventh and final volume of the series.

As the editor puts it very frankly, in the Preface, "Much has been written about unfreezable water and bound water, but to my knowledge there does not exist a reasoned account of its occurrence, study, significance and physical description. That may be the reason why this is a subject that often raises the blood pressure of participants at scientific meetings." Perhaps we need to give more attention to topics which do create enough genuine enthusiasm to raise our blood pressure. Sometimes it seems as though much of modern chemical research is done by automatons seated at computer consoles.

The separate chapters include Super-cooled Water, by C. A. Angell; Amorphous Solid Water and Its Relationship to Liquid Water, by M. G. Sceats and S. A. Rice; Properties of Aqueous Solutions at Subzero Temperatures, by Professor Franks; and Dynamics of Water in Heterogeneous Systems with Emphasis on Subzero Temperatures, by W. Derbyshire.

The subject of supercooled water received much attention in the press in the 1960's because of "anomalous water", proposed by B. V. Derjaguin, but the subject of amorphous solid water, H_2O (as), has not received similar attention. Sceats and Rice tell us, "there is a low-density form of H_2O (as) that is derived from ice Ih in the same way as are amorphous Si and Ge from their crystalline parents." The only known method of preparation of H_2O (as) is by slow deposition of water vapor onto a cold substrate, according to these authors.

The growth of ice in water and aqueous solutions is discussed by Professor Franks. I suppose in a project of this type it is impossible to touch all bases, but I admit I searched in vain for mention of the work of E. J. Workman in this area, which resulted in the discovery of the potential that develops across an ice-water interface during freezing, and is believed by some to be the cause of electrification in thunderstorms. He does discuss, however, the very interesting topic of chill and freeze resistance in bacteria. Freezing does damage to microorganisms which might otherwise survive for long periods of time at subzero temperatures because of slowing down of physiological processes. Whether or not supercooled water could be used to prolong life without freezing at subzero temperatures does not seem to have yet been investigated.

The molecular properties of vicinal water are discussed by Professor Derbyshire in Chapter 4. The range of the modification of water molecular properties induced by a surface "indicates that the orthodox viewpoint is that the perturbation range is considerably shorter" than the several micrometers suggested by several authors, including the present reviewer. Nevertheless, he concludes that "evidence in support of the conclusion that water molecules are sensitive to the presence of nearby solute molecules or surfaces is substantial."

I believe that this volume, and in fact this whole series of seven volumes, will bring back the attention of chemists to that most important substance, water, and perhaps correct the attitude of an editor of the *Journal of the American Chemical Society* who not too long ago turned down a paper on the properties of water with the excuse that "this was not chemistry."

Joseph A. Schuffe, *New Mexico Highlands University*

Physical Chemistry. By Keith J. Laidler (University of Ottawa) and John H. Meiser (Ball State University). Benjamin/Cummings Publishing Company, Inc., Menlo Park, CA. 1982. xvi + 919 pp. \$29.95. **Introduction to Physical Chemistry.** By Arthur M. Lesk (Cambridge). Prentice-Hall, Inc., Englewood Cliffs, N.J. 1982. xv + 746 pp. \$28.95.

Each of these textbooks is a comprehensive and readable treatise on physical chemistry, covering the standard topics of thermodynamics, kinetics, quantum mechanics, and spectroscopy. Numerous worked examples and clearly defined study goals, features which are appreciated by many students, are found in both books. The level of mathematics of either book is appropriate for a course taken by chemistry or chemical engineering majors. There are, however, some important differences in

emphasis and style that ought to be considered.

For example, Lesk devotes a considerable portion of this very nice introductory chapter to error analysis, an important but often neglected topic, which is not treated by Laidler and Meiser. Lesk's book also includes an entire chapter on electric and magnetic properties, a subject which is not covered in detail by Laidler and Meiser. Coverage of kinetics, on the other hand, is slightly more extensive in Laidler's and Meiser's book. The kinetics chapter is unfortunately the last one in Lesk's book, and may be neglected by the instructor who follows too closely the order of presentation of topics in the textbook. Laidler and Meiser also devote more pages to spectroscopy, including specialized topics such as laser spectroscopy, transition probabilities, and Mössbauer spectroscopy.

Style is as important a factor to consider as content when choosing a book for a course that is often unpopular with the students who have to take it. The text in Lesk's book is definitely more colorful, with plenty of interesting examples, many of them biologically relevant, and a liberal sprinkling of humor and anecdotes. Personally, I would prefer to use Lesk as the assigned textbook, and have Laidler and Meiser available as an excellent reference.

Jeanne L. McHale, *University of Idaho*

MMI Press Polymer Monograph Series. Volume 1. Thermodynamics of Polymer Solutions. By M. Kurata (Kyoto University). Translated by H. Fujita (Osaka University). Series editor H. G. Elias. Harwood Academic Publishers GmbH, Chur, Switzerland. 1982. xi + 294 pp. \$94.00.

This book should prove a welcome and timely addition to the bookshelf of any researcher or teacher concerned with the physical properties of polymer solutions. It is essentially a translation of the 1975 monograph "Kobunshi Yoeki Ron" (Asakura Publishing Company, Tokyo). The material is divided into four chapters: Thermodynamics of Solutions, Thermodynamics of Polymer Solutions, Light Scattering, and Sedimentation Equilibrium. The first is a very clear and thorough exposition of the fundamentals of solution thermodynamics; the decision to include this background material is to be commended. However, a few of the details in the development, legitimately omitted in the interests of brevity, are unfortunately not referenced. The second chapter discusses analogous material for the case of polymer solutions. Particular attention is paid to solutions with polydisperse polymer constituents, and to ternary solutions of either the mixed-solvent or mixed-polymer type. The discussion of these issues and the introduction to spinodal decomposition are especially pertinent. The light scattering chapter is the largest of the four, and deals solely with theoretical considerations relevant to "elastic" (time-integrated intensity) light scattering. The section on critical exponents will be appreciated by those whose introduction to light scattering from polymer solutions was from the experimental side. The final, brief chapter is an introduction to sedimentation equilibrium in the context of the preceding chapters. Throughout the book the material is well-organized and clearly presented; the translation is one of the highest quality.

Timothy P. Lodge, *University of Minnesota*

Handbook of Carcinogens and Hazardous Substances: Chemical and Trace Analysis. Edited by M. C. Bowman (National Center for Toxicological Research, U.S. Food and Drug Administration). Marcel Dekker, Inc., New York. 1982. ix + 750 pp. \$99.50.

This is a book composed of nine chapters which follow the introductory chapter and summarize the following classes of toxic substances: alkylating agents; aromatic amines and azo compounds; estrogens; mycotoxins; *N*-nitrosamines and *N*-nitroso compounds; pesticides and related substances; polynuclear aromatic hydrocarbons; toxic metals and metalloids; halogenated contaminants (dibenzo-*p*-dioxins and dibenzofurans). It does not treat certain ubiquitous toxic environmental agents such as toluene, benzene, alkanes (not so innocuous), and plasticizers, to name a few. The general approach of each chapter is to discuss the following: (A) sources of each toxic agent, (B) occurrence in environmental, food, or tissue samples; (C) modes of analysis; and (D) selected specific procedures in sufficient detail to justify the title "handbook". Each chapter tends to reflect the interests of its author. The chapter of alkylating agents concentrates on workplace and biological samples but not on ambient monitoring. In the workplace, one can justify a procedure for aziridine detection by titration. However, in the analysis of ambient environmental samples, one must be prepared for a mixture of hundreds of compounds at trace levels. Capillary gas chromatography, a pre-re-

*Unsigned book reviews are by the Book Review Editor.

quisite for such a study, is not discussed. Also, screening methods for general alkylation activity would have been a worthwhile inclusion. The mycotoxin chapter is judged to be particularly useful and up to date. The metals chapter almost appears to be an outline. It focusses on atomic absorption and colorimetric methods but barely mentions more modern and increasingly widely employed techniques such as X-ray fluorescence and emission spectrometry with the inductively coupled argon plasma.

The best comment that one can make for the book is that it contains much useful information, amply footnoted, on diverse classes of compounds in one set of covers. As such, it is a useful addition to an institutional library. On the other hand, in a field where being up to date is absolutely crucial, this expensive monograph often provides out-of-date information. For example, in the chapter on polynuclear aromatic hydrocarbons, the author cites a "recent study" of reversed-phase HPLC separation whose publication data is 1974 and genesis is probably 1972-1973. The implication that HPLC is inferior to capillary GC is not justified in the light of recent work.

Finally, one pet peeve: even in this book, the work "toxin" is occasionally misused in referring to a toxic agent which is neither metabolite nor biological in origin.

Arthur Greenberg, *New Jersey Institute of Technology*

Reactivity Indices for Biomolecules. By Chen-An Chin and Pill-Soon Song. Texas Tech Press, Lubbock, Texas. 1981. 175 pp. \$33.00 (hardbound); \$20.00 (paperback).

This book contains a list of π -electron indices (electron density, superdelocalizability for nucleophilic attack, frontier orbital density, superdelocalizability for radical attack, frontier orbital density, superdelocalizability for electrophilic attack, frontier electron density, atom-atom polarizability) for 126 biomolecules. The Hückel theory has been used for the calculations of these indices. The analytical formula of these indices and the Hückel parameters are provided at the end of the book. Although we are all aware of the approximations in this theory and this methodology, these indices have been found quite successful in predicting the preferential center of reactivity toward electrophiles, radicals, or nucleophiles.

O. Eisenstein, *The University of Michigan*

Lecture Notes in Chemistry. No. 29. Unified Valence Bond Theory of Electronic Structure. By N. D. Epiotis (University of Washington). Springer-Verlag, New York and Heidelberg. 1982. viii + 305 pp. \$23.40.

This is certainly a quite provocative issue of "Lecture Notes in Chemistry". After proclaiming that the perturbational molecular orbital (PMO) analysis is now obsolete and cannot rationalize accurately the structure and reactivity of molecules, the author describes the unified valence-bond theory as the method best suited to inherit the role played by the PMO analysis. As a matter of fact, his presentation is far from convincing. After describing the method, the author uses a diagrammatic representation of the electronic interactions which may remain entirely obscure for most of the users. One may question the usefulness of an analysis which may be harder to master than the full calculation. The success of the PMO analysis was mainly due to its utmost simplicity. If the unified valence-bond theory can only be used by experts, it will not easily dethrone the PMO analysis. The author ends his book by applications of the unified valence-bond theory to some structural problems which have been already successfully analyzed by other means.

O. Eisenstein, *The University of Michigan*

Electronic Properties of Polymers. Edited by J. Mort (Xerox Corporation) and G. Pfister (Cerberus Corporation, Switzerland). John Wiley and Sons, New York, NY. 1982. xi + 366 pp. \$44.95.

This book is an excellent review of current (to 1981) knowledge on the electronic properties of polymers, with chapters covering the different aspects of this subject written by experts in the various fields. The scope and spirit of this book can best be shown by quoting the editors from their Introductory Chapter: "Given limitations on length, the chapters are not intended to be all-embracing reviews of the field, but rather to present a detailed discussion of key ideas and directions with the objective of delineating the most pressing and exciting problems. Specifically excluded is any detailed discussion of vibrational, morphological, mechanical, or thermal properties or synthesis except as these are specifically relevant to the electronic phenomena. Our objective has been to collect in one book the most up-to-date assessment of our understanding of the electronic properties of polymers and their actual or potential technological applications. It is our hope that it will further highlight this rapidly developing and important field and stimulate current and new researchers and ideas in the field."

The topics covered in this book are shown clearly by the Chapter Titles: Electronic States and Triboelectricity, Charge Storage, Piezo-

electricity and Pyroelectricity, Energy Transfer, Photoelectronic Properties of Photoconducting Polymers, and Conducting Polymers: Polyacetylenes. Some of the unsolved theoretical and practical problems that fall under the above headings are discussed, in addition to some of the commercial applications of polymers with the various electrical and electronic properties. Most of the chapters include experimental methods used to study the properties discussed as well as the theoretical framework of these properties. It should be noted that most of the chapters include a number of references published in 1981.

This is not a textbook for self-study and it is well to have a reasonable knowledge of physics before reading most of the chapters. Within these limitations, this book provides an excellent and timely introduction to a fascinating field of research.

Sonja Krause, *Rensselaer Polytechnic Institute*

Problems in Quantum Chemistry. By P. Jørgensen (Aarhus University) and J. Oddershede (Odense University). Addison-Wesley Publishers, Reading, MA. 1983. x + 286 pp. \$26.95.

Here is a book which is going to be warmly welcomed by undergraduate and graduate students struggling for the first time with the numerous concepts of quantum chemistry. It contains an excellent collection of problems mainly on the applications of molecular electronic structure theory. The collection is very comprehensive: non-empirical and empirical methods, qualitative molecular orbital theory, π electron systems, crystal and ligand field theory, and also applications of symmetry in chemical reactions. Detailed calculations of the integrals required in all electron problems, spectroscopic terms, correlation diagrams, and application of group theory to chemistry are some of the topics that are treated. A short summary of the concepts used in each chapter serves as an introduction to it. Relevant textbooks providing the sufficient background and guiding a more elaborate treatment of the topics are indicated. The solutions are detailed and clear. An appendix containing an alphabetic list of the concepts in quantum chemistry with a brief description of each one is a very nice idea in this well-designed and -edited book. I simply wish I had had it some years ago.

O. Eisenstein, *The University of Michigan*

An Introduction to Spectroscopy for Biochemists. Edited by S. B. Brown (University of Leeds). Academic Press Inc., London. 1980. xvi + 403 pp. \$38.50.

This nine-chapter book is devoted to describing the spectroscopic methods and their application to biological systems. Each chapter is independently contributed and the authors are primarily interested in presenting nonmathematical, yet rigorous, accounts of particular techniques.

The first chapter provides a general introduction to spectroscopy and types of information available in biological systems. Ultraviolet and visible spectroscopy are presented in Chapter Two, which also includes fast reaction techniques as well as difference spectroscopy and its applications. The subsequent chapters are devoted to molecular emission spectroscopy, vibrational spectroscopy, circular dichroism and optical rotation, nuclear magnetic resonance, and electron paramagnetic resonance, respectively. Atomic absorption spectroscopy is briefly described in Chapter Eight. The last chapter covers the technique of mass spectrometry and its potential use in structure determination and identification of small amounts of compounds not detectable by other methods.

The general approach of each chapter is the presentation of basic concepts, a schematic diagram of the instrumental arrangement, sample preparation, data collection, and representative spectra which illustrate the types of information that can be obtained for biological systems. At the end of each chapter, a short bibliography is provided that includes books, specific references, and review articles.

The book is written for undergraduate science or medical students, and individuals engaged in biochemically related research. I recommend this book also to graduate students who are familiar with spectroscopic techniques but lack an understanding of how these methods can be applied to gain insight into the structure of biological macromolecules.

Minou Bina, *Purdue University*

Chemistry and Physics of Carbon. Volume 18. Edited by P. A. Thrower (Pennsylvania State University). Marcel Dekker Inc., New York. 1982. xii + 185 pp. \$45.00.

A statement on the back cover of this new book stresses the interdisciplinary approach which has been taken by the series, "Chemistry and Physics of Carbon". This approach is evident in the current volume, in which there are three chapters: Impurities in Natural Diamond, by D. M. Bibby, which comprises about half the book and emphasizes chemical composition and spectroscopy; A Review of the Interfacial Phenomena in Graphite Fiber Composites, by K. Wolf, R. E. Fornes, J. D. Memory, and R. D. Gilbert, which emphasizes applied considerations, particularly

strength of materials; and The Palladium-Catalyzed Conversion of Amorphous to Graphitic Carbon, by W. L. Holstein, R. D. Moorhead, H. Poppa, and M. Boudart, which reports new research utilizing, particularly electron microscopy.

Perusal of the contents of other volumes of the series reveals that earlier volumes concentrated on the black forms of carbon, tended toward more topics per volume, and put a considerable emphasis on chemistry. Later volumes and this volume, in particular, have drifted somewhat from the origins of the series. Diamond is certainly carbon but I suspect it is somewhat removed from the range of interest of most workers on carbon. The chapter on diamond impurities is certainly fascinating but whether its interest merits half of the book depends on the individual reader in the carbon field. The chapter on graphite fiber composites relates the chemistry of the interaction of the graphite fiber and matrix surfaces and parameters relating to the performance of the composite under various conditions. The emphasis is on the performance aspects, since there is a wealth of data on this (and probably much more known but proprietary) and much less is known about the actual surface chemistry involved. The final chapter, on conversion of amorphous to graphitic carbon, starts with an excellent but short review of the topic, but then shifts to a report on an original study involving electron microscopy and diffraction. The work described is excellent and interesting but the reader may question whether an original research report belongs in a volume of this nature.

Volume 18 is certainly a book that I want to see in the library at my institution. Whether or not the individual would want it in his own collection would depend on his own interests.

Herbert Beall, Worcester Polytechnic Institute

Photopolymerization of Surface Coatings. By C. G. Roffey (Industrial Chemist). John Wiley & Sons, New York, NY. 1982. XVII + 353 pp. \$54.95.

This is an interesting and well-written book. The first 40 pages are devoted to an excellent summary of the fundamental principles of photochemistry, including a section on the kinetics and thermodynamics of photochemical reactions. Then come chapters on ultraviolet lamp systems, photoinitiators and photosensitizers, photopolymerizable film-forming materials, ink technology and the application of radiation curing, photoresist technology, and finally, the potential hazards of ultraviolet light systems, which includes details of animal tests, how toxic materials should be handled, first aid recommendations, etc. Details are given for the photochemistry of many organic systems, as well as for the mechanical properties, hardness, gloss, adhesion, etc. of the films formed. Much information of a practical nature is given such as how to test films with the finger, effect of temperature on cure rate, rate of surface cure vs. rate of through cure, use of electrolytic and hot-dipped tin plate, wood or textiles as substrates, problems of decorating metal and plastic objects, etc. Some formulations for various coatings and inks are also given.

This should prove to be a valuable book for use in the coating industry as well as a helpful reference book in courses on photochemistry taught in chemical or chemical engineering departments in universities.

Malcolm Dole, Los Gatos Meadows, M-1

Trace Analysis. Volume 2. Edited by James F. Lawrence (Health and Welfare Canada). Academic Press, New York. 1982. xi + 275 pp. \$35.00.

This volume covers applications of liquid chromatography to problems of trace analysis in a variety of fields. All five chapters are concerned with the separation and determination of organics. This book has been extremely well edited; there is a uniformity of style and presentation among the chapters that makes finding information easy. Each chapter is written as a good balance of historical and critical review, although some chapters are more the work of an individual chapter author than others. There are a large number of informative tables in each chapter, and there are many figures of chromatograms and apparatus all of which leads to a high degree of utility for a "skim" reader. The index is detailed enough to be useful.

Chapter 1 (J. N. Thompson) covers vitamin determinations. The chapter is organized by vitamin and includes a brief introduction into the chemistry and determination of each vitamin before the review of chromatographic methods. The determinations have been broken further into the type of matrix from which the vitamin comes, e.g. foods, clinical samples.

The second chapter (R. C. Willoughby and R. F. Browner) covers LC-MS. The coverage seems complete, going over GC-like separation schemes (direct coupling), ionization sources which can be used with the liquid phases most commonly encountered, and mechanical transfer. I found section V most interesting. This section dealt with a variety of ingenious methods for enhancing the solute/solvent ratio to a level which would allow LC-MS coupling.

The application of size exclusion chromatography to trace analysis is

the subject of the third chapter (R. E. Majors and T. V. Alfredson). After a brief introduction into the traditional applications of SEC to chemical analysis problems and a concise overview of the advantages and disadvantages of gels and silica as stationary phases, several ways in which SEC can be useful are treated. In the simplest case one is looking for one or a few low molecular weight species in the presence of other higher molecular weight interferences in which case the SEC column is the main analytical tool. SEC may be used as a sample preparation step followed by concentration and off-line analysis, or it can be incorporated into a two-column separation scheme. In the latter case the SEC column is used to isolate a fraction which, by fluid stream switching, is introduced onto another LC column. A troubleshooting section closes the chapter.

The fourth chapter (N. A. Saner) complements the third. This chapter covers trace enrichment techniques. Direct injection with mobile phase changes is the simplest method, but off-line and on-line dual column techniques are also useful. Applications in environmental, clinical, and pharmacological areas are given. This review contains very detailed accounts of several applications, including where problems have arisen or may arise.

The final chapter covers mobile phase additives which allow the analysis of polar mixtures using unmodified silica. Many interesting and useful selectivity features are available, if one chooses to add various amines or carboxylic acids to one's mobile phase. In particular the selectivity for certain compounds shown by amino bonded phase columns can be mimicked with use of unmodified silica and a mobile phase of glyme with 0.1% (v/v) ethylenediamine. A sufficiently large number of compounds have been studied in order for general correlations to be drawn, but there is no theoretical backup or mechanistic conjecture.

All in all, this book is a well-written and -edited volume packed with useful facts and data for the practicing analyst.

Stephen G. Weber, University of Pittsburgh

Environmental Toxicology. By John H. Duffus (Heriot-Watt University). John Wiley & Sons, New York. 1980. viii + 164 pp. \$15.95.

"Environmental Toxicology" is one of several books published in the "Resource and Environmental Science Series" of the Halsted Press, which is intended to develop the student's awareness in problems of the environment and natural resources. In this book, the author uses an interdisciplinary approach to the analysis of environmental effects of toxic substances by dealing with assessment of toxicity in the first chapter. This is followed by three chapters describing the metabolism of toxic substances by animals, plants, and microorganisms, four chapters discussing our knowledge of toxic substances of current concern, and finally in the last chapter, the problems of toxic substances monitoring and of environmental risk assessment. This book also includes an appendix comprising full chemical names of many proprietary synonyms of commercial pesticides and herbicides, a bibliography of relevant literature, and a general guide to pertinent information sources.

Throughout this book, the content of chemistry, physics, and mathematics has been kept to a minimum. Non-biologists, however, may find a biology dictionary useful to explain unfamiliar biologic terms. Although intended for environmental science students, this book should also be useful to qualified scientists and other specialists who are faced with problems caused by environmental toxic substances.

Stephen K. Hall, Southern Illinois University at Edwardsville

Spectroscopic Properties of Inorganic and Organometallic Compounds. Volume 15. Edited by G. Davison (University of Nottingham) and E. A. V. Ebsworth (University of Edinburgh). The Royal Society of Chemistry, London. 1982. xv + 413 pp. \$105.00.

This volume reviews the recent literature up to late 1981. The only major change from the last volume of this series is the stepping down of D. M. Adams as a Reporter and Associate Senior Reporter and his replacement by G. Davison. The format of the report is the same as in the past.

Chapter 1 is the largest and covers nuclear magnetic resonance (B. E. Mann, 136 pages, 2469 references). A useful appendix lists papers in which the use of nuclei other than ¹H has been described. Chapter 2 (K. B. Dillon, 17 pages, 99 references) deals with nuclear quadrupole resonance spectroscopy while Chapter 3 (S. Cradock, 12 pages, 191 references) covers rotational spectroscopy. Vibrational spectroscopy is divided into three sections, Chapter 4 (S. Cradock, 19 pages, 249 references) deals with characteristic vibrations of main group element compounds with Chapter 5 (J. S. Ogdén, 21 pages, 395 references) covering the vibrational spectroscopy of transition-element compounds. Chapter 6 (G. Davison, 77 pages, 388 references) then reviews the vibrational spectra of some coordinating ligands. Mössbauer spectroscopy is dealt with in Chapter 7 (S. J. Clark, J. D. Donaldson and S. M. Grimes, 79 pages, 770 references), while the final chapter reviews gas-phase molecular structure as determined by electron diffraction (G.

Gundersen and D. W. H. Rankin, 40 pages, 83 references).

Ian P. Rothwell, *Purdue University*

Physics of Laser Driven Plasmas. By H. Hora (University of New South Wales). John Wiley and Sons, New York. 1982. xiv + 317 pp. \$41.95.

This book is written in very clear language and in a style which provokes the reader to continue on. The subject matter is presented in such a manner as to instill interest, not to confuse the reader with elaborate detail. At the same time, the subjects are treated thoroughly. This is not a typical physics text which presents theory and data in a disconnected fashion. Dr. Hora makes good use of numerical examples, comparing these where possible to experimental data. These example calculations lend credibility to the difficult theories presented and give the reader a concrete basis for comparison of these theories. Figures are used extensively throughout the text. The figures are used to illustrate both the difficult concepts in a derivation and the net result of this calculation. There are only a few exceptional cases where the equations are not illustrated in a figure, and these numerical calculations are illustrated along with the data where possible.

The subject matter is presented in a logical fashion. The basic theories of plasmons and hydrodynamics are given in the early chapters. The wave equations describing the plasma-light interactions are then treated. Dr. Hora presents these subjects with amazing clarity given the complex nature of the mathematics. The book hereafter takes a more pointed approach and discusses the overlap of experiment with theory. The subjects covered in length include solitons and resonance absorptions. The author also discusses some aspects of the propagation and scattering of laser beams, and free electron lasers. The final chapter deals with the use of lasers for nuclear fusion. Not deviating from the style of the rest of the text, this chapter is a delightful merge of theory and experiment.

In general, this appears to be a very good text for those who want a good understanding of the laser-plasma interaction. The text is supported with an extensive and current bibliography. The index is very useful.

Stephen E. Bialkowski, *Utah State University*

Phase Theory: The Thermodynamics of Heterogeneous Equilibria. By H. A. J. Oonk (University of Utrecht). Elsevier Scientific Publishing Company, Amsterdam and New York. 1981. XIV + 269 pp. \$59.50.

This book is unique in its treatment of non-ideal phase behavior. After a brief review of classical thermodynamics and the phase rule, the author presents a comprehensive study of how phase diagrams are related to the excess Gibbs energy and how the excess Gibbs energy can be derived from phase diagrams. The author's entire thesis is based on the concept of an "equal-G-curve". This is not a new approach to phase behavior (it has long been used by metallurgists); however, it is unknown to most thermodynamicists. Despite the fact that thermodynamics is an exact science, and is therefore independent of the language used to describe it, since the "equal-G-curve" approach is fundamentally different from Lewis' approach of fugacity and activity coefficients, it is likely that this book will give new insights into non-ideal phase behavior for the majority of its readers. The book is written in such a way that it is suitable for either self-study or as a course text; it is likely to be most useful to experimentalists in fields such as materials science or geology who have little theoretical background in thermodynamics.

There are two strengths but also two deficiencies to this book. The strengths are that it is comprehensive and systematic; the author presents a wide variety of phase diagrams and clearly explains how each is a result of the excess Gibbs energy and differences in pure-component fugacities. The first deficiency in the book is that the author never relates the non-idealities in the phase diagram to the molecular physics. Though there are few texts or articles that explain carefully the relation between the excess Gibbs energy and differences in molecular size, structure, and intermolecular potential energy, this author takes an entirely empirical approach to solution non-idealities. As a result, any information gained by the calculations the author outlines are useful only for interpolation of experimental data and would not likely be extrapolatable to new conditions or to other similar mixtures. The second weakness in this book concerns the notation. In addition to using non-standard notation (e.g., " f " for activity coefficient), the author also complicates equations unnecessarily. For example, the author writes:

$$\mu_1^{\text{liq}} + RT \ln (1 - X_c^{\text{liq}}) + RT \ln P_{01} = RT \ln P + RT \ln (1 - X_c^{\text{vap}})$$

instead of the common

$$y_1 \phi_1 P = x_1 \gamma_1 P_1^{\text{SAT}}$$

In summary, this book should prove valuable to experimentalists trying to correlate their data. More importantly, it is likely to affect the way thermodynamicists think about phase behavior and therefore should have a lasting impact on the field.

Marc Donohue, *The Johns Hopkins University*

Comprehensive Organometallic Chemistry. Edited by G. Wilkinson, F. G. A. Stone, and E. W. Abel. Pergamon Press, Inc., Elmsford, NY 10523. 1982. 9 Volumes. \$2150.00 the set.

This set of volumes in which the whole of organometallic chemistry is comprehensively reviewed is a truly monumental work. The first 8 volumes contain 69 separate review articles (ca. 7800 pages) by 116 authors, in which are cited over 40000 references to the original literature. Volume 9 (1570 pages) is the index to the first 8 volumes and contains subject, formula, and author indices, a formula index to structures determined by diffraction methods, and an index to review articles and books.

The general classification of the material in Volumes 1-6 is by periodic groups, subdivided in some cases according to types of compound, ligands, etc. Volume 1 contains chapters on Structure and Bonding in Main Group Organometallics, the alkali metals, beryllium, the alkaline earths and strontium, boron (alicyclics, cyclics, boron rings as ligands to metals, and polyhedral organoboranes, metallaboranes, and carboranes), and the group 3 metals, Al-Tl. Volume 2 deals with organic compounds of Si, Ge, Sn, Pb, As, Sb, Bi, Cu, Ag, Au, Zn, Cd, and Hg, including a chapter on the environmental aspects of organometals.

In volume 3 are found articles on the bonding of unsaturated organics to transition metals, fluxionality, and the organometallic chemistry of Sc, Y, the lanthanides and actinides, Ti, Zr, Hf, V, Nb, Ta, Cr, Mo, and W. The material on Cr, Mo, and W is further subdivided according to ligand type (mono- vs. polyhapto). The chemistry of Mn, Tc, Re, Fe, Ru, and Os is discussed in Volume 4. There are 5 chapters on Fe, organized by ligand type and nuclearity (mono-, di-, and polynuclear). Volume 5 covers Co, Rh, and Ir, and in Volume 6 are chapters on Ni, Pd, Pt, compounds with heteronuclear, metal-metal bonds between transition metals, and compounds with bonds between a transition metal and the main group elements (B-Tl, Mg, Zn, Cd, Hg, Si-Pb).

Volume 7 deals with the use of main group organometallics in organic synthesis. The metals covered in the 6 chapters are alkali and alkaline earth metals, boron, aluminum, thallium, silicon, and Zn, Cd, Hg, Cu, Ag, and Au. Volume 8 contains 11 chapters devoted to the use of transition metal organometallics in organic synthesis and catalysis. Topics covered include (1) use of CO and CO₂ to form organics, (2) addition of H₂ and HCN to carbon-carbon multiple bonds, (3) alkane and alkyne oligomerizations, (4) asymmetric syntheses, (5) alkene and alkyne metathesis, (6) polymer supported catalysts, (7) organonickel compounds, (8) organopalladium reagents, (9) organoiron compounds in stoichiometric syntheses, (10) organic chemistry of coordinated cyclopentadienyl and arene ligands, and (11) reactions of dinitrogen complexes.

This reviewer does not pretend to be well acquainted with the entire scope of the literature these volumes cover. However, several areas of both main group and transition metal chemistry with which I am familiar impressed me with the thoroughness of the literature searches. Even the obscure notes published by this reviewer while an Assistant Professor were unearthed. All the chapters are well organized and, refreshingly, many of the authors took a critical posture in their reporting. Most authors also made useful observations which help to tie the material together and which enhance the reader's interest.

For a work of this magnitude, the subject index is respectably complete, but there are curious gaps which emerge as a result of the organization of the material and the tendency to index headings used by authors rather than actual subject matter. For example, if one wished to look up properties of complexes with multiple metal-metal bonds, one would have a difficult and frustrating experience since only heteronuclear bonds were indexed. For homonuclear metal-metal bonds, an element by element search would be necessary.

Since the price of this set will limit its use mostly to libraries, the advice of our Departmental Librarian, Mr. Stephen Lucchetti, was sought. Mr. Lucchetti stated that the binding, paper, and printing are of high quality and should stand up to heavy use. He further stated that the volumes are too thick (for a few hundred dollars more, smaller volumes could be produced which maximize both multiple use and shelf life), and the fact that the contents are not printed on the spine covers necessitates an undue reliance on the index volume. Furthermore, neither CAS registry numbers nor formal CA names are used, thus severely limiting forward searches. Perhaps these shortcomings can be rectified in future printings.

In spite of its deficiencies, this set is extremely useful to a wide variety of researchers and teachers. One has at one's fingertips a distillation of the now vast organometallic literature. This work will surely and rapidly become the standard reference work in organometallic chemistry.

M. David Curtis, *The University of Michigan*

Experiments with Mixtures: Designs, Models, and the Analysis of Mixture Data. By John A. Cornell (University of Florida). John Wiley and Sons, New York. 1981. xvii + 305 pp. \$30.95.

The proper design of experiments and analysis of data is crucial to the blending of components into a mixture that has specific properties. This is particularly important in the formulation of the end use products of chemical industry, where mixtures often have properties that are a complex function of their composition. While a trial-and-error approach may be adequate for analysis of mixtures with a small number of variables, it is likely to be inefficient and costly when dealing with situations which involve a large number of variables.

Cornell's book focuses on the most commonly used statistical techniques and methods used in designing, modeling, and analyzing mixture data. The author concentrates on the mathematical methods to be used after proper choice of the measured property and controllable variables have been made. Numerical examples of problems taken from real life situations are solved in considerable detail and should help to make the book useful to chemists beginning to work on mixture problems. No practical advice is given in the book on how to avoid the problems that result from improperly choosing the measured properties and controllable variables.

John W. Larson, *Marshall University*

The Natural Coumarins—Occurrence, Chemistry and Biochemistry. By R. D. H. Murray (University of Glasgow), J. Mendez (Consejo Superior de Investigaciones Cientificas, Spain), and S. A. Brown (Trent University). John Wiley & Sons, New York. 1982. ix + 702 pp. \$162.00.

This book is a detailed and carefully written handbook of the natural coumarins. It will be of great interest not only to natural products chemists but also to biochemists and physiologists who are concerned with the important biological effects of compounds such as the aflatoxins and psoralen. More than half the book is taken up with listings of the natural coumarins, the compounds being arranged in many different ways to allow information retrieval by a variety of users. The literature is covered through mid-1980, and there are 3383 literature references.

This book will be essential for the libraries of any institution working with natural products, and will be indispensable to anyone working with coumarins.

P. W. Le Quesne, *Northeastern University*

Elementary Statistical Thermodynamics, A Problems Approach. By N. O. Smith (Fordham University). Plenum Press, New York. 1982. xiii + 216 pp. \$25.00 (\$14.95 paperback).

The seven chapters cover the topics in molecular statistics usually found in a general undergraduate physical chemistry text, but in a more leisurely manner. A discussion of the Distribution Law for distinguishable, localized (distinguishable), and nonlocalized (indistinguishable) particles is followed by the derivation of thermodynamic functions for an ideal gas (linear and nonlinear), and a final chapter on chemical equilibrium. Ensembles are omitted. There are 46 worked examples in the text, and answers (some very detailed) to the 80 problems are provided. The book is well written, and the mathematics can be followed by anyone with a class in calculus and some knowledge of partial differentials. It achieves its stated objective of helping the less competent student to appreciate and comprehend statistical thermodynamics.

Brian Kybett, *University of Regina*

The Foundations of Chemical Kinetics. By E. N. Yerebin (Moscow State University). Translated into English by Artavaz Beknazarov. MIR Publishers, Moscow. 1979. Distributed by Imported Publications, Inc., 320 W. Ohio St., Chicago, IL 60610. XIV + 423 pp. \$11.00.

This book would have been a reasonably competent contribution 30 years ago. However, this edition, which was revised in 1979 from the 1976 edition and has now been translated into English, is a bad book. A few examples will illustrate how the late author was not swayed by developments since 1960 and in some instances before 1960. Since 1967 when Sullivan showed that formation of HI from $H_2 + I_2$ was not a four-center reaction, all kineticists have dismissed that archaic view—all except Yerebin. The incorrect notion that azomethane decomposes in a unimolecular mechanism to produce ethane and nitrogen has also been resurrected by the author, who even applies RRR theory to the decomposition. The author appears not to have been aware of Marcus' contribution to unimolecular rate theory, since it is nowhere to be found.

Also, the dozens of papers demonstrating molecular elimination of hydrogen in methane and ethane photolysis have been totally ignored in favor of the (incorrect) idea that simple C-H and C-C bond rupture are the dominant processes. A few conspicuous absences may be noted: laser-induced fluorescence, resonance fluorescence, flash photolysis, pulse radiolysis, multiphoton decomposition, chemical shock tubes, very low pressure pyrolysis.

Physically, the volume is down to the usual Soviet standards. The paper and binding are cheap but mercifully there are very few misprints. However, there are occasional holes in the middle of pages (two in my volume, one of which is in the middle of a key equation). There is little to recommend this book.

James R. McNesby, *University of Maryland*

Advances in Carbohydrate Chemistry and Biochemistry. Volume 40. Edited by R. S. Tipson and D. Horton. Academic Press, New York. 1982. x + 452 pp. \$65.00.

This latest volume of the *Advances* comprises five chapters and a cumulative index for the last five volumes (36-40). The topics in the present text cover a broad range of subjects, starting with monosaccharides in the first two chapters, specifically, their total synthesis, and the biochemistry of sialic acids, and moving to glycosphingolipids and the glycosylation of proteins in chapters three and four, and concluding with a review of polysaccharide crystal structures.

The first chapter, entitled *The Synthesis of Sugars from Non Carbohydrate Precursors*, is authored by A. Zamojski, A. Banaszek, and G. Gryniewicz of the Polish Academy of Science, a group that has contributed extensively to our knowledge of the subject. The starting materials used to achieve the total synthesis of optically active carbohydrates, namely, alkynes and alkenes, dihydropyrans, furan derivatives, and vinylene carbonate are discussed in detail.

R. Schauer, of the Christian-Albrechts University in Kiel, then discusses *The Chemistry, Metabolism, and Biological Functions of Sialic Acids*. These acids play a key role in the process of cell recognition, which ensures the protection of life against foreign organisms, but because of anti-recognition, also leads to the survival of malignant cells.

Next follows a short chapter, *Biosynthesis and Catabolism of Glycosphingolipids*, by a team from Tulane University, Yu-Teh Li and Su-Chen Li. Recent interest in this group of glycolipids was stimulated by the discovery that various lipid-storage diseases could be attributed to inborn errors of glycosphingolipids catabolism.

Chapter 4, *The Lipid Pathway of Protein Glycosylation and its Inhibitors: The Biological Significance of Protein-bound Carbohydrates*, by R. T. Schwarz and R. Detma, of the Justus-Liebig University in Giesen, deals with the biosynthesis of lipid-linked oligosaccharides and the inhibitors of protein glycosylation. The latter glycosylation is of significant biological importance, because the composition, arrangement, and interaction of the cell-surface molecules produced determine the social behavior of cells.

Since 1974, the last chapter of the *Advances* has traditionally dealt with a bibliography of crystal structures. This year is no exception; P. R. Sundararajan and R. H. Marchessault, of the Xerox Research Center, in Ontario, thoroughly review the bibliography from 1977 to 1979 on the *Crystal Structure of Polysaccharides*. The latter include amylose, cellulose, amino-polysaccharides, bacterial polysaccharides, and peptidoglycans.

Volume 40, like previous volumes in this series, is a credit to its editors, who have succeeded in maintaining throughout the years a flow of excellent reviews, contributed by capable and respected authors in the various branches of the broad field of carbohydrates. Their success has made the series indispensable in any Chemical or Biochemical Library, and a must in the private book collection of anyone seriously interested in carbohydrate chemistry or biochemistry.

Hassan S. El-Khadem, *Michigan Technological University*

Stereochemistry. By O. Bertrand Ramsay (Eastern Michigan University). Heyden & Son Ltd., London. 1981. xv + 256 pp. \$29.95.

This enjoyable book is one volume in the series "Nobel Prize Topics in Chemistry". The purpose of the series as stated by its general editor is to cover the history of chemistry by taking "...one of each Nobel Laureate's most significant publications, to reprint it (as an English translation if appropriate), discuss it, and then to place it within the context of the Laureate's life and works in particular and the history of science in general...". The present volume reprints (in Chapter 1) four of these "key papers" (one each by Hassel, Barton, Prelog, and Cornforth) which are felt to have laid the foundations of modern stereochemical theory. After these landmark publications have been considered, the author then traces the historical evolution of modern theories of molecular geometry and the stereochemistry of reaction pathways (Chapters 2 through 11). Chapters 12 through 14 continue with a review

of the development of conformational analysis, and Chapters 15 and 16 conclude with a brief discussion of asymmetric transformations and some "chemical curiosities" taken largely from recent work in synthetic organic chemistry. A chronology, glossary, and supplementary reading list are included as appendices as well as a delightful section titled Stereochemical Satire. Both a subject and name index are provided as well.

The level of presentation is roughly equivalent to that of a modern introductory text in organic chemistry. Thus, the book is aimed primarily at readers with some chemical background, but the glossary of chemical terms is intended to make it useful to nonscientists as well. It will be of interest to anyone wishing a brief review of the history of this specific area of the field of chemistry. It should also be helpful to those teaching an introductory course in organic chemistry, since it brings together and thus makes conveniently available a variety of historical materials not ordinarily included in a general text.

George B. Clemans, *Bowling Green State University*

Methods in Enzymology. Volume 85. Structural and Contractile Proteins. Part B. The Contractile Apparatus and Cytoskeleton. Edited by Dixie W. Fredericksen and Leon W. Cunningham. Academic Press, New York. 1982. xxiii + 774 pp. \$69.50.

The contractile apparatus and the proteins of the cytoskeleton are a complex group of interacting, non-interacting, and energetic macromolecules present in muscle and non-muscle cells. The transduction of chemical energy into mechanical work under the auspices of ATP sacrifice is a common thread in these diverse cells. The present text is a state-of-the-art exposé of the methods required to isolate, identify, and characterize the filamentous components from a multitude of sources. These sources are neatly divided into striated muscle, smooth muscle, and non-muscle tissues. The latter group contains a series on various bacterial sources of myosin and specific methodology comparing eucaryotic and procaryotic preparations. One senses that the approaches used for protein and enzyme isolation are by no means standardized in this field, and unfortunately the authors make no attempt at such a synthesis. However, each research group is adequately represented and their methodology adequately detailed; but for "non-contractile" researchers, a "method-of-choice" would be difficult to extract from all the papers in a given area. One fact which cannot be overlooked is the desire of each group of workers to identify a specific component and to give it a self-anointed title, descriptive or not. This treatise is full of such handles as the old-standbys—myosin, actin and tubulin—but then enter nebulin, titin, filamin, MAPS, dynein, desmin, vimentin ..., and the list goes on. The editors make no effort to organize these proteins in a review format explaining their origin, isolation, and possible function. The reader is left to organize such diverse data on his own.

The methodologies are explained in a very readable manner and the bibliography and subject index are quite useful for workers and readers in and out of the field. The final section offers modern physical biochemical techniques for studying macromolecules of the cytoskeleton and contractile system. In summary, this review is a valuable edition to the *Methods in Enzymology* series and should be sought by those involved in research on cytoskeleton proteins.

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

Magnetism Diagrams for Transition Metal Ions. By E. König and S. Kremer (University of Erlangen-Nürnberg). Plenum Press, New York. 1979. xi + 555 pp. \$59.50.

This book is a companion volume to the authors' earlier "Ligand Field Energy Diagrams" (LFED). The diagrams in the present volume are plots of the average effective magnetic moment and principal effective magnetic moments of d^1 to d^9 electronic configurations as a function of temperature (0 K to 400 K) and various ligand field parameters corresponding to octahedral, tetrahedral, tetragonal, trigonal, and cylindrical symmetry.

The book is divided into two parts: Part I, Theory and Methods; and Part II, Diagrams. Part I of this volume in conjunction with Part I of LFED provides a useful and up-to-date summary of ligand field theory at a high level using irreducible tensor operator methods. The experimentalist not well-versed in the theory might find this part difficult; however, he or she can use the diagrams directly and easily after reading a short chapter (seven) on the Description of the Diagrams and Their Application. Indeed it is clear that the purpose of the volume is to provide accurate magnetism diagrams for the experimentalist, who may not wish to delve deeply into the theory. This work adequately fills this need.

The question arises as to whether the number of diagrams (corresponding to the range of ligand field parameters, spin-orbit coupling, and orbital reduction factors) is sufficient for the experimentalist to find a diagram closely matching the compound under investigation. This can probably be answered in the affirmative. Another concern is the extent

to which the diagrams would vary as a result of different choices of the Racah and spin-orbit coupling parameters. One of the advantages of these diagrams is that the mixing in of excited electronic states has been included in their calculation. Consequently, it would have been informative if a few diagrams corresponding to different values of these parameters had been included for comparison. The authors remark (correctly), however, that the magnetic susceptibility is essentially an electronic ground state property, and the dependence on the accurate energies of the excited states is not pronounced.

The diagrams are carefully printed on oversize (8.5 in. \times 11 in.) pages and can be read accurately except in some cases at low (1 K to 4 K) temperatures.

Overall, the authors have again provided a very useful service, especially for inorganic chemists, who are interested in the magnetic properties of transition metal compounds. The volume should be a valuable addition to both institutional and personal libraries.

Charles Trapp, *University of Louisville*

Organic Syntheses with Carbon-14. By R. R. Mucino (Hoffman-La Roche, Inc.). John Wiley and Sons, Inc., New York. 1983. xi + 676 pp. \$52.50.

This book is meant to simplify the search for published preparations of ^{14}C -labeled compounds by presenting in a carefully organized way a comprehensive tabulation of the subject through 1979. There is no text, just equations, conditions, yields, and references in abundance. The structural formulas are presented in a form well suited for quick visual recognition. The material is arranged in eight chapters, according to structural type, and includes everything from simple hydrocarbons to carbohydrates and organic phosphorus compounds. It is good to see that low-yield reactions have not been overlooked, for they are not uncommonly the only feasible method for preparing certain types of labeled structures.

Every compound is included in both a formula index and a subject index, and finding a desired compound should therefore never be difficult. In the subject index, trade names or generic names are included as well as systematic names. This book represents a great deal of labor, and will spare its users much work; in addition to providing useful ideas to the browser.

Protein Folding. By Charis Ghelis and Jeannine Yon (Université de Paris-Sud). Academic Press, New York. 1982. 562 pp. \$74.50.

This book represents an up to date review of the theoretical and experimental data available in the literature on the intriguing problem of protein folding. The book is divided in three sections in which different aspects of the problem are analyzed. The first part deals with structural characteristics of the proteins, the contribution of the different chemical factors to the acquisition of the native structure, and the different theoretical approaches devised for the prediction of the protein conformation and for calculating the stability of the structures formed at different steps of the folding pathway. In the second part, various experimental results are reported and grouped according to the approach used. Well described are the studies of the folding-unfolding processes both under equilibrium conditions and with kinetic measurements. The folding process is analyzed and the physicochemical and immunological methods used for its characterization are discussed. The phenomenon that accompanies the assembly of monomers to produce the quaternary structure, and how the reappearance of the protein functions parallel the reassembly process are covered. In the last part, the authors correlate the experimental findings with theoretical predictions and summarize different aspects of the protein folding mechanism.

This book is a well-written, authoritative monograph in which the authors demonstrate a worthy effort to collect, discuss, and correlate current information about the problem of protein folding. It is needed and will prove very helpful to the researchers in the field and to the biochemist in general, providing a comprehensive survey and analysis of the current state of affairs.

Clara Fronticelli-Bucci, *University of Maryland*

Springer Series in Solid-State Sciences. Volume 15. Modern Crystallography. Volume I. Symmetry of Crystals, Methods of Structural Crystallography. By Boris K. Vainshtein (Academy of Sciences of the USSR). Springer-Verlag, Berlin, Heidelberg, and New York. 1981. xvii + 399 pp. DM 98; \$47.50.

The four-volume series "Modern Crystallography" is intended to present all aspects of crystallography in a unified way, so as to emphasize the interrelations of structure and properties. The series is written by a large group of distinguished authors from the Institute of Crystallography of the USSR Academy of Sciences.

Somewhat over half of Volume I is devoted to symmetry in general and the geometry of crystals, a field that has traditionally been a specialty

of Russian crystallographers, and to which they have made major contributions. This book makes recent work conveniently accessible in English; several kinds of generalized symmetry are described and illustrated (some in color), including antisymmetry, color symmetry, and symmetry in higher dimensions. Vainshtein treats the more familiar crystallographic point groups and space groups in the kind of thorough detail that comes from a long career of teaching and thinking about the subject. All those points that most books pass over with "It can be shown that ..." are here set out in detail.

The rest of the book treats diffraction phenomena in detail, concentrating on X-rays but with appropriate attention also to neutron and electron diffraction. The principles are covered thoroughly, including the dynamic theory of diffraction; the experimental and computational techniques used in structure determination are treated more briefly.

The value of the book is enhanced by an extensive general bibliography of nearly 200 entries, which provides thorough coverage of the Russian literature as well as a good selection of literature in other languages. The numerous (272) figures include many excellent photographs of crystals and diffraction patterns as well as carefully prepared line drawings.

The book will be a valuable reference for crystallographers and workers in solid-state sciences for its encyclopedic coverage. It will be less useful as an introductory textbook because of the extensive detail, and also because of occasional awkwardness in the English translation.

Gene B. Carpenter, *Brown University*

Membrane Mimetic Chemistry. By Janos H. Fendler (Clarkson College of Technology). John Wiley and Sons, New York, 1982. xi + 522 pp. \$59.95.

While the U.S. economy struggles to find a new identity in the face of a high-tech/information revolution, the science of chemistry continues its evolutionary redefinition for much the same reasons. In earlier times it was perhaps sufficient to understand chemical behavior, and even to predict it, when given reactants were mixed. Now, however, the emphasis is shifting to gain an increasing *control* of chemical processes. Chemistry's future may belong to those who can design molecular scaffolds which promote selective chemical events. Seeds of this future are now visible in the areas of laser photochemistry and gene splicing, while the near renaissance in catalysts is well underway.

Janos Fendler's multidisciplinary text announces a new and rapidly growing subdiscipline of chemistry which follows this theme of molecular control. For many chemists, biologists, and physicists who have been following the growth of their own fields, and for whom colloidal systems may have been last encountered as the traditional Hartley micelle, Fendler's text offers a detailed and coherent view of current events in this 7-year-old, artificial-membrane field. Few of us shared the wide perspective of Professor Fendler, which ranged from micelles, microemulsions, and monolayers to bilayer liquid membranes, vesicles and liposomes, the cryptands, crown ethers, cyclodextrins, and polyelectrolytes. Each of these macrochemical assemblies has its own particular microchemical environment, which may be exploited to further unique chemical reactions not possible in traditional media. Fendler's 522-page reference/text gives the reader just such a perspective, including references to Fendler's leading work in the area.

Several distinguishing features of the book are helpful to the reader, in addition to the informal and readable style in which it is written. Each chapter is preceded by a perspective-setting paragraph or two to give the reader a sense of direction. For example, it is pointed out rather early that the correspondence between naturally occurring membranes and their synthetic counterparts is less than perfect. Often the former contain protein components not present in the latter, and this difference is thought to lead to the much greater surfactant-binding power of the synthetic interfaces. But "mother nature need not be slavishly reproduced" in order to take chemical advantage of the unique microenvironments associated with these artificial systems.

After a 171-page exposition of the characteristics of each of the different macrochemical assemblies, there is a valuable chapter (of unfortunately only 9 pages) which compares all of them. This chapter is useful in guiding new experiments in the field. There is a 130-page group of 20 tables, almost Herzbergian in quality, summarizing the results of 414 references in terms of the macroassemblies, the chemical processes, the techniques, and the results. These tables provide a rapid scan through mid-1981 of practically all the relevant experiments for each type of system.

Following descriptions of the seven main types of macroassemblies, and their comparison, there is a 94-page section devoted to current applications. These include enzyme modeling, reactivity control, and solar energy conversion. The 4-page miscellaneous group (drug encapsulation, etc.) which concludes the volume is less useful.

One might not completely agree with the operational guideline set by the author to define the book's "depth of coverage". This was taken to

be "inversely proportional to the availability of recent reviews". It is fortunate that Fendler is not entirely constrained by his own directive. Thus the sections on micelles and vesicles, which have been reviewed, are developed systematically and comprehensively, as they should be.

It is fortunate that little time is devoted to ancillary topics such as photon correlator spectroscopy, or positron annihilation. Only enough is mentioned to indicate the relevance of the results to the reader. The only point of issue taken by this reviewer is one of balance. It does seem that the 11 pages dealing with solar energy storage and artificial photosynthesis unfairly downplays this field, when compared to the 83 pages used to cover enzyme modelling and reactivity control. Some important solar experiments have not been developed as completely as they deserve, such as those originating from the laboratories of Calvin, Porter, and Gratzel. However, this point should not obscure Fendler's Herculean effort in organizing and presenting the literature of this burgeoning field with clarity, efficiency, and coherence. That he has provided his readers with a conceptual framework with which they may intelligently interpret future developments is perhaps the book's most useful function. We are indebted to Professor Fendler for this service.

Howard D. Mettee, *Youngstown State University*

Techniques in Liquid Chromatography. By C. F. Simpson (Chelsea College, University of London). John Wiley & Sons, New York, NY, 1982. ix + 464 pp. \$54.95.

This is a multi-author text based on a series of lectures presented at a Residential School in High Performance Liquid Chromatography under the auspices of the Royal Society of Chemistry. As such, the authors make an excellent attempt to combine the theory of HPLC with sufficient practical details to appeal to the bench chemist. This is not an introductory text, however, and some precursory knowledge of HPLC is required to appreciate the book in its entirety. Unlike so many books one reviews on HPLC, this one can stake some claim to be original, which is very welcome. It nicely complements the more encyclopedic text, "Introduction to Modern Liquid Chromatography" by L. R. Snyder and J. J. Kirkland, Wiley, New York, 1979. Several recent developments, such as microbore HPLC, are treated in detail here, as well as an updating of information concerning separation mechanisms. The book is not comprehensive and the following topics are either treated poorly or not at all: instrumentation, derivatization, reaction detectors, gradient elution, multidimensional chromatography, solvent selectivity triangle, and ion chromatography. In fact, the book is organized around the different column types, each one given a separate chapter, a fact that makes it difficult to assess the contribution that the mobile phase makes to a separation. Also, in a book aimed at the practical chemist, it is unfortunate that room could not have been found for a chapter on sample preparation and prechromatographic methods. Likewise, some more detailed information on data handling and quantitative analysis is called for.

The book has its strengths; the descriptions of the various column types, microbore HPLC, preparative HPLC, and kinetic optimization of columns are all well-treated. The last chapter includes detailed instruction for 20 demonstration experiments in HPLC. Some of these are very narrow in scope or too esoteric to be useful, but others could be adopted for laboratory demonstrations. The general level of the book would make it suitable for adoption as a graduate level course text in HPLC if supplemented by additional information as indicated in the previous paragraph.

The editor and authors are to be congratulated on producing a useful and modern text on HPLC. Purchase could be recommended to all practicing HPLC chromatographers without reservation. I guess no book ever seems perfect to a reviewer, but this one is certainly at least very good.

Colin F. Poole, *Wayne State University*

Analytical Aspects of Environmental Chemistry. By D. F. Natusch (Liquid Fuels Trust Board, Wellington, NZ) and P. K. Hopke (University of Illinois, Urbana). John Wiley & Sons, New York, NY, 1983. ix + 267 pp. \$40.00.

This book is volume 64 in the series of monographs on "Chemical Analysis" edited by P. J. Elving and J. D. Winefordner. The title may mislead some readers as this is a multi-author text covering a few selected topics of interest to the analytical chemist. Chapter 1 deals with chemical speciation by R. S. Braman in 59 pages with 165 references. Rather narrow in scope it details analytical techniques for the determination of organometallic species of antimony, arsenic, copper, germanium, lead, mercury, sulfur, selenium, and tin. Some critical comparisons of the methods/data presented would have been welcome. Chapter 2 deals with capillary column gas chromatography in the analysis of environment by M. Novotny. This is a well-structured general review of column parameters and the use of selective detectors for environmental analysis in 51

pages with 158 references. This chapter would be specifically useful to the non-specialist chromatographer and contains a wealth of general and practical information. Chapter 3 deals with recent advances in gas chromatography/mass spectrometry in environmental analysis by P. W. Ryan in 23 pages with 37 references. The title of this contribution is misleading and its value dubious. Recent it certainly is not, as indicated by the bibliography, there are no references quoted after 1978. It concentrates mainly on a very general description of instrumentation without the depth or sustenance found in the other contributions to this volume. Chapter 4 deals with environmental applications of surface analysis techniques—PAS, XPS, Auger Electron Spectroscopy, and SIMS—by R. W. Linton, D. T. Harvey, and G. E. Cabaniss in 51 pages with 158 references. With Chapter 5, ESCA in Environmental Chemistry by T. Novakov, S. G. Chang, R. L. Dod, and L. Gundel (26 pages and 21 references), it provides a good review of the application of surface analysis techniques to environmental problems. As these techniques will find increasing use in the study of particulate matter and ambient aerosols they represent a timely contribution to the analytical literature. Chapter 6 entitled An Introduction to Multivariate Analysis of Environmental Data by P. K. Hopke in 43 pages with 61 references completes the contributions to this volume. Of obvious importance to environmental studies, I feel that this chapter contributes little to what is already available in standard texts on statistics. It is easy to read and would appeal to scientists looking for a chemist's view of the use of statistics in data evaluation.

Overall I feel that this volume is destined for the shelves of research libraries and covers too many fragmented topics to appeal to a general readership.

Colin F. Poole, *Wayne State University*

Synthetic Fuels. By R. F. Probst (M.I.T.) and R. E. Hicks (Water Purification Associates). McGraw-Hill Book Co., New York. 1981. xiv + 490 pp. \$29.95.

This book is primarily a text for a course for graduate studies in chemical engineering, but it can serve as a useful secondary reference. Although the emphasis is to applied aspects, early chapters contain a substantial amount of chemical, mineralogical, and geological information. The technology of the processes for converting coal, tar sands, biomass, and oil shale to liquid and gaseous fuels is presented clearly enough for the non-engineer to follow. The book abounds with tables, equations, figures, flow charts, and photographs. Each chapter concludes with a list of references of useful proportions. There are chapters on environmental and economic aspects. Appendices include constants, conversion factors, symbols, and acronyms. There is a good index. Altogether, this book seems to be a good means for a chemist to acquaint himself with the general subject of fuel conversion.

The Shape and Structure of Molecules. Second Edition. By C. A. Coulson (revised by R. McWeeny). The Clarendon Press; Oxford University Press, New York. 1982. 94 pp. \$18.95 (hardback); \$8.95 (paperback).

Coulson's booklet is perhaps the best non-mathematical brief elementary introduction to the theory of chemical valence available. It deals with the principles governing the structure of molecules, so central to modern chemistry.

The many superb illustrations and the well-written text made this book very enjoyable. The first three chapters explain the fundamental notions of quantum chemistry (valence bond, atomic and molecular orbitals, orbital hybridization), which are shown at work in organic and inorganic molecules later on. A couple of problems challenge the reader to think about molecular structures. This book is recommended for anyone interested in an introduction to modern theoretical chemistry.

Miklos Kertesz, *Cornell University*

Biological Magnetic Resonance. Volume 4. Edited by Lawrence J. Berliner (Ohio State University) and Jacques Reuben (Hercules Incorporated Research Center). Plenum Press, New York. 1982. xx + 340 pp. \$42.50.

The four chapters of this volume are strikingly similar in that they are comprehensive reviews of the fields in which the authors work and are written at a fairly detailed level in terms of the applications, but give only qualitative descriptions of underlying theory.

Chapter 1, Spin Labeling in Disease by D. Allan Butterfield, is a thorough compilation of examples where electron spin resonance has been used to study materials obtained from diseased individuals. Most of the results concern comparisons between normal and diseased samples of cell membranes.

Chapters 2 and 3 describe two of the more popular experimental NMR approaches to the study of proteins in solution. Principles and Applications of ^{113}Cd NMR to Biological Systems by Ian H. Armitage

and James D. Otvos is a review of ^{113}Cd NMR where ^{113}Cd has been substituted for other, less experimentally tractable, metal ions. Virtually all of the examples are of metal-binding proteins. Photo-CIDNP Studies of Proteins by Robert Kaptein is an authoritative survey of the applications of photoinduced CIDNP using flavin dyes to select for aromatic amino acid residues in proteins.

Chapter 4, Applications of Ring Current Calculations to the Proton NMR of Proteins and Transfer RNA by Stephen J. Perkins, is an extraordinarily thorough (143 pages) description of ring current effects on ^1H NMR chemical shifts proteins. In general, the mathematical aspects are summarized with a minimum number of equations, although a computer program for the Johnson-Bovey ring current tables is appended. Comparisons between NMR and X-ray diffraction studies of proteins are emphasized in the review.

Stanley J. Opella, *University of Pennsylvania*

Volumes of Proceedings

Quantum Biology and Quantum Pharmacology. Edited by Per-Olov Löwdin and John R. Sabin. John Wiley and Sons, New York. 1982. xii + 430 pp. \$64.95.

Proceedings of Quantum Biology Symposium No. 9, held in Florida in March, 1982, consisting mostly of full papers, plus some abstracts, and an author index. Set in type and published as an issue of the *International Journal of Quantum Chemistry*.

Mass Spectrometry Advances. 1982. Parts A and B; Parts C and D. Edited by E. R. Schmid, K. Varmuza, and I. Foggy. Elsevier Scientific Publishing Co., Amsterdam and New York. 1982. xii + 544 pp; xvii + 461 pp. \$361.75.

Proceedings of the 9th International Mass Spectrometry Conference, held in Vienna in 1982, containing seven plenary and 20 keynote addresses plus 400 contributed papers. Reprinted from the *International Journal of Mass Spectrometry and Physics*, reproduced from uniform typescript, hardbound, and provided with author and subject indexes.

Polymer Compatibility and Incompatibility: Principles and Practices. Edited by Karel Sölc. Harwood Academic Publishers, London and New York. 1982. x + 464 pp. \$97.50.

Contains the papers presented at the Tenth Midland Macromolecular Meeting, held in August 1980. Set in type and hardbound, and provided with a thorough subject index.

The Study of Fast Processes and Transient Species by Electron Pulse Radiolysis. Edited by John H. Baxendale and Fabio Busi. D. Reidel Publishing Co., Dordrecht, Boston, and London. 1981. xvi + 637 pp. \$74.50.

Proceedings of a NATO Advanced Study Institute held in Capri in 1981, consisting of 27 papers, reproduced from varying typescripts. The table of contents is unusually detailed, and it is supplemented by a subject index.

Non-Linear Raman Spectroscopy and Its Chemical Applications. Edited by W. Kiefer and D. A. Long. D. Reidel Publishing Co., Dordrecht, Boston, and London. 1982. x + 628 pp. \$74.00.

Proceedings of a NATO Advanced Study Institute held in Bad Windsheim in 1982. Consists of 30 addresses reproduced from mildly varying typescripts, arranged under the rubrics Raman and Infrared Spectroscopy, Hyper Rayleigh and Hyper Raman Scattering, Stimulated Raman Effect, CARS and Applications, Resonance CARS, Inverse Raman and Raman Gain Spectroscopy, and Photoacoustic Raman Spectroscopy and Raman Induced Kerr Effect. Author index only.

Solution Behavior of Surfactants: Theoretical and Applied Aspects. Volumes 1 and 2. Plenum Press, New York and London. 1982. xxx + 739 pp; xvii + 802 pp. Each \$75.00.

Proceedings of an international symposium organized under the auspices of the 11th Northeast Regional Meeting of the American Chemical Society, held in Potsdam, N.Y., in 1980. Consists of a large number of full papers, discussions, and an index; reproduced from uniform typescript and hardbound in two volumes.

Metal-Support and Metal-Additive Effects in Catalysis. Edited by B. Imelik, C. Naccache, G. Coudurier, H. Praliaud, P. Meriaudeau, P. Gallezot, G. A. Martin, and J. C. Vedrine. Elsevier Scientific Publishing Co., Amsterdam and New York. 1982. xii + 384 pp. \$83.75.

Proceedings of a symposium organized by the Institut de Recherches sur la Catalyse—CNRS—Villeurbanne, held in Lyon in 1982. Reproduced from fairly uniform typescript, hardbound, but not indexed.

New Coal Chemistry. Edited by A. Spinks, J. M. Thomas, and J. Gibson. The Royal Society, London. 1981. v + 215 pp. £26.85.

Contains the presentations made at a Royal Society Discussions

Meeting held in May 1980. Arranged under the rubrics Chemical and Physical Structure of Coal, Applied Coal Technology, and Coal Chemistry, A.D. 2000. The papers are set in type and are followed by transcripts of the ensuing discussion; they are reprinted from the Philosophical Transactions of the Royal Society, Vol. 300 (1981).

Air Pollution by Nitrogen Oxides. Edited by T. Schneider and L. Grant. Elsevier Scientific Publishing Co., Amsterdam and New York. 1982. xxiii + 1118 pp. \$159.75.

Proceedings of the U.S.-Dutch International Symposium held in Maastricht in 1982, consisting of a large number of papers from 17 countries and averaging about 10 pages each, on formation and sources, monitoring, transport, removal, health, ecological and biological effects, control technology, and policy. Reproduced from the authors' typescripts, hardbound, and indexed.

The Control of Exposure of the Public to Ionizing Radiation in the Event of Accident or Attack. NCRP Publications, Bethesda, MD. 1982. vii + 282 pp. \$20.00.

Proceedings of a Symposium held in Reston, Va., in 1981, consisting of papers, discussions, and appendixes, set in type, softbound, and not indexed.

Sintering—Theory and Practice. Edited by D. Kolar, S. Pejovnik, and M. M. Ristić. Elsevier Scientific Publishing Co., Amsterdam and New York. 1982. xii + 654 pp. \$151.00.

Proceedings of the Fifth International Round Table Conference on Sintering, held in Yugoslavia in 1981, consisting of a large number of short papers reproduced from the authors' typescripts. Hardbound and provided with a short subject index.

Coal Conversion and the Environment: Chemical, Biomedical, and Ecological Considerations. Edited by D. Dennis Mahlum, Robert H. Gray, and W. Dale Felix. U.S. Department of Energy Technical Information Center, Oak Ridge, TN. 1981. xii + 607 pp. \$24.75.

Proceedings of the Twentieth Annual Hanford Life Sciences Symposium, held at Richland, Washington, in 1980. The papers are arranged under the rubrics Chemistry, Ecological Considerations, Biomedical Studies (in vitro and animal studies), Assessment and Control Technology—A Panel Discussion. Softbound, set in type, and provided with a subject index.

Polymer Applications of Renewable Resource Materials. Edited by Charles E. Carrahar, Jr., and L. H. Sperling. Plenum Press, New York and London. 1983. xiii + 469 pp. \$59.50.

Proceedings of a Symposium on the Use of Renewable Resource Materials for Coatings and Plastics, held at the ACS meeting in New York in 1981. It consists of papers under the rubrics Saccharides and Polysaccharides, Wood Products, Oils and Lacquers, and Proteinaceous Materials, plus two introductory addresses. Hardbound and provided with a subject index.

Coordination Polymerization. Edited by Charles C. Price and Edwin J. Vandenberg. Plenum Press, New York and London. 1983. x + 331 pp. \$42.50.

Proceedings of a symposium organized for the occasion of the bestowal of the ACS award in Polymer Chemistry on Edwin J. Vandenberg at the meeting of the ACS in Atlanta in 1981. It consists of 15 papers, reproduced from the authors' typescripts. Hardbound and provided with a subject index.

Van der Waals Molecules. Faraday Discussions of the Chemical Society. No. 73. The Royal Society of Chemistry, London. 1982. 431 pp. £23.00.

Proceedings of a Faraday Discussion held at the University of Oxford in April 1982, consisting of 22 papers, including the Lennard-Jones lecture, Intermolecular Bonding, by J. A. Pople, plus the transcripts of the ensuing discussions, a list of poster presentations, and an index of names, all set in type. Softbound.

Electron-Atom and Electron-Molecule Collisions. Edited by Juergen Hinze. Plenum Press, New York and London. 1983. viii + 354 pp. \$49.50.

Proceedings of a workshop held in Bielefeld in 1980, consisting of 18 papers reproduced from pleasingly uniform typescript. Hardbound and provided with a very brief subject index.

Metal Microstructures in Zeolites: Preparations—Properties—Applications. Edited by P. A. Jacobs, N. I. Jaeger, P. Jiru, and G. Schulz-Ekloff. Elsevier Scientific Publishing Co., Amsterdam and New York. 1982. viii + 284 pp. \$76.75.

Proceedings of a "workshop" held in Bremen in 1982, consisting of 30 papers reproduced from somewhat varying typescripts, and a list of contributors.

Modelling of Chemical Reaction Systems. Edited by K. H. Ebert, P. Deufhard, and W. Jager. Springer-Verlag, New York. 1981. x + 389 pp. \$35.00.

Proceedings of an International Workshop held in Heidelberg in 1980, consisting of 27 papers reproduced from typescripts; not indexed.

Picosecond Phenomena III. Edited by K. B. Eisenthal, R. M. Hochstrasser, W. Kaiser, and A. Laubereau. Springer-Verlag, New York. 1982. xiii + 386 pp.

Proceedings of the Third International Conference on the title subject, held in Garmisch-Partenkirchen in 1982. Consists of a large number of papers averaging about 5 pages each, reproduced from a variety of typescripts; hardbound, with an index of contributors only.

Structure of the Interfacial Region. Faraday Symposia of the Chemical Society. No. 16. The Royal Society of Chemistry, London. 1981. 256 pp. £33.00.

Proceedings of a symposium held at the University of Oxford in 1981 by the Faraday Division of the Royal Society of Chemistry. There are 15 papers, 50 pages of transcripts of discussions, a list of posters, and an author index. Set in type and softbound.

Actinide Recovery from Waste and Low-Grade Sources. Edited by James D. Navratil and Wallace W. Schulz. Harwood Academic Publishers, New York. 1982. xiii + 386 pp. \$63.50.

Proceedings of an International symposium held at the national meeting of the American Chemical Society in New York in 1981, consisting of 22 papers reproduced from a variety of typescripts, arranged under the rubrics Plutonium Recovery/Removal Technology, Uranium Recovery from Low-Grade Sources, Reagents for Actinide Liquid-Liquid Extraction Processes, and General Actinide Recovery/Separation Technology; there is a subject index; hardbound.

Proceedings of the International Conference on Low-Dimensional Conductors. Parts A, B, C, D, E, and F. Edited by Arthur J. Epstein and Esther M. Conwell. Gordon and Breach Science Publishers, London, New York, and Paris. 1981. ca. 2100 pp. \$195.00 per part (\$1170.00 for the set).

These Proceedings are published in six parts as six volumes of "Molecular Crystals and Liquid Crystals" (Volumes 77, 78, 81, 83, 85, and 86) and consist of papers and abstracts reproduced from mixed typescripts; an index of contributors is in the last volume. The price might lead one to expect tooled leather bindings; in actuality, the volumes are paperbound.

Management of Industrial Wastewater in Developing Nations. Edited by David Stuckey and Ahmed Hamza. Pergamon Press, New York. 1982. x + 500 pp. \$70.00.

The 41 papers in this collection were presented at a symposium held in Alexandria, Egypt, in 1981. Topics of a general nature are included such as the role of government in pollution control and the nature of industrial pollutants. Twenty-four papers deal with specific problems such as the biodegradability of hydrocarbons in refinery wastewater, vacuum filtration of compressible material, wastewater from the juice industry, wastewater from the match industry, and others.

Pentachlorophenol: Chemistry, Pharmacology, and Environmental Toxicology. Edited by K. Ranga Rao. Plenum Publishing Co., New York. 1978. 402 pp. \$37.50.

Proceedings of a symposium sponsored by the U.S., E.P.A., and the University of West Florida, held in 1977.

Chemically Induced Magnetic Polarization. Edited by L. T. Muus, P. W. Atkins, K. A. McLauchlan, and J. B. Pederson. D. Reidel Publishing Co., Dordrecht and Boston. 1978. xii + 407 pp. \$38.00.

Proceedings of a NATO Advanced Study Institute held in Italy in 1977.