Book Reviews

1. Crystals: Growth, Properties, and Applications–Crystals for Magnetic Applications. Edited by C. J. M. Rooijmans (N. V. Philips Gloeliampenfabrieken). Springer-Verlag, Berlin–Heidelberg–New York. 1978. 139 pp. $29.00.

This book is the first volume in a series concerned with the growth, properties, and applications of crystals. The volume consists of five separately authored articles which describe methods for preparation of crystals of certain magnetic metal oxides. The crystals are important for industrial applications such as the manufacture of magnetic bubble devices. Three of the five articles deal with garnet crystals, iron, and gadolinium garnets in particular. The remaining two articles discuss spinels and other metal oxides. The crystal growth methods which are presented include high-temperature flux, hydrothermal, Bridgman, and Czochralski techniques. The preparation of epitaxial films as well as the growth of large single crystals is discussed. Each article is detailed, well illustrated, and well referenced. This volume would be a very valuable reference for any researcher with a serious interest in magnetic garnets or other similar materials.

Gary L. McPherson, *Tulane University*

Polymer–Polymer Miscibility. By O. Olabisi and L. M. Robeson (Union Carbide Cooperation) and M. T. Shaw (University of Connecticut). Academic Press, New York. 1979. xi + 370 pp. $42.50.

The area of polymer–polymer interactions in the solid state is becoming increasingly more important in view of the expanding commercial interest in polymer composites and blends. The growing industrial development of this field along with the expanding academic interest in fundamental investigations now require comprehensive reference works. This book does an excellant job of meeting the varied needs of both academic and industrial researchers.

This book is not the only one available on this subject and may be compared with "Polymer Blends and Composites" by Manson and Sperling; "Polymer Blends" by Paul and Newman; and "Multicomponent Polymer Systems" by Platzer. The latter two are edited collections of general reviews and symposium contributions, respectively. In comparison of specific areas, "Polymer–Polymer Miscibility" may not provide as detailed a coverage or as recent a reporting of research as one of the others. Nonetheless, this book does cover the field well with a usable combination of general discussions and illustrative examples. If one were to choose a single reference for this area, this should be the one. The subject coverage is indicated by the chapter titles listed below.

Chapter 1, Introduction—addresses basics, e.g., what domain size serves as criteria for defining a blend?

Chapter 2, Thermonodynamics of ...—provides the detailed theoretical and physical background of miscibility, almost one-fourth of the book.

Chapters 3 and 6 should be together, dealing respectively with Methods of Determining... and Properties of... miscible systems.

Chapters 4, 5, and 7 are written from an application and descriptive properties point of view. The titles are Methods of Enhancing Miscibility, Comprehensive Survey of..., and Utilization of Miscible Polymers.

Overall, this book is highly recommended as an introductory and reference work for the titled field.

Lon J. Mathias, *Auburn University*

Enzymic and Non-Enzymic Catalysis. Edited by Peter Dunnill (University College, London), Alan Wiseman (University of Surrey), and Norman Blakebrough (National College of Food Technology-Weybridge). Ellis Norwwod, Chichester, England. 1980. 249 pp. $59.95.

It is clear that recent advances in genetic engineering and enzyme chemistry are now resulting in expanded opportunities for widespread use of enzyme catalyzed reactions in the food and drug industries. At the same time, there has been rapid advancement in the chemistry of homogeneous catalysis. Taken together, these advances offer science and industry an enormous opportunity for practical achievements, especially in the food and drug related fields. One impediment to application of the new knowledge in the fields of enzymology, fixed enzyme technology, and homogeneous catalysis has been that industrial laboratories and academic laboratories have little contact with each other and that chemists and enzymologists likewise do not always have an opportunity to share ideas. In April 1978 a meeting was held at City University London to provide a forum for the sharing of ideas in the area of catlysis. This book reports the presentations of the meeting and the edited discussions resulting from the presentations. The problem with books of this sort (made up from meeting transcripts) is that they do not have enough experimental detail and primary scientific results to stand as a forum for new scientific information, nor do they have the cohesiveness of a review article. This present book shares these limitations and to this reviewer appears to consist of a hodgepodge of disparate presentations, with no clear viewpoint on the direction of research in the fields covered. Having dispensed with that criticism, however, there are some interesting presentations in the book. Chapter I is a good short summary dealing with enzyme catalysis, Chapter II is a good general discussion of enzyme technology, and Chapter III presents a clear well-referenced discussion of enzyme catalysis in organic synthesis. There is an interesting discussion of micellar catalysis (Chapter VII) and homogeneous catalysis (Chapter VIII) and finally a short chapter (IX) on polymer-attached catalysts. The chapters cited are clear and contain many interesting references. In conclusion, I am not terribly enthusiastic about this book; however, selected chapters will be of interest to many chemists.

James T. McFarland, *University of Wisconsin—Milwaukee*

Turbulent Forced Convection in Channels and Bundles: Theory and Applications to Heat Exchangers and Nuclear Reactors. By S. Kakac (Middle East Technical University) and D. B. Spalding (Imperial College of Science and Technology and Purdue University). Hemisphere Publishing Corporation, Washington, D.C. 1979. xiii + 1132 pp. $80 (2 volumes).

These two volumes are the product of a NATO Advanced Study Institute held in Instanbul, Turkey in July 1978. Sixteen invited review lecturers prepared specially edited versions of their lectures. Fifteen research reports were contributed from several different countries. The 53 presentations are organized under 11 headings distributed as follows: General Review, 2; Predictions of Turbulent Forced Convection, 16; Fundamentals of Turbulence, 11; Effects of Property Variations on Forced Convection, 4; Predictions of Turbulent Forced Convection in Liquid Metals, 7; Interaction of Radiation with Forced Convection, 1; Unsteady State Forced Convection, 2; Turbulent Heat Transfer Augmentation, 4; Measurement Techniques in Turbulent Flow, 2; Two-Phase Forced Convection, 3; and Suggestions for Further Research, 1. Greatest emphasis is on the second and third topics as these constitute most of Volume 1.

Although the authors acknowledge that coverage of the subject is incomplete because of the constraints of an institute, the wealth of information, often presented by authors with familiar names in heat trnsfer, constitutes a valuable resource to anyone with an interest in heat transfer research and applications.

Russell Mesler, *The University of Kansas*

Asymmetry in Carbohydrates. By R. E. Harmon (Western Michigan University, Kalamazoo). Marcel Dekker, Inc. New York. 1979. vii + 253 pp. $26.50.

The cliché that "you cannot tell a book from its cover" is certainly apropos in this case. The title on the cover is "Asymmetry *in* Carbohydrates", while on the title page it is "Asymmetry *of* Carbohydrates". This indecision and lack of attention to editorial detail is characteristic. The individual articles in this book are a random collection of 10 of the 24 papers presented at a symposium held by the Division of Carbohydrates Chemistry at the 1976 Fall meeting of the American Chemical Society in New York. The difficulty with the title of this book is reflected in an apparent indecision with respect to the title of the symposium from which it was taken. The author of one article states: "When I accepted the invitation to lecture in this symposium, it had a slightly different title, that of History and Modern Research Related to Asymmetry in Carbohydrates". I see now that the History and has been dropped.

So this book is a loosely connected set of 10 lectures (essays, reviews, or research reports) on subjects connected with the stereochemistry of carbohydrates. Each article by itself is reasonably good and authoritative for what it was intended, but together, they do not in any way represent an organized treatment of the subject implied by any of the titles. About half of the chapters are marred by having many small but inexcusable errors; the first page refers to work by Bargon (meaning Barton). The situation is further illustrated by ref 34 in the second article: "...*J. Carbohydr. Res.* (1976 in press)". There are no references beyond early 1976 although this book has a 1979 publication date. Apparently some of the authors did not have an opportunity to proof read and update their articles, which are reproduced from typed copy. In my opinion these articles would be much more useful if printed as separate reviews or papers in appropriate standard journals where they would be properly referred and made part of the organized chemical literature.

On the positive side, the individual articles were interesting and will certainly be of special interest to some readers. The subjects and authors are as follows: Development of Concepts of Ring Conformation and Neighboring Group Effects Prior to 1940, H. S. Isbell, pp 1–14; The Composition of Reducing Sugars in Solution, S. J. Angyal, pp 15–30; Prochirality and Pseudoasymmetry in Carbohydrate Biochemsitry, W. L. Alworth, pp 31–50; Influence of Configuration and Conformation upon Reactivity in Nitro Carbohydrates, H. H. Baer, pp 51–80; Study of Cuprammonium Complexing of Diols and Amino-Alcohols Using Circular Dichroism Techniques, C. B. Barlow, S. T. Bukhari, R. D. Guthrie, and A. M. Prior, pp 81–100; Synthesis of Chiral Tertiary Alcohols by Grignard Additions to Glycosulose Derivatives, J.-C. Fischer and D. Horton, pp 101–126; Asymmetric Reactions of Carbohydrates Containing Carbonyl Groups, G. H. Jones, J. G. Moffatt, R. S. Ranganathan, N. P. Damodaran, G. B. Howarth, M. D. Edge, H. Ohrui, and C. M. Gupta, pp 127–148; Effects of the Interaction with Reducing Sugars on the Conformation and Biological Activity of Poly-L-lysins: Investigation by Circular Dichroism and Carbon-13 N. M. R. Spectroscopy, L. Mester, B. Kraska, J. Crisba, and M. Mester, pp 149–166; Lock and Key Chemistry with Crown Compounds, A. C. Coxon, W. D. Curtis, D. A. Laidler, and J. F. Stoddart, pp 167–198; Chiral Sulfur in Carbohydrate Chemistry, R. L. Whistler and K. K. De, pp 199–228.

This is a book that you and your library can easily do without unless it happens that you are particularly interested in what one of these authors has to say about his chosen subject.

Harry S. Mosher, *Stanford University*

Physical Chemistry of Fast Reactions. Volume 2. Reaction Dynamics. Edited by I. W. M. Smith (University of Cambridge). Plenum Press, New York. 1980. xii + 277 pp. $32.50.

As indicated in the title, this book is the second in a series dealing with fast reactions. Whereas the first volume, published in 1972, dealt mainly with the macroscopic kinetics of small molecules and free radicals in the gas phase, the current volume has as its goal the elucidation of state-to-state reaction probabilities. The major areas of coverage include the theory and practice of energy consumption and disposal in chemical reactions.

I. W. M. Smith authors the first chapter, which deals with chemical reactions of selectively (primarily vibrationally) excited systems. After a brief review of statistical and dynamical theories of chemical reactivity, experimental results are considered. Both unimolecular and bimolecular collisions are examined, with emphasis on molecular beam and single photon infrared excitation techniques.

The second chapter, by B. E. Holmes and D. W. Setser, addresses the problem of energy disposal in chemical reactions following a discussion of experimental methods; results are presented for a number of unimolecular and bimolecular reactions. The relationship of potential energy surfaces to the detailed product energy distributions is then considered in detail.

Chemical lasers is the topic of the third and final chapter, written by T. A. Cool. The emphasis again is the study of state-to-state dynamics, both in the function of chemical laser systems and in the use of chemical lasers in studying reaction dynamics in other systems. Experimental techniques are discussed in detail.

Overall this volume provides good coverage of a number of current topics in chemical dynamics. The authors are unquestionably experts in their fields, and the material is well chosen. Citations are substantially complete through the middle of 1978, with a few selected references postdating that time.

Nicholas S. Nogar, *University of Nebraska—Lincoln*

Macromolecules, An Introduction to Polymer Science. *By* F. A. Bovey and F. H. Winslow (Bell Laboratories). Academic Press, New York. 1979. xiii + 549 pp. $39.50.

This book is an excellent introduction to polymers. It is written by six polymer scientists, all of Bell Laboratories, but despite so many authors there is good consistency between the chapters. In the preface, the editors state that the book is an outgrowth of an introductory course at Bell Laboratories and that it is intended as an introduction to polymer science at an undergraduate and first year graduate student level. It is, indeed, a good introductory book, but in order for it to be useful as a course textbook, additional material needs to be prepared by the instructor, chiefly mathematical derivations which have generally been omitted in this book. Therefore, the book is of most use to chemists and other scientists who want to learn about polymers. Its relatively high price also argues against its use as an undergraduate text.

The book is in eight chapters, with the first seven covering synthetic polymers and the last chapter a short introduction to biopolymers. The first chapter is a short but useful introductory chapter, giving the definitions and briefly describing the history of polymer science. The second chapter is a long and very thorough discussion of polymer synthesis, including kinetics and mechanisms of all major homopolymerizations and copolymerizations. Some derivations have been included here and it is thus one of the most useful chapters in the book. Chapter 3 covers the polymer microstructure, including chain statistics, sequence determination, and some crystal structures. There is good, advanced level discussion of chain statistics in this chapter, and some material is included that is usually not seen in introductory polymer books. However, the short discussion of polymer crystal structure represents a curious mix of some new and some very old work.

The solution properties of polymers are quite adequately treated in Chapter 4, although without any derivations. But again, some material is included that is usually not present in other books. Similarly, the polymer crystallinity and morphology are reasonably well treated in the next chapter, although, unfortunately, a discussion of crystallization kinetics is omitted.

Chapter 6 is an interesting grouping, in one place, of the elastic and viscoelastic properties possessed by polymers in different states. This is good in terms of attempting to unify the physical properties of elastomers, glasses, melts, etc.; however, some very necessary information has been omitted. For example, the theory of rubber elasticity is hardly mentioned and there is no mention at all of the WLF equation.

Chapter 7 is a very useful discussion of the reactions of polymers and includes such topics as degradation, photooxidation, stability, and biodegradation, again, material that is usually not present in polymer textbooks.

Biopolymers are described in the final chapter and despite the authors' claim that the material is treated with thoroughness, it is the weakest chapter in the book. Generally, it is a useful introduction to proteins and nucleic acids, but the polysaccharides are treated very offhandedly. None of the new and important polysaccharide structural work of the last 10–15 years is included; instead, very old information, some of it known to be incorrect, is reproduced. But at least the reader is referred to a useful text on biopolymers for more information.

In general, the book is well written and contains many references. Where it is thorough, it is very good. It is difficult to write a textbook of polymer science that contains all of the necessary information for a polymer course in one volume, and this book is no exception. Nonetheless, its strong points far outweigh its faults and it belongs on the shelf of any scientist interested in polymers.

Anatole Sarko, *State University of New York College of Environmental Science & Forestry*

Experimental Methods in Polymer Chemistry. By Jan F. Rabek. Wiley-Interscience, Somerset, NJ. 1980. xxv + 86] pp. $135.00.

This volume surveys essentially all of the physical and physicochemical techniques used in the modern study of polymer systems. The author presents exceedingly concise outlines of the experimental operation, underlying physical principles, and applications of each technique, referring the reader to the literature for greater detail. The volume includes 7350 references, approximately 1400 of which are to other books and review articles; the literature through 1978 is extensively covered.

The 40 chapters are organized around different experimental techniques. In addition to classical procedures (e.g., osmometry, colligative techniques, ultracentrifugation, viscometry, optical activity, light scattering, chromatography (3 chapters), infrared spectroscopy, and X-ray diffraction), more modern procedures (such as Raman spectroscopy, nuclear and electron spin resonance, mass spectrometry, electron diffraction, and modern calorimetry) are discussed. One also finds discussions of emerging techniques, including positron annihilation, neutron scattering, and electron scattering.

This volume introduces a remarkable range of classical and modern experiments. One may distinguish three levels of knowledge about a technique: (i) knowing what a technique does well enough to decide whether or not the technique is relevant to the problem, (ii) knowing enough to make a routine use of the procedure, (iii) understanding the technique, that is, knowing when the usual assumptions and approximations do not apply to the system under study. Rabek's volume provides the first level of understanding for its procedures; the copious footnotes will lead interested students to further reading. In writing a text of this breadth, there is always a risk that an author will distort or mispresent a less familiar technique. In examining the sections dealing with my own expertise, I did not find any significant grounds for complaint. While one might have a different emphasis, the obvious qualitative considerations and important applications are well presented. This volume can be highly recommended for graduate students and workers in the field as a concise summary of classical and modern experimental techniques.

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

Principles and Problems in Physical Chemistry for Biochemists. Second Edition. By N. C. Price (University of Stirling, U.K.) and R. A. Dwek (University of Oxford, U.K.). Oxford University Press, New York. 1980. xiii + 258 pp. Cloth, $23.00; Paper, $9.95.

This is the second edition of a book published originally in 1974 and is a valuable text which covers basic topics in physical biochemistry by using worked examples with additional problems and detailed answers. The general organization of the original version is maintained with the treatment of thermodynamics being followed by a discussion of kinetics; the authors have changed to SI units in this edition.

Five of the eight chapters dealing with the laws of thermodynamics, chemical equilibrium, thermodynamics of solutions, and acids and bases contain relatively minor changes apart from the addition of some new problems. However, Chapters 4, 6, and 8 which deal with the binding of ligands to macromolecules, solutions of macromolecules, and electrochemical cells, respectively, contain major alterations. A treatment of cooperative effects in binding is included in Chapter 4 while Chapter 6 has a new section on the ultracentrifuge. Chapter 8 now contains a description of oxidative phosphorylation.

After introducing basic chemical kinetics and transition state theory in Chapter 9, the authors follow with a chapter on enzyme kinetics and enzyme inhibition which is expanded to include a discussion of two substrate reactions.

Revision has improved the book which provides a clear and concise treatment of the above topics along with plentiful worked examples. This text will be very helpful to both teachers and students who are involved with basic physical biochemistry.

M. C. Phillips, *The Medical College of Pennsylvania*

Zeolites and Clay Minerals. By R. M. Barrer (Imperial College, London). Academic Press, New York. 1978. vii + 497 pp. $52.50.

Professor Barrer, himself a distinguished and prolific researcher in the area of zeolites and clays, has written this book with the intention of filling certain gaps left by specialized books and monographs in this expansive area of chemistry. This clearly written and fully documented product of his efforts surely will benefit both newcomers and veteran researchers in the field.

The volume is organized in eight chapters. Following a brief introductory chapter on the nature and uses of zeolites, the second chapter provides an exceptionally thorough and well-illustrated discussion of zeolite structures. Stereographic views of several classes of frameworks are especially helpful in visualizing the elegant pattern of windows, channels, and cavities.

Physical adsorption phenomena in zeolites are treated in quantitative detail in three separate chapters. One chapter examines the utility and limitations of thermodynamic models for the isothermal adsorption of gases under equilibrium conditions. A second chapter describes the energetics of adsorption, and a third deals with entropies and heat capacities. The kinetic aspects of adsorption are treated in a following chapter on diffusion in which the methods of measurement and interpretation of diffusion coefficients are critically evaluated.

The treatment of zeolites is concluded with a chapter on chemisorptive processes. Special emphasis is placed on the importance of zeolite hydrolysis and the role of framework Bronsted and Lewis acid sites. Also included are important examples of complex formation between donor sorbates and metal ions on exchange sites, oxidation–reduction of exchange cations, and the clustering of metallic and nonmetallic elements in zeolite cavities.

The structures and adsorption properties of clay minerals are covered in the last chapter. Although all of the two- and three-layer sheet structures are given some attention, smectites and vermiculites are treated in greatest detail. Particular attention is given to the induction of permanent porosity in these layered silicates and to their resulting molecular sieving properties which parallel in many respects the function of zeolites.

Thomas J. Pinnavaia, *Michigan State University*

Inorganic Biochemistry. Volume 1 (Specialist Periodical Reports). Senior Reporter: H. A. O. Hill (Oxford University). The Chemical Society, London. 1979. xvi + 442 pp. $61.50.

The inaugural volume of this title, as a component of the "Specialist Periodical Reports", is long past due and quite welcome. The quantity of work published in the interdisciplinary field of bio-inorganic chemistry in the two most recent decades attests to this and, although the publisher's state that this book contains "A review of the recent literature published up to late 1977", the bulk of the material presented originates from the period 1975–1977. Individually, the chapters are clear and concise expressions of informative material. Some offer a greater exercise of prose style and are consequently more readable than others, but they all provide references to recent review articles, primary sources of recent work, and are well illustrated.

Structures, figures, and reaction schemes appear to the greatest extent in Chapters 1 and 2 which treat the Inorganic Analogues of: Biological Molecules (C. A. McAuliffe) and Biological Processes (B. T. Golding, G. J. Leigh). Both of these chapters concentrate on attempts to reproduce biological structure and function in model systems. The references extend to 1966.

Chapters 3 (M. N. Hughes) and 4 (P. M. Harrison, A. Treffry) treat the Storage, Transport and Function of Non-transition Elements and Storage and Transport of Transition-metal Ions, respectively. The former includes many biological functions such as ion transport, control mechanisms, secretion, and clotting, while the latter yields particularly strong discussions of transferrin and ferritin and includes reviews of medical as well as chemical journals. Chapter 4 includes several 1978 references.

Studies of Oxygen Transport Proteins are reviewed by M. Brunori, B. Giardina, and J. V. Bannister in Chapter 5. The content of this chapter reflects the experience and perspective of Dr. Brunori in its treatment of the molecular aspects of hemoglobin, hemocyanin, and hemerythrin function. A vast amount of data is summarized here, everything from model complexes to the clinical aspects of sickling.

The iron- and copper-containing electron-transfer proteins are the subject of Chapter 6 (C. Greenwood and D. Barber). This chapter provides references to many review articles. The Oxidases and Reductases are the topics of Chapter 7 (B. E. Smith and P. F. Knowles), which includes discussions of the peroxidases and nitrogenase, as well as complexes I–III of the mitochondrial electron transport chain.

Metalloenzymes in which the metal ion does not undergo redox reactions are treated in Chapter 8 (A. Galdes and H. A. O. Hill). This chapter contains several early references and includes zinc, cobalt, and manganese enzymes.

Chapter 9, entitled Inorganic Elements in Biology and Medicine (N. J. Birch and P. J. Sadler) is so generally important that its placement at the end of the book is unfortunate. It treats the general medical consequences of dietary and metabolic deficiencies (or accumulation) of the "essential elements" with references which extend to 1957. This chapter offers insight into the molecular basis of many diseases as well as healing and such sensory processes as taste and blindness. It is an enlightening chapter for those wishing a perspective on health.

This book is highly recommended for workers and novices alike who wish to identify primary sources and review articles, while simultaneously treating themselves to introductory background material. Dr. Hill is to be commended for supervising a volume which attains consistently high levels of presentation. Uniform inclusion of enzyme EC numbers along with EC and subject indexes would have been helpful and should be considered for future volumes. As with most of the Reports this work presents a helpful, informative source of recent research.

James D. Satterlee, *Northern Illinois University*

Introduction to Radiochemistry. By David J. Malcome-Laws (Loughborough University, U.K.). Wiley/Halsted, New York. 1979. 145 pp. $24.95.

This is a suitable text for a short course in radiochemistry or an elementary preparation for practicing chemists and biologists who have not had previous experience in the use of radioisotopes. It would be particularly suitable for those who are about to use liquid scintillation techniques. As the physics of radioactive decay that is presented is quite minimal and useful equations are presented in most cases without derivation, the book is very readible and can be used at an elementary level. As such it fills a gap for those who wish to become involved in radiochemistry, but do not wish in the first instance to deal with unnecessary detail. This presentation may wet the appetite of the reader to seek a greater knowledge of the many included topics. The bibliography lists other texts giving greater detail but not the primary sources. The topics covered include the common types of radiation and modes of decay together with various detectors, counting techniques, and statistics, as well as health considerations. Also included are sections on such techniques as radiochromatography, radioimmoassay, compound labeling, and storage, but not activation analysis. A list of British suppliers of both equipment and materials is included. The book is well written and relatively free of errors. It does not include suggested experiments for those considering it as a text, but it must be conceded that most instructors have their own favorite experiments based on available equipment.

Richard H. Tomlinson, *McMaster University*

Neutron Capture Gamma-Ray Spectroscopy. Edited by Robert E. Chrien and Walter R. Kane (Brookhaven National Laboratory). Plenum Press, New York. 1979. xix + 880 pp. $69.50.

The proceedings of the Third International Symposium on Neutron Capture Gamma-Ray Spectroscopy and Related Topics, which was held September 18–22, 1978 at Brookhaven National Laboratory and at the

State University of New York, Stony Brook, have been published under this title. The text includes 519 pp devoted to 28 invited papers plus an excellent 18-p summary paper by P. Axel that is an expanded version of the concluding remarks he gave at the meeting. Also included are 97 contributed papers, each typically 3 pp long.

The range of topics covered at the symposium was considerably broader than the title of this book implies. For example, one paper deals with quantum electrodynamics, another with meson capture. Most of the invited papers are concerned with topics of interest principally to practicing nuclear chemists and physicists. A number of invited papers treat somewhat repetitiously the experimental status of neutron capture studies and several discuss extensively one of the current models of nuclear structure.

Of greatest interest to the general chemistry community are invited papers by R. C. Greenwood and by E. T. Jurney on applications of neutron capture γ-rays to elemental analysis. In this method, sometimes called prompt γ-ray activation, the prompt spectrum of γ-rays deexciting the excited nuclear state produced by neutron capture is used to identify a particular nuclide. Several elements (e.g., H, B, N, S, P) not easily detected by conventional activation analysis can be determined in this way. These prompt methods provide a means to analyze process streams and in situ samples in real time.

Also likely to be of interest to chemists are invited papers by W. R. Kane on new instruments and techniques in neutron capture studies, by G. A. Bartholomew on high-intensity neutron sources, and by E. G. Kessler on precise γ-ray energy standards. Among the contributed papers are perhaps a dozen that would be of wide interest to chemists. However, nuclear chemists whose specialty is nuclear structure are likely to benefit from reading many of the contributed papers.

T. T. Sugihara, *Texas A&M University*

Progress in Inorganic Chemistry. Volume 26. Edited by S. J. Lippard (Columbia University). John Wiley and Sons, New York. 1979. vii + 489 pp. $35.95.

Progress in inorganic chemistry consistently provides scholarly reviews of current inorganic research. Alan Cowley contributes a comprehensive (115 pp) account of the utility of ultraviolet photoelectron spectroscopy for probing the electronic structures of transition-metal complexes in the vapor phase. The nonspecialist can readily appreciate the discussion thanks to the inclusion of spectra, orbital energy diagrams, and background information about the technique. Joseph Templeton's review (89 pp) contains synthetic and structural data about complexes (primarily of Mo and Re) with a metal–metal bond order of four. Raman and electronic spectroscopic data along with magnetic data on redox altered species are considered in the context of orbital models for the quadruple metal–metal bond. This eclectic survey offers a painless introduction to the myriad studies of binuclear d^4–d^4 compounds thru mid 1978. Dimitri Coucouvanis describes (168 pp) the structural and electronic properties of dithio acid and 1,1-dithiolate complexes with exceptionally thorough style. Complexes with transition-metal ions, as well as those with the nontransition elements, are summarized for the period 1968–1977.

Two research summaries of a more personal nature are also included in this volume. M. Gerloch has composed a spirited defense (42 pp) of magnetochemistry. The author contends that application of the angular overlap method to studies of paramagnetic transition-metal complexes (e.g., cobalt benzoates and copper acetate) furnishes chemically meaningful results. Richard Lagow and John Margrave describe (49 pp) a new procedure for performing direct fluorination reactions. Their method, which employs a time-dependent fluorine dilution technique, applies to the syntheses of inorganic and organic compounds.

William C. Trogler, *Northwestern University*

The Laser Doppler Technique. By L. E. Drain (Atomic Energy Research Establishment, Harwell, England). John Wiley and Sons, New York. 1980. ix + 246 pp. $39.95.

The measurement of velocities from the Doppler shifts of scattered laser light is an important technique in an advanced state of development. Hundreds of investigators have published reports in this field, and there have been numerous reviews, including at least five books, devoted to laser Doppler velocimetry, with many more on the general subject of laser light scattering. This book was written to be an introductory description for workers who are previously unfamiliar with the topic, and for that purpose it should be quite useful.

The author begins by reviewing the basic principles of optics, including the essential physics of lasers and optical detection. He then proceeds to describe the theory of the optical Doppler shift in light scattering and reflection measurements. Standard theoretical constructs, such as the scattering vector and the complex representation of the electric field, are omitted in favor of simple geometrical arguments and trigonometric functions. The emphasis is on a physical understanding of the experimental parameters which are important in making a measurement, and the logic and clarity of the presentation justify this approach. There is an excellent comparison and contrast of the reference beam (optical beating) methods and the crossed beam (differential Doppler) methods. Experimental designs and signal-to-noise considerations for both types of measurement are described in detail.

The experimental descriptions are biased quite strongly in favor of high velocity measurements such as those found in engineering applications involving fluid flow, anemometry, and turbulence. The description of signal processing techniques is excellent for those applications but would be misleading for investigators who are interested in lower velocity applications such as biological motion or electrophoresis. For example, there is no mention of the existence of real-time Fourier transform spectrum analyzers. The discussion of signal processing does distinguish very well between the different considerations for continuous and burst data. There is also a thorough description of the methods for directional discrimination in laser Doppler velocimetry and of considerations of the scattering properties of particles which may be added to fluids to increase the scattered signal. The final chapter on applications serves more to illustrate than to survey the many applications of the laser Doppler technique. The bibliography is not extensive.

This book does not increase the sophistication of the literature in the laser Doppler field, but the author's physical insights have been clearly and concisely organized to form a fine introductory monograph. For the uninitiated person desiring to obtain a working knowledge of laser Doppler methods, particularly for high-velocity applications, this is the book to read first.

B. R. Ware, *Syracuse University*

Electron-Molecule and Photon-Molecule Collisions. Edited by Thomas Rescigno (Lawrence Livermore Laboratory, University of California), Vincent McKoy (California Institute of Technology), and Barry Schneider (Los Alamos Scientific Laboratory, University of California). Plenum Press, New York. 1979. x + 355 pp. $39.50.

This book represents a collection of contributions from invited speakers to the first Asilomar Conference on electron-molecule and photon-molecule collisions, held at Pacific Grove, California in August 1978. In addition to the invited papers, evening and roundtable discussions of current research by participants at the conference are included at appropriate points in the text. Overall, this book provides a convenient source of information regarding current theoretical techniques employed to study electron-molecule scattering, molecular photoionization, and resonance phenomena. As well as the more traditional numerical close-coupling methods, which are discussed in the initial section of the book, considerable attention has been focused on the growing number of discrete basis-set approaches (the L^2 methods) now being employed in molecular scattering theory. A strong motivation for development of such L^2 methods in molecular scattering theory is to take full advantage of the wealth of refined and efficient computer codes that have been developed for discrete basis-set calculations of bound-state molecular properties by quantum chemists over the last 10–15 years. Topics discussed in this book relating to such L^2 methods include the **R** matrix and **T**-matrix methods for electron-molecule scattering, Stieltjes–Tchebycheff-moment theory as applied both to molecular photoionization and to the calculation of resonance widths, and a discussion of complex coordinate and complex basis-function techniques for the investigation of resonance phenomena.

The area of research covered in this text has undergone considerable expansion over the last few years, both from the point of view of renewed interest in the field as well as new theoretical developments, due to its importance to future efforts in gas laser development, laser fusion, isotope separations, atmospheric physics, and other energy related fields. The present book is a timely publication that should provide a valuable reference source not only for those already working in this field, but also for research students and others wanting a general overview of this area of research.

Geoffrey R. Williams, *Indiana University*

Vinyl Cations. By P. J. Stang (University of Utah), Z. Rappoport (Hebrew University of Jerusalem), and M. Hanack and L. R. Subramanian (University of Tübingen). Academic Press, New York. 1979. xi + 513 pp. $53.00.

This is an interesting and worthwhile book, which should prove to be invaluable to anyone working in the field of vinyl cation intermediates, as well as being of more general interest to a wide range of physical organic chemists, and perhaps to many synthetic and structural organic chemists as well.

The coverage of vinyl cations from several different points of view is indeed extensive. There are long, detailed and generally well-written chapters on the involvement of vinyl cations in electrophilic additions to both acetylenes and allenes (as well as the participation of such systems

in solvolysis) and on the direct solvolysis of various types of vinyl system. There are shorter and less detailed discussions of the thermodynamic, theoretical and spectroscopic aspects of vinyl cation chemistry, and a short but nonetheless useful chapter on rearrangements. For a monograph written by four contributing authors, the style and format is surprisingly uniform. The literature coverage is comprehensive and the book contains well over 700 pertinent references. If the book has any fault at all it is that the discussion of purely solvolytic processes tends to dominate the text. While less than half of the references cited deal primarily with this subject, Chapters 5 and 6 constitute about half of the actual body of the text, to say nothing of the further discussion of solvolysis in Chapters 3 and 4. This is probably not surprising in terms of the particular research areas of the four authors, but the interesting theoretical and spectroscopic aspects of vinyl cations are given a more cursory treatment than that of the solvolytic work. Other potentially interesting topics such as aryl and ethynyl cations, and the photochemical generation of vinyl cations, are given short shrift.

A less important point is that after an initial spate of entries under A, the subject index becomes so sparse as to be not very useful.

All in all this is a very good monograph on an interesting and important subject. It is timely and should prove to be an indispensable part of the library of any organic chemist interested in reactive intermediates.

Keith Yates, *University of Toronto.*

Spectroscopy in Chemistry and Physics: Modern Trends. Edited by F. J. Comes (Institute fur Physikalische und Theoretische Chemie, Frankfurt/Main), A. Müller (Lehrstuhl fur Anorganische Chemie, Universität Bielefeld), and W. J. Orville-Thomas (Department of Chemistry & Applied Chemistry, University of Salford, England). Elsevier Scientific Publishing Co., New York. 1980. x + 340 pp. $87.75.

This book comprises a collection of the invited papers presented at the 14th European Congress on Molecular Spectroscopy, Frankfurt/AM, September 3–7, 1979. These articles also appeared in the *Journal of Molecular Structure*, *59* (1980), and in a certain sense this volume is thereby redundant.

Topics covered in the volume range from Fourier transform infrared techniques for the study of atmospheric chemistry and polymers to nonlinear optical properties of molecules. In general the subjects are too varied, too quickly covered, and too diverse to be of much use to a single laboratory in a tutorial sense. The volume would probably be appropriate for a library not receiving *J. Mol. Struct.*, however.

The only coherent aspect of these lectures that might be of interest to the chemistry community is the set of lectures on inorganic spectroscopic studies by Cotton, Day, Lever, and Clark. Cotton presents a clear picture of the current status of metal–metal bond chemistry and spectroscopy for bond orders three and four. Emphasis is placed on calculations and their correlation with spectroscopic data. Systems such as $[Re_2Cl_8]^{2-}$ are discussed in detail; low-temperature spectra are presented for $Mo_2[CH_2P(CH_3)_2]_4$ and vibronic analyses are suggested. Day gives an account of intermolecular interactions in inorganic complex ion containing crystals with the goal of elucidating crystal environment effects on electronic spectra. The emphasis here is placed on understanding intermolecular interactions. Topics covered include lattice vibrational side bands, dipolar shifts and splittings (Davydov effects), and intermolecular charge transfer. Lever presents a treatment of ligand-to-metal charge-transfer electronic spectra of dioxygen-containing metal complexes. From intensity and energy data, geometry and the charge carried by the O_2 ligand can often be obtained. Resonance Raman scattering is next discussed by Clark, who demonstrates its use in obtaining information on the vibrational and electronic properties of inorganic species such as metal–metal bonds, oxygen, nitrogen, and dinitrogen bridges, and linear chain halogen complexes.

Of more chemical-physics interest are discussions of picosecond techniques by Kaiser, et al., quantum beat effect in intersystem crossing by van der Waals, spectroscopic studies of inert gas complexes by Klemperer, nonlinear molecular processes by Bloemberger, and inter- and intramolecular energy transfer in dilute gas phase systems by Flynn, Zare, and Kneba et al.

In summary, these review articles are mainly designed to update researchers in the areas discussed. To others, they indicate activity in certain fields and provide some useful references which enable those with more than a passing interest to delve deeper into the subject on their own.

Elliot R. Bernstein, *Colorado State University*

Photoelectrochemistry. By Yu. Ya. Gurevich, Yu. V. Pleskov, and Z. A. Rotenberg; Translated from Russian by H. S. Wroblowa, and Translation; Edited by H. S. Wroblowa and B. E. Conway. Plenum Publishing Company, Consultants Bureau, New York. 1980. xiii + 239 pp. $39.50.

The title of this book will be misleading to many practitioners and readers interested in photoelectrochemistry per se. It should be more appropriately entitled "Photoelectron Emission Phenomena in Electrochemistry". The book contains 11 chapters and each one deals substantially with photoelectron emission as its central theme, but electrochemical systems are discussed in most of the chapters. The authors are international experts in the field of photoeffects resulting in electron emission. The text reads very smoothly and clearly as a consequence of the excellent work done by the translation editors. There is no question whatsoever that this ia a good book on photoemission phenomena from metals and semiconductors into solution. The emphasis, however, is on the fundamental physics of photoelectron properties. The theory of photoelectron emission from metals into solutions and photodiffusion currents is very lucidly explained. The mathematical treatments are easily understandable to physical chemists and chemical physicists. The chapter on experimental techniques in photoemission studies is covered in only 12 pp and this is a disappointing feature of the book. Photoemitted electrons in solutions and properties of hydrated electrons are reasonably well covered in Chapters 4 and 5, but the reviewer recommends supplementary reading of two other books: "The Hydrated Electron" by E. J. Hart and M. Anbar (Wiley-Interscience, New York, 1970) and "Electrons in Liquid Ammonia" by J. C. Thompson (Clarendon Press, Oxford, 1976) for a more thorough knowledge of these topics. The average electrochemist will find this book rather limited in catering to their interests. For example, there is an imbalance by way of excessive treatment on photoemission phenomena on the structure of the electrical double layer. While adsorption effects on electrodes in electrochemical processes are important, the authors give very little attention to several other modern aspects of photoelectrochemistry which are of contemporary interest, such as photo-galvanic cells for example. While Gerischer is referenced four times and the latest citation is to only one of his papers in 1973, there are no references to the works of Bard, Albery, Hackermann, Wrighton, Bolton, and other active workers in the important field of electrochemical energy conversion. In electrode kinetics the authors devote Chapter 7 exclusively to hydrogen evolution reaction. Ten pages constitute Chapter 8 on Photoemission as a method of investigating homogeneous reactions involving free radicals, and there is no reference at all to the many important authors and subjects contained in the Faraday Society Discussion on Intermediates in Electrochemical Reactions held at Oxford in 1973, which was subsequently published by the Chemical Society as a volume in 1974. In fairness one cannot be too harshly critical of the Russian authors on this matter. By comparison the superb monograph entitled "Ring Disc Electrodes" by W. J. Albery and M. L. Hitchman (Oxford University Press, 1971) has been properly criticized for not containing enough of the contributions by renown Russian workers. Chapter 9 devotes 24 pp to a good account of Photoelectron Emission from semiconductors into solutions and from solutions into the vapor phase. The penultimate chapter deals with a few selected problems of photoelectrochemical phenomena and of particular interest is a section on Effects Due to Surface Plasmons. The final chapter summarizes in 2.5 pp certain perspectives on new techniques, objectives, and problems of Photoemission Studies. In an overall assessment this book deserves the attention of physical chemists. One of its weaknesses is the lack of citations to publications beyond 1975, but this is inevitable because of the necessary time delay required for translation from Russian to English and the subsequent important job of careful editing of the translated English version. The reviewer feels that despite some of the drawbacks mentioned above, this book is a well-written monograph by the three established international Russian authors which will be a valuable asset to North American chemists interested in photoelectron emission studies and their relation to electrochemistry.

R. G. Barradas, *Carleton University*

An Atlas of Spectral Interferences in ICP Spectroscopy. By M. L. Parsons, A. Forester, and D. Anderson (Arizona State University). Plenum Publishing Corp., New York and London. 1980. x + 644 pp. $59.50.

Because the popular low-power (1–2 kW) inductively coupled plasma (ICP) discharge operating at atmospheric pressure in argon emits atomic spectra which differ in both transitions and intensities from classical arc, spark, and glow discharge emission sources, spectroscopists attempting to apply standard wavelength tables in their evaluation and estimation of spectral interferences from ICP discharges can be seriously mislead. In recognizing this distinction between ICP and conventional excitation sources, the authors have compiled a handbook of wavelength tables to assist in identifying, sorting, selecting, and predicting wavelengths of ICP atomic spectra. Unfortunately, the book is less than totally successful in achieving its purpose of describing ICP spectral interferences.

At the time of preparation no experimental atlas of ICP spectra existed, and the authors collected data from conventional excitation sources as listed in classical wavelength tables (MIT Wavelength Tables, Naval

Research Laboratory table). Appreciating the impossibility of transferring the intensity values from one atomic excitation source to another, the authors warn the reader about the lack of reliability in applying these published intensity values to ICP spectra. However, the quantitative evaluation of spectral interferences critically depends upon the availability of reliable intensity values. Lacking this data, the present volume fails to meet the requirements for ICP spectral interference corrections, and the authors make no attempt to quantify the degree of interference.

The atlas consists of four tables, one of which constitutes the principal bulk of the volume. First an abridged atlas of ICP spectra, based upon a recently published line list from the Ames Laboratory, Iowa State University, is supplemented with additional wavelength and measured detection limit values. Unfortunately entries for each element in the table are not consistent with the original Ames Laboratory listing, the order is not uniform, and a recent ICP tabulation prepared by the Philips Research Laboratories, Eindhoven, The Netherlands is not incorporated.

The second table is the heart of the book and comprises a coincidence atlas for approximately 175 wavelengths corresponding to from one to six of the most sensitive transitions for each element observed in ICP emission spectra. This section consists of two separate tables for each element wavelength. The first provides all transitions in the data base located within ±0.1 nm from the primary wavelength. The second includes all prominent transitions within ±0.5 nm. MIT Wavelength Table spark and arc relative intensity values accompany each wavelength, and an occasional ICP signal-to-background ratio from the Ames Laboratory list is included. For the novice this coincidence table can be both valuable and confusing.

Compared to Kuba et al.'s "Coincidence Tables for Atomic Spectroscopy", derived from an earlier version of the MIT Wavelength Tables, the present table eliminates errors in Kuba et al.'s table resulting from the early MIT Wavelength Tables and includes prominent lines from the ICP discharge. Kuba et al. effectively employed type styles to distinguish potential interference limits, but in the present table, apparently set with an electric typewriter in a single uppercase font, these distinctions are not readily recognized, thus making the table harder to use.

The remaining two tables list wavelengths in order along with intensities for all elements in the range between 185 and 200 nm and argon transitions between 185 and 1000 nm, some of which were measured in the ICP.

In total the authors provide a single useful volume for the novice, the technician, and the student studying spectrochemistry, which may be convenient if used with caution for *preliminary* ICP spectral interference evaluation. It is of no use for quantitative interference corrections.

A revised version of this atlas compiled with absolute intensity values derived from an ICP source would be invaluable to the spectroscopic community. If the revision also incorporated spectral features of primary concern required in quantitatively evaluating spectral interferences, such as the magnitude of the spectral background, molecular band intensities, and the practical linewidths as a function of spectral bandpass of the measuring system, then a truly unique atlas would be available. Information like this for many, but not all, possible spectral transitions is, in fact, being prepared independently by scientists at the Ames Laboratory and Philips Research Laboratories.

Ramon M. Barnes, *University of Massachusetts*

Structure Reports for 1978. Volume 44A. Metals and Inorganic Sections. General Editor, J. Trotter; Section Editors, L. D. Calvert and J. Trotter. D. Reidel Publishing Company, Dordrecht, Holland/Boston. 1980. vi + 387 pp. 120 Dfl (60 Dfl to personal subscribers).

The aim of this long-established and valuable series is "to present critical accounts of all crystallographic structure determinations", and in this it succeeds very well. Volume 44A describes about 1250 inorganic compounds for which detailed structures have been published in 1978, lists another 1000 for which structures have been inferred from powder data, and lists a further 100 for which some limited structural information is available. The volume has appeared with exemplary speed. Spot checks reveal that the reports *are* critical: original misprints are corrected, a rare skeptical comment alerts the reader. Errors appear to be rare, but they do exist: on p 132, *Pnma* replaces the correct space group *Pmna*.

Gene B. Carpenter, *Brown University*

Structure of Crystalline Polymers. By Hiroyuki Tadokoro. John Wiley and Sons, Inc., New York. 1979. xviii + 465 pp. $35.00.

Professor Tadokoro provides his own condensed description of this book in his preface in writing that he hopes to "give the reader a basis for understanding the current literature on the structure of polymers, along with material useful for advanced studies in the field". The book will be much appreciated by students and research investigators who need to understand the methods used in studies of the structure of crystalline polymers or who want a convenient reference to the published crystallographic literature. For the latter, Chapter 7, Tadokoro presents an annotated table of crystallographic data on nearly 150 polymers.

The major part of the text is a pedagogical treatment of the experimental and theoretical methods used by Professor Tadokoro in his many investigations of the structure of crystalline polymers. These include X-ray analysis, infrared and Raman spectroscopy, and conformational energy calculations. Tadokoro is sensitive to the array of nomenclatures and symbols that confront the student in the crystallographic literature, and has provided a careful discussion of the system he uses along with comparisons with some others.

Chapter 3 (18 pp) is devoted to a discussion of symmetry of molecules and crystals and gives the nomenclature used in the remainder of the book. The bulk of the book is concerned with X-ray diffraction (Chapter 4, 142 pp) and infrared absorption and Raman spectroscopy (Chapter 5, 156 pp). These chapters contain clear descriptions of experimental methods, including consideration of advantages and limitations, and careful development of the necessary theoretical background. The emphasis throughout is on applications to polymers, and the text includes many examples taken from the literature to illustrate the reduction of principle to practice.

In Chapter 6 (30 pp) Tadokoro discusses the use of energy calculations to provide predictions and evaluations of crystal structure on the basis of interatomic interaction potentials.

The text is easy to read; it is well organized and the style is lucid.

G. C. Berry, *Carnegie-Mellon University*

Electrophoresis: A Survey of Techniques and Applications. Part A: Techniques. Edited by Z. Deyl (Czechoslovak Academy of Sciences). Elsevier Scientific Publishing Company, Amsterdam and New York. 1979. xv + 390 pp. $83.00.

This volume deals primarily with the theory and instrumentation of many electrophoretic techniques. It is very comprehensive with chapters covering not only the more common methods (e.g., isoelectric focusing) but also the less familiar ones (e.g., continuous flow deviation electrophoresis). Combination techniques including disc electrophoresis, immunoelectrophoresis, and a variety of two-dimensional methods are also presented. Several chapters deal with preparative techniques.

The book presents the theoretical basis for each of the techniques followed by a discussion of the practical aspects. The latter is one of the best features of the volume. The authors describe the technique itself and the apparatus involved. Frequently, a detailed materials and methods section as well as a step-by-step set of instructions are provided. Also, the main advantages and limitations of the technique are candidly discussed. Many helpful suggestions allow one to avoid the most common pitfalls. Modifications of existing procedures are noted if they result in increased ease or efficiency. Chapters dealing with manipulation and interpretation of data are also included.

Some applications of the techniques are presented in detail in this volume while others are simply mentioned. The extensive reference lists, however, will direct the reader to key articles. For every technique the types of compounds which can be separated are discussed. While some methods separate only macromolecules and consequently are most useful to biochemists, others have wider versatility and can be used to resolve a variety of organic as well as inorganic molecules. Thus, this would be a good reference book for any chemist considering electromigration techniques.

Mary Lou Caspers, *University of Detroit*

Chlorofluorocarbons in the Environment: The Aerosol Controversy. Edited by T. M. Sugden (University of Cambridge) and T. F. West (formerly of the Society of Chemical Industry, U. K.). Ellis Horwood Publishers (for the Society of Chemical Industry), Chicester. 1980. 183 pp. $57.95.

This expensive little book was edited from the proceedings of a Society of Chemical Industry sponsored meeting entitled "Fluostrat 78" held in Brighton, England in October, 1978. Eleven chapters comprise the book as follows: 1. Background and Present Position (16 pp) by T. M. Sugden (University of Cambridge); 2. The Chlorofluorocarbon/Ozone Issue: The Industrial View (8 pp) by G. Diprose (Imperial Chemical Industries); 3. Stratospheric Chemistry (16 pp) by B. Thrush (University of Cambridge); 4. Halocarbons in the Atmosphere (12 pp) by J. E. Lovelock and P. Simmonds (University of Reading); 5. Chlorofluorocarbons in the Atmosphere: The Meteorological Problems (17 pp) by R. Murgatroyd (Meteorological Office, Bracknell); 6. Modelling Stratospheric Motions and their Influence on Ozone (24 pp) by J. A. Pyle and J. T. Houghton (University of Oxford); 7. Medical Aspects: UV and Skin Cancer (20 pp) by R. H. Mole (Medical Research Council, Harwell); 8. The Fluorocarbon/Ozone Issue: An Industrial View (15

pp) by R. L. McCarthy and F. A. Bower (E. I. duPont de Nemours and Co.); 9. Fluorocarbons in the European Polyurethane Foam Industry (3 pp) by B. M. Grieveson (Shell Research, Amsterdam); 10. A Continental European Industrial Viewpoint (13 pp) by J. von Schweinichen (Montedison); and 11. Aerosols (13 pp) by R. A. Gunn-Smith (Metal Box Ltd.). Interspersed between the chapters are four edited discussions from conference participants totaling nine pages.

Aside from several highlights mentioned below, the book is generally disappointing. Advertised as ". . . an authoritative assessment (of the chlorofluorocarbon environmental problem) . . . that aims to clarify much of the continuing controversy in this field", and claimed to have arisen from ". . . a unique meeting (mentioned above) . . . which provided a unique opportunity for industrialists and scientists to debate this vital and controversial topic on a face-to-face basis", the book will instead catalyze new support for truth-in-adverstising laws. While the chapters on chemistry, meteorology, medical effects of ultraviolet radiation, and aerosol products (Chapters 3–7 and 11) are concise and accurate, the politically contentious sections (Chapters 8–10) feature no debate and not a few self-serving representations. Furthermore, it is unsatisfying to see yet another document of this type so narrowly focused on only one of the possible environmental effects of these chemicals, the reduction of the total amount of ozone overhead. No attention is paid to the direct greenhouse effect of the fluorocarbons or to the possible effects on atmospheric circulation and climate of changes in the distribution of ozone in the atmosphere, whether accompanied by a total reduction or not.

Highlights of the book include Lovelock's enlightening discussion of the electron-capture detector (his own invention), several tutorial passages from Murgatroyd on atmospheric winds, and Mole's concise review of relevant medical knowledge. *J. Am. Chem. Soc.* readers who are familiar with the literature of atmospheric chemistry will be annoyed with the loose and very incomplete usage of references. Those who followed Molina and Rowland but who actually performed the first ozone-depletion calculations, e.g., P. Crutzen and S. C. Wofsy, et al., will find no mention of their work here. This reviewer found one figure originally prepared by S. C. Liu and one from his own work that appear without any attribution. Other author's names are misspelled, suggesting that original references were not consulted. On the positive side, Chapter 11 provides a very readable history of spray cans including anecdotes on the use of modified beer cans as containers. In several places the book is outdated due to research progress in atmospheric chemistry, e.g., the belief that $CFHCl_2$ in the air came from decomposition of $CFCl_3$, never held widely, is less tenable now, and the overemphasis on the high values of stratospheric ClO seen by J. G. Anderson and co-workers in a 1977 balloon flight. Only lower (and more comprehensible) values have been observed in subsequent flights.

In Chapter 10 it is stated that any product that is accepted by the market is essential. For those who cannot remember the extent of the pervasive advertising for aerosol products that ended in the U.S. in 1978, I refer you to D. A. Davis' chapter in "The Science and Technology of Aerosol Packaging", edited by J. J. Sciarra and L. Stoller (John Wiley & Sons, New York, 1974), for a discussion by industry sources of the necessity of advertising to overcome consumer resistance to aerosol products. The point here is that if massive advertising is needed to overcome consumer resistance to gain "acceptance", can anyone maintain that the products in question are (were) essential? In the case at point I trust the free market to limit sales of this book rather sternly.

Ralph J. Cicerone, *University of California, San Diego*

Modern Aspects of Electrochemistry. No. 13. Edited by B. E. Conway (University of Ottawa) and J. O'M. Bockris (Texas A&M University). Plenum Press, New York. 1979. xi + 430 pp. $42.50.

This volume, which is a worthy addition to this well-established series, should be useful to a wide range of experimental scientists beyond the electrochemical community. The following topics are treated in authoritative and substantial review chapters: (1) Temperature Dependence of Conductance of Electrolytes in Nonaqueous Solvents, by J. Barthel, R. Wachter, and H.-J. Gores; (2) Solvent Adsorption and Double-Layer Potential Drop at Electrodes, by S. Trasatti; (3) Electrochemical Aspects of Adsorption on Mineral Solids, by P. Somasundaran and E. D. Goddard; (4) Application of Auger and Photoelectron Spectroscopy to Electrochemical Problems, by J. Augustynski and L. Balsenc; and (5) An Introduction to the Electrochemistry of Charge Transfer Complexes II, by F. Gutmann and J.-P. Farges.

Trasatti presents the recent work on the potential drop in the inner double layer at different electrode materials in an especially clear fashion. The roles of solvent structure, solvent–electrode interactions, and solvent–dipole contributions to the inner-layer potential are emphasized in this review which contains almost 500 references. Augustynski and Balsenc have also written a noteworthy and informative survey of Auger and photoelectron spectroscopy which contains good descriptions of the experimental nuances of these methods. The first 60 pages of this chapter are devoted to a large extent to the analytical aspects of these techniques (instrumentation, qualitative and quantitative analysis, surface analysis, deconvolution techniques, etc.), while in the last 35 pages, applications to electrocatalysis, passivation, and corrosion are reviewed.

The chapter by Gutmann and Farges, which is sprinkled with insights and ideas, is a wide-ranging, eclectic discourse centered around the physics and chemistry of charge-transfer complexes. The case is made for the significance of these complexes to diverse areas such as solid-state physics, biophysics, electrocatalysis, and heterogeneous catalysis. This chapter also includes a theoretical analysis of the stochastic processes that lead to measurable noise levels in conductivity measurements of charger-transfer complexes in solution. The chapter by Barthel et al. contains a wealth of experimental detail which is pertinent to many physical-chemical measurements in nonaqueous solvents. This chapter contains 17 tables and 22 figures which present a rather complete picture of conductance data in nonaqueous solvents.

James Q. Chambers, *University of Tennessee*

Pattern Formation by Dynamic Systems and Pattern Recognition. Proceedings of the International Symposium on Synergetics at Schloss Elman, Bavaria, April 30–May 5, 1979. Edited by H. Haken. Springer-Verlag, New York. 1979. viii + 305 pp. DM 68.00, $34.00.

What patterns form in nature, why do they occur, and how are they recognized by animals and computers? These questions are the leitmotifs of 26 invited papers which deal with patterns in many different fields.

The papers discuss patterns found in laser optics, fluid convection, turbulence, biological development, chemical waves, the immune system, metabolism, ecology, social economic differences, history, and semantics. Why these patterns occur is treated in papers on nonlinear thermodynamics, bifurcation theory, the growth of fluctuations, and evolution. Pattern recognition in biology is treated as pattern formation in the nervous system. There are papers on the visual system of the fly and on hallucinations. Digital pattern recognition is discussed in three papers.

Of most interest to chemists are the papers on chaos in chemical reaction systems by K. Tomita, chemical patterns in biological development by H. Meinhardt, electrochemical waves by P. Ortoleva et al., the kinetics of the immune system by P. Richter, energy metabolism by E. E. Sel'kov, and nonequilibrium thermodynamics by J. Keizer.

A very nice analogy between pattern formation and pattern recognition is explained by H. Haken in his introductory paper. Pattern recognition by an animal or computer entails the formation of certain patterns in the animal brain or computer memory. In digital pattern recognition it is the software which governs these patterns, while in animals it is the laws of physics. Despite this difference, digital pattern recognition has many similarities with physical pattern formation.

The authors of the individual papers are well known in their field and their talks should appeal to a wide audience. This book will be of special interest to those who can see the individual papers as examples of a unifying idea.

Bruce L. Clarke, *University of Alberta*

Disorder in Crystals. By N. G. Parsonage (Imperial College) and L. A. K. Staveley (Oxford University). Oxford University Press, Oxford and New York. 1979. xxviii + 926 pp. $69.00.

This book, one of the International Series of Monographs on Chemistry (edited by J. S. Rowlinson and J. E. Baldwin), is a survey of present knowledge concerning disorder in stoichiometric crystals. Positional, orientational, and magnetic disorder are all discussed at length, but crystal defects are not considered explicitly.

Chapters 1 and 2 are devoted to a brief introduction and a review of necessary thermodynamic background, with particular emphasis on various classification schemes for phase transitions. Chapter 3 is a rather lengthy discussion of statistical mechanical treatments of order–disorder transitions, while Chapter 4 is a survey of the most useful experimental techniques for studying various types of disorder. Each of the remaining eight chapters presents a summary and discussion of the information now available on disorder in a particular class of crystals: alloys, inorganic crystals with positional disorder, salts exhibiting orientational disorder, ice and related hydrates, simple molecular solids, more complex molecular solids (cyclic and cage molecules, long-chain compounds, etc.), clathrate and channel compounds, and magnetic systems are each considered in turn. There are also comprehensive, easy-to-use substance and subject indexes, as well as lengthy bibilographies at the ends of the chapters.

This work should prove very useful to the chemists and crystallographers for which it is intended, as well as to physicists and engineers interested in the systems discussed. It is well-written (aside from an annoyingly large number of split infinitives) and quite readable. Sentences are short and to the point; explanations are clear, concise, and

precise. It is also very well organized and despite the huge amount of material presented, never degenerates into a mere catalog of theories or techniques or experimental results—as so often happens in surveys of a broad field of scientific research. In short, the authors cover their subject in a very impressive manner. I have, in fact, only one criticism to offer: the bibliographies are not quite up-to-date. Although a few references from early 1976 are cited, comprehensive coverage of the relevant literature seems to stop with 1974 or 1975. As a result, very recent advances are not included. To cite just one example, the chapter on statistical mechanics does not discuss the renormalization-group approach to order–disorder transitions, although the use of the renormalization group has radically transformed the study of phase transitions and critical phenomena over the last 7 or 8 years.

Martha A. Cotter, *Rutgers University*

Information Theory as Applied to Chemical Analysis. By K. Eckschlager (Institute of Inorganic Chemistry of Czechoslovak) and V. Štěpanek (Environmental Research Centre, Prague). Volume 53 of the series on Chemical Analysis edited by J. D. Winefordner (University of Florida) and P. J. Elving (University of Michigan). John Wiley and Sons, New York. 1979. xv + 186 pp. $19.50.

The stated objectives of this text are to "discuss the fundamentals of the current understanding of information concepts in analytical chemistry and aims at presenting most of their applications described so far". Unfortunately, the authors encountered some difficulties in meeting these objectives.

The first difficulty lies in the conceptual formulation of information theory which depends upon set theory and probability theory. The authors, correctly so, present most of the concepts without formal proof and rely upon subsequent discussion to illustrate the important points. However, this approach leads to the reader being confronted with extensive symbolism which will require careful attention by the reader.

The authors choose to meet the second of their stated objectives, regarding the applications of information theory, by presenting a condensed review of the field over approximately the last decade. I believe it would have been of considerably more value to the reader if the authors, in addition to the review, had selected two or three pertinent applications and discussed them in some detail to illustrate the concepts developed earlier. This would have been particularly useful since the text is lacking in illustrative examples.

As a general comment I found the vocabular and grammatical content of the text to be awkward, at times leading to ambiguities of meaning. A more rigorous editing process could have eliminated most of these shortcomings.

This volume would be a worthwhile addition to most technical libraries; however, I do not believe that individual researchers would find such acquisition profitable.

Edward G. Codding, *University of Calgary*

Photochemical and Photobiological Reviews. Volume 5. Edited by Kendric C. Smith (Stanford University). Plenum Press, New York, 1980. x + 316 pp. $35.00.

The editor defines the goals of photobiology as "the development of ways to optimize the beneficial effects of light, methods for protection from detrimental effects of light, photochemical tools for use in studies of life processes, and photochemical therapies in medicine". This review series surveys the current research in these areas stressing the interdisciplinary nature of this science and provides a valuable addition to the literature of photobiology, much of which is found scattered in specialized journals.

The fifth volume is more chemically oriented than previous volumes. The chapter "Photochemistry in the Dark" by Giuseppe Cileno is of particular interest to the chemist, reviewing the evidence for reactions generating chemoexcitation in the absence of light. Of special note also is the chapter by Richard McCurty, "Photosynthetic Phosphorylation by Chloroplasts", which nicely summarizes the evidence supporting the electrochemical proton gradient as the common intermediate between ATP synthesis and electron flow. A particularly interesting chapter stressing the multidisciplinary nature of the field is that on hypericism by Auther Giese, which includes synthetic organic chemistry, botany, and veterinary science. Other topics covered are membrane models for circadian rhythms, cross-linking of proteins to nucleic acids by UV light, immunological effects of UV radiation, immunological detection of radiation damage in DNA, and fluorescent probes for nucleic acids and chromatin in living cells. All the chapters are interesting, timely, and well written. However, some of the reviews cannot be considered comprehensive as much of the discussion involves the author's own research. This volume (and the series) is recommended as a useful review of current topics to any scientist with an interest in photobiology.

Rosalie K. Crouch, *Medical University of South Carolina*

Membrane Fluidity. Biophysical Techniques and Cellular Regulation. Edited by Morris Kates (University of Ottawa) and Arnis Kuksis (University of Toronto). The Humana Press Inc., Clifton, NJ. 1980. xii + 445. $44.50 (U.S.); $54.40 (outside North America).

The concept of membrane fluidity is fraught with misunderstandings, misconceptions, and fuzzy definitions. Fluidity, defined as the inverse of viscosity, is a macroscopic quantity that can be related to microscopic quantities. For bulk, isotropic, homogeneous fluids, the relationship is relatively simple and one can predict macroscopic fluidity from microscopic quantities. For small, anisotopic, inhomogeneous systems such as biological membranes, however, a measurement of microscopic quantities (such as the rotation of a membrane-bound probe by ESR or fluorescence spectroscopy) does not guarantee a clear, concise or even meaningful definition of membrane fluidity. Nonetheless, one measures some quantity about a membrane-bound probe, and it is hoped that further studies with model systems, coupled with correlations of the experimental "fluidity" quantity with physiological conditions in biological systems, will lead to a refinement of the concept of membrane fluidity.

"Membrane Fluidity" is a collection of 39 articles based on a symposium held in July 1979. One article deals with fundamental aspects of membrane fluidity; the other articles deal with correlations between membrane lipid composition, fluorescence polarization, ESR order parameters, membrane phase transitions, permeability, enzyme and capping activity, growth conditions, and genetic development of a variety of cell types. As such, this book is primarily intended for biochemists and membrane molecular biologists. The tacit assumption in these articles is that biophysical techniques such as fluorescence polarization reliably measure membrane lipid "fluidity", fluidity being ill-defined as an inverse degree of resistance to flow through or rotation in membrane lipids.

If one accepts the concept of membrane fluidity, then this book provides a fascinating collection of data on the relation between membrane fluidity, lipid composition, and membrane function. Particularly interesting is the section on the in vivo, homeostatic regulation of membrane fluidity, a process by which organisms maintain constant membrane fluidity in response to environmental changes in order to preserve membrane function. Other sections describe new techniques for lipid analysis, changes in membrane fatty acid and phospholipid composition in response to the physiological environment, and correlations between membrane fluidity and membrane function.

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Safety in Process Plant Design. By G. L. Wells. John Wiley and Sons, New York and Toronto. 1980. xiv + 276 pp. $59.95

As the chemist or chemical engineer soon learns in his professional career, chemical process safety is of concern to most organizations. This concern results not only from the organizations' interest in the health and safety of their employees, but also from their recognition that any losses resulting from fires and explosions cost money. Because of the heightened awareness of the need by recent publicity and increased governmental regulations, more people are becoming involved in safety studies that have been the responsibility of a few individuals in responsible industries. Wells' book on "Safety in Process Plant Design" provides tools to those who need to become more actively involved in ensuring the safety of the process they develop or design.

Wells addresses the widely recognized need for a single source of rules, advice, and procedures for the chemical engineer, whether a student or one working in the profession. A wealth of detail is presented with an extensive bibliography for those desiring to learn more. The book is of most value to the engineer who needs to use common sense in applying theory and good design principles to give a process that can be operated safely. This narrowed scope limits its usefulness, in that the chemist is without guidance on what safety data he must develop, or how he should alter the chemistry to result in a process that is safe to operate without expensive design and operating features. Also not covered is how the operator, through good operating practices and procedures, can provide the requisite safety. This is not to demean the book in any way, but to highlight its utility to the design engineer.

This book might serve as a useful text to the undergraduate in chemical engineering interested in plant design. Although much of the work and tools described are useful, their limitations are not always clear. The designer must be acutely aware of the limitations in theory and rules-of-thumb and make allowances accordingly. Since the book was written in the United Kingdom, it refers to British standards and regulations, again, limiting its value to the designer in this country.

In summary, this book fills a burning need and, until one better suited to U.S. designers comes along, deserves a place on the desk of any designer who accepts responsibility for the safety of his fellowmen.

John A. Fisher, *Union Carbide Corporation*