graphics package. It is great as a research aid, but data will have to be transferred over to other software, such as Quattro Pro(R), Lotus(R), or Sigma Plot(R), for final presentation quality output. Fortunately, Import/Export is painless with a separate menu operation. The same general comment can be made regarding the entire software package. In an age of Graphics User Interfaces (GUI) and Windows, the NCSS package is starting to look a bit dowdy by comparison. This becomes an individual preference though, with some people preferring to work at the DOS prompt level, rather than to have flashy windows appear anywhere on the screen.

My impression of the package remains that it is an economical but thorough package which will do a large percentage of the statistics that most scientists require. The total hard disk space required is less than 2 megabytes, and it will run with only 512K of free memory. Other packages on the market are more comprehensive, or more specialized, but often cost in the $500–$750 range. This program, for about $200, has the substance of almost any package out there, and lacks only the "flash". In my opinion, it remains a solid value and is recommended for the individual researcher with modest statistical analysis requirements.

Richard Hartwick, *SUNY Binghamton*

Book Reviews

Diffusion, Atomic Ordering, and Mass Transport: Selected Topics in Geochemistry. Advances in Physical Geochemistry. Volume 8. Edited by J. Ganguly. Springer-Verlag: New York, Berlin, and Heidelberg. 1991. xiv + 567 pp. $149.00. ISBN 0-387-97287-0.

This book successfully brings together, under the collective umbrella of mass transport, several topics central to current research in mineral physics and physical geochemistry. The main emphasis is the role of diffusion in geological processes. Diffusion in the solid state, in silicate melts, and to a lesser extent in aqueous solutions is covered from both theoretical and empirical vantage points, and from the atomic to the macroscopic level.

The first three chapters deal with the prediction of properties of solids and liquids by consideration of atomic-level interactions. Molecular-dynamic computer simulations are described which allow calculation of crystal and liquid structures and thermodynamic and kinetic properties from interatomic force potentials. The application of the Ising model to the prediction of the time–temperature dependence of cation ordering in minerals is discussed. A particularly lucid description of the derivation of electrostatic properties and structural information from X-ray diffraction data is presented using BeO as an example. Although diffusion coefficients may not be calculated directly using this approach, implications for anisotropic diffusional pathways are evidence from the predicted electronic structures.

The relatively slow kinetics of solid-state diffusion in silicates and other refractory minerals provide a means of unraveling complicated p–T–t histories. However, success rests on the availability of accurate diffusion data and an understanding of the mechanisms of species transport possible under prescribed conditions. Detailed discussions throughout the book focus on predictive and experimental methods for obtaining diffusion coefficients. Significant portions are likewise devoted to the use of these data in kinetic models for reconstructing thermal histories of geologic terranes, and for predicting rates of isotopic exchange, atomic ordering and disordering, development and elimination of compositional zoning, rock deformation, and hydrothermal metamorphism.

Chapters 4–11 cover the mathematics of volume and grain boundary diffusion, review and critically evaluate the extensive data base of experimentally determined diffusion coefficients, and discuss various factors that influence diffusion rate (temperature, pressure, composition, H_2, O_2, and H_2O fugacity, a_{H^+}, strain rate, etc.). The mechanisms and kinetics of exsolution in the alkali feldspar system are discussed, and the development of microtextures found in natural crystals resulting from complex compositional zoning is explained using various diffusion-based models. Finally, thermal diffusion or the "Soret effect" is examined in silicate melt systems in Chapter 12. Experimental Soret data are summarized, and the relative importance of Soret separation in creating the chemical differentiation observed in some geologic systems is evaluated.

Although the book is primarily concerned with diffusion in solids and in silicate melts, aqueous solutions are considered in the final chapter in a discussion of the quasistationary-state model of fluid–rock interaction. Here a detailed mathematical treatment of the evolution of hydrothermal alteration is presented. The model considers both diffusive and advective transport of aqueous species and assumes local equilibrium at the fluid–rock interface.

Recent advances in microanalytical instrumentation have resulted in greatly improved measurements of diffusion coefficients thereby allowing more accurate kinetic models. Similarly, faster computers enable more sophisticated simulation studies. Thus, the future of diffusion research in geology looks promising and should lead to a better understanding of the temporal aspects of geologic processes in the years to come. The information presented in this volume not only provides an excellent summary of the current state of knowledge about diffusion-related geological processes but will also draw the attention of the creative mind to a number of new and illuminating research possibilities along these lines.

S. Michael Sterner, *University of California, Berkeley*

Recent Progress in the Chemical Synthesis of Antibiotics. Edited by Gabor Lukacs (C.N.R.S.) and Masaji Ohno (University of Tokyo). Springer-Verlag: Berlin. 1990. xii + 803 pp. $199.00. ISBN 3-540-52444-4 and 0-387-52444-4.

The use of naturally occurring antibiotics in the treatment of bacterial and fungal infections has had an enormous impact on modern healthcare, including their more recent and selected use as antitumor agents. The initiative for this text came from the first symposium on the Chemical Synthesis of Antibiotics held at Aussois in Savoy, France (May 2–6, 1988), in what is now an international biennial meeting. This book has been organized such that a premier major investigator in the chemical synthesis or functionalization of antibiotics has provided a comprehensive chapter on the chemistry of a class of agents. Each chapter provides an account of the work identified with and conducted by various individual research groups. In this manner the key issues of synthetic strategy and chemical methodology are underscored within a framework that highlights the broad significance of the past and present efforts on the specific targets.

The individual chapters are the following: Chapter 1, Total synthesis of macrolide antibiotics; Chapter 2, Structural modification of macrolide antibiotics; Chapter 3, Avermectins and milbemycins; Chapter 4, Ansamacrolides; Chapter 5, Polyene macrolides: Stereostructural elucidation and synthetic studies; Chapter 6, The chemistry of pristinamycins; Chapter 7, Recent advances in the chemistry of quinolones; Chapter 8, Actinobolin and bactobolin: chemical aspects and syntheses; Chapter 9, Nucleosides: potential drugs for AIDS therapy; Chapter 10, Total synthesis of lincomycin and related chemistry; Chapter 11, Synthetic study on man-made bleomycins based on the anticancer mechanism of natural bleomycins; Chapter 12, Synthesis of mitomycins; Chapter 13, Total synthesis of polyether antibiotics; Chapter 14, Synthesis of anthracyclines related to daunomycin; Chapter 15, Synthesis of polynuclear aromatic antibiotics; Chapter 16, Synthetic aspects of monocyclic β-lactam antibiotics; Chapter 17, Recent advances in the synthesis of PS-5 and PS-6 antibiotics and related carbapenem compounds; Chapter 18, Synthesis of penems; Chapter 19, 1-Oxacephem antibiotics; Chapter 20, Non-β-lactam analogs of penicillins and cephalosporins.

All research libraries will want to ensure that a copy of the book is available to investigators active in the area and to those who wish a comprehensive introduction to the past and present efforts. One might hope that subsequent texts might be forthcoming that would treat agents not presently included.

Dale L. Boger, *The Scripps Research Institute*

NMR, NQR, EPR, and Mössbauer Spectroscopy in Inorganic Chemistry. By R. V. Parish. Ellis Horwood: New York and London. 1990. 223 pp. $31.95. ISBN 0-13-625518-3.

As stated by the author, the purpose of this book is to give the reader "an introduction to the *interpretation* of some of the types of spectra often met with in the inorganic laboratory". Omitted by design are details in the spectroscopic theory behind each of the techniques. The book is intended for a synthetic chemist initiating a spectroscopic project. The topics covered are done so at a level appropriate for a beginning graduate student; however, some important matters are omitted.

The introductory chapter, which touches on the Boltzmann distribution, line widths, quantum numbers, etc., is largely familiar to a student after a spectroscopic laboratory course. The NMR chapter is largely oriented to solution-state 1D NMR spectroscopy and includes useful figures and tables listing typical values for the chemical shifts and *J*-coupling constants for ^1H, ^{13}C, ^{15}N, ^{19}F, and ^{31}P in coordination and organometallic complexes. There are 18 worked problems on solution-state NMR spectroscopy, with the emphasis on using chemical shifts and *J*-coupling constants for product identification. Some topics are covered so briefly as to be of little benefit: chemical exchange, 2D NMR spectroscopy, and solid-state NMR spectroscopy are covered in only 6 pages, making this chapter of little use for the inorganic chemist involved in complex structure or materials science problems.

The NQR chapter is short and dated; the most recent reference is from 1981. Readers wishing to learn about ^{17}O and $^{63,65}Cu$ NQR for application to high-T_c superconductors, ^{27}Al for zeolites, or ^{11}B for ceramics will be disappointed. Tables list quadrupole coupling constants for some complexes containing halogens, ^{14}N, ^{55}Mn, ^{59}Co, ^{75}As, ^{123}Sb, and ^{209}Bi. The EPR chapter consists of mononuclear coordination complexes. The NQR and EPR chapters have seven and eleven worked problems, respectively.

The Mössbauer chapter is lengthy (13 worked problems) and informative and it provides a good appreciation for the technique. Matters such as sample preparation, sample temperature, and the expected resolution of the experiment are discussed for eight Mössbauer-active nuclei. The detail is such that one can expect to address questions such as oxidation state, site symmetry, and relative abundance from a Mössbauer spectrum.

In summary, this text is comparable to portions of *Physical Methods in Chemistry* by R. S. Drago. Given a choice between the two, my preference is for Drago's text, circa 1977. The Parish book has some errors (spin of ^{14}N, equation for lifetimes, stated lack of analytical expressions for NQR energy levels for some spins) that detract some from its usefulness.

Leslie G. Butler, *Louisiana State University*

Solubility of Gases in Liquids. By P. G. T. Fogg and W. Gerrard (both formerly of the Polytechnic of North London). John Wiley & Sons: New York. 1991. x + 332 pp. $187.00. ISBN 0-471-92925-5.

The solubility of gases in liquids continues to be an important topic in both applied and theoretical chemistry. The present book is a continuation of the approach used by the late Professor Gerrard in his 1976 and 1980 books. His "reference line" approach is explained with some thermodynamic background to make clearer than before the semantic nature of its basis.

The authors discuss the many ways of presenting gas solubility data. They give particular attention to the pitfalls of using the Ostwald coefficient and the Henry's law constant. There is a brief and useful chapter on experimental methods.

The principal strength of the book lies in its presentation and correlation of gas solubility data with a special emphasis on polar inorganic gases. There are chapters on sulfur dioxide, ammonia and amines, the hydrogen halides, hydrogen sulfide, and the oxides of nitrogen. The available data on these gases of industrial and environmental importance are well covered. There are equally good chapters on chlorine, carbon dioxide, methane, and other hydrocarbon gases and a chapter on carbon monoxide, nitrogen, oxygen, and hydrogen.

The book concludes with an interesting and useful list of over 200 substances that may be considered "gases" in that they have normal boiling points below 298 K. The listing contains normal boiling point, critical temperature, enthalpy of vaporization at the normal boiling point, vapor pressure at 298 K, and vapor density at 273 K and 1.013 bar when known.

The noble gases and the halocarbons, both chlorofluorocarbons (CFC's) and hydrogen chlorofluorocarbons (HCFC's), are not covered. The noble gases have been well covered in a number of other publications and their absence is not important. However a chapter on the CFC's and HCFC's would have added to the usefulness of the book. This is a practical reference book containing much well-presented information on the solubility of gases in liquids.

H. Lawrence Clever, *Emory University*

Electroanalytical Chemistry: A Series of Advances. Volume 17. Edited by Allen J. Bard (University of Texas). Marcel Dekker, Inc.: New York. 1991. xii + 393 pp. $145.00. ISBN 0-8247-8409-X.

Since its inception in 1966, the *Electroanalytical Chemistry* series has served as an excellent point of entry for scientists interested in pursuing research in electrochemical systems. Many current researchers (myself included) were introduced to the field by reading the seminal chapters in previous volumes by D. M. Mohilner, T. Kuwana, S. W. Feldberg, R. W. Murray, and many other authors. The most recent volume in this series continues in this fine tradition with four chapters on modern methods of monitoring electrochemical interfaces.

The first three chapters in the volume are reviews of three relatively exotic techniques that are currently employed as monitors of electrochemical systems: quartz microbalance frequency measurements by D. A. Buttry, surface optical second harmonic generation by G. L. Richmond, and electrochemical mass spectroscopy by B. Bittins-Cattaneo, E. Cattaneo, P. Königshoven, and W. Vielstich. All of the authors are well-recognized experts in the application of their respective techniques to electrochemical systems. As with previous articles in the series, the chapters are a combination of review article, a healthy dose of the author's own work, and a development of the background, theory, and methodology that the author believes is necessary for a scientist interested in entering the field. These chapters demonstrate that electrochemists now have a large number of increasingly powerful spectroscopic and mass-selective techniques to choose from in the analysis of the solid–liquid interface.

The fourth chapter in the book further illustrates this point by focusing on a single electrochemical system and applying modern spectroscopic techniques to the study of surface morphology and structure as it relates to the electrochemical behavior of the surface. An extensive study of carbon electrodes is presented by R. L. McCreery that relies heavily on the author's use of Raman scattering in conjunction with other in situ and ex situ methods. The surface structure of a wide variety of carbon electrodes is examined with the spectroscopic measurements and then correlated to the voltammetry of these surfaces.

As with all review articles, the four chapters in this book are out of date at the moment of publication. But that is quite understandable given the contemporary nature of the topics chosen. Suffice it to say that this volume will undoubtedly appear on the desks of many graduate students as they learn about the various techniques now employed in electrochemistry. A survey of *Electroanalytical Chemistry* in our library normally finds over a quarter of the volumes currently checked out—the best testimony to the utility of the series. My only complaint with the book is that the title is somewhat misleading: the articles in this series serve not only those in the field of electroanalysis but all researchers interested in the electrochemical interface.

Robert M. Corn, *University of Wisconsin*

Metal–Ligand Multiple Bonds. By William A. Nugent (E. I. du Pont de Nemours and Company) and James M. Mayer (University of Washington). John Wiley & Sons: New York. 1988. xi + 334 pp. $60.00. ISBN 0-471-85440-9.

This excellent and extremely readable book is concerned with the chemistry of transition-metal complexes containing oxo, nitrido, imido, alkylidene, and alkylidyne ligands. The emphasis is on mononuclear species in which these groups are terminal ligands, although some polynuclear systems (e.g., bridging alkylidyne and nitrido derivatives) are also included. The vast majority of complexes discussed contain transition-metal elements in high formal oxidation states; it therefore seems logical that low-valent Fischer-type carbene and carbyne complexes (for which there are several comprehensive reviews available) are only briefly discussed. Multiple bonds to heavier main-group ligands and to alkoxide and amido groups have been excluded to keep the volume to a manageable size.

The book is divided into seven chapters: Ligand Types and Overview, Electronic Structure, Reactions Resulting in the Formation of Multiply Bonded Ligands, Vibrational and NMR Spectroscopy of Multiply Bonded Ligands, Structural Studies, Reactions of Multiply Bonded Ligands, and Role of Metal–Ligand Multiple Bonds in Catalysis. These contain extensive well-organized tables covering synthetic, spectroscopic, and structural studies and providing an extremely useful reference. The accompanying text, in turn, focuses on trends and common themes, giving a framework for understanding this wealth of detail. Emphasis is placed on using straightforward models for electronic structure to understand and predict the behavior of transition-metal oxo, nitrido, imido, alkylidene, and alkylidyne complexes; this works well. The authors cover the reactivity of these complexes in two complementary chapters: the first discusses their chemistry as a function of added reagent, the second considers the involvement of metal–ligand multiple bonds in industrial and biological processes, providing perspective on the significance of these species. Throughout the book, the authors' commentary is thought-provoking, challenging the reader to consider the potential for new discoveries in the investigation of metal–ligand multiple bonds. As a result this volume has already had a substantial influence on research in this area.

This comprehensive and authoritative volume is becoming the classic reference defining the field of metal–ligand multiple bonds. It provides an excellent starting point for chemists interested in learning about the chemistry of transition-metal oxo, nitrido, imido, alkylidene, and alkylidyne complexes and belongs in every chemistry library as well as in the personal libraries of chemists whose research involves metal–ligand multiple bonds.

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