Computer Software Reviews

DADiSP Worksheet. Version 1.03. DSP Development Corp.: One Kendall Square, Cambridge, MA 02139. List price $795.00, 20% discount for academic users and site-wide licensing available. Purchase price includes six months of free updates and technical support. After the initial six months, an annual support/update contract is available for 15% of the product purchase price. A demonstration disk is available from DSP systems for $20.00.

The DADiSP worksheet is a sophisticated signal analysis program that allows analyses to be carried out in a spread sheet format. The program is designed to accept as input files consisting of single columns of numbers in ASCII, 8-bit Byte, 16-bit Integer, Lotus PRN, and several other formats. The interval between data points may be specified with the input. Units may also be specified, and DADiSP will process engineering units along with the signal. Once the file containing the signal has been loaded into DADiSP (using a simple command sequence), the signal may be displayed and operated upon using an extensive library of functions, described in more detail below.

DADiSP will run on IBM PC/XT/AT and compatibles with 512 K memory (640 K is recommended). DADiSP runs best with one hard drive and one floppy, but it also runs well on two-floppy systems. IBM PC-DOS 2.0 or later and the IBM CGA, EGA, or Hercules graphics adapter card are required. The current version (1.03) does not take advantage of the high-resolution capability of the IBM EGA card, but the next version due out in Summer 1987 will have high-resolution display with the EGA card. Another problem with the current version is that the only hard copy available is a rather slow screen dump to an Epson printer. This problem will also be cured with the next release which will be able to dump displays to HP plotters, with other hardcopy devices to follow. Versions of DADiSP are also available to run on the DEC Microvax II, DEC Vax, HP 9000 series 300, and several other workstation computers.

DADiSP is extremely user friendly, and many features can be learned immediately with the tutorial program (about 15 min) without consulting the manual. Once the program is started, the user loads the files containing the desired signals into the DADiSP program, then enters a worksheet, and displays the desired signals in windows on the screen. A worksheet consists of a user-specified number of windows which contain signals related by a user-specified sequence of functions. A typical worksheet display is shown in Figure 1. Two signals have been loaded in the first two windows. Operations may be performed on these signals by entering an empty window and typing an operation such as "INTEG(W1)" which calculates the integral of the signal currently in window 1. The result of the operation is displayed in the window as shown for the two integrals in Figure 1. If new signals are loaded, the operations are automatically performed on the signals and all necessary windows in the worksheet are updated, as when an item in a business spreadsheet program is changed. Individual signals or entire worksheets

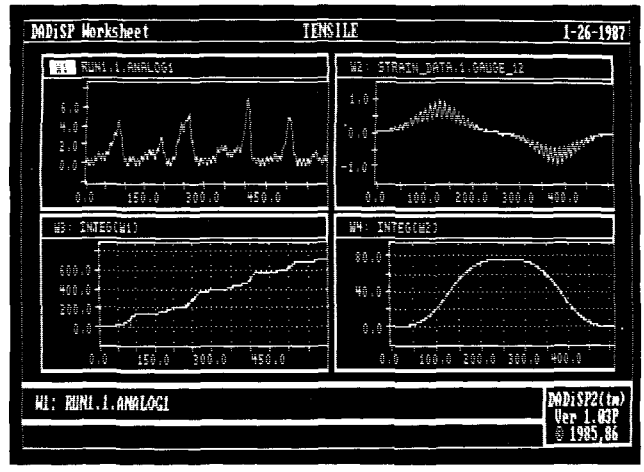

Figure 1.

may be saved and are stored in a compact binary format by DADiSP.

A wide variety of signal processing functions are available in the package, including waveform generation, integrals and derivatives, fast fourier transforms, and smoothing functions. The most recent documentation did not include details on algorithms for some of the more complex functions (fourier analysis, integration, etc.) but this was to be remedied with the next release. Calculations run quickly, and even long chains of operations can be performed on a signal in reasonable times.

Information such as the date and time of acquisition, comments, units, and other parameters may be stored with the signal and displayed on the screen. A cursor mode is available, and any window may be selected and examined with the cursor mode with zoom and scroll functions. The quality of the screen display is good, and the zoom function allows the data to be examined in any desired degree of detail.

In addition, a feature called DSP pipeline allows users to interactively run their own data acquisition and processing programs from DADiSP, greatly increasing the flexibility of the package. About 200 K memory is left for other programs on a 640 K system with DADiSP running.

DADiSP is sold on three floppies and a very complete manual with examples is included. A tutorial program and several sample files are included on the floppies. DADiSP is a very attractive program for industrial or academic chemists who must analyze extensive amounts of data generated or collected by computer.

Gary H. Kruppa and J. L. Beauchamp, *California Institute of Technology*

Book Reviews

Electroanalytical Chemistry. Volume 14. Edited by Allen J. Bard (University of Texas). Marcel Dekker, Inc.: New York. 1986. xv + 459 pp. $101.50. ISBN 0-8247-7608-9

This volume is part of a series aimed at authoritative reviews of electroanalytical techniques and related areas of investigation. Volume 14 clearly maintains the high standards and proven usefulness of the series.

The first chapter differs from the others in that it discusses conformation change and isomerization associated with electrode reactions rather than a particular family of techniques. Written by Dennis H. Evans and Kathleen M. O'Connel, it provides a particularly lucid organization and a summary of a diverse, but important, body of literature. The use of diagrammatic schemes with associated examples is extremely helpful. Conformational conversions and isomerizations preceding, succeeding, and congruent with electron transfer are reviewed. In summarizing the authors point out that such work can yield new insights and information to organic and inorganic chemistry, as well as new information on the details of heterogeneous electron transfer mechanisms.

Infrared Vibrational Spectroscopy of the Electrode-Solutions Interface is the title of the last and largest chapter written by the group including S. Pons at the University of Utah. They outline early work on vibrational spectroscopy at electrode surfaces including SERS and un-enhanced Raman spectroscopy but specifically review work since 1979 using specular reflectance infrared methods involving modulation. Electrochemically applied voltage modulation with subtractively normalized interfacial FTIR (SNIFTIRS) and with dispersive IR (EMIRS) are included. Also polarization modulation IR absorption spectroscopy (IRRAS) is treated. In addition to these techniques the principles of applied voltage induced difference spectra and the uses of far-infrared and of time-resolved spectroscopy are treated. The cell is designed to allow easy adjustment of optical path length according to solvent requirements. A series of applications with literature references includes

molecular, ion, and radical adsorption, surface applied electric field effects on vibrational frequencies, surface coverages, adsorbate–adsorbate reactivities, and deposition studies. An appendix on the laws of reflection and Fresnel's equations is a service to the reader.

Two chapters in this volume contain up-to-date treatments of established electrochemical techniques. The chapter by Vernon D. Parker entitled Precision in Linear Sweep and Cyclic Voltammetry more than meets its title. It should be required reading for anyone initiating voltammetric examination of electron transfer related reaction kinetics research. Also, it is recommended reading for review and perspective for electrochemists already involved with these techniques. Precision actually attainable, including experimental considerations and actual experimental data, is discussed. Very useful classifications of the several techniques and of data interpretation methods are given. As a result, the simplest technique for the problem can be selected. Specific procedures for data treatment are offered for several cases.

J. Osteryoung provides an excellent short history of the electrochemical techniques which include the term "square wave" and in the process helps the reader delineate among the methods with that general description. Square wave voltammetry as discussed here is a staircase applied potential with one cycle of a square wave superimposed on each step. She suggests that the nomenclature problem will eventually solve itself by the emergence of this technique as predominant. Advantages of the technique in comparison to other voltammetric techniques include speed of data collection, background current discrimination, insensitivity to electrode size and shape and to convection, and minimal net charge transfer (if desired). The digital instrumentation and computation capabilities necessary for further research as well as for further applications are commercially available with still more versatile systems expected. The chapter first presents a review of the theory for reversible electron transfer and then reviews kinetics limited electron transfer, preceding, succeeding, and catalytic chemical steps cases. As applied to electrode reaction kinetics, square wave voltammetry is an inherently digital technique which allows for computer nonlinear least-squares search of 3-dimensional (α, k, E) space for optimum fit to theory. A section on experimental results provides an excellent perspective on the literature on this technique. The number of instances for which the method showed superior applicability for kinetics studies and/or showed lower detection limits for analytical applications is impressive.

Calvin O. Huber, *University of Wisconsin—Milwaukee*

Understanding Our Environment. Edited by R. E. Hester (University of York). The Royal Society of Chemistry: London. 1986. XIII + 333 pp. $77.00. ISBN 0-85186-907-6

This book contains six chapters by various authors from British universities and professional institutions covering an introduction to aspects of environmental pollution and control. The chapters are the following: Monitoring (by C. N. Hewitt and R. M. Harrison), Air (by A. G. Clarke), Water (by H. Fish), Land Contamination and Reclamation (by E. E. Finnecy and K. W. Pearce), Assessing the Ecological and Health Effects of Pollution (by S. Smith), and Regulation and the Economics of Pollution Control (by P. Burrows, N. Highton, and A. I. Ogus). There is both a subject index and a special index on "Information Retrieval" by M. L. Richardson.

The individual chapters are well written. "Monitoring" covers topics that include the suitability of analytical techniques, sample collection and randomization, theoretical modelling of plume dispersal, and an interesting comparison of vehicle emission control testing techniques for Europe, Japan, and U.S. Federal and U.S. California driving cycles. The two chapters on "Air" and "Water" are very detailed and cover, for example, fog and mist formation, acid rain, pollutant sources and their dilution and dispersal, atmospheric stability and departures from stability, an excellent overview of air pollutant interactive chemistry, and individual treatments of lakes, estuaries, streams, ground-water aquifers, water control and disposal, and even descriptions of problems resulting from agricultural effluents separately and distinctly from pig, cattle, and poultry farming water effluents. The chapter "Land Contamination and Reclamation" has a good overview of the problems involved, under this title, and an excellent set of site-histories and case-histories that emphasizes the difficulties of converting a factory site into a children's playground, or even into a parking lot. There is an interesting chapter on "Ecological and Health Effects", perhaps the best chapter in this book, which provides a good global view of problems as diverse as ozone and photochemical smog effects on flora (not limited to U.S. cities), mercury in water and thence to food chains (Niigata and Minamata in Japan), Selenium poisoning from cigarette smoke, oil contamination on marine organisms (such as the Torrey Canyon and Amoco Cadiz disasters), and organo-chlorine DDT effects on avian reproduction. The final chapter ("Regulation and Economics of Pollution Control") is also excellent and deals well with global issues. Since citizen rights and economics vary so widely from region to region on this planet this chapter is less detailed and more philosophical, but this in itself is a useful approach for certain academic programs. It does illustrate and highlight the economics needed to balance costs and convenience against benefits and risks. It also provides an introduction to that unenviable task of agreeing that a single human life has a monetary equivalent, and then estimating an actuarial value for this.

The book provides an excellent introduction to a diverse array of topics with authors from, among others, chemistry, environmental studies, economics, fuel sciences, and law, and although it emphasizes predominantly British presentations, there are sufficient references and examples to U.S. and North American, European, and Japanese problems to fulfill general interest needs for American academic usage. I could foresee a variety of uses for this book. It would fit well into a program that offers a Chemistry or Biology minor for non-scientists such as journalism majors, humanities/arts, and business/economics majors. In my own university, it would also offer limited use (specific chapters) for meteorology as a minor for non-science majors. It provides more general use for majors in urban planning and environmental studies (environmental management, health, technology, and science) and would suit a general education interdisciplinary course for non-science majors. I enjoyed reading through this book.

A. Campbell Ling, *San Jose State University*

Analytical Profiles of Drug Substances. Volume 15. Edited by K. Florey (The Squibb Institute for Medical Research). Academic Press: Orlando, FL. 1986. ix + 795 pp. $70.00. ISBN 0-12-260815-1

This volume is part of a continuing series that attempts to bring under a "single cover" the most important data pertaining to the analysis of drugs. Without a doubt this is an ambitious undertaking, but ready access to such documentation can be of great value to the workers in the pharmaceutical industry or, for that matter, to a clinical or commercial analytical laboratory. In fact, contrary to what the title indicates, the contributed articles cover more than just the subject of analysis. The conscious effort to inlude comprehensive summaries on the synthesis, metabolism, and pharmacokinetics of the compounds adds to the thoroughness of the publication.

According to the editor, essentially any substance of medicinal value is considered a drug and is a candidate for this series. The current volume covers the following topics: Amiloride Hydrochloride (D. J. Mazzo); Aminoglutethimide (H. Y. Aboul-Enein); Caffeine (M. U. Zubair, M. M. A. Hassan, and I. A. Al-Meshal); Cocaine Hudrochloride (F. J. Muhtadi and A A. Al-Badr); Ephedrine Hudrochloride (S. L. Ali); Estradiol (E. G. Salole); Guanabenz Acetate (C. M. Shearer); Iodamine (D. Pitre); Lithium Carbonate (H. C. Stober); Maprotiline Hydrochloride (S. K. Suh and J. B. Smith); Penicillin G, Potassium (J Kirshbaum); Piroxicam (M. Mihalic et al.); Ranitidine (M. Hohnjec et al.); Strychinine (F. J. Muhtadi and M. S. Hifnawy); Vidarabine (W.-H. Hong, T. Chang, and R. E. Daly), and Zomepirac Sodium (M. Zinic et al.). Supplemental information is also provided on the following drugs: Chloramphenicol (A. A. Al-Badr and H. A. El-Obeid); Lidocaine and Lidocaine Hydrochloride (M. F. Powell); and Sodium Nitroprusside (A. Bult, O. R. Leewenkamp, and W. P. vanBennekom).

The reference data provided for the aforementioned compounds range from common physical properties such as melting point and solubility to spectroscopic and chromatographic information. With some minor exceptions, there is a uniformity among chapters in terms of both the subject content and the format of presentation, a sign of good editorial management. The laboratory analyst will also be relieved to find summaries of isolation procedures for the various drugs discussed in the volume. Significantly, this covers the workup of samples from different types of matrices in conjunction with specific techniques, e.g., titrations, polarography, NMR, GC/MS, etc. These are well-referenced so that the user can easily access the necessary details. Moreover, reference citations cover much of the current literature which has permitted the inclusion of data from some of the recently developed techniques—e.g., fast atom bombardment mass spectrometry—where relevant.

In summary, this is a publication that can be treated almost like a detailed Merck Index. Organizations or laboratories which deal with the day to day consideration of drugs and the problems of their analysis will find this series a useful addition to their libraries.

Paul Vouros, *Northeastern University*

Reconstitutions of Transporters, Receptors, and Pathological States. By Efraim Racker (Cornell University, Ithaca, NY). Academic Press, Inc.: Orlando, FL. 1985. xvi + 271 pp. $28.00 ($12.95 in paperback). ISBN 0-12-574664-4

This entertaining monograph is an updated compilation and extension of a group of lectures presented by the author. As the title implies the book is concerned with the resolution and reconstitution of membrane-

bound enzymes, transport carriers, and receptors. Reconstitution is one of the classical approaches of biochemical research and the author amply describes the historic and current usefulness of this approach. Dr. Racker has followed the style of his previous books and this monograph is peppered with humorous anecdotes and scientific lessons which, on there own, make this book worthwhile reading for a broad spectrum of researchers in biochemistry.

In the eleven lectures presented the author not only emphasizes the reconstitution of membrane-bound enzymes and carriers but delves into the realm of reconstitution of organelles, metabolic regulation, and pathological states. Initial lectures are devoted to general principles and methodology and proceed from simple protein–lipid reconstitutions through ever more complex pathways to pathology. The examples discussed extend from mitochondrial F_0/F_1 ATP synthetase, through a number of ATP driven ion pumps, electron transport chains, bacteriorhodopsin, transport carriers, membrane receptors, to cancer. Figures are sparse and simple, clearly defining the point the author wants to make. One fault is that the tables lack references and require that the reader consult the text to locate the appropriate citations. Dr. Racker has selected examples of membrane associated enzyme systems and metabolic pathways with which his laboratory has had personal experience. Researchers familiar with the subtilties of the subject matter will find the authors insights into current questions to be quite stimulating. The book would have limited value for those readers intent on becoming informed on the selected topics unless they were prepared to do a lot of work on their own. Those unfamiliar with the experimental systems will probably have some difficulty following the details of the discussion and may come away unsatisfied. As an aid the author provides numerous literature references including detailed review articles. Following the intricate details of the scientific discussion is not critical to the usefulness of this book and should not deter readers. What is important is the approach to research and the history and philosophy of science presented from the author's perspective. In many ways this will prevent the work from becoming outdated. The author has called upon his vast knowledge of biochemistry and personal contributions to research to provide an historical perspective which serves to stimulate the imagination and creativity of the reader. Although many of the structural and enzymatic questions posed will surely be answered in the near future the ways of critically thinking about the problems will still be relevant. The book distills the essence of the authors approach to biochemical research and imparts the flavor of a personal discourse.

Joel H. Weiner, *University of Alberta*

Spectroscopic Properties of Inorganic and Organometallic Compounds. Volume 19. A Specialist Periodical Report. Senior reporters G. Davidson (University of Nottingham) and E. A. V. Ebsworth (University of Edinburgh). Royal Society of Chemistry: London. 1986. 474 pp. £95 ($160.00 U.S.). ISBN 0-85186-173-3

This outstanding volume reviews the literature of 1985 in the broadly defined areas of inorganic and organometallic spectroscopy. It belongs in every institutional library but is, unfortunately, rather expensive, so that most individuals cannot afford a copy. One of the editors even apologizes for the price in the foreword. As in the previous year, the survey is divided into eight chapters: (1) Nuclear Magnetic Resonance Spectroscopy by B. E. Mann; (2) Nuclear Quadrupole Resonance Spectroscopy by K. B. Dillon; (3) Rotational Spectroscopy by S. Cradock; (4) Characteristic Vibrations of Compounds of Main-Group Elements by G. Davidson; (5) Vibrational Spectra of Transition-Element Compounds by G. Davidson; (6) Vibrational Spectra of Some Coordinated Ligands by G. Davidson; (7) Mössbauer Spectroscopy by S. J. Clark, J. D. Donaldson, and S. M. Grimes; and (8) Gas-Phase Molecular Structures Determined by Electron Diffraction by D. W. H. Rankin and H. E. Robertson.

Overall, the coverage of the appropriate literature published in 1985 is very thorough and complete. The reporters take a very broad view of their topics, so that gas-, liquid-, and solid-phase spectroscopy are all covered. For example, Chapter 8 fits in very well with the structural theme of this volume, although, strictly speaking, electron diffraction is not a spectroscopic technique.

The main criticism I have is that for Chapters 3 and 4 the astronomical literature is not covered. A considerable amount of laboratory spectroscopy is published in astronomical journals. More importantly, many new molecules of great chemical interest are found first in space, mainly by microwave techniques. Examples include HCO^+, HC_n (n = 2–6), and HC_nN (n = 9, 11).

Each well-organized chapter is followed by a massive list of references, but there are no overall subject, molecule, or author indices. These indices are expensive and time-consuming to produce, but they are quite useful. Extensive computerization of the entire book production process might make index publication much cheaper. Authors would then submit computer-ready copy on floppy disks rather that camera-ready copy.

In summary, this book, like the previous eighteen in the series, is very useful. Most spectroscopic workers in physical and inorganic chemistry will want to consult this volume in order to quickly fill gaps in their knowledge of the literature.

P. Bernath, *University of Arizona*

The Art of Problem Solving in Organic Chemistry. By Miguel E. Alonso (Institute of Scientific Research of Venezuela). John Wiley & Sons: New York. 1987. xii + 324 pp. $29.95. ISBN 0-471-84784-4

This book is a collection of 56 carefully selected mechanistic problems, taken from mostly recent chemical literature. Each problem is part of a brief chapter (3–6 pages), which includes a thorough discussion of several reaction pathways that might explain a proposed transformation. References to the original primary sources are provided at the end of each chapter. A succinct introductory section ("the rules of the game", as the author calls it) outlines useful principles for an effective participation, on the part of the reader, in the extensive discussion of the mechanistic intricacies presented by each problem. Given its contents and its organization, this book will be most useful to advanced level undergraduates and beginning graduate students, for whom it should be made a required reading. More mature readers will enjoy working out solutions to the many interesting exercises, some of them genuine brain teasers, and savor, among the alternative pathways presented by the author, the ones that had eluded their mechanistic wit.

The Art of Problem Solving is an excellent medium to convey to those who are baffled by their first encounters with mechanistic chemistry that even the most arcane of organic transformations is vulnerable to the attack of chemical logic. Each problem stresses, and shows, the importance of careful thinking when considering mechanistic pathways. Many of the exercises demonstrate admirably well how a careful analysis, one that moves beyond an obvious solution, often reveals elegant possibilities that would otherwise slip by, unnoticed. Most importantly, this book leaves the reader with some confidence that, as much as problem solving in organic chemistry is an "art", it is just as much the product of rigorous, perceptive reasoning. The mental skills that are required for such exercises may be developed, strengthened, and cultivated through constant application of one's intellect. *The Art of Problem Solving* differs from many other good compilations of mechanistic problems precisely in that it is singularly successful in providing younger readers with a means to acquire their own critical capabilities in the area of organic chemical reactivity. Alonso's effort is laudable. His book is excellent.

Marco A. Ciufolini, *Rice University*

Mathematical Concepts in Organic Chemistry. By I. Gutman (University of Kragujevac) and O. K. Polansky (Max-Planck-Institut für Strahlenchemie). Springer-Verlag: Berlin. 1986. x + 212 pp. $71.00. ISBN 0-387-16235-6

The authors contend that a new branch of science, called mathematical chemistry, has arisen as the result of the application of graph theory to organic chemistry. The present book is an attempt to give a cross-section through this work. Attention has been focused on topology, graph theory, and group theory. The presentation is mainly concerned with mathematical theorems. The authors' intention was not only to outline the existing results but also to indicate how they were obtained. Generally only the idea of the proof is indicated or a pertinent reference is quoted. Additionally, a few concrete examples and/or applications are sketched as illustrations.

The book is directed to all those chemists who use, or intend to use, graph theoretical methods in their research. The level of exposition is adjusted to the mathematical background expected of European graduate students in the mathematical sciences. This does not mean that mathematical rigor has been avoided. Numerous tedious, but necessary, details are included.

The text reads much like a dictionary of mathematical theorems and definitions. Many definitions are introduced only never to be mentioned again. The discussion often requires jumping ahead in the text to find the relevant definitions (which are cross-referenced to make this easy to do). As a collection of theorems needed to understand the results of chemical graph theory, this book will fill a missing niche. It is not, however, intended as an introductory text for nonspecialists.

The book is fairly expensive. There are actually only 164 pages of text not including the introduction, appendices, and index. This is divided into sections on topology, graph theory, group theory, and special topics. The special topics treated are (a) topological indices, (b) π-electron resonance energy, and (c) topological effect on molecular orbitals (TEMO). One long appendix is devoted to the usual character tables of the point groups.

Ernest R. Davidson, *Indiana University*

Physical Chemistry. Seventh Edition. By Robert A. Alberty (Massachusetts Institute of Technology). John Wiley and Sons, Inc.: New York. 1987. x + 934 pp. $49.21. ISBN 0471-82577-8

The seventh edition of this book is a real revision in several ways. Many topics that in the past were part of the physical chemistry course have been eliminated as they are now covered in lower level courses. This has permitted the inclusion of more advanced material. The number of chapters has been increased from 21 in the sixth edition to 25 in the seventh. The first law of thermodynamics is now presented as a separate chapter, no longer combined with the treatment of real gases. One change this reviewer considers a great improvement is that the chapter on chemical equilibrium is presented before that on phase equilibrium. Another definite improvement is the splitting into two chapters of the treatment of ideal and non-ideal solutions.

The section on quantum chemistry precedes the section on chemical dynamics, permitting the application of concepts of atomic and molecular structure and statistical mechanics to theoretical kinetics, and the author has added one chapter on theoretical gas kinetics to the section on chemical dynamics. The presentation of the basic concepts of quantum mechanics follows the same line as in the previous edition. Black-body radiation has been the traditional way to introduce the student to the concepts of quantum mechanics. However, the students of today are more familiar with spectroscopic notions which would provide a better introduction to quantum mechanics. The Schroedinger equation is presented dogmatically, discouraging students' interest in Chemical Physics. The chapter on molecular spectroscopy has been divided into two chapters, one on rotational and vibrational spectroscopy and the other on electronic spectra of molecules. As in the previous edition, a chapter on magnetic resonance spectroscopy and one on statistical mechanics have been included.

The section on chemical dynamics has been revised by more effective use of the statistical mechanics presented in the previous chapter. A separate chapter on theoretical gas kinetics affords a good opportunity to present effectively the concepts involved in the transition-state theory.

The book includes a fourth section, on solid-state chemistry, which is presented along the same lines as in the previous edition.

The present edition contains 1134 problems, an increase from 1040 in the previous edition, with 200 new problems.

The book reads very well, reflecting the extensive experience of the author. It covers topics that will make it a very useful text, not only for chemistry majors but for biochemists, biophysicists, and chemical engineers as well.

Jose R. de la Vega, *Villanova University*

Metal Ions in Biological Systems. Volume 20. Concepts on Metal Ions Toxicity. Edited by Helmut Sigel (University of Basel). Marcel Dekker, Inc.: New York. 1986. xxiv + 386 pp. $85.00. ISBN 0-8247-7540-6

This is a companion to and extension of Volume 18 in this series, *Circulation of Metals in the Environment*. It is a collection of eleven monographs whose intended focus, as stated in the preface, is the relation between the chemistry of metal ions and their toxicological properties. This focus is strongest in the first four chapters which cover the distribution of potentially hazardous trace metals in the environment, the bioinorganic chemistry of metal ion toxicity, the relationship between essentiality and toxicity of metals in the aquatic ecosystem, and the speciation and toxicity of metal ions in aquatic systems. The first two chapters are especially excellent for readers with little background in inorganic chemistry.

The 5th and 6th chapters are on metal toxicity to agricultural crops and to humans and animals. They are followed by a chapter on toxicity and human nutrition with special emphasis on zinc and selenium. Then come the chapters dealing with chromosome damage in humans exposed to metal ions and with mechanistic aspects of metal ion carcinogenesis. The final two chapters cover methods of in vitro assessment of metal ion toxicity and problems in the analysis of biological materials for toxic trace elements.

An omnipresent theme in this volume is that the total metal ion concentration in an environment, or even in a biological sample, is rarely a useful index of toxicity due to the bewildering complex interactions of metal ions with both organic and inorganic ligands. The difficulty of toxicological studies becomes increasingly clear as the book proceeds. For example, conclusions about toxicity in humans are painfully restricted by the difficulty of finding appropriate quantitative indicators of toxicity, and when it comes to correlating studies by different investigators, by nonuniform methods, and by irregularities in sampling and sample treatment. Overall, the writing is clear, well-organized, and concise, although two or three of the chapters would have benefited by briefer, less general introductions, or more substantive summaries. This volume is a useful addition to an excellent series.

Lawrence C. Kuo, *Boston University*

Chemical Stability of Pharmaceuticals. A Handbook for Pharmacists. Second Edition. Edited by Kenneth A. Connors (The University of Wisconsin), Gordon L. Amidon (The University of Michigan), and Valentino J. Stella (The University of Kansas). John Wiley & Sons: New York. 1986. xii + 847 pp. $54.50. ISBN 0-471-87955-X

The Second Edition of this well-known text continues in the tradition of the previous edition as a valuable reference for pharmaceutical scientists. The authors of this book outline two objectives: to provide stability data on drugs and dosage forms of interest, and to provide the pharmacist with a "feel" for kinetic data. To meet these objectives, the authors divide the book into two parts. Part One deals with fundamentals and contains such topics as stability calculations, interpretation of kinetic data, hydrolysis and other acyl transfers, oxidation and photolysis, and solid-state chemical decomposition. As a practical feature, strategy and tactics of stability testing are also discussed. Part Two contains stability information on 91 drugs. The drug monographs are organized in a common format, including general information, a discussion of drug kinetics, degradation reactions and stabilization methods for the drug formulations, and literature references. A series of appendices, containing units, physical constants, temperature conversions, useful formulas, etc., is presented at the end of the book.

The book is labeled as a *Handbook for Pharmacists*, and the authors state in the Preface that their goal is "to assist the pharmacist in applying kinetic methods and data to stability problems in professional practice". In terms of providing useful information for practicing community and hospital pharmacists, the authors do not achieve their goal. Information regarding packaging materials, storage conditions, product/package compatibility testing, etc., would better serve the dispensing pharmacist. In contrast, the book should prove to be very useful to industrial pharmaceutical scientists. Of particular interest to industrial pharmaceutical scientists will be the discussions of regulatory requirements for stability testing and the design of stability-testing protocols.

The book is well-written, clearly organized, and extensively illustrated with structural formulas and chemical equations. The authors made liberal use of tables in their presentation. Numerous references and a good subject index make the book a useful reference. The book suffers, however, from one drawback, the omission of recent references. Also, in the opinion of this reviewer, the fact that the text is not typeset makes the book difficult to read. Nevertheless, the book represents an impressive survey of drug-stability data from the literature, and it will be an essential addition to science libraries and to the collections of those working in this area.

W. Larry Paul, *United States Pharmacopeial Convention, Inc.*