

copying the driver files to a hard or floppy disk, running the supplied INSTALL program, and redirecting the PLOT file to the proper COM port for the plotter.

Data manipulation is achieved through a "Lotus-123-like" spreadsheet, complete with all the mathematical transformation ability, including logic statements, that one would expect from a good spreadsheet program. NCSS's spreadsheet data system is particularly useful for handling large data sets, allows for clear data labeling within the set, and provides for both spreadsheet and individual data cell editing.

The statistical options provided by NCSS include descriptive statistics, cross tabulation, scatter plots, multiple regression, discriminant analysis, factor analysis, cluster analysis, T-test, ANOVA, nonparametric tests, and forecasting. With the NCSS Power Pack, the options are expanded to include linear logistic regression, response surface regression, correlation analysis, nonlinear regression, advanced ANOVA, and MANOVA.

Only a fraction of the statistical options offered by NCSS were actually tested in the course of this review, and probably the true power of the package can only be appreciated by a statistician. However, even the most rigorous of statistical procedures was easy to accomplish with NCSS. The program responded admirably to the routine treatment of chemical data and to multiple linear regression analysis of large data sets. However, the large amount of statistics generated became burdensome on routine analysis where extensive statistical data treatment was not required.

The truly impressive part of NCSS lies in its graphics capability. In

addition to generating two- and three-dimensional plots in a variety of forms and orientations, NCSS provides the unique ability to easily rotate three-dimensional data vertically and horizontally, and to plot in multidimensional space through star and parallel coordinate plots. Plotter output is achieved through DOS, enabling multiple users of a single plotter.

In some respects NCSS may be cumbersome for routine statistics in the chemistry laboratory, since all of the statistical results are presented on the screen. A useful modification for future revisions would be the ability to create templates, presenting only the desired data and results. This is a fairly minor point, however, and overall, NCSS should prove to be a valuable tool for handling large data sets and for manipulating data where rigorous statistical treatment is required. If for no other reason than its outstanding graphics capabilities, NCSS is a valuable addition to the modern chemistry laboratory and an invaluable aid in the presentation and publication of data.

During the course of this review, we were unaware of the cost of the NCSS package. The price is the biggest surprise of all. We know of no better statistics/graphics software value for \$200.00. It is worth \$200.00 in graphics capability alone, not to mention the power of NCSS's statistical operations. Its power and ease of use surpass packages costing 10 times as much. It is fun and simple to use, and we highly recommend it to chemists, statisticians, and software junkies, alike.

Barbara J. Bassler, *Hoechst-Celanese Corporation*
Richard A. Hartwick, *Rutgers University*

Book Reviews*

Applied Geochemical Analysis. Volume 88. By C. O. Ingamells and F. F. Pitard. John Wiley and Sons: New York, 1986. VII + 733 pp. \$89.95. ISBN 0-471-83279-0.

In the preface, the authors state the hope that this book will be of value to a wide variety of specialists ranging from mining engineers to academic geochemists. This review is from the perspective of the latter. The book emphasizes classical types of analysis, in part because of the aim of being useful for low-budget labs. However, a pervasive theme in the text is a mistrust of recent innovations in analytical instrumentation. To a degree this is a healthy attitude. I fully agree that—"Modern instrumentation (especially computer output) gives a false sense of security to the analyst." It is also true that even for sophisticated instruments, data quality depends critically on the skills of the analyst. Moreover, even an accurate analysis is only useful if the sample analyzed was chosen with a clear definition of the problem being addressed. In fact, the major message of Chapter 1 is that the sampling process can legitimately be considered the most important aspect of an analytical problem in geochemistry. Precise and accurate data on unsuitable samples are useless. Most of the chapter is devoted to semiempirical approaches to the important problem of obtaining a representative small sample of a large body. This is not a trivial problem, but it is too often ignored. It is an important and relevant chapter, but it is not easy to read.

Chapter 2 emphasizes many important laboratory skills that are essential to analytical geochemists, but too often ignored in modern chemical curricula. However, the authors seem out of touch with the real world in their rejection of single-pan digital-readout balances in favor of a two-pan balance. Usually weighing errors are minor relative to other sources of error, especially with the authors' endorsement of the relatively imprecise ($\pm 5\%$) technique of emission spectroscopy. Discussion of analytical techniques is very uneven. While the relatively new (to geochemistry) technique of inductively coupled plasma-emission spectrometry is endorsed, they downgrade the usefulness of X-ray fluorescence and electron microprobes, two instruments that have had major positive impacts on geochemistry.

Chapters 3 and 4 on classical analysis techniques are, I am sure, the "heart" of the book to the authors. They note that "classical analysis" is not the "old" approach but the "hard core" of well-tried methods of maximum accuracy. They state that when a new technique is developed and proven more accurate it is incorporated into the classical analysis scheme. I question whether the authors are open-minded in this respect. Much of the innovation in analytical chemistry is now done by geochemists. A plethora of new instruments developed over the last 10–20 years have enabled geochemistry, especially trace-element geochemistry,

to develop dramatically. Accurate and precise data now enable formulation and testing of hypotheses, something that could not be previously done.

It is interesting to have documented what can be done with limited instrumentation. However, I suspect that all geochemists are aware of instrumentation advances that can be as precise and accurate and more rapid than wet chemical techniques. What geochemists need to know is what analytical approach is best for a specific element or sample, or problem? Indeed their own lab may not have the appropriate equipment, but increasingly it is possible to visit other facilities to learn about and utilize new equipment.

Chapter 6 is a pot-pourri that left me bewildered by its diverse and unrelated topics. Chapter 7 addresses the important issue of geochemical standards, an important topic when studying natural rocks and minerals.

In summary, there is a wealth of practical analytical chemistry information in this book. We are indebted to the authors for passing on their lessons learned from experience. All of this expertise is needed whether one does a gravimetric analysis or uses the latest in new instrumentation. However, this book is not a well-rounded summary of the state of the art in Geochemical Analysis.

Frederick A. Frey, *Massachusetts Institute of Technology*

Vapor-Liquid Equilibrium Data Bibliography. Supplement IV. Edited by Ivan Wichterle, Jan Linek, and Eduard Hála (Institute of Chemical Process Fundamentals, Czechoslovak Academy of Science). Elsevier Science Publishers: Amsterdam and New York, 1985. vii + 274 pp. \$92.50. ISBN 0-444-42518-7.

This supplemental volume is an uncritical compilation of the literature in which liquid-vapor equilibrium data were reported for the period January 1982 through December 1984. It includes binary and higher order systems of both organic and inorganic substances. Entries are arranged according to the Hill system used in the Chemical Abstracts Formula Index. Following the names and formulae of the constituents are numbers, in order of publication, corresponding to the 780 bibliographical entries at the end of the text. These are arranged alphabetically and are in the standard format found in the chemical literature.

This compilation will undoubtedly be useful to chemists and chemical engineers involved in the design and operation of separation and distillation equipment and will find use in other disciplines concerned with fluid phase equilibria such as experimental and theoretical geochemistry. However, I believe that the references could have been made more complete. While the compact version is acceptable for journals concerned with saving space, in a reference work whose sole purpose is to provide a list of articles to be investigated by the reader I believe that the full reference, including the title (translated into English if in another lan-

*Unsigned book reviews are by the Book Review Editor.

guage), should be added. Also, the language that the citation was published in has been omitted. Some references are in journals that small libraries may not carry. By giving more information on the contents of the paper, for instance, over what pressure-temperature-composition range liquid-vapor equilibrium was measured, and by including a complete reference, the reader would be able to assess if it is worth requesting the paper through interlibrary loan.

Donald L. Hall, *Virginia Polytechnic Institute*

Enamines: Synthesis, Structure, and Reactions. Edited by A. Gilbert Cook (Valparaiso University). Marcel Dekker: New York. 1988. vii + 717 pp. \$149.75. ISBN 0-8247-7764-6.

This book, an update on the 1st edition published in 1968, serves as a comprehensive secondary source for those needing information on the chemistry of enamines. In nine chapters with a total of about 2500 references, essentially all important aspects of enamine chemistry are covered. Although not explicitly stated by the editor, it appears that citations run through 1986 (at least in some chapters). The book contains relatively few typographical errors. In several chapters structures were clearly not computer generated but are nevertheless satisfactory.

Chapter one covers the structure and physical and spectral properties of enamines. It is written in a manner that makes it accessible even to those not well versed in physical organic terminology. Chapter two deals with the preparation of enamines. Thoroughly surveyed are not only the standard carbonyl/amine condensation processes but also a wide range of other useful and/or esoteric methodologies. Chapter three is a short, detailed look into the process of enamine hydrolysis. Chapters four and seven cover electrophilic substitutions and additions and cycloaddition reactions of enamines, respectively. Treatment extends from classic reactions to the use of organometallic electrophiles and intramolecular 6 + 2 cycloadditions. Metalloenamines are not covered. Chapter 5 deals with the oxidation and reduction of enamines. Chapter 6 covers the important area of iminium ions, accessible from electrophilic reactions of enamines and by other means. Unfortunately, the discussion is limited to "simple" iminium salts and no data or references concerning such species as acyl iminium ions are given. The point is made, however, that such entities are beyond the scope of the review. Chapter eight deals with heterocyclic enamines. Interestingly, of the 440 citations associated with this section of the book, only 18 are more recent than 1980; it thus provides a rather historical perspective on this area of enamine chemistry. Chapter nine is on the use of enamines in natural product synthesis and contains only 1 page of text. The remainder of the chapter diagrammatically presents portions of synthetic procedures in which enamines play an important role, either as intermediates or final products. The reaction diagrams are clear and easy to follow. Enamides and vinylogous amides are heavily but not exclusively covered.

To serve the book's apparent purpose of presenting a wealth of information in a relatively small space, the authors are frequently very succinct in their commentary on certain subjects. This is acceptable in a work which amounts to a doorway to a vast amount of primary literature.

Enamines in their broadest context can be quite useful in organic synthesis and this book serves as a good introduction to and review of all aspects of their chemistry. However, considering the amount of data available in this work, I found the index a bit light. It is certainly worth having in a chemistry library.

Michael Harmata, *University of Missouri—Columbia*

Deterministic Chaos. By Heinz Georg Schuster (Institut für Theoretische Physik und Sternwarte der Universität, Kiel). VCH Publishers: New York. 1988. xxiii + 270 pp. \$59.95. ISBN 0-89573-611-X.

This book presents the concept of deterministic chaos in a manner that will seem well-rounded to the connoisseur of the stochastic aspects of physical phenomena and is also accessible to those who spend most of their chemical lives along the straight and narrow of "well-behaved" physical phenomena. The introduction focuses on the history of the concept of chaos, providing a good general summary of the issues that underly the term, but without defining it. The definition is left to the first chapter. The first chapter is the first of six on deterministic chaos in dissipative systems. This chapter contains numerous examples of deterministic chaos, which represent the range of physical and chemical systems that are capable of showing such behavior. The "definition" is then an operational one. The examples are used to characterize the essentials of deterministic chaos. This first chapter includes as examples Rayleigh-Bénard convection and the Belusov-Zhabotinski reaction. This chapter concludes with a discussion of measures that can be used to determine the existence of and the character of the chaos. The first chapter and the introduction make an excellent summary of deterministic chaos for the nonspecialist.

In Chapters 2 through 6, a detailed discussion is undertaken that

explores the possible processes that can lead to deterministic chaos. This mathematically detailed section uses a set of idealized, but mathematically tractable, systems to show how chaos can be constructed. The concepts dealt with include Liapunov exponents, Feigenbaum numbers, deterministic diffusion, quadratic maps, period doubling, noise, fractals, power spectrums, intermittency, renormalization, strange attractors, Kolomogorov entropy, quasiperiodicity, turbulence, and mode locking. Each chapter ends with a section on physical systems which lend evidence for the existence of the behaviors seen in the mathematically simple systems.

Chapters 7 and 8 deal with conservative systems. In Chapter 7 the ergodic hypothesis and the classical mechanics of Hamiltonian systems is studied and relationships are drawn with chaotic systems. Chapter 8 deals with the question of the existence of quantum chaos.

Although this book is not for everyone, it should be taken notice of by those who delve into the unusual and esoteric. As the author clearly states, and as I agree, the majority of everyday situations that are naturally occurring are dominated by the complexity of apparently disordered phenomena that are governed by apparently simple processes.

Michael D. Hatlee, *University of Missouri—Kansas City*,
and Brian Cliff College

Advances in Polymer Science. Volume 79. Biopolymers/Non-Exclusion HPLC. By J. D. Andrade et al. Springer-Verlag: New York. 1986. 232 pp. \$82.00. ISBN 0-387-16422-7.

The subject of polymer characterization continues to be an important one at both the academic and industrial levels. This book, mainly written by scientists from Eastern Block countries, attempts to summarize current progress in this area. Over the whole, it succeeds in its goal; however, as the fields are moving rapidly, there is some out-of-dateness in the book. The most important chapter would appear to be that by Andrade and Hlady dealing with protein adsorption: a tutorial. While parts of this chapter have appeared elsewhere, nevertheless, the chapter outlines an excellent summary of the current basis of protein adsorption at interfaces. The other chapter of general interest is the final one by Glockner dealing with polymer characterization by using HPLC methods other than size exclusion. This is an excellent summary of the status of this important field. Particularly noteworthy is the author's own work dealing with polymer characterization. The area of protein chromatography is also covered, but only to a limited extent. The other chapters deal with a variety of focused subjects that represent the general interest of the authors but unfortunately do not provide a coherence to the text as a whole. Overall, the book generally provides useful information for those interested in polymer characterization. However, the price is rather steep for a reader who may typically be interested in only one chapter. Nevertheless, the book should appear in scientific libraries.

B. L. Karger, *Northeastern University*

Organic Solid State Chemistry. Volume 32. Edited by G. S. Desiraju (University of Hyderabad). Elsevier Science Publishers: Amsterdam and New York. 1987. xx + 550 pp. \$175.50. ISBN 0-444-42844-5.

This volume is a collection of 14 chapters individually written by experts of their subdisciplines, thus giving the feeling of a volume of an "Advances in..." series with the usual advantages and drawbacks of such an admirable enterprise. The book constitutes a valuable collection of present day understanding and knowledge of large areas of the organic solid-state science. The fields covered include such diverse areas as structural trends and energetics of molecules in the solid state, solid-state reactivity and principles of topochemistry, the role of phonons in organic solid-state reactions, phase transitions of organic solids, and various special groups of compounds, such as clathrates, phenols, diolefins, etc. A geometrical approach dominates many chapters, which is based on the knowledge of the structures in the solid state as revealed primarily by X-ray crystallography. One large area, that of conducting organics, has been deliberately omitted, as there are several recent books available on those materials.

The volume does a good job in bringing the reader up to date on what is going on in several leading laboratories in the world of organic solids and it is recommended for specialists and graduate students alike.

Miklos Kertesz, *Georgetown University*

Supramolecular Photochemistry. Edited by Vincenzo Balzani (University of Bologna and Institute FRAE-CNR). D. Reidel Publishing Company: Dordrecht and Boston. 1987. xx + 469 pp. \$99.50. ISBN 90-277-2593-4.

This 214th volume of the NATO ASI, Series C, reports the proceedings of the Advanced Research Workshop of Photoinduced Charge Separation and Energy Migration in Supramolecular Species held in April 1987 in Anacapri, Italy.

A rapidly expanding branch of photochemistry concerns the studies

of assemblies of molecular components properly combined to obtain light-induced functions. The ultimate goal of these studies is the production of photochemical molecular devices (PMDs) with vectorial control of electron or energy transport or conformational changes. The achievement of a fully operational PMD requires a considerable understanding of the structural, kinetic, and thermodynamic parameters that influence photochemical processes in "supramolecular" assemblies. These fundamental studies are the focus of this workshop report.

The initial chapter in this volume, by Balzani, Moggi, and Scandola, outlines several strategies for construction of PMDs to accomplish such diverse functions as follows: remote energy transfer, remote generation of optical signals, antenna, light up-conversion, conversion of light into chemical or electrical energy, electron collection, electron transfer, switches for electrical signals, and switches to control molecular function through changes in conformation.

The dominant theme of the other contributions is electron transfer. Lehn discusses the photophysical and photochemical aspects of the problem and Marcus presents several recent advances in the theoretical treatment. Space does not permit individual reviews of the remaining 27 chapters. These contributions, all by recognized leaders in this field, describe both theoretical and experimental advances in fundamental research designed to elucidate the relationship between structure and the physical and/or chemical processes that accompany light absorption in multifunctional assemblies.

While the diversity of the subject does not permit a neat classification of these contributions, the following topics are presented and discussed: through-bond electron transfer (3 chapters), factors affecting the efficiency of electron transfer and subsequent charge separation (5 chapters), molecular design to increase electron-transfer efficiency (4 chapters), and subjects related to photosynthesis (7 chapters including antenna effects, porphyrin-porphyrin interactions, porphyrin-quinone interactions, triplet-state quenching, and model photosynthetic systems). Six chapters are devoted to modification of more traditional aggregated systems to achieve charge transfer. These contributions include the following: semiconductor solids, "Q-state" particles in reversed micelles, Langmuir-Blodgett films, metal-loaded polymers, micelles, and semiconductor colloidal suspensions. The book concludes with summaries of two discussions of the future trends in supramolecular photochemistry.

The presentations in this volume are both timely and enlightening and should stimulate new thinking about the development of photochemical molecular devices. The chapters are well-referenced and should serve as a primary source for review of the several topics discussed. Although the price is on the high side for the general reader, this volume should be on the shelf of every serious photochemist interested in the future directions of photochemistry and photocatalysis.

Robert R. Kuntz, *University of Missouri—Columbia*

Polymer Characterization by Liquid Chromatography. By Gottfried Glockner (Technische Universität Dresden). Elsevier Science Publishers: Amsterdam and New York. 1986. xxii + 564 pp. \$109.25. ISBN 0-444-99507-2.

This text is a good, basic compilation of dated information on the use of liquid chromatography in the analysis and characterization of polymers. The volume was originally written in German and completed in 1980. This translation to English brings a wealth of information together for the benefit of the reader but presents it in a tolerably clear though sometimes stilted style. The slight difficulties presented by the periodic lapses from idiomatic English encountered in the book do not detract from the review of size-exclusion theory and practice up to 1980 contained in the volume. Simultaneously, the author spends one-third of the book detailing how all mechanisms of chromatography apply to polymer analysis and devotes over 50 pages to a careful documentation of work published before 1981 on chromatography by adsorption, precipitation, and thin-layer methods. This is a unique and very functional addition to the common emphasis on size-exclusion chromatography in polymer analysis.

However, the fact that the book is copyrighted in 1986 and being distributed in 1988 leaves a sizable and very important portion of current knowledge on the chromatography of polymers out of the book. This is the major defect of this text. It only presents material and techniques common to the literature up to 1980. The recent developments in diode array detectors, the use of broad bandwidth spectra to identify peaks, the numerous developments in theory and practice of precipitation chromatography, and many similar advances currently enjoying wide application are not mentioned in the book. In this sense, the book is dated. The availability of the German edition of this text should have made an update to the computer-controlled, multiple-data-channel, analysis approach that is common today a significant but not impossible task. Unfortunately, the translation only adds limited material on selected topics to update the German edition from 1977 to 1980. This lapse is

the reason that my personal niche for the book is as an introduction to chromatography on polymers for a graduate student who is facing polymer separations and characterization for the first time. The professional who has experience in polymer characterization by liquid chromatography will find this book a functional but dated (and in some areas already outdated) compendium of information on (1) basic chromatography on polymers or (2) old issues.

John J. Meister, *University of Detroit*

Analytical Gas Chromatography. By Walter Jennings (University of California Davis). Academic Press, Inc.: Orlando. 1987. x + 259 pp. \$39.95. ISBN 0-12-384355-3.

Was your GC originally supplied with a packed column; does it have a sensitive detector; and do you want to convert it to a capillary system to get better and faster separations? Do you desire to do the conversion at a reasonable cost? Are you contemplating the purchase of capillary columns, but are not sure of the correct column diameter for a direct injection system because you do not want to use a stream splitter? Are you using a GC with a capillary column and need recommendations in establishing the conditions for optimum performance? Are you looking for Van Deemter plots for capillary columns? Do you want help because you are getting a drifting base line, do you need suggestions on column rejuvenation, are you plagued by peak distortions, or desire quick information on the type of column and stationary phase for a particular separation? Are you looking for information on injectors? Are you seeking a book that has intensive, abbreviated, understandable treatment of GC theory with practical illustrations at an affordable price? This book offers all this and much more information. The treatment is superb and complete. The author's style of writing makes the book easy to read and interesting. Thus, if you desire a well-written, interesting treatment on the practical considerations involved in gas chromatography, emphasizing the selection, installation, evaluation, application, and basis for the use of open tubular glass capillary columns, this book should be your choice.

Peter F. Lott, *University of Missouri—Kansas City*

Laser Spectroscopy and its Applications. Optical Engineering Series. Volume 11. Edited by Leon J. Radziemski, Richard W. Solarz, and Jeffrey A. Paisner. Marcel Dekker, Inc.: New York and Basel. 1987. xviii + 685 pp. \$99.75. ISBN 0-8247-7525-2.

The intention of this text is to provide the general reader with an overview of the current field of laser spectroscopy. It is targeted for those persons who have some familiarity with the field and who are interested in a comprehensive picture of current techniques and advances. It is a very well written text with an appropriate level of equations and examples for the newcomer to the field. Many chapters could be used in advanced senior or introductory graduate level courses in Laser Spectroscopy. Even though it is a multi-author book, the material in each chapter compliments the others without any significant redundancy.

Chapter 1 (Semiclassical Principles of Atomic and Molecular Spectra by C. W. Patterson) provides the novice spectroscopist with a general overview of the theoretical principles behind atomic and molecular spectroscopy. The chapter is clearly written, highlighting the most important aspects of the semiclassical treatment of such topics as transition probabilities, atomic spectroscopy, and vibrational and rotational spectroscopy of molecules.

Chapter 2 (Lasers for Spectroscopy by J. R. Murray) summarizes the more recent advances in laser optical devices used in spectroscopy. Particular emphasis is placed on dye lasers with additional updates on new solid-state lasers. Also included are discussions of the design and use of various optical components to obtain the desired optical characteristics including pulse duration, line width, tunability, and cavity stabilization. This is not written for those experienced in the field since it often lacks the details of new advances on several fronts including ultrashort pulse generation. It is however a good overview for the novice.

Chapter 3 (Resonance Photoionization Spectroscopy by J. A. Paisner and R. W. Solarz) is written to give the reader an overview of the principles and applications of resonance photoionization spectroscopy. It begins with a theoretical treatment of the field and follows with a discussion of experimental technique. The last half of the chapter summarizes the applications of photoionization in atomic spectroscopy, molecular spectroscopy, chemical physics, chemical analysis, and isotope separation.

Chapter 4 (Applications of Laser Absorption Spectroscopy by H.-L. Chen) demonstrates to the reader the distinction between using lasers in absorption spectroscopy instead of more conventional sources. It outlines the principles of optical absorption and follows with a discussion of various linear and nonlinear laser absorption methods. It contains an excellent summary of some molecular systems studied with various laser systems.

Chapter 5 (Laser Plasmas for Chemical Analysis by D. A. Cremers and L. J. Radziemski) summarizes the recent uses of laser plasmas for chemical analysis and to review established applications. The chapter is divided into two sections, one involving the use of lasers to ablate materials which are then studied by an auxiliary method and the second in which the spark plasma is analyzed directly.

Chapter 6 (Laser-Induced Molecular Dissociation by J. L. Lyman) is on the applications of laser-induced chemical reactions of molecular species. The majority of the review of the field pertains to laser isotope separation, summarizing the large volume of work that has been done in recent years. Included is a discussion of the economic feasibility of laser isotope separation. The review is mainly a compilation of experiments done in this area and is not intended to address issues regarding scientific aspects of photochemistry.

Chapter 7 (Laser Raman Techniques by J. J. Valentini) is an excellent summary of the principles of both linear and nonlinear Raman spectroscopy. It provides the newcomer to the field with an overview of the principles behind Raman processes, as well as the advantages and disadvantages of the experimental methods described. Applications of the techniques to such areas as combustion, biology, photochemistry, surface science, remote sensing, and molecular jets are also presented.

Chapter 8 (Laser Remote Sensing Techniques by W. B. Grant) describes the use of lasers to measure properties of a medium or its constituents at some distance from the laser system. It gives an excellent summary of the state of the field including problems associated with making such measurements, progress made to date, and various techniques used in remote sensing.

Chapter 9 (Applications of Laser-Induced Fluorescence Spectroscopy by R. P. Lucht) discusses the principles of laser-induced fluorescence, instrumentation for making these measurements, and its application. Particular emphasis is placed on its application in combustion and fusion plasma diagnostics.

Geraldine L. Richmond, *University of Oregon*

Vibrational Spectra and Structure. Volume 15. Edited by James R. Durig (University of South Carolina). Elsevier Science Publishers: New York, 1986. xviii + 512 pp. \$190.25. ISBN 0-444-42722-8.

This is the most recent volume in this series on *Vibrational Spectra and Structure*. As in the previous volumes, it provides the reader with chapters that summarize recent work in various fields of current interest. It is a multiauthored book in which experts from the various fields represented have been chosen to summarize their field of expertise. Except for Chapter 7, the chapters are written primarily for persons with expertise in these various fields; this allows the authors to describe current work in depth. Chapter 1 examines the use of supersonic jet spectroscopies to study molecular dynamics. Chapter 2 is devoted to the band profile analysis of vibrational-rotational transitions of infrared and Raman spectra of liquids. The author has written Chapter 3 to acquaint the reader with the advantages and versatility of Raman spectroscopy in applications related to energy chemistry, i.e., fossil-fuels, electrochemical energy sources, solar energy, and environmental energy issues. Spectroscopic analysis of the long wavelength vibrations in layer crystals is the focus of Chapter 4. A detailed discussion is provided on theoretical analyses of the dynamics of layer crystals that have been used to translate the experimental data into information about the basic interaction forces which play a key role in their dynamics. Chapter 5 reviews the spectra and structures of hetero-metal complexes with particular attention to thiometalato complexes. In Chapter 6, the author describes how gas phase band contour simulation can be used to provide additional structural and conformational information. A number of molecules are examined. Chapter 7 is a review of Hadamard transform spectroscopy. It provides the reader with an excellent discussion of the experimental method and its advantages and limitations relative to other transform methods. Various applications are described.

Geraldine L. Richmond, *University of Oregon*

Handbook of Polycyclic Hydrocarbons. Part A: Benzenoid Hydrocarbons. By J. R. Dias (University of Missouri—Kansas City). Elsevier Science Publishers: Amsterdam and New York, 1987. xii + 388 pp. \$124.50. ISBN 0-444-42802-x.

The aim of this monograph, as stated in the introduction, is "to update the field of PAHs with a modern data reference source that brings all the known properties of these compounds together under one cover within a graph theoretical framework". A unifying theme is the author's recently developed "formula periodic table" for benzenoid polycyclic aromatic hydrocarbons. The book begins with a brief, but helpful, overview of PAH nomenclature. This is followed by chapters describing the formula periodic table, isomer enumeration, and spectroscopy. These chapters, especially the first two, would have benefited from the firm hand of an editor, both to produce a more readable text and to remove

typographical errors. Emphasis is on formal mathematical relationships, employing graph theoretical methods to discern connections among PAH structures, and one might have wished to find more concrete examples of structure-property correlations illustrating the utility of the formula periodic table in dealing with, e.g., experimental data on chemical reactivity or other nonspectroscopic properties of the PAHs.

The bulk of this work, roughly 250 pages, is devoted to data compilation on the benzenoid PAHs. Two compounds are listed on each page. For each one finds its name, structure, and when available, melting point, boiling point, π energy, HOMO energy, number of Kekule' structures, as well as, in some cases, terse notes on solubility, synthesis, spectral lines, carcinogenic activity (yes/no), uses, and literature references. Blanks are left for missing data. Regrettably, the experimental data available for all but the most common PAHs are quite sparse, and for many compounds only the number of Kekule' structures is listed. Surprisingly for a reference work, there are no indexes of formulas, names, or topics at the end of the book.

Paul G. Seybold, *Wright State University*

Analytical Chemistry. 4th Edition. By Douglas A. Skoog (Stanford University) and Donald M. West (San Jose State University). Saunders College Publishing: Philadelphia, PA, 1986. xiv + 686 pp. \$51.25. ISBN 0-03-0002954-6.

The fourth edition of this established text is still intended for a one-semester course in analytical chemistry. The authors state that this book, like its predecessors, is a shortened version of their *Fundamentals of Analytical Chemistry*. This abbreviated text is directed toward two audiences. The first is one for students in a course with career goals in medicine, biology, geology, and physical sciences other than chemistry. The second is for chemistry majors in a sophomore-level, one-semester course, where fewer laboratory experiments and a less detailed treatment of descriptive topics is desired. These chemistry majors will later enroll in a senior-level instrumental analysis course. The aims of this edition are to provide a rigorous background in chemical principles pertinent to analytical chemistry, hone students' abilities to judge and obtain accurate and precise data, and introduce students to the wide range of techniques and skills available for analyses. Lofty ideals!

The text begins as in the prior edition, but with a briefer one-chapter coverage of elementary concepts consisting of acids and bases, quantitative solution chemistry, stoichiometry, and a shortened review of equilibrium. The following chapter is on the evaluation of data to prepare the student to handle the results of his first determination. This chapter continues to be a high-light presentation.

Gravimetric methods is followed by solubility equilibria. A modest section on activity, activity coefficients, and effect of ionic strength continues to be presented well and is not given perfunctory status and representation. Titrimetric methods follows. The equivalent weight concept and normality still appear in this edition. Too many texts in general and quantitative have been deleting this; I am glad that the concept is included. It is useful and exists in the "real world". The transition from "classical" to "instrumental" methods continues to be made through potentiometry, electrogravimetry, coulometry, polarography, and amperometry. A brief new section has been added on three-electrode polarography. The authors have revised the discussion of membrane electrodes, devoting more space to solid-state and immobilized liquid membranes, but no mention of enzyme electrodes is included.

The order of presentation of optical methods is essentially unchanged from the prior edition. However, the presentation on flame spectroscopy has been revised by expanding the section dealing with atomic absorption and by adding a section on plasma sources. The authors have done a good and necessary job here.

The chapter on analytical separations follows but chromatography has been provided its own chapter with expanded coverage. The presentation is well-done and includes the various types of high-performance techniques.

The increase in number of pages devoted to spectroscopy and chromatography has been done at the expense of descriptive material dealing with gravimetric and volumetric procedures.

There have been a number of changes and welcome updates in chapters devoted to laboratory work. The section on the equal arm balance has been replaced with one on electronic balances of both classical and top-loading designs. Several experiments have been introduced; a few have been deleted. Some additions are most welcome and long overdue, especially for the type of student this text is attempting to reach. Noteworthy here are the following: determination of nickel and zinc after separation by ion-exchange, determination of alcohol content of beverages by gas chromatography, the determination of fluoride ion in water and toothpaste by specific-ion electrode, and the determination of lead in pottery glaze by atomic absorption. These last several experiments contain determinations that are rapid, capable of good precision, and

current.

This edition contains new and expanded sets of problems. They have been well thought out and are a positive addition here. Many answers are provided and the authors state that a solutions manual is available.

The authors have once again presented analytical principles in clear and concise fashion. There is much chemistry here; the treatment is fundamental and the selection of methods, both classical and instrumental, are all just right. This book is a definite for consideration for the one-semester quantitative course for the non-chemistry major and now the chemistry major. The additions and deletions have been well considered and this text, yes text, and not the all too often reference work, can serve admirably for the new as well as old audience to which this fourth edition is directed. This book is still designed for flexibility, allowing variations in order of presentation as well as the omission of portions at the discretion of the instructor.

Gerald I. Spielholz, *Lehman College,
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Advances in Photochemistry. Volume 14. Edited by D. H. Volman, G. S. Hammond, and K. Gollnick. John Wiley & Sons: New York. 1988. ix + 340 pp. \$65.00. ISBN 0-471-81524-1.

Volume 14 is a welcome addition to the continuing series of *Advances in Photochemistry*. In this age of information explosion, it is becoming increasingly difficult to cope with the swelling tide of details and complexities of scientific progress, and under such conditions, the most effective vehicle for the dissemination of scientific knowledge is coming to be the specialists' reviews such as *Advances in Photochemistry*, which have been serving the photochemists' community for the past quarter century. During this time many changes have taken place, but the high scientific standards for *Advances in Photochemistry* established right at the beginning have remained and have been carried through to Volume 14. The five articles that comprise Volume 14 are as follows: 1. Spin-Statistical Factors in Diffusion-Controlled Reactions, by Jack Salteil and Beauford W. Atwater; 2. Photochemistry and Molecular Motion in Solid Amorphous Polymers, by James Guillet; 3. Photochemistry of Simple Olefins: Chemistry of Electronic Excited States or Hot Ground States?, by Guy J. Collin; 4. The Decomposition of Alkyl Nitrites and the Reactions of Alkoxy Radicals, by Julien P. Heicklen; and 5. Photochemistry in Surfactant Solutions, by Gunther Von Bunau and Thomas Wolff.

Chapter 1 is the lucid presentation of an effort to bring together all necessary factors to create a unified theoretical treatment of diffusion-controlled bimolecular rate constants and the evaluation of experimental rate constants for a variety of different reactions, including the quenching of singlet and triplet excited states by ground state oxygen molecules, both with and without the production of $O_2(^1\Delta_g)$, radical self-termination, triplet excitation transfer, and triplet-triplet annihilation reactions. This chapter is of great value to everyone interested in the above reactions or in diffusion-controlled processes in general.

Chapter 2 deals with the theory and experimental studies of molecular motion, diffusion, permeability, solubility, internal viscosity, cage effect, etc., in polymers. The photochemistry of polymers containing ketone groups is discussed in detail, along with a number of different types of photoreactions. The application of polymers as photoresists and in this connection synchrotron-radiation studies of polymers are briefly discussed. This Chapter is easy to read and of interest to free-radical and polymer chemists and photochemists.

Chapter 3 is a brief, informative overview of the photochemical behavior of simple olefins with the central issue being the nature of the electronic states—vibrationally excited ground state, valence excited and Rydberg states—involved in the chemical processes. Both photochemists and free-radical chemists will find this review stimulating.

Chapter 4 is a major, critical review of the photodecomposition and thermal decomposition of alkyl nitrites and the reactions of their principal products, the alkoxy radicals. The latter are important intermediates in the oxidation of hydrocarbons and in air pollution, and consequently this article is of considerable relevance to atmospheric and combustion chemists. For the photolysis of alkyl nitrites a good account is given of the relevant spectroscopy, mechanism, and primary quantum yields.

Among the reactions of alkoxy radicals discussed are the combination-disproportionation processes with NO , NO_2 , O_2 , and various O_3 radicals, the addition to olefins and hydrogen abstractions from hydrocarbons, oxygen-, halogen-, and nitrogen-containing organic molecules. The decomposition and isomerization reactions are covered in detail as well. A comprehensive tabulation of all the relevant rate coefficients, along with their evaluation, is given.

This is a thorough, elegant review, and a potentially important future source reference.

Chapter 5 provides a good, well-referenced introduction to "photochemistry in surfactant solutions", a field of rapidly growing importance because of its relevance to solar energy conversion, the study

of micellar structures, and photosynthetic applications.

Lastly, a word of praise for the high quality and good readability of printing, which is a vast improvement over prior volumes. The cumulative index for Volumes 1-14, given at the end of the volume, is very useful.

Otto P. Strausz, *University of Alberta*

Aquatic Surface Chemistry: Chemical Processes at the Particle-Water Interface. Edited by Werner Stumm (Swiss Federal Institute of Technology). John Wiley & Sons: New York. 1987. xix + 520 pp. \$69.95. ISBN 0-471-82995-1.

Prof. Stumm and his co-authors have provided 18 highly authoritative, lucidly written articles on virtually all aspects of the chemical processes that take place at the interface between water and soils or other natural particulate material. The very clear introductory discussions of the various types of processes involved make this volume useful to the beginner; the specialist will appreciate the mechanistic, dynamic, mathematical treatments that are provided whenever possible, as well as the extensive bibliographies. The substantial number of unanswered significant questions that the authors raise will make the book a valuable resource to people planning research in the area.

After a brief preface stating the objectives of the book and outlining its coverage, the book is divided into three main parts. The first deals with the solid-solution interface, and includes chapters on adsorption mechanisms in aquatic surface chemistry, the electric double layer, a model for describing proton and metal ion interactions with polyelectrolytes, the surface chemistry of (hydr)oxides and oxide minerals, spectroscopic studies of molecular structure in surface complexes, and surface chemical processes in soil. The second part is concerned with the formation and dissolution of solid phases. This includes chapters on the hydrolysis of iron in synthetic, biological, and aquatic media; on the dissolution of oxides and aluminum silicates, which provide examples of surface-coordination-controlled kinetics; on the reductive dissolution of metal oxides; on Monte Carlo simulations of surface reaction rates; and on mechanisms of dissolution of silicate minerals. The third part of the book discusses the mechanisms by which the composition of natural waters are regulated. This includes a chapter on the surface chemical aspects of the distribution and fate of metals in lakes; an unusually clear and complete discussion of metal complexation by heterogeneous complexants; a section on particle-particle interactions; a discussion of the role of colloids in the partitioning of solutes in natural waters; a section on abiotic transformation of organics at the particle-water interface; a discussion of the mechanisms by which particles participate in regulating the composition of seawater; and a final chapter which deals with the effects of such geological processes as plate tectonics, vulcanism, erosion, etc.

The editor and authors have maintained high standards of science, organization, and clarity. As a result the book will be a valuable resource to a number of non-specialists who should be aware of developments in this field—soil chemists, environmental engineers, oceanographers, geologists, hydrologists, etc.

David J. Wilson, *Vanderbilt University*

Books on Applied Subjects

Laboratory Data and Patient Care. Edited by P. L. M. Kerhof and M. P. van Diejen-Visser. Plenum Press: New York and London. 1988. x + 180 pp. \$49.50. ISBN 0-306-42800-8.

This book is the proceedings of a conference held in the Netherlands in 1987. The papers include such topics as data bases, decision making, and economic use of clinical laboratories.

Polymer-Modified Textile Materials. By Jerzy Wypych. John Wiley & Sons: New York and Chichester. 1988. xiii + 317 pp. \$79.95. ISBN 0-471-83959-0.

The primary concern of this book is the manufacture of coated materials: textiles in a polymer coating. The ten chapters range from Raw Materials for Coating to Industrial Wastes. There are many figures, including graphs and electron micrographs, as well as substantial lists of references and a 3-page subject index.

Biodeterioration Research. 1. Edited by Gerlad C. Llewellyn and Charles E. O'Rear. Plenum Press: New York and London. 1987. xvii + 388 pp. \$69.50. ISBN 0-306-42764-8.

This is the proceedings of the First Pan-American Biodeterioration Society Annual Meeting, held in Washington in 1986. It consists largely of reports of original research on rotting, described by technical euphemisms. A particularly intriguing title is "Microbial Ecology of an Automotive Engine Plant". The 8-page subject index is an asset.

Flavor Encapsulation. ACS Symposium Series 370. Edited by Sara J.

Risch and Gary A. Reineccius. American Chemical Society: Washington, D.C. 1988. ix + 202 pp. \$54.95. ISBN 0-8412-1482-4.

A symposium held at the 194th meeting of the ACS, in 1987, produced the 18 typescript papers in this book. The first one is a review of the subject by R. J. Versic, who sets the stage by the statement that food "is not just a biological necessity; its consumption is a social activity, an esthetic experience, and an expression of cultural and personal experiences". Adding microcapsules to food may affect any of these features. The other papers are essentially reports of original research. Thoroughly indexed.

Characterization and Measurement of Flavor Compounds. ACS Symposium Series 289. Edited by Donald D. Bills and Cynthia J. Mussinan. American Chemical Society: Washington, D.C. 1985. viii + 183 pp. \$42.95. ISBN 0-8412-0944-8.

The eleven typescript papers in this book originated in a symposium held at the 188th ACS meeting in 1984. They are a mixture of review and reports of original research. The methods for characterizing flavors range from direct testing to automated chromatography and mass spectrometry. Thoroughly indexed.

Food Toxicology. Part A: Principles and Concepts. Part B: Contaminants and Additives (Food Science and Technology Series 26). By Jose M. Concon. Marcel Dekker, Inc.: New York and Basel. 1987. 1440 pp. \$250.00 as a set. Part A: ISBN 0-8247-7736-0. Part B: ISBN 0-8247-7737-9.

This comprehensive work in two volumes deals with endogenous toxicants, such as those in toadstools and some marine foods, carcinogenesis, mycotoxins, inorganic and organic contaminants, radionuclides, food additives, etc. There is much chemistry in it, most of it quite sound, but with occasional slips, such as the conversion of mercaptopyruvic acid to "CH₂COCOOH", and writing thiocyanate as CN₅, as though it were thiofulminate. Oxiranecarbaldehyde (glycylaldehyde) is consistently misnamed "glycylaldehyde", but the abundant structural formulas help to overcome this and other difficulties. The number of references is very large and correspondingly useful, and tables abound. The index of 21 pages further enhances the usefulness of this work, which appears to have no competitor.

Fundamentals of Chemical Technology. Edited by I. P. Mukhlyonov. MIR Publishers: Moscow (Imported Publications: Chicago). 1986. 366 pp. \$9.95. ISBN 0-8285-3222-2.

This is a revised English translation of a 1983 edition in Russian. It is apparently for use as a text book. About half of the book is on general principles of chemical engineering. The second half is devoted to the manufacturing technology of a selected group of inorganic and organic chemicals. Well indexed.

Polymer Yearbook 4. Edited by Richard A. Pethrick. Harwood Academic Publishers: London and New York. 1987. xii + 410 pp. \$120.00 (HB)/\$35.00 (PB). ISBN 3-7186-0406-X (HB); 3-7186-0408-X (PB).

This book is a mix of review articles, a survey of recent publications, a tabulation of dissertation abstracts, information on forthcoming meetings, and developments in nomenclature. Of the six reviews, five are from the USSR and one from the German Democratic Republic. They are on such subjects as vinyl chloride polymers, biodegradable polymers, synthesis by ultrasonic methods, alicyclic polyheterocycles, and prediction of physical properties.

Introduction to the Principles of Ceramic Processing. By James S. Reed (Alfred University). John Wiley & Sons: New York and Chichester. 1988. xvii + 486 pp. \$44.95. ISBN 0-471-84554-X.

This book treats the subject from the standpoint of the general principles that have been developed over the past 20 years. It is intended as a reference book as well as a text book.

Process Control. Structures and Applications. By Jens G. Balchen (Norwegian Institute of Technology) and Kenneth I. Mummé (University of Maine). Van Nostrand Reinhold Co.: New York. 1987. ix + 540 pp. \$59.95. ISBN 0-442-21155-4.

This book is intended to provide an understanding of "the relationship between unit operation processes, their dynamic characteristics, and the various strategies needed to control them". It is intended for students and engineers.

Rubber Compounding. Principles, Materials, and Techniques. By Fred W. Barlow (Rubber Consultant). Marcel Dekker, Inc.: New York and Basel. 1988. ix + 325 pp. \$99.75. ISBN 0-8247-7851-0.

This book is a comprehensive treatment of natural and synthetic rubber as generally used, compounded with each other, with reinforcers, plasticizers, processing aids, accelerators, and retarders, etc. There is a lot of practical information and there are five appendixes. The references generally number a dozen or fewer per chapter. An index of 9 pages is included.

Encyclopedia of Conditioning-Rinse Ingredients. By Anthony L. L. Hunting. Micelle Press: Cranford, New Jersey, and London. 1987. xiv + 492 pp. \$89.00. ISBN 1-870228-02-2.

In the arcane terminology of cosmetics and grooming, "rinse" refers to hair and shampooing. About 85% of this book is an alphabetically arranged list of ingredients found in "rinses", with information on names, use, physical data and specifications, and suppliers.

High-Solids Alkyd Resins. By Krister Holmberg. Marcel Dekker, Inc.: New York and Basel. 1987. vi + 240 pp. \$99.75. ISBN 0-8247-7778-6.

The expression "high solids" refers to coating preparations having a low emission of organic solvents; the subject has become important in the effort to reduce pollution of the atmosphere by paints, lacquers, and enamels. In the six chapters, the subject is reviewed with attention both to principles and specific approaches.

High-Modulus Polymers. Approaches to Design and Development. Edited by Anagnostis E. Zachariades and Robert S. Porter. Marcel Dekker, Inc.: New York and Basel. 1987. xiv + 523 pp. \$99.75. ISBN 0-8247-7799-9.

The viewpoint of the editors in selecting the 15 contributed chapters in this book is "current understanding of property enhancement through development of molecular structure". Four chapters are about liquid crystals, three are about rheology, and several are about mechanical properties and drawing of fibers and sheets.

The ICI Polyurethanes Book. By George Woods. ICI Polyurethanes: The Netherlands. John Wiley & Sons: Chichester and New York. 1987. viii + 330 pp. \$61.95. ISBN 0-471-91426-6.

This is a book written for those who want "to understand polyurethanes better without necessarily having to understand the subtleties of the chemistry and physics involved". It contains an overview, two chapters on manufacture, one on health and safety, one on testing, three on foams, and one each on injection moulding elastomers, adhesives, and "practical advice". It includes a bibliography, glossary, and index.

Detergents and Textile Washing. Principles and Practice. By Gunter Jakobi and Albrecht Lohr (Development Detergents, Dusseldorf). VCH Publishers: New York. 1987. xii + 248 pp. \$59.95. ISBN 0-89573-686-1.

This monograph "is taken from a chapter in *Ullmann's Encyclopedia of Industrial Chemistry*". It is subdivided into 13 chapters, ranging from "Theory of the Washing Process" to "Washing Machines and Wash Cycles", with chapters on detergent ingredients, household, institutional, and specialty detergents, production, analysis, testing, economic aspects, and ecology. Includes 590 references and an 8-page index.

Frontiers in Chemical Engineering. Research Needs and Opportunities. National Academy Press: Washington, D.C. 1988. ix + 219 pp. \$19.95. ISBN 0-309-03793-X (paperback); 0-309-03836-7 (hardcover).

This soft-bound volume presents the reports and recommendations of the panels of the Committee on Chemical Engineering Frontiers of the National Academy of Sciences. Included are reports on biotechnology, electronic and photonic materials, polymers and ceramics, energy and natural resources, environmental protection and waste management, computer-assisted control, and surfaces, interfaces, and microstructure. A concluding chapter presents recommendations, and an appendix gives recommendations for funding in detail.

Contributions of Chemistry to Health. Volume 1. Perspectives and Recommendations Compiled at the Fifth CHEMRAWN Conference, Heidelberg 1986. Edited by H. Machleidt, H. Meyer, and P. Tanswell. VCH Publishers: Weinheim and New York. 1988. ix + 54 pp. \$15.00. ISBN 3-527-26717-4.

This small book is largely composed of the recommendations from the daily sessions of the conference, on analytical chemistry in diagnosis and therapy, snitbacterial and antiviral chemotherapy, parasitic infections, cardiovascular diseases, metabolic disorders, neuropsychiatric disorders, and cancer.