Atomic Energy Levels [*J. Am. Chem. Soc.* **1982**, *104*, 4506]. LIBERO J. BARTOLOTTI.

Page 4506: The authors of the book should read—S. Fraga and K. M. S. Saxena (University of Alberta) and J. Karwowski.

Wavelength and Solvent Effects on Ionic Photodissociation of Charge-Transfer Complexes. The Hexamethyl(Dewar benzene) System [*J. Am. Chem. Soc.* **1981**, *103*, 4630]. GUILFORD JONES II* and WILLIAM G. BECKER.

Page 4631: Several entries in Table I reporting quantum efficiencies for photoisomerization of CT complexes of hexamethyl(Dewar benzene) are incorrect. Column four (under 436) should be 0.94 and 0.34; column five (under 405) should be 3.2 and 1.2.

Role of Solvent in the Mechanism of Amine Oxide Thermolysis Elucidated by the Temperature Dependence of a Kinetic Isotope Effect [*J. Am. Chem. Soc.* **1981**, *103*, 4650–4652]. HAROLD KWART* and MARTIN BRECHBIEL.

Page 4652: The following should be included after the last sentence in column 2.

Acknowledgment. This work was supported by the National Science Foundation under Grant CHE 7911110.

Book Reviews

Coordination Chemistry Reviews. Volume 37. June 1981. By A. B. P. Lever. Elsevier Scientific Publishing Company, Amsterdam. 1981. 339 pp. $86.15.

This volume of Coordination Chemsitry Reviews is a companion to Volume 35. The general purpose is to provide thorough coverage of the coordination chemistry of d-transition elements that appeared in the scientific literature during late 1978 and 1979. Organometallic chemistry, reaction mechanisms, and spectroscopic studies have not been included in this review as the topics are extensively reviewed elsewhere. Contained within this volume are reviews of the coordination chemistry of scandium, titanium, zirconium, hafnium, vanadium, niobium, tantalum, chromium, molybdenum, tungsten, manganese, technetium, rhenium, nickel, zinc, cadmium, and mercury. The reviews generally are arranged according to oxidation state and donor atom. The reviews generally are quite thorough, although the review article on technetium overlooked several important discoveries in Tc(V) chemistry that were published in 1979.

Harvy S. Trop, *Bell Laboratories*

Advances in Infrared and Raman Spectroscopy. Volume 8. Edited by R. J. H. Clark and R. E. Hester. Heyden & Son, Ltd., London. 1981. xv + 368. $84.00.

This volume continues the tradition of excellence that we have come to expect from this review series. It is my own favorite review series, partly because these books are so attractively printed but also because I usually find the reviews to be interesting and written at a reasonable level for someone interested, but not expert, in a particular field. I believe that the real value of review books such as represented by this series, in addition to helping "vibrational molecular spectroscopists" keep up with new developments in their field, lies in the stimulation and training they provide for graduate students. It is thus with increasing despair that I note the rapidly rising cost of books in this series, making it prohibitively expensive for students (or practicing spectroscopists, or even libraries) to continue regular purchase of all volumes. When one has to watch one's budget very carefully even to purchase the books that are essential to keep abreast of one's own specialty, purchase of review books of this type, with their usual wide range of topics, becomes an expensive luxury.

This book contains an interesting set of reviews, ranging all the way from Raman and Infrared Spectroscopic Techniques for Remote Analysis of the Atmosphere (Chapter 1, 51 pp, by H. W. Schrötter) to Antisymmetric Light Scattering and Time Reversal (Chapter 6, 18 pp, by L. D. Barron and E. Nørby Svendsen). The former surveys briefly and generally a field that has long been of considerable interest, and has been reviewed earlier in more depth in the Springer "Topics in Applied Physics"; the latter is a mathematical treatment that is extremely difficult reading for an outsider and that I found to be the only review in this volume that is obviously written for an expert in the field.

In between these extremes, we find an extremely fine review of Spectroscopic Studies of Vibrational Energy Transfer (Chapter 2, 99 pp, by R. T. Bailey and F. R. Cruickshank). This highly physical review summarizes and extends through 1979 their earlier reviews of this subject for the Chemical Society (*Mol. Spectrosc.*, **2**, 262 (1974); *Gas Kinet. Energy Transfer*, **3**, 109 (1978); as well as, *Annu. Rep. Prog. Chem. Sect. A*, **75**, 49 (1978)). It is a very good summary of this interesting and fast-developing field, with many new results, and is an excellent place for graduate students to begin learning about this subject.

The last three chapters are related to liquid crystals and optical rotation and form a sharp contrast to the more physical material in Chapter 2. The first is Vibrational Spectra of Liquid Crystals (Chapter 3, 75 pp, by Bernard J. Bulkin), introducing us to liquid crystals and organizing and summarizing results from Raman and infrared spectroscopic studies of assignments and structures of these complicated species. This chapter is a very useful introduction to the next one: A New Chiroptical Method: Infrared Rotatory Dispersion of Induced Cholestic Solutions (Chapter 4, 37 pp, by Ernst-Heiner Korte and Bernhard Schrader). This surveys results, experimental techniques, and applications of this novel technique and should be of considerable interest to workers studying optical rotation in any form. The final chapter in this sequence on Infrared Circular Dichroism Spectroscopy (Chapter 5, 39 pp, by Stephen F. Mason) is an authoritative historical review of optical rotation in general and infrared circular dichroism (down to about 2000 cm^{-1}) in particular. These three chapters form a nicely related group covering this general subject.

In summary, I find this volume to be as interesting (if wide-ranging) as usual and recommend it to those wanting an introduction to the subjects it covers.

Willis B. Person, *University of Florida*

Amino Acid Analysis. Edited by J. M. Rattenbury (Royal Hospital for Sick Children, Edinburgh). Ellis Horwood, Chichester, and John Wiley & Sons, New York. 1981. 380 pp. $89.95.

The papers presented in this book came from a June 1979 symposium entitled Amino Acid Analysis in Clinical Chemistry and Medical Research under the sponsorship of the Department of Pediatric Biochemistry, Royal Hospital for Sick Children, Edinburgh, and the Department of Child Life and Health, University of Edinburgh. The emphasis is on the amino acid analysis of physiological fluids and tissues for biomedical applications.

The book is divided into four parts: Part One—Technical Developments in Amino Acid Analysis; Part Two—Amino Acid Analysis in the Study of Physiological Processes; Part Three—Amino Acid Analysis and the Investigation of Systemic Disease; and Part Four—Amino Acid Analysis in Congenital Disorders.

Part One covers fluorimetry, gas chromatography, high-pressure liquid chromatography, and mass spectrometry analysis of amino acids and peptides. Unfortunately, several of these procedures have been in use for some years, so what is said here is not new, while other methods are developing so rapidly that the best techniques are found not in books, but in more recent journal articles. Two contributions, one by R. P. Ambler on Standards and Accuracy in Amino Acid Analysis and the other by A. P. Williams on Collaborative Trial and Amino Acid Analysis, are worthwhile reading for anyone responsible for maintaining high accuracy and precision in the data output of a modern amino acid analysis facility.

Part Two illustrates the results of amino acid analysis as applied to physiological studies in the areas of digestion, nutrition, growth, starvation, injury, and neurobiology. Part Three is concerned with chronic renal failure, acute liver failure, alcoholism, and parenteral nutrition of the newborn. Part Four surveys the use of amino acid analysis in congenital metabolic errors. These latter sections may not be of interest to most analytical chemists, yet they do provide interesting background reading.

The book contains a variety of methods for the analysis of many unusual amino acids that arise due to protein catabolism, but for those

amino acids appearing during protein synthesis as post translational modifications, a review by M. Horáková and Z. Deyl (*J. Chromatogr.* **1978**, *159*, 227) would prove more valuable. The editor is due high marks for a careful assembly job, as errors are rare, while the figures and tables are nicely set. In summary, the price is revolting, but the book is particularly recommended to the clinician involved in the analysis and identification of both common and uncommon amino acids.

Boris Weinstein, *University of Washington*

Magnetic Resonance in Colloid and Interface Science. Edited by Jacques P. Fraissard (Université Pierre et Marie Curie, Paris) and Henry A. Resing (Naval Research Laboratory, Washington). D. Reidel Publishing Co., Dordrecht, The Netherlands. 1980. xv + 716 pp. 145 dfl ($76.00 US).

This book is a published collection of invited lectures and contributed papers presented at a NATO sponsored Advanced Study Institute held at Menton, France, in mid-1979. This Institute was divided into two parts—the first part being a series of lectures that taught the general theory and basic applications of spin spectroscopy (NMR, ESR, and Mössbauer) and the second part being the Second International Symposium on Magnetic Resonance in Colloid and Interface Science. Both the lectures and the papers presented during the Symposium proper are reproduced in this publication. Except for one short contribution, the entire text is written in English.

The published lectures, each 10–20 pages in length, contain material that can be found in standard texts or various review publications such as *Advances in Magnetic Resonance*, *NMR: Basic Principles and Progress*, or *Progress in NMR Spectroscopy*. Many of these lectures include simple, yet illustrative, problem sets. The 50 Symposium papers, which span approximately 300 pages of text, discuss various specialized topics such as applications of magnetic resonance to the fields of gas–solid and liquid–solid interfaces and biological and organic surfaces. A useful Index of Subjects is included.

Although the reproduced lectures are generally clear, concise, and quite well presented, I believe that very few instructors would consider this 700 page tome to be a suitable text in either field at either the undergraduate or the graduate level. However, the researcher interested in sampling a representative collection of state-of-the-art applications of magnetic resonance in interface science will find this publication invaluable.

Larry Werbelow, *New Mexico School of Mines*

Photon, Electron, and Ion Probes of Polymer Structure and Properties. Edited by D. W. Dwight (Virginia Polytechnic Institute and State University), T. J. Fabish (Ashland Chemical Co.), and H. R. Thomas (Xerox Corp.). American Chemical Society, Washington, D.C. 1981. xi + 444 pp. $37.00.

The use of photon, electron, and ion probes for studying polymer structure and properties has gained increasing emphasis in polymer science. This 25-chapter volume gives basic work on the physics of interactions between beam and specimen, elucidates the theory of photoelectron spectroscopy, and finally concentrates on experimental results on specific polymers. Much of its content is devoted to X-ray induced photoelectron spectroscopy (XPS), also known as electron spectroscopy for chemical analysis (ESCA), which is a valuable method for studying the electronic structure of materials, particularly polymers. Since many of the important properties of a polymeric solid are dependent upon the surface structure, and since the surface can be considerably different from the bulk, the ESCA technique is likely to be of increasing importance in polymer characterization.

This book is *ACS Symp. Ser.*, **No. 162**. The contributors include many pioneers in this field; further progress along this line is expected to be prosperous.

Tong-yin Yu, *Fudan University, Shanghai*

Quimica General. By J. Castells Guardiola (Universidad de Barcelona). Editorial Alhambra, S.A. 1981. xv + 607 pp. 2690 ptas.

This text, written in Spanish, exposes first-year college students to an excellent and rigorous treatment of the theoretical concepts that are essential to a basic understanding of chemistry. The author concentrates on the study of atomic and molecular structure, thermodynamics, and kinetics as a basis for the interpretation of chemical phenomena.

After a brief five-chapter introduction to the fundamental topics that are normally covered in an introductory chemistry course, the author proceeds with a thorough and rigorous treatment of the first and second laws of thermodynamics. The author's approach to the presentation of these laws and their application to chemistry is particularly noteworthy and unique when compared to treatments offered in standard first-year college texts. The concepts of internal energy, enthalpy, and entropy are well developed, and a chemical reaction is treated as a thermodynamic system for which ΔE, ΔH, and ΔS are analyzed for the system and its thermal surroundings. The entropy of mixing for the system is also evaluated. The direction of chemical change is established by the sign of $\Delta S_{universe}$. The Gibbs free energy change, ΔG, for the system in a chemical reaction is scarcely discussed in this text, since the author demonstrates that $-\Delta G_{system} = T\Delta S_{universe}$.

Pursuant to the extensive introduction to thermodynamics, the reader is exposed to the topics that logically follow, namely, chemical equilibrium and the equilibrium constant, properties of solutions, and solubility equilibria and acid–base equilibria.

The part of the text which is dedicated to atomic and molecular structure begins with a thorough treatment of nuclear chemistry. The chapter on nuclear chemistry includes an interesting discussion that deals with the origin and evolution of the elements. In the ensuing chapters related to atomic structure, the author exposes the reader to a lucid and thorough discussion of the following: the Bohr model of the hydrogen atom, probability theory, fundamentals of quantum mechanics, including the particle in a box, and the quantum mechanical model of the hydrogen atom. The treatment of atomic structure is completed with two chapters that are devoted to electronic structure, the periodic classification of the elements, and the properties of the elements.

After the discussion of atomic structure and the periodic system, the author proceeds with the study of molecular orbital theory and chemical bonding. The treatment of molecular structure is, in general, excellent for the beginning student. However, the text does not include an exposure to crystal field theory. Bonding in the transition-metal complexes is explained by the use of molecular orbital theory.

The last part of this text has three chapters that are devoted to the study of chemical kinetics. The presentation of this subject is complete and thorough when compared to the standard general chemistry texts. The reaction order, molecularity, and mechanisms for elementary and consecutive processes are quantitatively treated. The transition-state theory for reaction rates, the Arrhenius equation, and the effects of temperature are also discussed.

In general, the text is written for advanced beginning students. The parts of this book that deal with atomic and molecular structure and chemical kinetics require a fundamental knowledge of calculus. Unlike most first-year texts, this one does not include extensive materials related to stoichiometry and quantitative relationships between substances in chemical reactions. Also absent is a discussion of the gaseous state and the gas laws. Most of the Spanish students who use this book will have most likely acquired a knowledge of the above-mentioned topics in a good high school course or a college preparatory institute.

The book does not contain an extensive number and variety of problems and questions at the end of each chapter. This is typical of a good number of European texts.

Ernest J. Baca, Jr., *Pan American University*

EXAFS Spectroscopy. Edited by B.-K. Teo and D. C. Joy (Bell Labs). Plenum Press, New York. 1981. VIII + 275 pp. $32.50.

This book is the product of a symposium on the Applications of EXAFS to Materials Science, held at the November 1979 Meeting of the Materials Research Society. After brief chapters on the historical development (E. A. Stern) and theory (P. A. Lee) of EXAFS spectroscopy, there is an extended review of the EXAFS technique and how structural information is derived (B.-K. Teo). The next chapter is a discussion of transferability problems with EXAFS amplitudes (E. A. Stern, B. Bunker, and S. M. Heald). Two chapters follow on the analysis procedures required to interpret the EXAFS of disordered systems (T. M. Hayes and J. B. Boyce; E. D. Crozier).

The middle third of this volume is a mixed bag of EXAFS applications, punctuated by an excellent discussion of fluorescence detection methods (J. B. Hastings). The particular applications discussed are superionic conductors (J. B. Boyce and T. M. Hayes), EXAFS at high pressures (R. Ingalls et al.), solution studies (D. R. Sandstrom, B. Ray Stults, and R. B. Greegor), supported catalysts (G. H. Via, J. H. Sinfelt, and F. W. Lytle), amorphous materials (S. H. Hunter), and trace impurities (M. Marcus). The next three chapters discuss the research and capabilities of the three national synchrotron radiation sources suitable for EXAFS, namely SSRL, Stanford Synchrotron Radiation Lab (A. Bienenstock), CHESS, Cornell High Energy Synchrotron Source (B. Batterman), and NSLS, National Synchrotron Light Source (J. B. Hastings).

The final five chapters deal with the EXAFS information contained in electron energy loss spectra. There are considerable experimental difficulties in recording EXAFS by this technique, but the various authors also point out certain advantages for low Z elements or position sensitive detection.

The most valuable features of this volume are the treatments of amorphous or disordered materials and the data analysis requirements

imposed by non-Gaussian pair distribution functions. This is an area where initial high expectations have been tempered by a growing awareness of potential pitfalls. Anyone interested in applying EXAFS to a materials-related problem will get a good feeling for the strengths and limitations of the technique. However, the coverage of EXAFS theory is not very deep, and one would do better to refer to the original literature. Furthermore, biological applications have been touched on only briefly. Finally, better information about the current capabilities of the national synchrotron radiation laboratories can be gained by writing each facility directly. In short, it would have been more accurate to apply the symposium title to the book as well. This volume can be recommended for materials scientists, but those who are biologically oriented or interested in the physics of EXAFS would do better with some recent review articles.

Stephen P. Cramer, *Corporate Research Labs, Exxon Research and Engineering Corp.*

Particle Size Measurement. By T. Allen (University of Bradford). Chapman and Hall Publishers, London. 1981. xxii + 678 pp. $55.00.

This book is recommended as the most thorough and up-to-date treatise on particle size analysis presently available. The author is a lecturer on powder technology and has published on a variety of sizing methods; this book has clearly benefited from both involvements. Since it was designed as a textbook for a graduate course, the contents present a progressive, detailed development, including many examples of calculations. As a result, the book will aid both the beginner and the specialist in selecting the most effective techniques and carrying out measurements. Separate chapters present the principles and math development for all standard and exploratory methods of size analysis, together with comments on a variety of commercially available equipment for measurement.

The new edition has been expanded by 50% by additions to every section, plus new chapters on on-line analysis, porosimetry, and exemplary problems. There has been a major enlargement of the chapter on basic aspects of particle size, shape, and distribution to permit easier absorption of this subject. As in the earlier edition, the sampling of powders, suspensions, and gases has been alloted space for quite detailed discussion, with indications that the neglect of these techniques in the past has led to serious errors. The complete and updated references included in each chapter are a valuable resource, as is the listing of commerical equipment and manufacturers. A variety of quite challenging problems is provided at the end of the book, but no references to these could be found in the relevant chapters.

In summary, this meaty and yet readable book is a valuable service to all who are involved or have an interest in particle size analysis.

George L. Beyer, *Eastman Kodak Co.*

Reactivity of Metal–Metal Bonds. ACS Symposium Series No. 155. Edited by Malcolm H. Chisholm (Indiana University). American Chemical Society, Washington, D.C. vii + 327 pp. 1981. $39.00.

This 15-chapter volume contains contributions by some of the leading inorganic/organometallic chemists in North America and Britain. Each chapter details briefly aspects of the work carried out by the authors and their associates into the reactivity of metal–metal bonds.

Several chapters deal with the chemistry of metal–metal multiple bonds, their formation, and reactivity. Other chapters deal with the kinetic, thermal, and photolytic reactivity of metal–metal bonds. The remaining topics covered include: metal–metal bond breaking and bond formation to yield novel new compounds, cluster formation particularly by rhodium, molybdenum, and tungsten, reactivity at metal surfaces, and reactivity of dimetallic units with organic substrates.

This book will be a useful addition to the library of all chemists interested in metal–metal bonds, both from the synthetic and reactivity points of view.

While not intended as a definitive exposition on metal–metal bond chemistry this book provides an excellent background to the chemistry covered. The many references cited then allow the reader to delve further into those aspects of the reactivity of metal–metal bonds that particularly interest him.

D. Neil Duffy, *University of Michigan*

Faraday Symposia No. 15. Chromatography, Equilibria, and Kinetics. Edited by D. A. Young. The Faraday Division, The Royal Society of Chemistry, London. 1981. 192 pp. £27.00 ($60.00 US).

This book contains the published proceedings of a symposium on chromatography, equilibria, and kinetics held at the University of Sussex on December 16th and 17th, 1980. The meeting was primarily concerned with the interface between physical chemistry and chromatography, and the book contains 13 papers as well as an Introductory Lecture and a General Discussion of the presented papers. The organizers of the symposium assembled a very impressive list of contributors, and the general high level of the papers reflects this.

The general context of the papers can be broken into three rather broad categories: 1. Physical parameter measurements, seven papers; 2. Papers dealing with the physical understanding of modern liquid chromatographic packings and separations, four papers; and 3. Exclusion techniques, two papers.

The last 32 pages of the book are devoted to transcripts of discussions of the presented papers by authors and attendees. This portion of the book is highly informative and gives more insight into the high level and excitement of the symposium. It is wished that more publishers of symposium proceedings would adopt this practice. It is also here that the only negative comment about the book occurs. While the discussion participants are always identified, the paper which they are discussing must be ascertained from the context of the comments, and there is no indication when the discussion switches to another presentation. It would perhaps have been more useful and certainly more clear if the discussion of a particular presentation had been included immediately following that paper.

While this book is not broadly useful to all practicing chromatographers, it would be highly useful to anyone making measurements of physical parameters by chromatographic techniques and to those of us interested in the physical basis of chromatographic separations. Within this context it is recommended.

John G. Dorsey, *University of Florida*

Monographs in Modern Chemistry. Volume 12. Solid State Reactions. Second Edition. By Hermann Schmalzried (Universität Hannover). Verlag Chemie, Weinheim. 1981. x + 254 pp. $61.30.

This concise monograph is an updated revision of the 1974 edition. While the second edition is only slightly longer than the first, many of the chapters have been rewritten to improve clarity and relevance and new sections have been added. The book is extremely well-written and provides a thorough introduction to quantitative aspects of the chemistry and physics of reactions in the solid state. All concepts are defined clearly and are often illustrated by diagrams as well as carefully selected examples. General and specific references at the end of each chapter greatly enhance the utility of the book—it should be valuable as a personal reference copy or as a reference text for a course in solid-state reactions.

The text opens with a short treatment of the basic principles of the solid state including bonding, classification of reactions, and crystal defects. Next follows a detailed treatment of the thermodynamics of point defects and chemical diffusion in solids. The remainder of the material centers on a quantitative discussion of reactions in ionic crystals, metals, and solid–gas and solid–liquid reactions. The last chapter contains a detailed discussion of several exemplary reactions in the context of concepts developed earlier. These include: (a) microstructure formation in ferrites, (b) reactions in solid-state galvanic cells, (c) photographic applications, (d) reduction of wüstite and magnetite, and (e) degradation of ceramic oxides.

The major shortcoming of this volume is that it avoids the complementary treatment of solid-state reactions from a structural and/or crystallographic point of view. Thus, for a specific example, the formation of single crystals of spinels AB_2O_4 from single crystal–single crystal reactions of AO and B_2O_3 is discussed rather briefly. The concept of topotaxy, and how it often can be used to demonstrate coherency of the oxygen arrangement and packing between each constituent oxide and the spinel product, is not presented. Such relationships have been the basis for important practical experiments on the syntheses of single crystals and have provided a rationale for mechanistic experiments leading to straightforward syntheses of scientifically and technologically important materials. Both these areas have received considerable attention in the scientific and patent literature in the last decade. Further, some mention of the mechanistic information available from electron microscope and time-resolved X-ray diffraction studies would have been helpful. Finally, a discussion of the possible relevance of the theories presented in the text to studies of reactions in *molecular* solids would have broadened the work considerably.

The above paragraph is not intended as a severe criticism of the monograph but rather as a means for placing the work in the broadest possible context of the solid-state-reaction area. The author's purpose is not to give a complete survey of the field but to provide "a quantitiative understanding of solid state reactions rather than describing many experimental facts which cannot be quantitatively explained." With regard to the topics covered, the text is an excellent reference work on the thermodynamics and kinetics of solid-state reactions in nonmolecular solids and is highly recommended.

Bruce M. Foxman, *Brandeis University*