voking an electron transfer quenching mechanism, therefore, requires that the rate of recombination (k_b) greatly exceed that of forward electron transfer. It is noteworthy that in the two analogous studies with ZnHb/Fe^{III}-b_5[7] and $\alpha_2^{Fe^{III}}\beta_2^{Zn^{II}}$-Hb,[6] in which electron transfer products have been detected, the low yields of formation of Fe^{II} are consistent with $k_b > 10k_f$.

Our results suggest that electron transfer within a protein–protein complex can be quite efficient, even over a large distance (18-Å center–center, 8-Å edge–edge). And they underscore the value of *energy* transfer as a tool for testing protein–protein structural models.

Acknowledgment. This work was supported by National Institutes of Health Grants HL-21451 (G.L.M.) and GM-28834 (A.G.M.) and by National Science Foundation Grant CHE82-18502 (H.B.G.). J.R.W. and D.G.N. acknowledge graduate fellowships from the Sun Co.

Registry No. Cytochrome b_5, 9035-39-6.

Additions and Corrections

The Relaxational Behavior of Self-Associated 6-Methylpurine [*J. Am. Chem. Soc.* **1984**, *106*, 2239]. HEINZ STERK* and HERMANN GRUBER

Page 2240: The formula of the AK model should read

$$a_0 = a_1 + \frac{2K(2)}{K} a_1 [e^{Ka_1} - 1]$$

Book Reviews *

Electrical Properties of Polymers. Edited by Donald A. Seanor (Xerox Corporation). Academic Press: New York. 1982. xi + 379 pp. $52.00.

This is a comprehensive work edited by a chemist who has worked for many years on this complex interdisciplinary subject. Chapter 1 is an excellent overview of electrical conduction in polymers, written by the editor. It can be easily understood by readers with diverse scientific backgrounds. It assumes no previous knowledge of the subject but goes into some depth in the topics covered. It is rich in references but is much more than a simple listing of the literature, since it effectively merges much past work into understandable summaries and conclusions.

Chapters 2–8 are written in the same mode as Chapter 1, although they are by different authors. These chapters are much more detailed descriptions of the topics summarized in Chapter 1, such as photoconductivity, electrets, contact electrification, thermally stimulated discharge currents, and dielectric breakdown in polymers. The chapters overlap to some extent, but the book avoids the discontinuities present in many books written by multiple authors. A more detailed description of the interaction between electrical properties and polymer molecular structure and morphology would be useful.

Overall the book is well-written and a very valuable reference source on the electrical properties of polymers.

Perry L. Grady, *North Carolina State University*

Building Scientific Apparatus: A Practical Guide to Design and Construction. By J. H. Moore, C. C. Davis, and M. A. Coplan (University of Maryland). Addison-Wesley: Reading, MA. 1982. xiii + 483 pp. $54.95.

The authors' stated intention is to provide a practical volume to serve as "an introductory text for the beginning researcher and as a shelf reference for the experienced scientist". Given the breadth of their topic, they have done an excellent job. The material is divided into six chapters of varying length with greatest coverage given to optics (including charged particle optics) and electronics, each of which receives about one third of the volume's total coverage. The other third provides brief coverage of glassworking, mechanical design, and vacuum technology. The authors realize that the modern scientist's greatest need when approaching the construction of scientific apparatus will be to decide what he himself can do and what is best left to others. In the latter case, an ability to define and communicate needs is all important. Sufficient information is provided on each of the topics to permit the reader to converse intelligently without having to master excessive detail. End of chapter reference lists are provided to allow further study, as needed. It is worth noting that these lists are well catagorized and include both basic and more advanced works.

The book does have some flaws. Most importantly, a more detailed index would be expected in a book planned as a general shelf reference. Also, the listings of manufactures and suppliers given with each chapter, while not a bad idea, will date very rapidly. Particularly in a field such as electronics, a check with someone having current knowledge of suppliers is advisable. Finally, cost is likely to keep this volume from taking its place as a common reference in the libraries of many young scientists. If so, much of its great worth will be lost.

Donald Bath, *Western Illinois University*

Aggregation Processes in Solution. Edited by E. Wyn-Jones & J. Gormaly (University of Salford). Elsevier Science Publishing Company: Amsterdam and New York. 1983. x + 632 pp. $138.50.

This book is comprised of 20 chapters, each written by different authors, with an overall broad coverage of the field from a generally fundamental, physical-chemical point of view. Topics include micellar solutions, liquid crystals, bilayer membranes, colloidal properties of drugs, aggregation of dyes and of polymers, drug/protein binding, and even ferrofluids. A number of experimental techniques are also covered in separate chapters, including ultrasonic absorption, ultrasonic relaxation spectrometry, and stopped-flow measurements. The authors are from all over the world, mostly from England, many from Europe, with Americans in the minority.

The chapters generally stand alone as reviews of recent developments in the theoretical and physical chemistry of the systems discussed; all are appropriately subsumed under the general topic of aggregation in solution. As the editors point out, these areas traditionally have been pursued in isolation, and it is the express intention of this volume to bring such work and workers together. There are a number of common threads which run through several chapters each, such that the book may well succeed in its purpose. All chapters are authoritatively written, with generally good coverage of the literature, usually with emphasis on the

*Unsigned book reviews are by the Book Review Editor.

authors' own works.

The book is thus a valuable resource for those who are entering the field as well as for those more experienced who wish to learn of developments in ancillary areas. The typography is virtually free of errors. A weakness is the index which, although accurate, is thin and thus of little utility. There should have been a table of contents at the beginning of each chapter, as well as running page headings, so that the reader who is rapidly scanning can easily find his place. The sytematic numbering of sections and figures is to be applauded.

This book can be highly recommended for neophytes as well as experts interested in aggregation phenomena in (primarily aqueous) solutions.

Robert M. Fitch, *S. C. Johnson & Son, Inc.*

The Jahn–Teller Effect and Vibronic Interactions in Modern Chemistry. By I. R. Bersuker (Moldavian Academy of Sciences). Plenum Publishers: New York. 1984. iv + 139 pp. $ 45.00.

This is a monograph on the Jahn–Teller effect and, more generally, on nonadiabatic phenomena in spectroscopy, stereochemistry, solids, and chemical reactions. It reflects the rather personal outlook of its author, which is perhaps not yet so well-known in the West as in the U.S.S.R. The book begins with condensed but very readable chapters covering molecular stability and adiabatic potentials. There is a welcome emphasis on the dynamic Jahn–Teller effect, the pseudo-Jahn–Teller effect, and the multimode problem. A chapter follows on effects of vibronic interactions on energy levels and wave functions. The next chapter is on applications to spectroscopy. This includes sections on ESR and Mössbauer spectra as well as vibronic IR and Raman spectra and electronic transitions between different terms. The latter half of the book is rather more provocative than what has come before. There is a chapter on stereochemistry rules, cooperative vibronic effects in crystals, structural phase transitions, vibronic crystal chemistry, and plasticity and deformation isomerism. The flavor of this half of the book is conveyed in the chapter heading, which states "The origin of molecular and crystal atomic structures, including structural phase transitions, is determined mainly by vibronic interaction effects". The final chapter is on activation in chemical reactions and catalysis. It includes an interesting section on the connection of energy maxima in reaction coordinates to vibronic interactions and a section on orbital symmetry rules, followed by one on vibronic activation in elementary acts of chemical reactions and catalysis. Not all readers will be swayed by the author's belief in "vibronic structure as a basis for a new approach to the problem of chemical transformations". After all, it is a truism that chemical systems consist mainly of nuclei, electrons (and their spins), and their mutual interactions. Nonetheless, this is a very useful and readable book. It appears to cover contributions mainly through 1980.

Michael E. Kellman, *Northeastern University*

The Jahn–Teller Effect: A Bibliographic Review. By I. B. Bersuker (Moldavian Academy of Sciences). Plenum Publishers: New York. 1984. ix + 589 pp. $45.00.

This comprehensive bibliographic review is systematically divided into many short sections, with a short expository preface to each, followed by the bibliographic entries, arranged chronologically. The major subject headings are general theory of vibronic interactions; electronic and vibrational spectroscopy; magnetic resonance and magnetic, electric, and impurity thermodynamic properties; cooperative Jahn–Teller effect, structural phase transitions, ferroelectricity, and crystal chemistry; and vibronic effects in chemical reactivity. There are useful author, subject, formula, and substance indices. This is a useful compilation which would be even more so if it did not end, apparently, at 1979.

Michael E. Kellman, *Northeastern University*

Annual Review of Physical Chemistry. Volume 34. 1983. Edited by B. S. Rabinovitch, J. M. Schurr, and H. L. Strauss. Annual Reviews, Inc.: Palo Alto, CA. xvi + 669 pp. $28 (USA); $31 (elsewhere).

The 1983 edition of this review series contains articles on the spectroscopy of H_2CO and H_2CS, photochemistry of H_2CO, calculation of vibration–rotation levels of molecules with a large-amplitude vibration, pseudorotation, application of lasers to microelectronics, chemical lasers, nonequilibrium molecular dynamics calculations on nonlinear flow, dynamics of electronically excited states, neutron scattering from ionic solutions, gas-phase acid–base chemistry, order–disorder transitions in chemisorbed layers, high-resolution vibration–rotation spectroscopy, pulsed-nozzle Fourier-transform microwave spectroscopy of van der Waals molecules, excited states of DNA and RNA bases, theory of rubber elasticity, magnetic-field effects on solid-state reaction yields, parametric sensitivities in chemical kinetics, nonhomogeneous kinetics (kinetics of single-phase or microheterogeneous systems where at least one reactant is nonrandomly distributed, e.g., radiolysis systems, burning fuel sprays), diffusion-controlled reactions, supercooled water, and density functional theory.

The high quality, authoritativeness, and timeliness of previous volumes in the series is maintained. An index of authors of papers referred to (which was present in previous volumes) is absent.

In addition to the reviews, there is a reminiscence by Hirschfelder on his early scientific work. Hirschfelder comments that "instead of using their own judgment and experience, theorists in the new generation code their giant computing machines with a jumble of physically meaningless input...we leave the thinking to the computer and do not put enough stress on the physical significance". Parr in his article on density functional theory of electronic structure indicates that future developments of this theory may provide greater "perspicuity...economy of description...simplicity of interpretation...and closeness to the ideas of structural chemistry" than given by current electronic-structure calculations.

Ira N. Levine, *Brooklyn College*

Cyclophanes. Volumes I and II. Edited by Philip M. Keehn (Brandeis University) and Stuart M. Rosenfeld (Smith College). Academic Press: New York. 1983. Volume I: xxx + 357 pp. $65.00. Volume II: xxx + pp 359–725. $60.00.

These volumes represent Volume 45 of "Organic Chemistry. A Series of Monographs", under the general editorship of Harry H. Wasserman. Their aim is to provide a comprehensive survey of the field of cyclophane chemistry since the much earlier volume in this series, "Bridged Aromatic Compounds", by B. H. Smith (1964). The literature coverage is generally through 1981, but there are citations into 1983. The selection of topics is excellent and there is much of interest here even for those for whom cyclophane chemistry may not be an area of primary research activity.

The combined volumes consist of 12 chapters by 17 contributors from 6 countries. The chapter titles define well the diverse and fascinating chemistry which has been characteristic of this field for the past quarter of a century: Cyclophanes. A Personal Account (by D. J. Cram); The Conceptual Chemistry of Cyclophanes (J. F. Liebman); Crystal Structure of Cyclophanes (P. M. Keehn); Nuclear Magnetic Resonance Properties and Conformational Behavior of Cyclophanes (R. H. Mitchell); [*n*]-Cyclophanes (S. M. Rosenfeld and K. A. Choe). Volume II: Synthesis and Properties of Heterophanes (W. W. Paudler and M. D. Bezoari); Condensed Benzenoid Cyclophanes (J. A. Reiss); Nonbenzenoid Cyclophanes (S. Ito, Y. Fujise, and Y. Fukazawa); Multibridged Cyclophanes (H. Hopf); Multilayered Cyclophanes (S. Misumi); Cyclophanes in Host–Guest Chemistry (K. Odashima and K. Koga); and Cyclophanes as Synthetic Analogs of Enzymes and Receptors (I. Sutherland).

Collectively the chapters present a lucid and comprehensive summary of what has been accomplished as well as pointing the way for further work in this still evolving field of chemistry.

Daniel T. Longone, *The University of Michigan*

The Chemistry of Peroxides. By Saul Patai (The Hebrew University, Jerusalem). John Wiley & Sons: New York. 1983. xiv + 1006 pp. $240.00.

This is a volume in the series "The Chemistry of Functional Groups". It includes 24 chapters on a variety of topics having to do with the structures and reactions of compounds containing the O–O bond. Unquestionably, this book will be of great use to persons in the field. It should be noted that Swern's review of organic peroxides is now 14 years old. Since this series of volumes is probably automatically obtained by all major libraries, it should be widely available; the price virtually prohibits individual purchases.

The authors and area covered by the individual chapters provide an indication of the breadth of this volume and the enormous variety of topics reviewed. The list of chapter numbers, authors, and subjects covered is as follows: (1) D. Cremer covers electronic structure in a lengthy chapter with 320 references. (2) O. Exner reviews conformation and stereochemistry in a short chapter. (3) A. C. Baldwin covers thermochemistry and updates the group additivity terms for compounds and radicals containing oxygen and the peroxide bond. (4) H. Schwarz and H.-M. Schiebel cover mass spectrometry. Reports dealing with systematic investigations rather than simple analytical work are stressed. (5) W. H. Richardson covers acidity and complex formation. (6) R. A. Sheldon reviews the synthesis and reactions of hydroperoxides and dialkyl peroxides. This chapter, just 40 pages long, may be too short. (7) A. A. Frimer reviews singlet oxygen. (8) J. A. Howard covers mechanisms of the decomposition of peroxides in solution. This chapter, just 24 pages long, is useful as a supplement to the earlier, much longer reviews of this topic by this author and by K. U. Ingold. (9) R. V. Hoffman reviews sulfur- and phosphorus-containing peroxides.

(10) G. Bouillon et al. review the chemistry of diacyl peroxides, peroxycarboxylic acids, and peroxycarboxylates (carboxy esters). (11) I. Saito and S. S. Nittala review endoperoxides, both natural and synthetic,

in a chapter 57 pages in length with 213 references that does a very adequate job on all compounds of this type except the prostaglandins. (12) J. Z. Gougoutas discusses some structural problems, particularly in cyclic compounds. (13) R. Ceresa reviews polymeric peroxides in an extremely brief chapter. (14) A. A. Frimer covers the superoxide radical ion. (15) H. Mimoun reviews transition-metal peroxides in a brief chapter. (16) B. Plesnicar reviews organic polyoxides and in Chapter 17 reviews polar mechanisms for the decomposition of peroxides. (18) S. Oae and K. Fujimori review prepartion of isotopically labeled peroxides. (19) K. Keinan and H. T. Varkony discuss the ozonation of single bonds. Unfortunately this chapter was written before the appearance of recent work in which hydrotrioxides were positively identified as the products of the reaction of ozone at C–H bonds. (20) L. Batt and M. T. H. Liu cover gas-phase pyrolysis. (21) Y. Ogata, K. Tomizawa, and K. Furuta cover photochemistry and radiation chemistry in a 63-page chapter with 210 references. (22) M. Lazar covers solid-state reactions. (23) P. B. Brindley covers organometallic peroxides. (24) W. Adam covers peroxides containing four-membered rings in a 91-page chapter with 257 references.

William A. Pryor, *Louisiana State University*

Trends in Analytical Chemistry, Reference Edition. Volume 2. 1983. Edited by P. T. Shepherd. (Elsevier Publications (Cambridge)). Elsevier Science Publishers B.V.: The Netherlands. 1984. 298 pp. US $92.25/Dfl. 240.00.

Fresh insights and new approaches are vital elements for nurturing or enhancing one's problem-solving powers. That is why analytical chemists and other problem-solving specialists may well be rewarded by taking time to peruse this collection of articles reprinted from the 12 regular issues in 1983 of "Trends in Analytical Chemistry". This compendium efficiently provides concise reviews and digests of new developments and ideas in analytical sciences. Although lacking considerably in detail, all of the articles are quite adequate to alert interested readers to the possibilities as to whether or not they might profitably explore the subject matter more fully, the better to apply it to their particular problem-solving needs.

Volume 2 of this series features articles on sampling, sample preparation, and separations based on electrophoresis. Also included are timely articles that focus on analytical aspects of biotechnology, computer applications, statistical methods, spectroscopy, chromatography, and other analytical techniques.

Alfred A. Schilt, *Northern Illinois University*

Physical Methods in Heterocyclic Chemistry. Edited by R. R. Gupta. John Wiley and Sons: New York. 1984. xi + 682 pp. $150.00.

This is a volume in the General Heterocyclic Chemistry Series under the overall editorship of E. C. Taylor and A. Weissberger. It consists of nine contributed chapters, four of which are on spectroscopy: infared, NMR, ultraviolet photoelectron, and Raman. Conventional UV–vis spectroscopy is thus omitted, perhaps because it has been reviewed elsewhere (although the most recent review, by C. N. R. Rao, is 9 years old). The chapter on NMR omits both ^{1}H and ^{13}C NMR, but it is strong on ^{14}N and ^{15}N.

The other chapters are devoted to X-ray diffraction, diamagnetism, dipole moments, electrochemical behavior, and circular dichroism. Each begins with some information on theory and experimental method, but the amount varies widely, from but 1 page on infared to 27 pages on NMR. In the latter case, much of the treatment is so elementary as to be superfluous, and some parts deal with techniques of instrumentation, such as probe construction, that are not especially related to heterocyclic chemistry and seem out of place.

The principal part of each chapter is a discussion, in some cases critical, in others, not, of the results of the method as applied to heterocycles, accompanied in some instances by extensive tables of data, but in others by none at all. Similarly, applications are a major part of some chapters, but they are lacking in others. The result is an unevenness of greater amplitude than is usual in edited works. The information presented in this volume is authoritative and potentially quite useful, but the gaps and areas of underemphasis are likely to cause disappointments, according to the nature of one's interests.

Structure and Bonding. Volume 52. Edited by C. K. Jorgensen (Université Geneve), D. Reinen (Universität Marburg), and R. J. P. Williams (Oxford University). Springer-Verlag: Berlin. 1982. 202 pp. $48.00.

This lastest volume in a continuing series is subtitled "Structures versus Special Properties" and contains four contributed reviews and an author index to all previous volumes. Actually, only first authors are indexed; succeeding authors and titles are listed but not indexed.

The first contribution by R. G. Woolley, Natural Optical Activity and the Molecular Hypothesis (32 pages, 70 references), is a theoretical treatment reflecting the author's own work in quantum field theory over the last decade. No experimental results are cited, but the last section compares and criticizes the theoretical work of others. Theoreticians and those experimentalists well versed in quantum mechanics and electrodynamics will find this account of a complex phenomenon readable. All chemists should read the introduction; it is a brief, literate review of some of the basic (and often forgotten) philosophical underpinnings of chemistry.

The second chapter is by L. Banci, A. Bencini, C. Benelli, D. Gatteschi, and C. Zanchini, Spectral-Structural Correlations of High-Spin Cobalt(II) Complexes (42 pages, 227 references). The authors characterize their contribution as "...a comprehensive review of the ligand field interpretation of ... high spin cobalt(II) complexes, as well as of the most common spectral and magnetic techniques". Numerous energy level diagrams and sample spectra, as well as two dense tables of experimental values, illustrate results from optical spectroscopy, magnetic susceptibility, EPR, ^{1}H NMR (briefly), and MCD. Four-, five-, six-, and higher-coordinate complexes are described, and a useful glossary of ligand abbreviations is included.

The third contribution, Relationships Between Structure and Low-Dimensional Magnetism in Fluorides is by A. Tressaud and J. -M. Dance (52 pages, 274 references). Section 1 outlines theoretical magnetic models and calculational approaches and also describes the dimensionality of magnetic interactions. Section 2 reviews briefly some experimental techniques of magnetic measurement, including susceptibility, neutron diffraction, Mössbauer, NMR, and EPR. The final section describes experimental results for specific fluoride salts and general structure types. Numerous structural drawings (none of them stereographic) are correlated with extensive tables and plots and with the relevant Heisenberg and Ising models. The discussion concludes with a small correlation table showing the various 1-D and 2-D magnetic models, their interaction types (ferro- or antiferromagnetic) and selected examples. The authors might have provided an exhaustive correlation table here, but this has been left as an exercise for the reader.

The last chapter, Structure and Bonding in Organic Derivatives of Antimony (V) by V. K. Jain, R. Bohra, and R. C. Mehrotra (41 pages, 407 references) reviews the literature between 1970 and mid-1981. The compounds are arranged by ligand type, and the discussion simply catalogs structural, synthetic, and general physicochemical results. Some experimental measurements are cited in the text, but few are arranged in tables. No attempt has been made to generalize or systematize the field.

Steven F. Watkins, *Louisiana State University*

Biochemical Research Techniques; A practical introduction. Edited by John M. Wrigglesworth (Chelsea College, University of London, UK). John Wiley & Sons Publishers: New York. 1983. viii + 239 pp. $41.95.

This book addresses a large cross section of research investigators in the field of biomedical sciences. The book consists of seven chapters. The first four chapters deal with the physical techniques viz. Absorbance Spectroscopy (P. Nicholls), Fluorescence (W. P. Williams), Spin labelling (G. Benga), and High Performance Liquid Chromatography (R. F. G. Booth and P. J. Quinn). Each chapter is well written, containing necessary theoretical and practical details as well as applications including adequate and up-to-date reference listings. Particularly the chapter on spin labeling is very impressive. It enables the reader who is unfamiliar with the technique to decide whether this technique is useful in solving a particular problem. The remaining three chapters, Electron Microscopy (J. M. Wrigglesworth), Monoclonal Antibodies (N. A. Staines), and Cell Culture (A. H. Brittles), focus mainly on experimental details followed by advantages and disadvantages of these techniques. The chapter on Electron Microscopy begins with a brief introduction of theory and instrumentation followed by specimen preparation methods. This chapter is written in an unusually simple style; it is easy to understand for both beginners and senior researches. At the end of the last two chapters, a glossary of terms is useful for any investigator who is not familiar with monoclonal antibodies and cell culture techniques.

Generally, both the beginners and the senior research scientists in the field of biomedical sciences should find this book valuable.

Kan Agarwal, *The University of Chicago*