

can be used on all Macintosh computers and is extremely straightforward and uncomplicated to use. It allows easy editing of an expression in a similar manner as MacWrite. Prescience Corporation informs you that the use of Expressionist with Microsoft 4.0 can present a problem in terms of Microsoft 4.0 corrupting picture information when you paste a picture in. This results in Expressionist not recognizing the picture and it "chokes". Prescience Corporation has determined that the fault lies in a bug in Microsoft 4.0 and suggests several options to work around this problem.

It will be a useful addition to a laboratory that requires complex equations with unorthodox symbols in reports and communications. Prior to this program (and others), typesetting of these equations has been difficult and tedious, but now it has been reduced to a simple and straightforward task. It adds a professional touch to reports and will be particularly useful for publications submitted to journals that require the manuscript to be camera-ready. Numerous journals and book companies now require camera-ready manuscripts in order to improve the speed of publication and reduce cost. A professionally produced complex equation appears so much better than the hand-drawn equations one finds frequently in the literature.

Joseph Sneddon, *University of Lowell*

CLR ANOVA. Clear Lake Research: 5616 Morningside, No. 127, Houston, TX 77005. List Price Unknown.

CLR ANOVA is an analysis of a variance package written for the Macintosh which can compute up to 10 factors with 5 between and 5 within subject variables with equal or unequal sample sizes. After computing the anova, the program can compute marginal means, pairwise

comparisons, simple effects, and specific contrasts. Furthermore, interactions can be plotted graphically. The graph can then be pasted into a file which can be accessed by MacPaint, Superpaint, or MacDraw or sent directly to the printer.

CLR ANOVA does exactly what it is supposed to do. Furthermore, the package is very easy to learn and operate. One can become an expert in use and operation in under an hour, as long as one knows how to use pull down menus. Unfortunately, the data files must be constructed with the raw data only; labels and headings are not allowed. After the anova is performed, the statistical analysis does not take full advantage of the window techniques of the Macintosh in that only one analysis window can be open at a given time. This necessitates printing or saving each window, a potentially tedious operation when many variables are present. The graphs, once produced, can only be crudely modified in CLR ANOVA. A custom designed graph can be created by transferring the graph to a graphics package such as Superpaint. While none of these objections are at all serious, it seems that such a narrowly focused statistics package would perform these tasks well.

While the program has no serious problems, I question how generally useful the package is for the average chemist. This program does not perform other more common statistical tests which the program Statview does. Statview also computes anovas, but it does not allow any further analysis once the anova is computed. Essentially CLR ANOVA performs tasks that the vast majority of chemists may never need, while neglecting to perform the less sophisticated routine statistical operations needed. This reviewer would recommend a broader based statistics package such as Statview, rather than CLR ANOVA.

Robert E. Rosenberg, *Columbia University*

Book Reviews*

Advances in Polymer Science. Volume 94, New Polymer Materials. With contributions by Tohru Takekoshi (General Electric Corp.), Masahiro Irie (Kyushu University, Japan), B. Boutevin (Ecole Nationale Supérieure de Chimie, France), and Yasuhiko Tobato and Yoshito Ikada (Kyoto University, Japan). Springer-Verlag: New York and Berlin. 1990. xii + 160 pp. \$74.50. ISBN 0-387-51547-X.

This is a poorly edited and poorly typeset volume containing three good reviews and one very poor review of very different areas of polymer chemistry. The review of Polyimides by Tohru Takekoshi is a well-written presentation of the advances of the past 10 years in preparation of polyimides with better processability or applications in composites. The extensive emphasis on monomer and polymer synthesis is supported by tabulations of data and illustrative examples. The synthesis compendium is arranged by desired properties (processability, crystallinity, composite use, etc.) or by products (monomers dianhydrides, diamines, etc.). The review is current, well organized, and well referenced.

The review of Photoresponsive Polymers by Masahiro Irie is clearly written, well supported by both structural equations and data compilations, comprehensive, and moderately well buttressed by references, one-half of which come from the 1980s. The topic lends itself well to review since a discussion of the seemingly infinite ways that chromophore-containing polymers adjust to and reversibly relax from exposure to light is fascinating.

The third review on Telechelic Oligomers by Radical Reactions by B. Boutevin is the nadir of the book. The English is poor with numerous sentences that are literally indecipherable. Coupling poor English with poor typesetting makes this section of the book very hard to read. Organization is wanting, illustrative examples are missing, summations of data are few and lack breadth, and the presentation of the information is choppy with subtopics, anomalies, and details of specific materials dropped into the discussion in short sentences. Only one-third of the references are from the 1980s.

The final third of the book is taken up by Yasuhiko Tabata and Yoshito Ikada's review of Phagocytosis of Polymer Microspheres by Macrophages. How the body's immune system attacks or responds to polymers is of major importance in biomedical research and controlled drug release. The review is well written, comprehensive, detailed, and well ordered and organized. The topic of how the body attacks and degrades small spheres of step-synthesized polyesters, ethers, and saccharides is extensively discussed. Properties and structures which promote or delay such degradation are defined. The review, though good,

suffers from the authors' preference for giving references without the year of publication, a practice which illustrated the poor editing shown repeatedly in this volume.

The poor editing, the very poorly written review on telechelic oligomers, and the typographical errors make the information presented in this book suspect. Without obtaining the original references, I would be loathe to accept any data presented in this book. For that reason, I would not buy the book, would not request its purchase by local libraries, and would only obtain it on interlibrary loan to gain a general overview and update on the topics covered. I would not use the book as a sole reference on anything. The book does have one benefit that too many review compilations lack and that is an index. The index is cursory but still present.

John J. Meister, *University of Detroit*

Principles of Catalyst Development. By James T. Richardson (University of Houston). Plenum: New York and London. 1989. ix + 288 pp. \$49.50. ISBN 0-306-43162-9.

During the early part of my graduate studies about 15 years ago, I had the opportunity to attend a short course "The Uses of Heterogeneous Catalysis". This short course was, and still is, extremely popular. At the time I attended, it was taught by Joe Hightower (Rice University), Dan Luss (University of Houston), John Sinfelt (Exxon Research and Engineering), and the author of *Principles of Catalyst Development*, James Richardson. The course was designed to teach the fundamental aspects of catalysis to students who had a background in chemistry or chemical engineering but lacked formal training in catalysis. This short course truly helped me get started in research in heterogeneous catalysis.

Principles of Catalyst Development is based upon and is similar in scope to the short course. The practice of heterogeneous catalysis relies upon utilizing scientific skills from diverse backgrounds, and coherent coverage of the material for beginners is difficult. Relying upon his many years of experience in teaching not only short courses but also as a chemical engineering faculty member, Professor Richardson has, in my opinion, presented a textbook which covers the important aspects of catalysis very clearly.

Each chapter in the book is, in essence, an introduction to a particular facet of catalysis. Major topics include a vital introduction to heterogeneous catalysis along with chapters dealing with structures, catalyst development, common catalytic materials, design, preparation, characterization, and deactivation. The topics are not covered in great detail, which is as expected for a book designed to be an overview. However, 283 references (mostly to books and review articles) are given which

*Unsigned book reviews are by the Book Review Editor.

provides a pathway for even the most experienced in catalysis to find details.

I highly recommend this book for those who have no training in heterogeneous catalysis and as a reference book for the experienced.

Geoffrey L. Price, *Louisiana State University*

Progress in Electron Properties of Solids. Edited by E. Doni, R. Girlanda, G. Parravicini, and A. Quattropani. Kluwer: Dordrecht and Boston. 1989. 459 pp. \$149.00. ISBN 0-7923-0337-7.

This volume is a collection of 35 contributed papers on experimental and theoretical solid-state physics honoring Franco Bassini. While the theme covers electronic properties of solids, the subject material is diverse and includes optical and magnetic behavior of semiconductors, metals, and superconductors. This book is packed with information, although apart from a very brief review on the major developments in the area of optical properties of semiconductors, there is no introductory material, which limits usefulness to specialists.

The book is loosely organized into sections dealing with optical and transport properties, excitons and collective phenomena, nonlinear optics, superconductivity, and superlattices. As an introduction, the first couple of papers deal with the problem of pseudopotentials and their modern extension to quantum Monte Carlo methods. A very useful and comprehensive paper on piezospectroscopy is followed by an easily digested description of spectroscopy with synchrotron radiation.

The role of excitons in electron properties of solids is illustrated with a set of mainly theory papers describing exciton interactions and two-particle Coulomb systems in a magnetic field. The first of three papers on nonlinear optics presents the topic of multiphonon transitions in semiconductors in a comprehensive manner; transitions with and without polaritons are illustrated by data on copper halides and zinc oxide. The same materials are used in subsequent papers to investigate multiphonon processes.

A set of three papers on high temperature superconductors is presented next, somewhat incongruously. These are introductory in nature and address the energy gap, an elusive parameter, and photoemission studies. The book finishes with a variety of work on surfaces of semiconductors and metals, quantum wells, and superlattices.

In summary, this is an impressive and eclectic collection of papers dealing with both theory and experiment of electrons in solids. Since the book honors a noted scientist's influence on his fellow physicists, cohesiveness has been limited by comprehensiveness. This book is recommended for the specialist wishing a well-written account of some of the important advances in the field.

Joseph B. Schlenoff, *Florida State University*

Prediction of Protein Structure and the Principles of Protein Conformation. Edited by Gerald D. Fasman (Brandeis University). Plenum: New York and London. 1989. xiii + 798 pp. \$95.00. ISBN 0-306-43131-9.

The book contains 20 chapters from 36 contributors. The initial chapter is a general introduction to the principles and patterns of protein conformation by Jane and David Richardson. Fasman contributed a long chapter describing the development of the subject, along with five useful appendices listing reviews, available programs, and data bases.

The extensive information available in the book should be of interest to both experts and novices, and to investigators who have not been active in the area for a while. There are many interesting examples of the innovations and analyses of the last two decades.

One chapter, by Gerald Stubbs, describes results of the past decade on virus structure. Other chapters consider correlation of sequence data with secondary and tertiary structure. A number of chapters consider important physical phenomena such as the role of electrostatic interactions in the structure of globular proteins, hydrophobic effects, and the role of energy minimization in simulation strategies.

Ultimately, the research in this area will lead to the ability to predict protein structures and to design new proteins with specific structures and functions. While these goals are still in the future, the fascinating details of the evolving research presented in this monograph make it very interesting reading.

William H. Orttung, *University of California, Riverside*

Elementary Polarization Spectroscopy. By E. W. Thulstrup (Royal Danish School of Educational Studies) and Josef Michl (University of Texas). VCH: Weinheim and New York. 1989. vii + 167 pp. \$35.00. ISBN 0-895-73755-8.

The earlier book by the authors, *Spectroscopy and Polarized Light*, is an advanced, comprehensive, and necessarily somewhat expensive treatise on the spectroscopic study of partially aligned substrates, such as liquid crystals, membranes, and polymers. The authors have written this shorter treatment of the subject in order to make it suitable for and available to undergraduate students.

In the shortening, the mathematics has been greatly curtailed, and fluorescence polarization, Raman scattering, and magnetic optical activity are touched only lightly. An introductory chapter discusses polarized light, molecular states and symmetry, and transition moments. The second chapter is devoted to experimental techniques. In it the experimental setups as well as the measurements are described with the minimum amount of mathematical expressions for sound exposition. Specific experimental procedures are not included however.

The third (and longest) chapter is on dichroic absorption. The interpretation of the spectra of a large variety of samples, as obtained from stretched polyethylene films containing them, is presented in reasonable detail. Interesting information about the orientation of substructures in the molecules can be obtained; the application to binding of such substances as carcinogenic benzopyrene metabolites to DNA is particularly intriguing.

Three substantial appendixes are devoted to group theory, character tables, and direct products of irreducible representations. A compound index as well as a subject index complete the book, which is not only suitable for a specialized undergraduate course, but is a useful introduction to the study of anisotropic samples for those who know little of the subject.

Photochemistry on Solid Surfaces. By M. Anpo (University of Osaka) and T. Matsuura (Kyoto University). Elsevier: Amsterdam. 1989. xx + 565 pp. \$90.02. ISBN 0-444-87413-5.

This book from the Studies in Surface Science and Catalysis Series consists of 35 papers grouped into 9 different chapters. The nine chapters include an introduction and the areas of photochemical reactions, organic photoreactions, inorganic photochemistry, laser-induced photoreactions and photochemical vapor deposition, photochemistry on semiconductors, optical media and liquid crystals, and proteins.

The introductory papers include a short overview by K. Tanaka and a specific chapter on photoisomerization reactions. Both of these papers are quite specific and do not give an overview of the other eight chapters.

Reflectance, lifetime, fluorescence, microscope, time resolved UV-visible reflection, attenuated total reflection, picosecond absorption, diffuse reflectance, flash photolysis, transient absorption, triplet-triplet absorption, excitation, emission, and photoacoustic methods are discussed in Chapter 2. Pyrene excimer, polymers, bilayers, silica, dyes on cotton fabric, and luminophors on oxide surfaces were studied with these methods.

Chapter 3 concerns photoreactions on solid surfaces such as ketone photolyses, azocumene decomposition, ethanoic acid decomposition, generation of radicals, and chemiluminescence of adsorbed biacridylenes.

Photoreactions on zeolites, reverse micelles, and electron transfer reactions of dyes are the focus of Chapter 4. Inorganic photochemistry of metal carbonyls in matrices, Vycor glass, silica, and other metal oxides is covered in Chapter 5. These two chapters are well organized. IR, Mössbauer, and catalytic activity measurements were carried out on the inorganic systems.

Chapter 6 includes studies of UV lasers for decomposition of small molecules and chemical vapor deposition of amorphous Si. Fluorescence, mass spec and IR studies were done to understand the mechanisms of photodecomposition of small molecule precursors.

Semiconductors are the materials discussed in Chapter 7. Fractal dimensionality of photoprocesses, area selective electrode reactions, acid-based coated CdS, and fluorescent dye systems are discussed. Chapter 8 discusses near-IR-absorbing organic dyes, photoinduced liquid crystal transitions, and lithography.

The last chapter primarily includes photochemical studies of liquid crystals with one paper on excited-state relaxation in proteins.

In summary, this book is a collection of specialized articles concerning various aspects of photochemistry at surfaces. It should be useful for experts in the field.

Steven L. Suib, *University of Connecticut*

Encyclopedia of Polymer Science and Engineering. Second Edition. Volumes 15 and 16. Edited by H. F. Mark (Polytechnic University), N. M. Bikales (National Science Foundation), C. G. Overberger (University of Michigan), and G. Menges (Institut für Kunststoffverarbeitung of the RWTH Aachen). John Wiley & Sons: New York and Chichester. 1989. Volume 15: xxiv + 797 pp. \$200.00. ISBN 0-471-80947-0. Volume 16: xxvi + 935 pp. \$200.00. ISBN 0-471-81182-3.

These two volumes are the latest in one of the widely used reference series in the field of polymer science and engineering. Among the editors are some of the most eminent scientists and pioneers in the field. Most of the contributors are leading experts in their parts of the field. Volume

16 includes 24 full articles with more than 60 entries and cross-references, covering from Styrene Polymers to Transfer Molding. Volume 15 has 23 articles with over 80 entries from Scattering to Styrene-Butadiene Copolymers. Depending on the subject matter, the length of articles varies from 6 pages to more than 200 pages.

I have read about ten articles including short and long ones, either related to my research interests (polymer chemistry) or in the area of which I knew very little. I enjoyed reading those entries familiar to me such as Telechelic Polymers, Stereoregular Linear Polymers, Styrene Polymers, etc. The article on Telechelic Polymer begins with the basic definition followed by concise descriptions of the synthesis and applications of telechelic polymers. The synthetic methods include every major type of polymerization from classical anionic polymerization to the recently invented group-transfer polymerization. The article on Stereoregular Linear Polymers represents an excellent comprehensive review with 1091 references on stereoisomerism in polymers, stereospecific and stereoselective polymerizations, and an in-depth coverage of synthesis and structure of a great number of stereoregular polymers and mechanisms of polymerizations. The topics covered in Styrene Polymers provide good examples of the integration of fundamental research with industrial applications. This long article (246 pp) discussed every aspect of styrene polymers, from synthesis of monomers and polymers to physical properties, to process engineering, and to the economic considerations. The articles that are remote from my research area have been, indeed, educational. The entries, such as Structural Foams, Sutures and Synthetic Skin, are all well-written, easy to comprehend and informative.

Of course, the level of articles can be uneven. However, most of the articles are well-organized and have a brief introduction at the beginning. For those who merely want to find out the definition and basic concept of an entry, reading of the introduction will be sufficient. Those who wish to learn more will find that they can acquire most of the background materials through the cross-references in the encyclopedia. Every article has extensive journal citations which in almost all the cases are up-dated to middle or later 1980s. For example, the article Sulfur-Containing Polymers (122 pp) has 748 references (up to 1988). Even a short entry like Template Polymerization (15 pp) has 84 references. The reader can proceed finally to any of these references for further exploration of the subjects.

Many academic chemists and most industrial chemists often encounter problems related to polymers. This encyclopedia will be one of the most useful reference books for them, whether they want to get a taste of a subject or become well versed in that area.

Yen Wei, *Drexel University*

Elastomers and Rubber Compounding Materials. Studies in Polymer Science 1. Edited by I. Franta (Institute of Chemical Technology, Prague). Elsevier: Amsterdam and New York. 1989. 580 pp. \$207.25. ISBN 0-444-42994-8.

In the rubber industry, it is often heard that compounding is an art and it is based more on experience than on a scientific approach. This book intends to change this misconception. Properties of basic materials used for formulating rubber compounds are given in a systematic fashion. Rubber compounders can use this information for their formulations.

This book is divided into seven chapters. The first chapter includes a very brief history of rubber development and some general properties of rubber. The second chapter describes natural rubbers, including methods of production, compositions, physical properties, and chemical reactions. The third chapter is a general description of polymerization methods of synthetic rubber.

The bulk of this book is in Chapter 4, covering the production, structure, properties, vulcanization, and application of synthetic rubbers. These synthetic rubbers are classified according to their chemical structure. Information concerning compounding two or more rubbers is also provided in cases of commercial importance. It is understandable that only basic information is included in this chapter due to the limitation of space. However, references are given for more in-depth study. One section is devoted to the commercial grades and trade names for each type of rubber. This is very convenient for the compounders working in the factory.

Chapter 5 covers reclaimed rubber. Processes used to reclaim rubber

and their applications in various areas are discussed. The advantages and problems encountered in the utilization of waste rubber are also addressed. With the worldwide mounting problems of solid waste, recycling should be considered seriously.

Chapter 6 deals with compounding materials and special-purpose additives, which include vulcanizing agents, activators, accelerators, fillers, antidegradants, and others. A great amount of detail is given to the characterization and application of fillers.

The last chapter is devoted to textile materials for rubber reinforcement. Terminology, production, basic properties, testing methods, and application for different types of fibres and cords are discussed. Adhesion of these fibres with rubber is also briefly discussed. This is the fastest developing area in the rubber industry. New products with improved properties are available in the market. Further prospects for future development are commented on at the end of this chapter.

This book is very useful to those in the rubber industry. It can also be used as an introductory text for students of polymer science. This book contains a large list of commercial grades and trade names of various synthetic rubbers, as well as trade names of additives that are available worldwide. With the increasing emphasis on global economy, the people in sales and marketing also benefit from this book.

Shaio-wen Wong, *University of Detroit*

Chemistry of Coal Weathering. Edited by C. R. Nelson (Gas Research Institute). Elsevier Science Publishers: New York. 1989. x + 230 pp. \$134.25. ISBN 0-444-88088-7.

This book is a survey of the chemistry of coal weathering. It is composed of six chapters of approximately 25–30 pages each with the exception of the last chapter which is 75 pages long. The volume, as with many of this type, is somewhat uneven in its coverage of the subject because different authors write each chapter. Chapters 1, 3, and 4 are the most chemical in their approach to discussing the process of weathering. Chapter 1 (C. R. Nelson) considers the analytical chemical changes during weathering and what this means in terms of mechanism. Chapter 3 (E. Jakab, Y. Yun, and H. L. C. Meuzelaar) concerns changes in composition and chemical characterization of coals which are used to develop a molecular structural analysis of weathering. Chapter 4 (B. M. Lynch and J. A. MacPhee) considers the application of photoacoustic FTIR to the determination of surface changes of coals during weathering and their relationship to chemical structural changes and Gieseler fluidity. There is some overlap between these chapters, but each also shows the particular interpretation of the facts by the individual authors. Since a highly detailed picture for weathering is apparently lacking, this approach does give different points of view of the phenomena involved.

Chapters 2, 5, and 6 are more concerned with the technology of the weathering of coal and how weathering changes properties that are typically measured for coals. Chapter 2 (F. E. Huggins and G. P. Huffman) is concerned with the early stages of weathering and oxidation of coal and focuses on the alteration of maceral, mineral matter, thermoplastic and caking properties, and the role of moisture in weathering processes. Chapter 5 (M. R. Khan and R. G. Jenkins) considers mainly the change in thermal plastic properties of coals during low-temperature oxidation and weathering. Chapter 6 (D. Schmal), the longest chapter in the volume, summarizes in considerable detail a long-term, practical chemical engineering study of the spontaneous heating of stored coal. While the techniques of this approach have been published, most of the details have appeared in Dutch language literature. This report provides a fascinating example of a difficult, industrially important problem and how the techniques of chemical engineering have been used to model and forecast storage problems with coal. The development of an experimental protocol to test the model has provided insight into the critical aspects of coal storage.

For those interested in coal weathering, this volume provides a good introduction without necessarily providing a definitive model for all that occurs. The text contains over 600 references to critical work in the literature for those interested in a more detailed view of the topic which is obviously still in flux and changing with the application of new techniques. A good feeling is given of what processes occur in general and what effects these processes have on various important properties of coals.

Neil F. Woolsey, *University of North Dakota*