

Additions and Corrections

The Organic Metal (Me₂-DCNQI)₂Cu: Dramatic Changes in Solid-State Properties and Crystal Structure Due to Secondary Deuterium Effects [*J. Am. Chem. Soc.* 1993, 115, 7696–7705].

KLAUS SINZGER, SIEGFRIED HUNIG,* MARTINA JOPP, DAGMAR BAUER, WERNER BIETSCH, JOST ULRICH VON SCHUTZ,* HANS CHRISTOPH WOLF, REINHARD KARL KREMER, TOBIAS METZENTHIN, ROBERT BAU,* SAEED I. KHAN, ANDREAS LINDBAUM, CHRISTIAN L. LENGAUER, AND EKKEHART TILLMANN'S*

Page 7700, eq 2: The equation should read:

$$d_{\text{Cu-Cu}} = \sqrt{(a/2)^2 + (7c/4)^2}$$

Electrochemically-Reversible, Single-Electron Oxidation of C₆₀ and C₇₀ [*J. Am. Chem. Soc.* 1993, 115, 9818–9819].

QINGSHAN XIE, FRANCISCO ARIAS, AND LUIS ECHEGOYEN*

TCE, the solvent used in these studies, stands for 1,1,2,2-tetrachloroethane in this communication.

Protonation of a Bridging Oxo Ligand Is Slow [*J. Am. Chem. Soc.* 1992, 114, 8744]. JAMES M. CARROLL AND JACK R. NORTON*

Page 8744: Although the calculated and found analyses given for [(6-methylbispicen)Mn^{III}(μ-O)(μ-OH)Mn^{III}(6-methylbispicen)](ClO₄)₃ are correct, the empirical formula is stated incorrectly in ref 15; it should be C₃₂H₄₅N₈O₁₄Cl₃Mn₂. Also, footnote d of Table I should read: "Reported as 3.5 in H₂O in ref 7b; can therefore be estimated as about 11 in CH₃CN by the procedure of ref 8d", and the estimated pK_a of 4H⁺ should therefore be 11 instead of 13.

Book Reviews

Practice of Thin Layer Chromatography. Third Edition. By Joseph C. Touchstone (University of Pennsylvania). John Wiley & Sons: New York. 1992. vi + 377 pp. \$74.95. ISBN 0-471-61222-7.

To practicing synthetic organic chemists, thin layer chromatography is now so commonly used as to have become almost invisible. High quality, uniformly-produced thin layer chromatography plates with a wide range of solid phases are commercially available from a number of manufacturers. It is the very ubiquitousness of thin layer chromatography plates which draws attention to the dated aspects of this edition of Touchstone's book. Although the jacket promises "state of the science", a glance at the text, dates of the references cited, and, in particular, a number of obviously dated photographs shows this edition to be very similar to the second edition. With that said, the volume has a number of invaluable tables that the practicing chemist will find useful. For example, Chapter 4 contains extensive tables of sorbent types including suffix designations, thicknesses, binders, plate sizes, and manufacturer. Chapter 7 lists solvent systems for various classes of compounds, amongst them sugars, food dyes, nucleotides, amino acids, steroids, and barbiturates; solvent systems arranged in an "equieluotropic" series; and solvent strengths for mobile phases of polar solvents in pentane and benzene. Chapter 8 contains 207 reagent recipes for visualization of compound classes ranging from alcohols to vitamins; Chapter 8 alone is probably worth the purchase price of the book. Other chapters cover techniques including *in situ* scanning, isotope scanning, preparative thin layer techniques, *in situ* reactions, and the combination of TLC with other analytical techniques.

The text is written in a straightforward style aimed at practice rather than theory. Those in possession of the previous edition of this book probably won't gain much from buying this later edition, but those synthetic and analytical chemists without it, who are stuck in the rut of using the same few solvent systems and visualization reagents, would do well to

have access to Touchstone's third edition of *Practice of Thin Layer Chromatography*.

Ruth E. TenBrink, *The Upjohn Company*

The Inositol Phosphates. Chemical Synthesis and Biological Significance. By David C. Billington (Institute de Recherches Servier, Suresnes, France). VCH Publishers: Weinheim and New York. 1993. xiv + 154 pp. \$85.00. ISBN 0-89573-977-1.

In the last few years, rapid developments in the molecular aspects of signal transduction in cellular processes have attracted the attention of organic chemists to this rapidly growing research area. Previous comprehensive reviews describing the chemical synthesis of inositol polyphosphates have reviewed the literature through 1988–89. It is a testimony to the high profile and high interest in this area that in this monograph almost 100 of the new publications cited have appeared in the last four years. These document the intensive synthetic effort directed to the preparation of naturally-occurring and isosteric analogues of compounds in the phosphoinositide pathway.

Billington has focused on the new synthetic achievements in a very clear and systematic fashion. The book opens with a preface that places the chemistry into a biological context. Two introductory pages of abbreviations, a detailed table of contents, and a ten-page subject index make for excellent access to material within the text. The presentation of structures follows the "flat cyclohexane" style and makes visual retrieval from a chemistry-rich text very straightforward.

In the first two of the book's nine chapters, the author presents background material on inositols and phosphoinositides, allowing easy orientation in the synthetic chapters. Chapter 1 introduces the stereochemistry and numbering, which can sometimes be confusing in this field. Chapter 2 summarizes the biochemistry of cell–cell signaling and

the biochemical pathways of the inositol cycle, illustrating the metabolic actions by analogues that retain second messenger function. The role of lithium in the inhibition of inositol monophosphatase, a pathway that affects the recycling rate of *myo*-inositol, is also discussed briefly.

In Chapter 3, the general synthetic considerations common to most of the described synthetic strategies are described. The methods developed in the late 1980s are augmented by presentation of more recent developments on each of the basic steps, including phosphorylation, protection/deprotection chemistry, and resolution. Alternative approaches using starting materials other than *myo*-inositol are also discussed.

Detailed synthetic methods for the preparation of inositol mono-, bis-, tris-, and tetrakisphosphates are described in Chapters 4–7. Each chapter has the same layout: Naturally-occurring isomers are discussed first, both in racemic and optically-active forms. Next, the key steps of each reaction sequence are indicated. Reducing the repetition of the standard protection–phosphorylation–deprotection sequences, which often characterize this research, makes for a rapid analysis and comparison for the reader.

Chapter 8 (45 pages), which includes the most recent references, presents a discussion of the synthetic and biological aspects of the unnatural analogues of the inositol phosphates. The complexity of the inositol cycle allows for exploitation of different modification strategies, resulting in longer biological half-lives and increased bioavailability in certain target cells. Particular emphasis is given to chemically-modified inositol mono- and trisphosphate analogues. In each case, the activity and metabolic characteristics are compared and the structural requirement for receptor and enzyme–substrate recognition is determined. The chemistry and biochemical applications of hydroxyl- and phosphate-tethered analogues as biochemical affinity probes are also discussed. Finally, Chapter 9 of this excellent monograph includes 5 pages and 15 references for 'late entries' that extend into early 1992.

This book is equally useful for synthetic and bioorganic chemists and is an essential desktop reference for graduate students, postgraduates, and faculty who are involved in this very fast-moving research area. The information contained herein simplifies access to a rich chemical literature still less than a decade old and allows selection among synthetic methodologies in an informed fashion. We strongly recommend this monograph for inclusion in both departmental and personal libraries.

György Dormán and Glenn D. Prestwich,
State University of New York at Stony Brook

State-Selected and State-to-State Ion–Molecule Reaction Dynamics. Part 2. Theory. Edited by Michael Baer (Soreq Nuclear Research Center) and Cheuk-Yio Ng (Iowa State University). J. Wiley and Sons: New York, 1992. xiv + 562 pp. \$140.00. ISBN 0-471-53263-0.

This book is another in the series of *Advances in Chemical Physics* edited by I. Prigogine and S. Rice. This collection of 8 chapters by 12 contributing authors (edited by C.-Y. Ng and M. Baer) is the second of a two-volume review series dealing with the topic of ion–molecule reaction dynamics. This particular book summarizes current theoretical approaches to deal with charge exchange between an atom (ion) and a molecule (ion). These various approaches scan the spectrum from exact quantum mechanical calculations to semiclassical and statistical techniques.

The first chapter (by B. H. Lengsfeld III and D. R. Yarkony) concerns adiabatic representation of potential energy surfaces and the uses of the analytic gradient technique. Chapter two (by V. Sidis) deals with diabatic potential energy surfaces and construction of diabatic states. The third chapter (by F. A. Gianturco and F. Schneider) deals with the construction of surfaces using semiempirical techniques, namely the diatomic in molecule wave expansion. This chapter also includes a very nice introduction to the DIM method. The fourth chapter (by M. Baer) concentrates on quantum mechanical treatments for low-energy charge-transfer processes, with application to several specific systems. The fifth chapter (by H. Nakamura) deals with semiclassical approaches to charge transfer. It goes into detail over different types of representations for nonadiabatic transitions and discusses reactive transitions as well. The sixth chapter (by E. A. Gislason, G. Parlant, and M. Sizun) describes classical path calculations of charge transfer including calculations of total and differential cross sections, with comparisons to experiment. The seventh chapter (by S. Chapman) summarizes trajectory-surface-hopping methods for a variety of different processes. Lastly, the eighth chapter (by J. Troe) deals with statistical rate theory applied to unimolecular and bimolecular systems.

While I may not be a theorist (either by training or inclination) I can certainly appreciate the appeal this book will have for the ion–molecule

community in general. The coverage of the various topics is broad yet balanced. The book makes for very interesting reading and effectively communicates the current state of the art in charge-transfer theory.

James F. Garvey, *State University of New York at Buffalo*

Quasicrystals: A Primer. Monographs in the Physics and Chemistry of Materials 48. By C. Janot (Institut Laue-Langevin, Grenoble). Oxford University Press: New York, 1992. xiv + 320 pp. \$65.00. ISBN 0-19-851389-5.

In accordance with its definition as a primer, this book is an excellent introduction to the mathematical and geometrical properties of quasicrystals, or long-range ordered structures without periodicity; the apparent oxymoron disappears if one thinks of a one-dimensional structure built by two series of points, each series with its own translational period, the ratio of the two periods not being a rational number. In three dimensions, this quasiperiodicity opens the way to the crystallographic blasphemy of solid extended materials with five-fold symmetry axes.

The author leads his readers through the algebraic intricacies which, in principle, should allow the quasicrystallographer to collect diffraction intensities and Fourier-transform her or his way to a complete structure solution, as in ordinary X-ray single-crystal diffraction work. The description is rather clear and concise, but the reader has to deal with six Miller indices instead of three and a number of refinable parameters that misbehave in between zero and infinity (even for a cubic structure). Nonuniqueness of solution and refinement hovers by.

Quasicrystal structures are a beautiful geometrical toy, and their mathematical manipulation is a challenge to a physicist's ingenuity. The question is, do they exist in a chemical sense—that of reproducible preparation and unequivocal characterization? The author lists about 70 examples (1986–1988), all of them being intermetallics, sometimes with a very critical non-Daltonian stoichiometry; one cannot avoid the impression that preparation is more or less haphazard. Since it is stated (p 76) that "there is no general rule...to predict which alloys and which compositions are susceptible of producing a quasiperiodic sample", chemistry is kindly but firmly dismissed. Characterization, in particular distinction between a true quasicrystal and microcrystalline aggregates or twins, "has to be handled very carefully" (p 89) and relies mainly on electron diffraction patterns (from thin films) and high-resolution electron microscopy; again, the impression is that it stands on the shaky pedestal of academic dispute over small detail on diffraction plates. A whole chapter describes vibrational and translational defects and dislocations; all of them ringing, to a structural chemist's ear, just as suspicious keywords of a vanishing order.

The author has done a beautiful job in exposing his subject, and his assessment of its real-life difficulties is more than fair. This book is excellent reading for some solid-state physicists and for a handful of good will crystallographers. To general chemists, even solid-state chemists, the subject at the present stage of development could be described as a frontier sector, largely unexplored, of metals science. For them, the investment of time and effort involved in reading this book is still quite premature.

A. Gavezzotti, *Università di Milano*

Liquid Crystals. Second Edition. By S. Chandrasekhar (Centre for Liquid Crystal Research, Bangalore). Cambridge University Press: Cambridge, U.K. 1992. xv + 460 pp. \$100.00. ISBN 0-521-41747-3.

Liquid crystals are a state of matter quite distinct from the gaseous, amorphous liquid, and crystalline states, between the latter two of which they lie intermediate with respect to their fluidity and degree of order.

This is the second edition of Chandrasekhar's earlier book published in 1977 and is again entitled simply *Liquid Crystals*. In the 15 years separating publication of the books, a very great deal has happened in this field. As already mentioned, liquid crystals are a state of matter, and not surprisingly they embrace many disciplines—applied and theoretical physics, chemical physics, chemistry in all its breadth from physical to organic synthesis, electrical and electronic engineering, and biology. Therefore a book called just *Liquid Crystals* has to be selective in coverage.

The first selectivity chosen by the author is that the book is primarily about the physics of liquid crystals, and the second is that it deals almost exclusively with thermotropic systems, where the phases are formed or undergo transitions on heating or cooling, together with the effects of pressure on such systems. The third selectivity is that the thermotropic systems are essentially those of the low molar mass type as formed by rod-like (calamitic) molecules (Chapters 2–5) or disc-like molecules (Chapter 6).

In the introductory chapter (16 pp) it is freely acknowledged that the large subject of lyotropic liquid crystals derived from amphiphilic molecules and solvent(s) and the rapidly escalating field of polymer liquid crystals are not discussed. However, in Chapter 1, they are summarized in 3–4 pages.

However, as a book concentrating upon the physics and physical characteristics of low molar mass thermotropic liquid crystals, this new edition has to be a must for the bookshelves of anyone interested in or researching on theoretical or physical aspects of these fascinating, anisotropic condensed states of matter formed by the self ordering of rod-like or disc-like molecules. Indeed any theoretician or physical scientist would naturally refer new research students to this book as part of their essential reading matter.

Two chapters are devoted to nematics. Chapter 2 (68 pp) is concerned with Statistical Theories of the Nematic State with particular reference to phase transitions; order parameter; magnetic, electrical, and flow birefringence; light scattering; and antiferroelectric short range order. Chapter 3 (127 pp) is devoted to Continuum Theory of the Nematic State and gives a very full treatment of its implications for a range of anisotropic properties and the relevance to important areas such as electro-optic displays, microscopic textures, surface effects, and a range of other properties including flexoelectric effects and electrohydrodynamics.

Chapter 4 (87 pp) is about cholesteric liquid crystals formed by chiral systems and deals in depth with theories and physical characteristics, including those of the blue phases. Chapter 5 (88 pages) covers smectics—their classification, relevant theories, and the panoply of physical characteristics that they manifest, including new effects such as twist grain boundary phases and commercially relevant aspects relating to ferroelectric behavior.

Chapter 6 is shorter (30 pp), despite the fact that today's strong activity in the field of discotic liquid crystals owes much to Chandrasekhar's work in the area in the 1970s. Theory, structure, and physical properties are again covered, for both discotic nematics and columnar phases of disc-like molecules.

The book carries a very good index indeed, but the drawing together of individual chapter references into one section, separated from the actual text, I do not find helpful.

Though strongly physics oriented, the text is very readable, a characteristic of the author's style in the first edition. It is also a good book for the nonspecialist to browse through, and it is a most valuable source of information and references to the literature. Within the limits of its selective coverage, the text has been brought well up to date in this edition. On a critical note, it could be said that the book points the reader at observations, facts, and theories, but where uncertainties exist or judgements are needed, the author steps back from expressing his own authoritative view of the situation. For example, the short section on biaxiality disappoints in lacking the author's view on this important subject.

But in relation to a subject that is now too big for any one book or for any single author to cover, Chandrasekhar has performed a service in taking us into the 1990s, in those selected areas that he chose to cover in the first edition of 1977, with the addition of new Chapter 6 on discotics.

Professor G. W. Gray, Merck Ltd.

General and Synthetic Methods. Volume 14. A Specialist Periodical Report. Edited by G. Pattenden (University of Nottingham). The Royal Society of Chemistry: Cambridge, U.K. 1992. xii + 500 pp. £147.50. ISBN 0-85186-954-0.

The format of this latest volume in the specialist periodical series, *General and Synthetic Methods*, remains the same as in previous issues. The titles and authors of the chapters are as follows: Chapter 1, Saturated and Unsaturated Hydrocarbons (A. R. Howell); Chapter 2, Aldehydes and Ketones (S. K. Richardson); Chapter 3, Carboxylic Acids and Derivatives (D. W. Knight); Chapter 4, Alcohols, Halogeno Compounds, and Ethers (J. B. Sweeney); Chapter 5, Amines, Nitriles, and other Nitrogen-containing Functional Groups (G. M. Robertson); Chapter 6, Organometallics in Synthesis (K. G. Morris, S. E. Thomas, G. J. Tustin, and M. Wills), Part I, The Transition Elements (K. G. Morris, S. E. Thomas, and G. J. Tustin), Part II, Main Group Elements (M. Wills); Chapter 7, Saturated Carbocyclic Ring Synthesis (J. D. Kilburn); Chapter 8, Saturated Heterocyclic Ring Synthesis (S. D. A. Street and J. Steele); and Chapter 9, Highlights in Total Synthesis of Natural Products (D. C. Harrowven, M. J. Kiefel, and G. Pattenden). A section entitled Reviews on General and Synthetic Methods compiled by S. M. Higton and G. Pattenden completes the book.

Since I reviewed this series last year (*J. Am. Chem. Soc.* 1992, 114, 9729), nothing has changed. This volume continues to maintain the thorough scientific standard of the previous volumes and provides a good overview of the main synthetic organic literature covering the period of 1989.

All good things must come to an end, because this is the last edition of this most useful series. Overall it has been a remarkable achievement to maintain the consistent high standard of literature coverage over the complete sixteen volumes. Fortunately, the good news is that *General and Synthetic Methods* will be replaced with a new review journal titled *Contemporary Organic Synthesis*. Doubtless the previous series will become available at a considerably reduced price (hopefully), which will make it an attractive purchase for the individual synthetic organic chemist.

Philip D. Magnus, University of Texas at Austin

Sourcebook of Advanced Organic Laboratory Preparations. By Stanley R. Sandler (Elf Atochem North American, Inc.) and Wolf Karo (Polysciences, Inc.). Academic Press: San Diego, CA. 1992. xiv + 332 pp. \$59.95. ISBN 0-12-618506-9.

The bulk of this book (40 chapters, 286 pages) consists of a collection of the older procedures used to prepare the more common groups of organic compounds. There is also a chapter on polymer preparation (11 pages), an appendix on documentation of product and process R and D (21 pages), and a two-page name reaction index. Nearly all of the 160 procedures given were taken from the literature prior to 1960 and were reported previously by the authors in their series *Organic Functional Group Preparations* (Volumes I–III, 2nd ed.) and *Polymer Syntheses* (Volume I, 2nd ed., and Volumes II and III). Of the over 500 references cited, only 70 were post-1970, and many of these were from inaccessible journals (e.g., *Stud. Univ. Babeş-Bolyai, Ser. Chem.* 1971) and foreign patents.

Despite its title, this book might have been suitable for those practicing preparative organic chemistry in the 1950s rather than the 1990s. The procedures described are for the preparation of simple compounds (e.g., *n*-butyl bromide, cyclohexene), which are characterized by their melting points, boiling points, and refractive indices; there is virtually no mention of spectroscopic and chromatographic methods. In the only instance where NMR data are provided (p 212), they were incorrectly reported. Similarly many reactions are incorrectly classified, exemplified by the Wurtz (p 5) and Diels–Alder (p 80) reactions. Possibly, the only useful feature of the book for students and beginning industrial workers is the appendix on record keeping.

Although the book is written in a clear manner with few typographical errors (e.g., p 19), there are a few linguistic blemishes, such as “A flask.....is refluxed” (p 255). Overall, this book is unsuitable for today's students and industrial chemists. One wonders why this book was published.

Percy S. Manchand, Hoffmann-La Roche Inc.

Liquid Crystallinity in Polymers: Principles and Fundamental Applications. Edited by A. Ciferri (North Carolina State University and University of Genoa). VCH Publishers: New York and Weinheim, Germany. x + 438 pp. 1991. \$95.00. ISBN 0-89573-771-X.

The front matter of this book begins with a dedication to the late W. R. Krigbaum, who, in spite of his declining health, was able to contribute impressively to this book (as he had in many earlier publications on liquid-crystalline polymers). It then provides information on all sixteen contributors and a preface written by T. Odijk, who is not one of the authors but is active in several of the research areas covered.

The first of the four parts of the book is concerned with “Conformation”. It covers analysis of the reduced conformational versatility shown by several types of relatively stiff chains which exhibit liquid-crystalline behavior and experimental evaluations of persistence lengths (one of the standard measures of chain stiffness). Part II then proceeds to “Molecular Theories”. One chapter covers the Onsager approach (most applicable to dilute solutions of rigid rods), the next one the alternative Flory lattice model, and the last one the remaining theories (which differ from the other two approaches primarily in the way specific models are used to represent a chain and to calculate its persistence length). Part III is on the “Experimental Behavior and Performance of Theories”. It emphasizes the confrontation of theory with experimental results, including aspects of phase equilibria for both rigid and semi-rigid chains, transition temperatures for segmented chains, and the effects of mechanical fields on cross-linked elastomers having liquid-crystalline side chains. The last part is entitled “Physics” but is really a miscellaneous section consisting of chapters on elastic and viscous properties, defects and textures, and rheology.

The book ends with separate glossaries of the main symbols used in each chapter, a list of acknowledgements, and a subject index.

It is a pleasure to recommend this book to anyone working in the area

of liquid-crystalline polymers or to those simply interested in a concise but very useful and sophisticated overview of this important field.

J. E. Mark, *The University of Cincinnati*

Advances in Solid-State Chemistry. Volume 3. Edited by C. R. A. Catlow (The Royal Institution, London). JAI Press: Greenwich, CT. 1993. x + 285 pp. \$90.25. ISBN 1-55938-271-6.

This volume is the third in a series and is devoted to the theme of interaction of experimental and theoretical studies of imperfectly ordered crystals, particularly oxide ceramics and superconductors. It contains five chapters with the following headings: Recent Studies of Plastic Crystals; Defect Processes in Ceramics; Oxide Superconductors: Structure and Electronic Properties; Simulation Studies of Structural and Defect Properties of High Temperature Superconducting Materials; and Control of Defects to Form Waveguides and Lasers in LiNbO_3 .

Chapter one, Recent Studies of Plastic Crystals, by M. Meyer and O. H. Duparc has 62 pages and 120 references. The title is accurate, and the emphasis is on the interaction of theory and experiment in studies of crystals with rotational disorder such as molecular crystals and sulfates and nitrates. The emphasis is on dynamic disorder, but recent developments in "glassy" crystals with frozen-in disorder are briefly described.

Chapter two, Defect Processes in Ceramics, by A. N. Cormack has 36 pages and 71 references. This article is devoted to a description of the extent to which theoretical methods (based largely on the ionic model) can be used to model defect behavior in ceramics, mainly doped zirconia, oxide perovskites, and reduced titanium and tungsten oxides.

Chapter three, Oxide Superconductors: Structure and Electronic Properties, by K. K. Singh and P. P. Edwards has 121 pages and 352 references. This article makes up almost half of the present volume. It was completed in 1990 but has a two-page addendum referring to some of the work reported in the last two years, and of course this subject is still seeing dramatic developments (such as the discovery of the Ba-Hg-Cu oxide superconductors). However it should serve as a useful introduction to the earlier literature for those entering the field.

Chapter four, Simulation Studies of Structural and Defect Properties of High Temperature Superconducting Oxides, by N. L. Allen and W. C. Mackrodt has 68 pages and 121 references. This article nicely complements the previous two. It describes how theoretical methods (again based on an essentially ionic model) can be used to model the structure, dynamics, and defect structure of copper oxide superconductors. The simulations described are largely the extensive work of the authors and their collaborators.

Chapter five, Control of Defects of Form Waveguides and Waveguide Lasers in Lithium Niobate, by P. D. Townsend has 34 pages and 48 references. This short article is devoted to methods (crystal growth and doping) used to control the optical properties of LiNbO_3 (which has very useful nonlinear and electro-optical properties). The emphasis is on recent work.

In summary, the book is well produced and almost free of misprints. References generally cutoff at 1991 or early 1992. Each chapter is preceded by a table of contents, but there are no indices.

M. O'Keefe, *Arizona State University*

Coordination Chemistry of Aluminum. Edited by G. H. Robinson. VCH Publishers: New York. 1993. xii + 234 pp. \$49.50. ISBN 1-56081-255-9.

Two score years ago, the chemistry of boron was accorded enviable attention on account of its potential use in high energy propellants. More recently, aluminum, its behavior congener, the most abundant metal, and the third most abundant element in the earth's crust, has become the subject of proper focus. The reasons are evident from the scope of chemistry subtended by this concise volume.

It begins with an overview of structure, bonding, and thermochemistry of aluminum compounds. There is a fine section on the aqueous coordination chemistry of aluminum, with all its implications for chemical ceramics as well as the biochemical and environmental impact of this metal.

A section on organoaluminanes describes advances in the chemistry of materials with Al-N bonds. Besides having a surprising beauty and complexity, such compounds are of interest as molecular precursors to aluminum nitride. Separately reviewed is the chemistry of aluminum alkoxides and thiolates.

The chapter on low valent and paramagnetic compounds reveals what advances have been made in research on "non-classical" and otherwise unusual aluminum derivatives. The final chapter, dealing with ionic organoaluminum compounds treats liquid clathrates and also some quite interesting species relevant to the important use of aluminoxanes as activators in metallocene-catalyzed olefin polymerization.

A review such as this could have been much larger. It could have made comparisons with boron chemistry and said more about use of modern spectroscopic techniques, particularly ^{27}Al NMR, in characterizing aluminum-containing materials, about their relevance to geochemistry; and about use as precursors to condensed-phase materials. I fear that there is an overreliance on X-ray crystallography which can say nothing about solution-state structures. But a sensible balance has been struck; the book is interesting, useful, well written, and thus easy to read. If it is not exhaustive, neither is it exhausting. It well fulfills its worthy, stated purpose of providing to the general reader a review of the status of and progress in a broad and significant area of chemistry.

A. R. Siedle, *3M Corporate Research Laboratories*

Nuclear Spectroscopy on Charge Density Wave Systems. Physics and Chemistry of Materials with Low-Dimensional Structures. Volume 15. Edited by Tilman Butz (Technische Universität München). Kluwer Academic Publishers: Dordrecht, Boston, and London. 1992. xii + 326 pp. \$129.00. ISBN 0-7923-1779-3.

Significant recent advances in solid state chemistry and physics have resulted from applying a variety of spectroscopic probes to systems with unique geometrical and chemical properties. The synthesis of "designer materials" with unique electronic and magnetic properties, accompanied by a rigorous theoretical analysis of the physical observations on those materials, leads to a picture of collective effects in solids which is significantly more subtle and interesting than those encountered in simple solids. The present volume provides such an example: dramatic changes in a widely-varying series of solid systems associated with atomic displacements known as charge density waves. A variety of spectroscopic techniques are employed to study these systems: nuclear magnetic resonance (NMR), nuclear quadrupole resonance (NQR), time differential perturbed angular correlations (TDPAC), and Mössbauer effect (ME). The systems examined include a striking array of materials: transition metal chalcogenides, molybdenum bronzes, and quasi-one-dimensional inorganic complex salts and organic charge transfer salts. This book was conceived at a 1989 conference of the same title, and the articles include literature references which extend to 1990-1 and illustrate the basic points.

The chapters are sufficiently long that the authors have the opportunity to explore their topics thoroughly, providing background information, establishing the interrelation of different observational tools, and developing the theoretical concepts, and all the authors have done an excellent pedagogical job. Rather than exhaustively reviewing observations in the class of systems, they focus on one or two materials and examine them in detail. I was particularly taken by the combination of NMR and transport property measurements which were used to study the motion of CDW's in the alkali molybdenum bronzes. Another *tour de force* was the study of Peierls transitions in the inorganic complex salt $\text{KCP} [\text{K}_2\text{Pt}(\text{CN})_4\text{Br}_{0.3}\cdot 3.2\text{H}_2\text{O}]$, a quasi-one-dimensional system. In this case the main chain properties were traced by ^{195}Pt NMR observation and contrasted with changes in order near the chain (^{13}C and ^{14}N NMR) and at greater distances (^{81}Br , ^{39}K , and ^1H).

Professor Butz has performed a great service to the solid state community by drawing these disparate systems into a single place so that they can be easily compared and contrasted. He has selected an outstanding set of scientists to write the reviews, and they have performed admirably. This book would be excellent for a graduate seminar class on the topic.

Bernard G. Silbernagel, *Exxon Research and Engineering Company*