An attractive feature of the book is the inclusion of a chapter on numerical techniques, mostly Monte Carlo and molecular dynamics, which have long provided an important avenue of investigation into the structural and thermodynamical properties of disordered matter. The treatment is relatively brief, however, and the results given for a few models (hard sphere, Lennard–Jones, semi-empirical liquid metal potentials and quenched Lennard–Jones glasses) are really only sketches.

The strongest chapters are those on simple liquids and liquid metals (including a chapter on nonlocalized electrons in disordered matter), the latter being the area of Cusack's own research. Theory is presented clearly, and its successes and limitations are spelled out. The coverage of liquid metals is relatively broad, given the limited allocation of space to each chapter; electronic and thermal properties for both simple elemental liquid metals and liquid alloys are discussed, and transport processes are introduced at this time. Comparison with experiment keeps pace with the theory throughout most of the book.

The chapters on percolation and localization are weaker, and illustrate some of the problems inherent in attempting to write a survey. One feels rushed in these chapters. Concepts are partially introduced but not given sufficient development into a coherent exposition; at times they end up somewhat jumbled. The problem seems mostly to stem from the author's attempt to squeeze too much into too little space; in many cases, discussion of a topic proceeds up to a point that leaves the narrative (and central idea) hanging, and then turns the subject over to the references, sometimes without leaving the reader with a clear idea of what exactly is in them. Deficiencies such as this are rather minor, but they leave the reader somewhat unsatisfied.

Similar problems persist in the chapter on insulating glasses, where the choice of topics is rather arbitrary. The only model of the glass transition discussed is the modified free-volume theory; the more recent mode-coupling theories are given only the briefest of mentions and then are consigned to the references.

The last two chapters treat amorphous and liquid semiconductors and metallic glasses. The discussion of the former, which includes treatments of defects and dangling bonds in the tetrahedrals and chalcogenides, electron spin resonance and photoluminescence, and transport, is again quite good and reasonably comprehensive. The chapter on metallic glasses is better than that on insulating glasses but exhibits some of the same shortcomings; some of the more recent work, such as that on local icosahedral order, is not mentioned.

Among the book's strongest points are the attention paid to both experiment and theory, and comparison of the two wherever possible. The references are very extensive and should be useful to workers in the field and to beginning graduate students. *The Physics of Structurally Disordered Matter*, despite its shortcomings, should help to introduce beginning researchers to a field in which pedagogically oriented books for graduate students are still scarce.

DANIEL L. STEIN
University of Arizona

New Directions in Solid State Chemistry: Structure, Synthesis, Properties, Reactivity and Materials Design

C. N. R. Rao and J. Gopalakrishnan
Cambridge U. P., New York, 1986. 516 pp. $79.50 hc
ISBN 0-521-30192-0

The senior author of this book, C. N. Ramachandra Rao, professor of solid-state chemistry at the Indian Institute of Technology, Bangalore, has made significant contributions to the synthesis and characterization of many solids, mainly but not exclusively inorganic. With his collaborator, Jagannatha Gopalakrishnan, he has covered most of the current activities in solid-state science. The attempt at such broad coverage makes the book too dense, moving quickly from one subject to another. Unfortunately, the bibliography is at the end. This makes finding a reference inconvenient. It would have been better to put each chapter's references after the chapter.

Chapter 3, "Preparative Strategies," should be very useful to physicists. It emphasizes synthetic methods such as decomposition of nitrates, cocrystallization of carbonates and sol–gel methods, which lead to formation of complex phases at low temperatures and to fine particle size, necessary when the product is a catalyst but also permit lower sintering temperatures, and, not incidentally, minimize porosity. The chapter also discusses intercalation, de-intercalation and ion exchange. In the midst of these clever strategies, the authors give a well-deserved nod to serendipity, citing Charles Torardi and Robert McCarley's accidental discovery of $NaMo_4O_6$ while attempting to prepare something altogether different. This compound proved to be the prototype of a series of so-called cluster-chain compounds. Another example might be the discovery of $YBa_2Cu_3O_7$-type compounds, which was made while following the methods in Georg Bednorz and Alex Müller's original report (*Z. Physik B* **65**, 189, 1986)—but this book was written before that paper.

Chapter 4, on phase transitions, briefly introduces Landau theory, followed by a quick treatment of soft modes, critical phenomena, mechanisms of phase transitions and so on. The brevity of these discussions makes them hardly adequate to enable the reader to calculate anything. They do serve to convey to chemists the existence of these concepts and to guide them to more detailed treatments.

In the introductory chapters on elementary bonding concepts and structures of solids, the authors cover most of the mandatory material to be found in several books entitled *Solid State Chemistry* or *Structural Inorganic Chemistry*. The book also deals with organic crystals, with examples of charge-transfer salts whose surprising metallic behavior has created much excitement in recent years.

Methods of characterization are briefly discussed, with emphasis on new methods such as EXAFS, XANES, solid-state nmr and various electron spectroscopies, enough detail to illustrate the usefulness of the techniques. Frequent references to reviews and books will help readers to locate more detailed information.

Defects of all types are reviewed in some detail. A case study of defect perovskite oxides shows how particular orderings of defects lead to different structures. Similar case studies are used in chapter 6, on structure–property relationships. A variety of magnetic and electrical properties are covered, from RKKY ferromagnetism and other magnetic orderings to optical and dielectric behavior to superconductivity. Case studies of oxides, sulfides and fluorides are used for illustration. Both band structure and localized bond concepts are used in attempts to understand the phenomena. Some physicists reject this qualitative understanding, but the complexities of most materials preclude the fitting of data to oversimplified models. In any event, the volume under review does not pretend to be a textbook on condensed matter physics. In that spirit, this chapter gives a

concise summary of metal–insulator transitions, both thermal and compositional, and mixed-valence compounds, including charge-transfer complexes. Low-dimensional solids are reviewed briefly.

The book goes on to discuss ferroics, liquid crystals, fast ion conductors, photoelectrochemistry, magnetic materials and amorphous materials, followed by solid-state reactivity, intercalation chemistry, organic reactions and heterogeneous catalysis.

In each case, the authors attempt to create some excitement by appealing to the "latest news" and practical applications. Chapter 7, on materials design, describes a number of major problems related to the energy crisis, and points to work on tailoring solids for storage batteries, solar energy conversion and magnetic bubble memories. The impression that these discoveries all occurred by design is misleading. Experienced workers are aware that the application of garnets to bubble memory devices was unanticipated owing to their cubic symmetry; the explanation of the uniaxial anisotropy of garnets has been the subject of numerous papers.

Having attempted the impossible, a one-volume treatise covering a vast field, the authors give a compact bibliography covering most of the known materials. Perhaps they are lucky to have gone to press before the recent explosion of copper-based superconductors.

The major use of this book is likely to be as a quick reference on the synthesis and properties of recently studied materials with unusual properties. It does not appear to be a viable text, but might be a useful supplement to illustrate structure–property relationships.

EPHRAIM BANKS
Polytechnic University
Brooklyn, New York

Introduction to Modern Statistical Mechanics

David Chandler
Oxford U. P., New York, 1987.
274 pp.
$42.50 hc ISBN 0-19-504276-X;
$24.95 pb ISBN 0-19-504277-8

I recently taught a one-semester course in statistical mechanics, the rapid-fire type in which a student who drops a pencil runs the risk of losing a week's work. Toward the end of the course, one of the students, about to go under for the third time, came to me in desperation. I suggested that she try the text by David Chandler. It worked—not a miracle cure, but it worked.

Measured on a logarithmic time scale, statistical mechanics feels like a middle-aged field. But its target—that of developing concepts and techniques appropriate to systems containing large numbers of similar units—has made it more and more the *lingua franca* of physics. This raises obvious difficulties in writing a modern textbook. One can dispatch—with admiration and without prejudice—older books such as *Principles of Statistical Mechanics* by Richard Tolman, *Statistical Mechanics* by Joseph and Maria Mayer, or even *Statistical Mechanics* by Terell Hill, as inadequate by current standards, too formal and of course incomplete. From a pedagogical point of view, the updated *Statistical Physics* (Pergamon, New York, 1980) by Lev Landau and Ev-