fluences on the structure of the diffracted rays. The mathematical methods are simple but fundamental and suffice to examine all the basic problems without obscuring them. The chapter on small-angle scattering brings together the rather diffuse literature on the subject, much of it by the author himself.

Those who wish to study the mechanics of diffraction and what one can learn from it about crystal imperfections would do well to study this book carefully. Disorder and imperfection problems are of great actual interest and form the subject of extensive investigations. This lucid exposé of the various experimental methods, and of what one can learn from them, is likely to prove extremely helpful to workers in the field.

Fundamentals of Ultrasonics. By J. Blitz. 214 pp. Butterworths, London, 1963. $6.95. *Reviewed by Walter G. Mayer, Michigan State University.*

The small family of introductory texts on ultrasonics has been increased by one. Although this new book is relatively small, it is very informative and should be brought to the attention of the student of physical acoustics who is asking for a modern, uncomplicated, and not particularly specialized book on ultrasonics.

The author divides the book into essentially two over-all groups of chapters: low amplitude and high energy waves. The first of the chapters on low amplitude waves deals with general principles of propagation, velocity, impedance, absorption, reflection, and diffraction. The section on propagation in gases describes classical concepts of velocity and absorption; it also includes a discussion of relaxation and velocity dispersion. The chapter on low amplitude waves in liquids treats current topics like propagation in liquid helium, shear and hypersonic waves in liquids, in addition to more fundamental topics. The section on solids gives enough classical background, so the reader can follow the more modern topics of absorption due to lattice imperfections, electron-phonon interactions, and photosensitive attenuation. These chapters also give condensed descriptions of experimental techniques and methods of measurement. The last chapter in this group describes briefly low power applications: flaw detection, delay lines, and other applications.

The chapter on high energy waves contains short discussions on cavitation, cleaning, and some other effects. The much longer section (Chapter 3) on generators and receivers gives an introduction to transducer theory, and applications of many types of transducers, including the depletion layer transducer.

One should not expect a complete and detailed treatment of all of these subjects, and in some instances the discussion is rather sketchy. This does not seem to be too serious, because the author frequently refers the reader to standard books (Kinsler and Frey, Cady, Mason, Bergmann's collection, etc.) whenever he feels that these books already cover a particular topic. However, in doing so the author has not sacrificed continuity and balance of his own text.

The book is up to date and deals with topics one does not usually find in elementary texts. I believe that students and teachers of ultrasonics will find this book helpful.

Operator Techniques in Atomic Spectroscopy. By Brian R. Judd. 242 pp. McGraw-Hill, New York, 1963. $9.95. *Reviewed by J. A. White, National Bureau of Standards.*

When applied to electronic configurations as complex as those commonly found in rare-earth and transition-metal ions and salts, the familiar, straightforward, and elementary techniques for compounding the angular momenta of equivalent particles often prove discouragingly cumbersome. Many potent methods have been developed to handle such complex configurations, however, and these are expounded with unusual clarity and scope, though not always in great detail, in Professor Judd's *Operator Techniques*. The methods necessarily lean heavily on abstract mathematical properties of finite and continuous groups. Professor Judd has attempted throughout, however, to keep the practical researcher in mind, and has included for this purpose a good and abundant collection of illustrations and exercises (some touching on controversies still current in the literature). He has taken pains with details and has used a consistent and familiar notation.

A list of some of the figures in the text will suggest the range of mathematical topics treated. There are coupling diagrams for 3,6,9, and 12-j symbols, root figures and arrays of weights for continuous groups, and Young tableaux for equivalent electrons. These and interesting asides—to note, for example, which of all simple groups obtained in Cartan's complete classification in 1894 have yet to find application in spectroscopy (answer: surprisingly few—compare p. 112)—lighten the mathematics. Even with the illustrations, the diverting asides, and concise paragraphing, however, the central portion of the book, dealing at length with abstract group properties, may seem unnecessarily demanding and extensive to many workers in the field. Fortunately, much of this material can be left to be savored at leisure as a rich dessert, for the preceding and following sections can be used independently for most practical calculations. Only the simpler group properties are used in the early chapters to dispose efficiently of simple configurations and general effects of external fields, while in the later chapters the reader is instructed in the use of Racah's tables of coefficients to calculate matrix elements in complex configurations.

The practicality of the techniques is nicely illustrated in the last chapter in a detailed discussion of the configuration f^6 such as is found in the Pu ion in PuI. There, the energy levels for the free ion, their decompositions and displacements in crystal fields, and the nature of the superposed hyperfine structure are treated and compared with experiment.

Although ambitious in scope, this is not a long book—only 242 pages. When used either as a text for a graduate course or as a research tool, therefore, it will need to be supplemented with other material to complete the discussion of many subjects. The carefully selected, representative bibliography should be helpful for this purpose, while serving also as an introduction to research problems. To sum up: in this reviewer's opinion, Pro-