abound: all substances are said to show a decrease in heat capacity upon cooling into the cryogenic region, just prior to giving details on low-temperature anomalies; the superfluid (component) conducts heat; the "Schottky anomaly" in a paramagnet is due to an "electric dipole interaction with the electric field of the crystal"; 0.5°K is "low enough" for orienting nuclei by the magnetic hfs alignment method; "phonons" are invoked in discussing pre-1911 forecasts concerning electrical resistivities at low temperatures, and "ions" in discussing ferromagnetic metals.

It cannot be denied that such defects (and the above is by no means an exhaustive compilation) detract seriously from the quality of a book, yet much of value remains. If one may be permitted a further effrontery, it would be to state that many of the needed revisions could be made fairly easily and one would then have at hand a quite attractive introduction to the wide field of cryogenics.

Energy Band Theory. By Joseph Callaway. 357 pp. Academic Press, New York, 1964. $10.00.
Reviewed by Gerald G. Johnson, Jr., Materials Research Laboratory, The Pennsylvania State University.

The calculation of the energy levels of electrons in solids has been given considerable attention in recent years. In writing a book unifying the myriad of works on this subject, Dr. Calloway, in *Energy Band Theory*, has undertaken a formidable project. Dr. Calloway's background, along with his earlier work on this subject (*Electron Energy Bands in Solids*, SSP Vol. 7), well qualifies him for this task.

Finding a text at the advanced graduate level that is clear and well written is certainly a pleasant surprise. Dr. Calloway's insight into the subject material enables him to elaborate on the explanation of many calculations that are too often hidden in the mathematics.

The notation, language, and general principles of band theory are developed early in the text. Through the methods of space groups, crystal symmetries are utilized in the solving of band structures and energy degeneracies. In addition to the spatial symmetries usually considered—translations, rotations, and reflections—the introduction of time inversion complements the spatial group theory.

The book contains a comprehensive survey of the general principles and methods of calculating the energy bands in a solid. The solving of the one-electron Schrödinger equation with the proper crystal potential and appropriate boundary conditions is approached by expanding the unknown function in a set of linear functions. Initially, plane-wave expansions are considered in detail. Due to the usual difficulties associated with plane waves, the orthogonalized plane wave and augmented plane-wave methods are then introduced. The alternate method of Wigner-Seitz is considered but only used in conjunction with the variational method in order to satisfy the boundary conditions by the easiest means. The evaluation of the crystal potential in Schrödinger's equation is first accomplished by means of the Hartree-Fock equations and the self-consistent fields obtained from them. Due to the iterative difficulties involved in the Hartree-Fock method for multielectron atoms, the Wigner-Seitz approximation is carried to the empirically constructed crystal potential. The experimental method for the determination of the crystal potential is finally considered in the quantum defect method.

The experimental results are excellent and complete. In the light of theoretical calculations, various types of crystals are considered—alkali, noble, and transition metallic crystals, and group IV type valence crystals. Specific examples of metals, semimetals, and semiconductors are given in detail. Avoiding mere tabular representation of these results, Dr. Calloway presents the transition from raw data to physical understanding in a logical step-by-step manner. The conclusions are interpolated and many references to experimental results are given for all the solids considered.

The book closes with a selected group of special topics, each of which is covered in good depth. An account of the effect of perturbations, electric, magnetic, and point defect, is discussed in view of the results of band theory. The last chapter gives the theoretical basis of the experimental methods involved in the measurement of parameters used in band-theory calculations.

An elementary knowledge of free-electron theory and band theory is assumed for the reading of this book. For anyone working with energy-band calculations either theoretical or experimental, this work would certainly prove to be of great value.

Linear Algebra and Matrix Theory. By Evar D. Nering. 289 pp. Wiley, New York, 1963. $6.95.
Reviewed by Dagmar Renate Henney, University of Maryland.

The author presents ideas in linear algebra very effectively with the help of matrices. Theory and computational procedures are combined and given equal emphasis. The introductions preceding each chapter (there are six of them) are excellent and help clarify the material substantially. The discussions in the introduction as well as in the body of each chapter are also very illuminating in details. From the very beginning the author explains precisely what he sets out to do. For instance, on page 16 he mentions the differing character of existence of bases in finite and infinite dimensions. On page 71, concerning the uniqueness of the normal form of a matrix, he clearly discusses the kinds of trivial nonuniqueness which we normally tolerate. On page 69, he brings out the double use of the word "equivalence" and on page 83, the double use of "adjoint". The many trivial ambiguities which we normally tolerate in our subject, but which are perplexing to the student, are always brought into consciousness for the student so that he can quickly learn to tolerate them too.

Another good feature of the book is the quick treatment of spectral decomposition in Chapter 3. This compares especially favorably to Halmos who takes (in this reviewer's opinion) too long before leading up to this.

Nering's treatment of determinants on the other hand seems somewhat unfortunate. He departs in it from his avowed program of introducing an abstract vector space concept and then discussing the concept's expression in matrix form. This means that until he has covered the first third of his book (i.e., up to page 93), Nering cannot assign a determinant to an operator. Determinants appear as a formidable complex computational tool which fortuitously can be applied to operators, which in turn can be calculated when necessary. The reason for this lapse from Nering's avowed program of vector concepts is clear. Trilinear forms, which precede determinants, must be preceded by linear forms. The author does not want to discuss linear forms until much later, in connection with bilinear forms and inner products. The reviewer believes though that any instructor can use Nering and add the extra material on linear forms and trilinear forms before determinants, without destroying the author's organization of the subject. This book is highly recommended as a textbook.

Selected Topics in Nuclear Spectroscopy. Summer School Proc. (Nijenrode Castle, Netherlands, July-August, 1963). Compiled by B. J. Verhaar. 348 pp. (North-Holland, Amsterdam) Interscience, New York, 1964. $12.50.
Reviewed by M. E. Rose, University of Virginia.

A review of the proceedings of summer school lectures and seminars, such as this one, is useful only if the prospective audience is given information concerning the actual contents thereof. This volume contains sixteen lectures given by twelve contributors. By and large, the subject matter is concerned with three topics although, obviously, there is some overlap among them. They are: (1) nuclear structure as revealed by energy level data and as interpreted in terms of nuclear models (shell, collective), (2) nuclear structure as revealed by reaction data and interpreted by the current models (e.g., optical), and (3) weak interactions. In the last category the emphasis is on the conserved vector current theory, its predictions and the attempts to establish its validity. In addition, the induced pseudoscalar interaction is the primary object of the discussions centered on muon capture.

In detail, lectures which are to be classified under category (1) are: Collective models by K. T. Hecht, En-