under $G_{i-1} \mid G_i$, then the factorization $h = \prod_{i=1}^{\mu}(F_i\,;\,G_i)$ is called an *indexial.* Chapter IV deals with complects of non-nilpotent subgroups of G. A Π-complect is defined as a mapping σ of Π into the subgroup set of G such that the order of the image of σp is divisible by p and the images of different members of Π are non-isomorphic.

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76[G].—D. K. FADDEYEV, *Tables of the Principal Unitary Representations of Fedorov Groups*, Mathematical Tables Series, Vol. 34, Pergamon Press, Ltd., Oxford, England, distributed by The Macmillan Co., New York, 1964, xxvi + 155 pp., 21 cm. Price $10.00.

The term "Fedorov group" is used in this book to denote what is more commonly called a space group, i.e., an infinite discrete group of Euclidean motions and reflexions of 3-dimensional Euclidean space which leave no point and no line or plane invariant. Space groups are fundamental in crystallography, and there are, in all, 230 of them. The subgroup, H, of any space group, G, which consists of the Euclidean translations contained in G, is an Abelian normal subgroup of G, and the factor group G/H is one of 18 different finite groups. The integral unimodular 3-dimensional representations of these finite groups define what are commonly known as crystal classes, of which there are in all a total of 73. The elements of H define a crystal lattice, which may also be denoted by H, and the lattice reciprocal to H is denoted by H^*. The lattice H^*, combined with the factor group G/H, furnishes a space group G^*, and certain space groups G have the property that the transform of a given vector, u, from the fundamental region of G^*, by any element of G differs from u by an element of H^*. Every vector u from the fundamental region of G determines an irreducible unitary representation of G, and when G has the property mentioned, this representation is termed basic. It is these basic representations which are tabulated, for all 73 crystal classes, in the present book. A short indication of how to determine nonbasic representations from the basic representations is furnished.

The book is carefully printed and should be very useful to anyone working in the field of crystallography.

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77[G, X].—HANS SCHNEIDER, editor, *Recent Advances in Matrix Theory*, University of Wisconsin Press, Madison, Wisconsin, 1964, xi + 142 pp., 24 cm. Price $4.00.

This book, the proceedings of an advanced seminar on matrix theory held at the Mathematics Research Center, University of Wisconsin, on October 14–16, 1963, is a collection of the following six papers:

1. Alfred Brauer, "On the characteristic roots of nonnegative matrices," pp. 3–38.
2. A. S. Householder, "Localization of the characteristic roots of matrices," pp. 39–60.

3. Marvin Marcus, "The use of multilinear algebra for proving matrix inequalities," pp. 61–80.
4. A. M. Ostrowski, "Positive matrices and functional analysis," pp. 81–101.
5. H. J. Ryser, "Matrices of zeros and ones in combinatorial mathematics," pp. 103–124.
6. Olga Taussky, "On the variation of the characteristic roots of a finite matrix under various changes of its elements," pp. 125–138.

Briefly, each author makes a penetrating study of a particular facet of matrix theory, and each author unifies and summarizes the important results in his area. This book is, without question, a very valuable collection of results and references in modern matrix theory, and the editor, Hans Schneider, is to be congratulated for his successful efforts in bringing together such distinguished researchers and for editing the final results.

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78[G, X].—GERHARD SCHRÖDER, *Über die Konvergenz einiger Jacobi-Verfahren zur Bestimmung der Eigenwerte symmetrischer Matrizen*, Forschungsberichte des Landes Nordrhein-Westfalen, Nr. 1291, Westdeutscher Verlag, Opladen, 1964, 59 pp., 23 cm. Price DM 58.50 (paperback).

As the title implies, this report deals with the convergence of Jacobi methods for the determination of the eigenvalues (and eigenvectors) of real symmetric matrices. Specific methods considered are the classical Jacobi method, the cyclic-Jacobi method, and the threshold-cyclic-Jacobi method.

For a number of cyclic methods a new proof of convergence is given which indicates quadratic convergence for a matrix with distinct eigenvalues. In the case of multiple and close eigenvalues, the classical Jacobi method and the cyclic-threshold-Jacobi method are examined. It is shown, for these methods, that convergence is improved for matrices with multiple eigenvalues. Close eigenvalues also improve the convergence.

Some numerical examples are discussed. For matrices of low order, high-accuracy computations were performed and the results obtained confirm the theoretical results about the rates of convergence of the methods employed.

For matrices of higher order, computations were performed with ordinary accuracy. Results obtained permit a comparison of the methods, with regard to speed and accuracy, and thus permit an evaluation of the methods for the practical determination of all eigenvalues and eigenvectors of a real symmetric matrix.

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79[K, X].—ROBERT M. FANO, *Transmission of Information, A Statistical Theory of Communictions*, The Technology Press, M.I.T., and John Wiley & Sons, Inc., New York, New York, 1961, 389 pp., 24 cm. Price $7.50.

Professor Fano's valuable textbook on modern information theory (for, certainly, it is not a research monograph) is the considered outgrowth of nearly ten