The authors of this book have made an important contribution in this area, by assembling and presenting in one volume some of the best known techniques currently being used in the solution of partial differential equations by finite-difference methods. This, I am certain, has not been an easy task, owing to the fluid state of many of the theories in this field. For the same reason it is not possible, at the present state of flux, to write a book on this subject which will successfully withstand the test of time. The authors well recognize this point when they state in their introduction: "The literature on difference methods for partial differential equations is growing rapidly. It is widely scattered and differs greatly in viewpoint and character. A definitive presentation of this field will have to wait until the present period of intense development has come to at least a temporary halt."

The book contains an introductory chapter in addition to four major chapters, as follows:

Introduction to Partial Differential Equations and Computers
1. Hyperbolic Equations in Two Independent Variables
2. Parabolic Equations
3. Elliptic Equations
4. Initial-Value Problems in More than Two Independent Variables.

Topics covered within these chapters include the concept of stability, the method of characteristics, the numerical solution of problems involving shock waves, the theory of Lax and Richtmeyer, the solution of eigenvalue problems, the Young-Frankel theory of successive over-relaxation, and the method of Peaceman and Rachford.

The phenomenon of instability, which frequently arises to plague and invalidate many solutions of partial differential equations by finite-difference methods, is discussed in detail. However, this reviewer cannot, in good conscience, agree with the method of approach used in presenting this important and fundamental concept. The authors begin their discussion by stating: "Although the stability of difference equations has been amply discussed in the literature, one rarely meets precise definitions. The subject is therefore in need of further clarification." Subsequently the authors proceed to develop their own definition of stability, which in the opinion of the reviewer, is neither precise nor especially illuminating. The definition of stability is unnecessarily complicated by its tie-in with the concept of convergence and with the "cumulative departure," whose order of magnitude can, in the words of the authors, "rarely be exactly determined."

Notwithstanding any differences of opinion concerning the method of treatment of specific topics, the book is highly recommended as an authoritative and timely exposition of some of the most significant techniques currently available for the solution of partial differential equations by finite-difference methods.

H. P.

33 [I, X].—CHARLES JORDAN, *Calculus of Finite Differences*, Second Edition, Chelsea Publishing Co., New York, 1960, xxi + 652, 21 cm. Price $6.00.

This is a reprint of the second edition of the well-known book by Charles Jordan. The republication of this excellent text on the calculus of finite differences and its availability at a reasonable cost should be welcomed by all students of numerical analysis.

H. P.

34 [K].—W. S. Connor & Shirley Young, *Fractional Factorial Designs for Experiments with Factors at Two and Three Levels*, NBS Applied Mathematics Series, No. 58, National Bureau of Standards, Washington, D. C., 1961, v + 65 p. Price $0.40.

This publication contains a collection of fractional factorial designs for experiments in which some factors are to be studied at two levels or conditions and others at three levels. It is the sequel to two other catalogs [1], [2] of designs in the National Bureau of Standards Applied Mathematics Series that contain, respectively, plans for m factors each at two levels, and plans for n factors each at three levels. This new document gives plans for the mixed series involving $(m + n)$ factors, where the m factors each at two levels and the n factors each at three levels are given for 39 combinations (2^m3^n) of positive integer values of m and n for which $5 \leqq m + n \leqq 10$.

For each design the following are given: number of effects estimated, number of treatment combinations employed in the design, fraction of complete factorial experimental plan, analysis, and construction.

The method of construction of designs is described in Section 2. Fractions are selected so that low-order interaction effects, including main effects, are aliased with each other as little as possible. Section 3 contains a description of the mathematical model, in which it is assumed that all interactions between three or more factors are nonexistent, and a procedure for estimating the parameters contained in the model. Section 4 contains a discussion of procedures to test hypotheses and to construct confidence intervals. A worked example of $2^3 3^2$ design is presented in Section 5.

Section 6 is devoted to six particular designs for which the interaction effects between factors at three levels are defined in a different manner from that of the other designs.

H. H. Ku

National Bureau of Standards
Washington, D. C.

1. National Bureau of Standards, *Fractional Factorial Experiment Designs for Factors at Two Levels*, NBS Applied Mathematics Series, No. 48, U. S. Gov. Printing Office, Washington, D. C. 1957.

2. W. S. Connor & Marvin Zelen, *Fractional Factorial Experiment Designs for Factors at Three Levels*, NBS Applied Mathematics Series, No. 54, U. S. Gov. Printing Office, Washington, D. C., 1959.

35 [K].—N. V. Smirnov, Editor, *Tables for the Distribution and Density Functions of t-Distribution ("Student's" Distribution)*, Pergamon Press Ltd., New York, 1961, 130 p., 28 cm. Price $12.50.

This book, which is Volume 16 in the Mathematical Tables Series of Pergamon Press, is a translation of the Russian work issued by the V. A. Steklov Mathematical Institute of the Academy of Sciences of the U. S. S. R. There are three main