of the z distribution as to independence of the estimates of the variance is satisfied.

But from a less rigorous point of view, there are many features in the book which are commendable. Some of these have already been indicated in our description of the contents; but special mention should be made of the fact that every significant piece of theory is illustrated with an illuminating numerical example, and there is a generous number of good exercises at the end of each chapter.

It is the reviewer's personal opinion that the book would be successful in its first aim (as a classroom text for a first course in statistics) only if it were used to supplement a set of lectures by a skillful teacher. But for the more advanced student of statistics who is not entirely familiar with the methods of Fisher and his followers, the book should prove to be a valuable reference work. Comparison is inevitable in this connection with Fisher's well known text, *Statistical Methods for Research Workers*,[1] for Rider covers somewhat the same theoretical ground and will appeal to much the same group of readers. Although there is something to be said for Fisher's omission of almost all mathematical notation when writing for these readers, it seems to the reviewer that wherever there is overlapping between the two books, Rider definitely excels in organization of material and clarity of presentation. This is not meant to imply that Rider should supplant Fisher in the statistical workers' library. Fisher's book contains a great many valuable suggestions, explanations, and warnings (and also dogmatic assertions) concerning experimental technique which are not to be found in Rider. But as a companion volume, and as a sort of translation of some of the more obscure passages in Fisher's book, Rider should immediately find an important place.

J. H. CURTISS

The Mathematical Theory of Huygens' Principle. By B. B. Baker and E. T. Copson. Oxford, Clarendon Press, 1939. 7+155 pp.

This work is the first of a series of monographs planned by the authors on the mathematics of physics. Each monograph is to be complete in itself and deal with some special topic in the theory of the partial differential equations of mathematical physics not adequately treated in existing books.

The aims of the authors are admirably achieved in the first monograph which deals with the mathematical theory of Huygens' principle in the propagation of sound and light waves. The theme of the

[1] Oliver and Boyd, Edinburgh and London.

work is the general theory of the solution by Green's method of the partial differential equations governing these phenomena.

Huygens' principle is a well known elementary method for treating the propagation of waves. The method assumes that a spherical wavelet starts out with velocity c from each point of a given wave front at time $t=0$. Each wavelet will have a radius ct at time t, and the envelope of these wavelets is taken to be the resulting wave front at this later time t. A difficulty arises in that this geometrical construction would give a wave traveling backward, as well as one traveling forward. To avoid this difficulty it is necessary to generalize Huygens' principle by having recourse to an analysis of the partial differential equation governing the wave motion and of the boundary conditions to be satisfied.

Chapter I deals with an analytical formulation of Huygens' principle for wave fields described by a single wave function. The physical example taken to illustrate this theory is the propagation of sound waves in which the wave function is the scalar velocity potential. Poisson's solution of the wave equation is shown to justify Huygens' construction for isolated spherical or plane sound waves generated by an initial temporary disturbance. Similarly Helmholtz's solution is shown to justify Huygens' principle for periodic trains of waves. Finally sound waves of any structure and origin are treated by means of a general theorem due to Kirchhoff. The chapter closes with a discussion of the solutions of the equation of cylindrical waves by Weber and Volterra. In this connection the recent important work of Professor Marcel Riesz is described in detail.

Chapter II gives an account of the diffraction of light by a black screen on the basis of Kirchhoff's theory according to which the field of a train of light waves may be described by a single scalar potential. Maggi's transformation is introduced by means of which the wave function of the diffracted light is expressed as a line integral along the rim of the diffracting screen. The diffraction of plane and spherical waves by a black half-plane is considered in detail.

The phenomenon of the polarization of light can be accounted for on the basis of the electromagnetic theory of light according to which the field of radiation can be described as a vector field. Chapter III is devoted to a formulation of Huygens' principle for electromagnetic waves in a vacuum. The Larmor-Tedone formulation and Kottler's formulation are compared. The diffraction of polarized light by a black screen is discussed from Kottler's point of view.

Chapter IV is devoted to an account of Sommerfeld's theory of the diffraction of polarized light by a perfectly reflecting half-plane and of

Voigt's theory of the diffraction of polarized light by a black half-plane. The method of many-valued wave-functions and Riemann surfaces is employed.

The standard of knowledge expected of the reader of this work is that of a graduate student who has completed the usual courses in analysis and electromagnetic field theory. Twenty-three exercises are provided in the first three chapters. The text is replete with footnote references to papers that have appeared in the literature up to 1939. By rigor of logical treatment and careful attention to detail the authors have produced a critical treatise which will undoubtedly become a standard reference work.

W. E. BLEICK

Modern Elementary Theory of Numbers. By Leonard Eugene Dickson. Chicago, University Press, 1939. 305 pp.

The first few chapters of this book contain, with minor exceptions, the same material as the corresponding chapters of Dickson's *Introduction to the Theory of Numbers.* This may lead those familiar with the earlier book to think that this is a new edition of that book. It is much more than that. Where the topics are the same the explanations are lengthened, more proofs included, examples worked to give clarity to the text and the number of exercises increased. Beginning with the fifth chapter the book is almost completely rewritten. New material and modern topics are introduced. Here Dickson has been able to offer more simply some of the work in theory of numbers that has been in the literature in recent years and to obtain some new results.

Chapters I through IV deal with divisibility, congruences and their solutions, quadratic residues and binary quadratic forms. Dickson states in his preface that these with a few chosen topics from the chapters on indefinite ternary quadratic forms and Diophantine equations would provide a brief elementary course.

Quadratic forms are the subject of several of the later chapters. In Chapter V a study is made of the numbers represented by various ternary quadratic forms with numerical coefficients. A table is given consisting of 102 regular forms and all positive integers not represented by each form. Chapter VIII treats of indefinite ternary quadratic forms, universal and zero forms. Here the problem of representation of integers by indefinite forms whose coefficients involve parameters is studied. The necessary and sufficient conditions for integral solutions of indefinite quadratic forms in four or more variables where the form equals zero are found in Chapter IX. And Chapter