and may be more fruitful to begin with the transform and examine its modification by the crystal lattice. The means of doing this optically, which is a subject of which they have special experience, is only briefly mentioned in an appendix, and is to be dealt with in a further publication. Applications of the Fourier transform theory to the trial-and-error method, to sign determination, to the direct recognition of molecular features, to structural imperfection such as stacking disorder, to the effects of crystal size and shape and other problems are given brief but stimulating consideration. In dealing with temperature effects, however, the impression is given that the diffuse regions around all reciprocal lattice points are similar and parallel, and this is an error which should be corrected in the next edition.

KATHLEEN LONSDALE

Introduction to Difference Equations with Illustrative Examples from Economics, Psychology and Sociology

By Prof. Samuel Goldberg. Pp. xii + 260. (New York : John Wiley and Sons, Inc. ; London : Chapman and Hall, Ltd., 1958.) 54s. net.

IN recent years new developments in the social sciences, economics, psychology and sociology have involved an increasing use of mathematics, and a branch of the subject which has found widespread application is the theory of difference equations. The book under review covers this topic and is "primarily intended for social scientists". The exposition is at an elementary level, and the style is sufficiently easy for the ordinary undergraduate to understand the methods for solving difference equations and to learn of some of the recent research applications such as inventory analysis and probability models for learning.

Two features of the book deserve special mention. There are a number of worked-out examples to illustrate the text and more than 250 problems with answers, so that the work should be very useful as a text-book. There are also many references to recent research papers, where the research student may find more detail. Altogether the book gives the impression of having been carefully written and with the student very much in the mind of the author.

Some topics of a relatively advanced nature are gently introduced towards the end. These include matrix methods, generating functions, a characteristic-value problem and the analysis of equilibrium and stability. The latter, unfortunately, is only discussed in the case of a second-order auxiliary equation, and the reviewer believes that it would have been useful to discuss the case of higher-order equations, via the Routh-Hurwitz determinantal conditions.

L. S. GODDARD

An Introduction to Combinatorial Analysis

By John Riordan. (A Wiley Publication in Mathematical Statistics.) Pp. xi + 244. (New York : John Wiley and Sons, Inc. ; London : Chapman and Hall, Ltd., 1958.) 68s. net.

THE classical text-book by Netto, "Lehrbuch der Combinatorik", published in 1901, is unknown to most present-day mathematicians ; and the subject-matter, namely, problems of enumeration, has been generally out of favour for two decades or more. Now the book under review appears and new life

is thereby injected into the subject. The author has given a careful exposition of various developments of recent decades which have until now remained locked away in scattered journals and proceedings. Perhaps the most valuable aspect of the present work is this bringing together of material and the connected account of a topic which is important in various branches of applied mathematics and probability theory, as well as in certain parts of pure mathematics where there is still an interest in finding 'the number of ways'.

For the contents an introductory chapter on permutations and combinations is followed by an important chapter on generating functions, including the polynomials of E. T. Bell. Then there are chapters on the principle of inclusion and exclusion, cycles of permutations, distributions and occupancy. The next chapter, which comes near to parts of graph theory, is concerned with partitions, compositions, trees and networks. The explicit results find application in the theory of electrical networks and in systems engineering, including coding problems in data transmission. The last two chapters cover permutations with restricted position.

The book includes a large number of problems and explicit results at the end of each chapter. These are for the serious student who wishes to know 'how to do it' rather than what has been done. They are, as the author says, "put in a form to aid rather than baffle", and they assume, as does the text itself, a considerable degree of mathematical maturity on the part of the reader.   L. S. GODDARD

Technology of Instrumentation

By Prof. Eric B. Pearson. (Applied Physics Guides.) Pp. 202. (London : English Universities Press, Ltd., 1958.) 25s. net.

INSTRUMENTS are indispenable in modern scientific and engineering work, and an understanding of the principles of operation is essential if correct results are to be obtained. The main emphasis is on the performance of the standard laboratory milliammeter type of instrument. The static and dynamic characteristics of instruments are explained and the importance of a knowledge of the transient response of an instrument is demonstrated. Electronic instruments are not included, and it is unfortunate that the cathode-ray oscilloscope is omitted since it is valuable where non-sinusoidal wave-forms are to be measured.

The application of instruments to control systems occupies the larger part of the book. The principles of servomechanisms are dealt with at length, and topics discussed include velocity feedback, reduction of velocity lag and general conditions for stability. A chapter on servomechanism components describes a number of elements used for measuring the difference in angular position of output and input shafts of a mechanism. This is followed by a description of electronic and hydraulic amplifiers and motors for supplying power to an output shaft. The final chapter on instrumentation of mathematics describes a number of electrical and mechanical devices for integrating and multiplying.

The book forms a useful introduction for students in the subjects of instrumentation and servomechanisms, but it is unfortunate that the author has not considered a wider range of measuring instruments and measurement principles.

R. L. GRIMSDALE