EPSTEIN, BERNARD, *Partial Differential Equations—An Introduction* (McGraw-Hill, New York, 1962), x+273 pp., 74s.

The subject of Partial Differential Equations is greatly neglected in Britain. Most of the workers in this field are Applied Mathematicians, interested in obtaining an analytical or numerical solution of some physical problem in which a partial differential equation arises. It is therefore a pleasure to welcome a book in English whose object is to present a rigorous modern treatment of the subject.

Although there is one chapter (Chapter 2) which gives the classical theory of partial differential equations of the first order, the book is almost wholly concerned with the quasi-linear equation of the second order, usually with two independent variables.

The book is intended for first-year graduate students, in the American terminology. The first chapter of 27 pages contains an account of the parts of the theory of functions of a real variable which the reader will need in the sequel.

Chapter 3 is concerned primarily with the Cauchy Problem for the quasi-linear equation $ar+2bs+ct+f(x, y, z, p, q) = 0$ in the usual notation, where $a$, $b$, $c$ are functions of $x$, $y$ alone. It introduces the idea of characteristics, the classification into equations of elliptic, parabolic and hyperbolic types, and the solution of the problem of Cauchy by Riemann's method. All this is classical, and can be found equally well in Goursat.

Newer ideas are introduced in Chapters 4 and 5, which are concerned with the Fredholm Alternative in a Banach or Hilbert Space, the principal object being to develop the theory of linear integral equations of Fredholm type. Instead of dealing explicitly with integral equations, the author presents a more abstract approach in terms of normed linear spaces. These chapters provide an excellent elementary introduction to the subject of abstract linear algebra.

Chapter 6 gives an introduction to the Elements of Potential Theory (Logarithmic Potential), followed by a long chapter of 50 pages on the Problem of Dirichlet. This problem is treated vigorously in five ways; (i) Poincaré's method of balayage, (ii) the method of Perron and Remak, (iii) the method of integral equations, (iv) the Dirichlet principle method, (v) the Courant-Friedrichs-Lewy method of finite differences. The chapter concludes with a brief account of the Riemann conformal mapping theorem.

The remaining two chapters deal with the Equation of Heat and Green's Functions and Separation of Variables, and are in more classical style.

In each chapter, there are many interesting exercises, and, at the end of the book will be found solutions to many of these.

Throughout the book, emphasis is laid on existence and uniqueness theorems, rather than on the effective solutions of specific classes of particular problems. The author intends it as a complement to other books which emphasise the more practical or applied aspects of the subject.

I can heartily recommend this book to the reader who wants a sound introduction to the rigorous theory of partial differential equations.

E. T. COPSON

*Essays on the Foundations of Mathematics*, edited by Y. BAR HILLEL, E. I. J. POZNANSKI, M. O. RABIN and A. ROBINSON (North Holland Publishing Co., 1962), 351 pp.

This handsome volume of essays is dedicated to A. A. Fraenkel, a pioneer in the logical study of set theory, in honour of his seventieth birthday on February 12, 1961. The collection is divided into four parts reflecting Fraenkel's interests in foundation studies, preceded by a bibliography of Fraenkel's works. Part I contains six papers on axiomatic set theory amongst which are a new codification of set theory by Paul Bernays. Part II contains an important paper by Th. Skolem on the interpretation

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