The main goal of this book is realized in Chapter 4 with the classification theory of open Riemann surfaces. This classification is carried out according to which classes of harmonic or analytic functions the Riemann surface supports. The problem is to find the possible inclusion relations between the different classes of surfaces. The known class inclusions are presented along with counterexamples to show that certain inclusions are not equalities. Many tools, such as the methods of extremal length, harmonic and analytic modules, deep coverings, and triangulations of bounded distortion, are introduced to provide tests for the class of a Riemann surface. There is certainly a wealth of ingenious devices contained in this chapter.

The book closes with a chapter devoted to the more classical theory of closed Riemann surfaces. The existence of harmonic and analytic differentials is repeated, this time using the method of orthogonal projections. A brief synopsis of the theory of abelian integrals on closed Riemann surfaces includes the Riemann-Roch theorem and some of its consequences. Perhaps it should be added that the book contains no lists of problems for the student. It does, however, contain an extensive bibliography.

GEORGE SPRINGER

*Anfangswertprobleme bei partiellen Differentialgleichungen.* By Robert Sauer. 2d ed. Grundlehren der mathematischen Wissenschaften, vol. 62, Springer Verlag, Berlin-Göttingen-Heidelberg, 1958. DM 38, bound DM 41.

A review of the first edition appeared in volume 59 (1953), of this Bulletin.

Only minor changes have been made in the first four chapters. In the new edition an extensive fifth chapter dealing with the theory and applications of distributions has been added. Distributions are introduced as symbolic derivatives of functions belonging locally to $L_1$. Their relations to Hadamard's theory of integration of second order equations and to the Riesz method of solution by means of analytic continuation are discussed. Applications of distributions to the solution of some specific problems of supersonic flow are given.

The book is concerned mainly with hyperbolic systems of equations in two independent variables and with problems relating to the wave equation in higher dimensions. Not included are more recent advances in the theory of equations of mixed type and of higher order equations in several variables. Within the limitations of subject matter this slim volume contains a wealth of well integrated material. Analytic constructions of solutions are usually accompanied by discussions of numerical methods and applications (mostly taken from the study of compressible flows). The book should be well suited to the needs of the physicist or engineer concerned with applications of partial differential equations.

This reviewer noticed only one inaccuracy. The definition of Green's function given on p. 141 has to be modified if the principal part of the elliptic operator is not the Laplacean.

FRITZ JOHN

*Funkcje Rzeczywiste* (*Real functions*), vol. II. By Roman Sikorski. (Monografie Matematyczne, vol. 37). Warsaw, Panstwowe Wydawnictwo Naukowe, 1959.

The second volume of Sikorski's *Real functions* (cf. the review of the first volume in Bull. Amer. Math. Soc. vol. 65 (1959) pp. 305–306) deals with function spaces, orthogonal series with special treatment of Fourier series and Fourier integrals. Chapter 12 gives an account of linear normed spaces and contains an account of bi-linear operations, of convolutions of functions, rings of functions, and the distributions of Sobolev-Schwartz. Chapter 13 deals with Hilbert space and orthogonal series, with a detailed discussion of convergence almost everywhere. Chapter 14, devoted to Fourier series, includes a discussion of convergence almost everywhere, and of periodic distributions. The final chapter deals with Fourier integrals, discusses criteria of convergence and an analogue of Fejér's theorem.

Instructive and interesting exercises accompany every paragraph. This volume continues the excellent treatment characterizing the first part—in its modern point of view and the concise and elegant development of recent results.

STANISLAW ULAM