

BOOK REVIEWS

Transfinite Zahlen. By H. Bachmann. (Ergebnisse der Mathematik und ihrer Grenzgebiete, New Series, vol. 1.) Berlin, Springer, 1955. 7+204 pp. 29.80 DM.

This first volume in a new series of the *Ergebnisse* continues the admirable tradition of the original series, of presenting a very valuable up-to-date guide to the results, problems, and literature of a special field—in this case the theory of transfinite numbers: ordinal numbers and powers, but not general order types. The author develops the theory from the beginning, in a clear and rigorous fashion, and presents proofs of most of the theorems cited, so that the book could well serve as the basis for an intensive course in transfinite numbers. The treatment is founded on the Zermelo-Fraenkel axiom system but is expressed in the language of naïve set theory, and although axiomatic questions are considered, the emphasis is definitely on the arithmetical aspects of the theory. It is shown how far it is possible to get in various branches of the subject before applying the axiom of choice to derive further results, and the use of this axiom is always expressly indicated.

The first chapter opens with a brief discussion of naïve set theory, the foundations problem, and the various schools of mathematics. The axioms are then introduced, as well as the fundamental notions of equivalence, similarity, well-ordering, transfinite induction, and transfinite number.

The next two chapters are devoted to the theory of ordinal numbers, mostly without the use of the axiom of choice. One finds here, in addition to standard material, a simple treatment of principal numbers, as well as recent results concerning normal functions, regressive functions, sequences of continuous functions, rarified classes of ordinal numbers, and permutations of sequences of ordinal numbers.

The fourth chapter is concerned with the arithmetic of powers without the aid of the axiom of choice, and then in the fifth chapter this axiom is used to develop the arithmetic of cardinal numbers. Much of what is known concerning alephs and beths (transfinite powers of alephs) is to be found here. The generalized continuum hypothesis, some consequences of it, and some propositions equivalent to it are also discussed.

Chapter six deals with the well-ordering and the cardinal number

of the continuum considered as an order type, and with the second number class and the problem of distinguished sequences. A few of the point-set-theoretical consequences of the continuum hypothesis are noted. There is a brief remark on the formal representation of ordinal numbers, and a short section on alternatives to the axiom of choice.

The work closes with a chapter on inaccessible numbers.

In addition to an index, the book is supplied with a useful bibliography arranged according to groups of sections in the text.

Springer's printing is excellent, as usual.

F. BAGEMIHLE

Experimental design, theory and application. By W. T. Federer. New York, Macmillan, 1955. 19+544+45 pp. \$11.00.

This book is addressed exclusively to the experimenter and practical statistician and presents a thorough comprehensive discussion and description of all major types of designs and of the methods for their analysis. Many of the designs described are here for the first time incorporated in a book. The underlying mathematical models are not discussed, but references to the pertinent literature are given. Although the book is not addressed to mathematicians or mathematical statisticians, it will be useful for this group as a reference work.

H. B. MANN

Mathematical theory of elasticity. 2d ed. By I. S. Sokolnikoff. New York, McGraw-Hill, 1956. 11+476 pp. \$9.50.

This book constitutes a welcome contribution to the field. It is well written, and is extensively documented, particularly in so far as work in Russia is concerned. This book fills a need which has been apparent for quite some time.

There are seven chapters. Chapters 1-4 and Chapter 7 contain the material which appeared in the first edition, except for minor modifications.

Chapter 5 is new. It deals with the two-dimensional problems of plane strain and of generalized plane stress, which are of course identical mathematically. The method of attack which is usually associated with the name N. I. Muskhelishvili is treated in considerable detail. It will be recalled that in this method the problem is reduced to the determination of two functions of a complex variable, which functions are determined by conformal mapping, together with either solution in series or the solution of certain integrodifferential equations. This material appeared in the author's Brown University