(3) The definitions based on the notion of measure. The starting point here is the linear measure of Carathéodory, that is, measure of order unity. There is then given an outline of the generalizations due mainly to Hausdorff and the relation of this to the work on potential theory done mainly about the middle of the last decade. There is also a brief discussion of the work on transfinite diameter in which the names of Pólya, Szegö, and Fekete play the prominent role.

This book furnishes an excellent sketch of the various points of view and serves as an introduction to a more detailed study for which there are available Menger's book on dimension, Fréchet's *Espaces Abstraits*, and a host of original articles.

J. R. KLINE

Versicherungsmathematische Aufgabensammlung. Vol. 1. *Beiträge und Deckungsrücklagen in der Lebensversicherung.* By C. Boehm and E. Rose. 75 pp. Vol. 2. *Umwandlung von Lebensversicherungen.* By C. Boehm and P. Lorenz. 52 pp. Leipzig and Berlin, Teubner, 1937.

These two pamphlets contain a collection of problems with their solutions illustrative of the more simple types of calculations of an actuarial nature which are required in actual life insurance practice. Although the authors very properly point out in the two prefaces that no book can be a substitute for actual experience, these pamphlets are written from a more practical standpoint than most textbooks and provide an interesting and valuable insight into the practice of German life insurance companies. The first volume deals with the calculation of net single premiums, net annual premiums, gross premiums, net reserves, gross reserves, and special plans of insurance, in that order. The examples seem, on the whole, well chosen, and cover the ground well. The argument against the use of ultraconservative interest and mortality bases on page 12 seems to the reviewer rather naïve and unconvincing. On page 27 in a problem to determine what per cent of the gross premium the various elements of expense constitute, the collection cost is expressed as a percentage of the entire gross premium, while in the case of the clerical and administrative expense and the prorated initial expense the denominator used is the gross premium less the collection expense. This may be the German custom but would seem to call for a word of explanation. The statement on page 51 that the prospective formula is the simplest for calculating net reserves is true, in general, but it is odd that it should occur in the discussion of a special varying insurance for which the retrospective formula would have been easier.

The second volume gives the impression that the German treatment of the difficult problem of policy changes is characterized by the same balancing of theoretical accuracy against practical expediency which is typical of our own approach to the subject. The per mille symbol referred to by Professor Dodd in the September 1938 Bulletin in reviewing a similar book is used frequently, and by its similarity to the per cent sign may confuse the reader to whom it is not familiar. The explanations are clear, and, generally speaking, these books have accomplished their purpose in an admirable fashion.

T. N. E. GREVILLE

Stellar Dynamics. By W. M. Smart. Cambridge, University Press; New York, Macmillan, 1938. 8+434 pp.

This book is an effort to present, in considerable detail, the development of stellar dynamics from a mathematical treatment of the results of observations. The general theory of the correction of observed facts is treated and results of this treatment are applied to the correction of parallaxes, absolute magnitudes, and transverse velocities.

The parallaxes which are derived in Chapter VI by a statistical discussion of the proper motions are of especial interest, for it was by applying this method to the Cepheids that Shapley and others determined the distances of the globular clusters.

The mathematical theory of a single star drift and its conflict with observations led Eddington to the division of the stars into two drifts. Both the single and double drift theories are discussed, the former leading up to the determination of the solar motion and the latter connecting with Kapteyn's two stream theory. A later chapter develops Schwarzschild's ellipsoidal hypothesis, and the results obtained by the use of different theories are frequently compared.

Much of the work on stellar statistics, particularly that of a theoretical nature, has been available for twenty-five years, but the practical applications have been few due to the lack of sufficient observed data. The author supplies this want in Chapter VIII.

The last few chapters are largely concerned with the work of Jeans and Eddington on stellar dynamics, and some very recent results have been incorporated. One of the most interesting chapters, at least to the reviewer, is concerned with galactic rotation.

The entire book bristles with probability integrals and complicated mathematical formulas. One wishes that it might be possible to read such a book without encountering the probability integral so often. It is not clear, always, just what the author is trying to show nor what has been proved after a page of formulas. Perhaps this is unavoidable; at least the author warns us in the preface that he is aiming at a mathematical treatment. One wonders occasionally if his equations are not "yes men" who give a mathematical character and amplification to the ideas entrusted to them by their master.

The book is well worth the effort required to read it and is the best available account of the subject. Dr. Smart is to be congratulated on the successful completion of such a comprehensive and scholarly book.

H. E. BUCHANAN

Vectoranalysis. By Siegfried Valentiner. (Sammlung Göschen, no. 354.) Berlin and Leipzig, de Gruyter, 1938. 136 pp.

The first sixty pages are devoted to the definition, algebra, differentiation, and integration of vectors. To motivate the development the author draws freely upon mechanics. In the second part of the book vectors are applied to potential theory, hydrodynamics, and the theory of electricity. Part three deals with linear vector functions, dyads, and tensors with applications to the theory of elasticity. The book contains thirteen carefully chosen figures and closes with a table of the more important formulas used. The notation is conventional.

The task of including so much material in such a few small pages required skillful planning. Although the explanations are in general not detailed, the beginner will find the account readable. For the person already acquainted with the elements of vector analysis the book will be a useful handbook.

V. V. LATSHAW

Grundbegriffe und Hauptsätze der höheren Mathematik, insbesondere für Ingenieure und Naturforscher. By Gerhard Kowalewski. Berlin, de Gruyter, 1938. 156 pp.

Dr. Gerhard Kowalewski, finding that mathematics is taking a less and less prominent place in the German educational system, has felt obliged to do his part in presenting the fundamentals of higher mathematics "without which a profitable study of engineering and the natural sciences is inconceivable."