

problem of the transverse vibration of a string and the classical boundary value problem of harmonic functions (the Dirichlet and Neumann distributions) are treated. This seems much too brief even for an elementary exposition of the theory of integral equations. It also seems rather unfortunate that almost no references to literature are made in the text. The author refers to the article of Hellinger and Toeplitz in the *Encyklopädie der Mathematischen Wissenschaften* as supplying completely the need for bibliographical material. In a book designed particularly for instruction, it seems unfortunate that more reference to the historical development and to the principal contributions has been omitted. The book could have been easily illuminated by such reference.

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*The Theory of Matrices.* By C. C. MacDuffee. (*Ergebnisse der Mathematik und ihrer Grenzgebiete.*) Berlin, Julius Springer, 1933. 110 pp.

To review in any really critical way such a book as this is impossible. The editors of the "Ergebnisse" series carefully pick one of the three or four men in the world that know most about matrices. That man spends a year or two of intensive reading of the literature, of intensive thought on both the details and organization of the subject, and then a reviewer is supposed to act learned and critical. It just isn't a proper set-up.

It is possible to point out what the author attempts to do and what he does not attempt and to give some idea as to how useful is this particular piece of work, under the amply fulfilled hypothesis that the workmanship is of high order.

Much adverse criticism, sometimes written but more often spoken, of scientific publications is based, not on how well a piece of work is accomplished, but on the decision of the reviewer as to whether he would like the author to have written something else instead. This is unfair. The reviewer's feeling is that we clearly need original contributions of high order, we clearly need organizing works which unify bodies of seemingly diverse doctrines, and we clearly need encyclopaedic discussions that make available a large body of already written material, and that we should welcome any book that fulfills any one of these purposes. This work definitely is of the encyclopaedic type though, owing to the author's search for elegant proofs and to the necessity of making each theorem depend on preceding work, there has been brought about a considerable amount of unity. Though this book is not lacking in original material, the author's personal contributions play a minor part and have been mostly published elsewhere.

The outline of the book is told simply by the chapter headings, which are as follows: 1. Matrices, arrays and determinants. 2. The characteristic equation. 3. Associated integral matrices. 4. Equivalence. 5. Congruences. 6. Similarity. 7. Composition of matrices (this chapter including questions dealing with direct sum and products, etc.). 8. Matric equations. 9. Functions of matrices. 10. Matrices of infinite order. Except for the fact that the author has a strong preference for the theory of linear algebras and especially for its associated number theory, this is just what anyone interested in matrix theory would use as an outline. The great value of the book, and its value is great, lies in the fact that a large amount of detail is presented in outline, with well arranged refer-