

lished, as well as the standard theorems on intersection and linking numbers. A final chapter deals with the Brouwer degree of a mapping, and the Lefschetz fixed point formula treated by the methods of Hopf.

The book contains a very complete bibliography, it is well indexed, and as a further help to the reader most chapters are prefaced by a summary of their contents. At many points in the text the reader is referred to supplementary notes collected at the end of the book, which indicate extensions of the theory and links with other work. Little attempt is made, outside these notes, to attribute ideas to their originators; this is particularly glaring when the ideas are heavily exploited. The authors apologize for their failure to treat the Alexander duality theorem and the theory of compact metric spaces (so beautifully rounded out by the recent work of Pontrjagin), but they promise to write a second volume on these matters if someone else does not do so first.

A. W. TUCKER

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#### WEDDERBURN ON MATRICES

*Lectures on Matrices.* By J. H. M. Wedderburn. American Mathematical Society Colloquium Publications, volume 17. New York, American Mathematical Society, 1934. vii+200 pp.

For the past seventy-five years matric theory has been growing in stature and in favor among men. Many branches of mathematics have been more promising infants, but few have shown such sustained growth and ever widening field of application. The concept of matrix, like that of group, extends its roots under algebra, number theory, geometry, differential and integral equations, wave mechanics—a fairly representative cross-section of modern mathematics. This fundamental nature of matric theory has never been so generally appreciated by mathematicians as at present. Thus Wedderburn's book is timely.

An evident fact in the history of matric theory is that the important theorems are not due to any small group of men. A few names stand out prominently, of course, but it has taken close to a thousand distinct contributions to bring the theory to its present state. Why this was so is not evident, but it must be true that the theorems which now seem so clear to us were not intuitive to mathematicians at the time of their discovery. It has been the common history of the important theorems that they were discovered first in special cases, then generalized and laboriously proved, and finally furnished with neat direct proofs. In the book under review most of the theorems have reached the last stage of development, and the reader is apt to be unaware of the amount of publication which it renders obsolete.

In recent years Wedderburn has been one of the most important contributors to matric theory. His discoveries have been published as they came, and have taken their place in matric lore. It would be absurd, therefore, to expect a large proportion of the results in this book to be new. But theorems have been extended, sharpened, and clarified to a remarkable degree.

It is the organization and presentation of the material, however, which