

Die Determinanten. By EUGEN NETTO. Leipzig, Teubner, 1910. 8vo. vi + 129 pp. 3.60 marks.

THE enormous growth in recent years of both mathematics and engineering is nowhere shown better than in the appearance in both Europe and America of many small handbooks particularly designed to give in little space the main features of some definite field of these large subjects. This volume is of such a character. It undertakes to develop the elementary theory of determinants with some applications. The applications are not technical.

The first two chapters are devoted to the elementary properties and expansions. Then follows one on evaluation, and one on products. A chapter follows on arrays, which are here called matrices. Then comes a chapter on particular determinants, one on the solution of linear equations, and one on resultants. Following is a chapter on linear substitutions, which could have properly formed part of the chapter on matrices. In our opinion, it is a mistake to consider the array of symbols merely as an array. The composition of matrices, if not the mere ordering, makes the symbols stand for more than mere arrays. They are indeed n^2 -fold multiple quantities and should at least be treated as multiplexes if not as operators. From this point of view the linear substitution is merely one example of a matrix. A chapter is devoted to geometric applications. The book is closed by a very brief chapter on differentiation and one on functional determinants, which last however would have been labeled more correctly "The Jacobian." As a whole the treatment is clear, well illustrated, and all that could have been given in the space.

JAMES BYRNIE SHAW.

Die Theorie der Kräftepläne. By H. E. TIMERDING. Leipzig, Teubner, 1910. 8vo. vi + 99 pp. 3 marks.

THIS little volume is number 7 in Teubner's Mathematisch-physikalische Schriften. It undertakes to occupy a middle ground between the purely theoretical or geometrical side of graphical statics and the purely practical or engineering side. The object is to interest the engineer in a more general mathematical point of view and to show the mathematician that applications furnish very interesting developments of pure theory. Thus we find the null-system of Möbius used throughout to show the reciprocal relations of the force polygon and