

Étude Élémentaire de l'Hyperbole Équilatère et de quelques Courbes Dérivées.

By J. Lemaire. Paris, Vuibert, 1927. 172 pp

Book one contains a detailed exposition of the elementary properties of the equilateral hyperbola; much attention is given to the osculating circles and the bitangent circles. The second book is concerned with the strophoid and lemniscate as inverses of the equilateral hyperbola, and with the three-cusped hypocycloid. The many properties of the osculating and of the bitangent circles of these inverse curves follow from the detailed treatment in book one. The discussion of these curves is more extensive than that in any standard treatise. The development is synthetic, well ordered, and the book is easy reading. The text is supplemented by nearly one hundred exercises.

On page 163, example 58, a 3-bar link-work is defined which gives an easy mechanical construction for the lemniscate. The author, apparently following Teixeira, attributes this to Carbonnelle (Lemaire says "Carbonnelle"). Carbonnelle proposed this in *Nouvelle Correspondance* (vol. 5 (1879), pp. 220 and 249). But the theorem had already been given by Phillips in the *American Journal of Mathematics* vol. 1 (1878), p. 386.

B. H. BROWN

Coup d'Oeil sur la Théorie des Déterminants Supérieurs dans son Etat Actuel.

By Maurice Lecat. Bruxelles, Lamertin. 1927, viii+97+100 pp.

This synopsis of the present state of hyperdeterminants is a continuation of the researches of M. Lecat on the properties of determinants of N dimensions. It is to be followed by a treatise in three volumes, soon to appear, which will include the applications. The synopsis contains 19 chapters and a bibliography. It is intended to be of a critical character, the author remarking that almost all the investigations before 1910 in this field were incorrect, or at least spotted with serious errors. The exceptions are Cayley and Sylvester. Gegenbauer's work is cited as containing many errors, his results on the adjoint and upon skew symmetric determinants being completely wrong.

This field of course is intimately connected with matrices of cubic, and higher arrays, and the first thing taken up is the "topology" of such arrays. In the next chapter "activity" is considered. This property belongs to a matrix when the elements (written with subscripts) are symmetric as to at least two subscripts. The succeeding two chapters introduce considerable terminology. The next four chapters deal with developments of the determinant. In the second part of the synopsis, which has a separate paging, though the chapters run consecutively, is considered multiplication of determinants, and some special forms, such as continuants, adjoints, circulants, etc.

The synopsis will be useful to the student who desires to follow up the investigations of this field, particularly the very important ones of M. Lecat himself. It really demands the "*Traité*" to make it thoroughly useful.

J. B. SHAW