of many minor points of interest in the volume before us, but we hope to refer to the subject again when the second portion of Mr. Thompson's work appears. Meanwhile, the book may be commended to all students of folk-lore, as well as to the Semitic philologist and anthropologist.

## LINE GEOMETRY.

*A Treatise on the Line Complex.* By C. M. Jessop. Pp. xv+364. (Cambridge: University Press, 1903.) Price 10*s.* net.

THE systematic study of what is now called line geometry was begun by Plücker in his "Neue Geometrie des Raumes." There was, it is true, a fairly complete theory of the linear complex due to Chasles and others before the publication of Plücker's work, and the geometry of systems of lines (congruences) has in some respects not progressed very much since the date of Kümmer's celebrated memoir, but it was only after the idea of line coordinates had been introduced that the essential qualities of the new geometry were recognised.

In his treatise on the line complex, Mr. Jessop has aimed at presenting the extensive investigations of German and Italian geometers in a form easily accessible to the English student of mathematics. It has been found necessary to write an introductory chapter on the elementary methods of synthetic geometry that are used in the book; then the next four chapters contain the theory of line coordinates, in the general form introduced by Klein, and the linear complex. A great portion of these chapters will be familiar to anyone who has studied the theory of forces in three dimensions with attention; the only omission that occurs to us is a number of easy exercises on the use of line coordinates, particularly in the ordinary Cartesian form, but this defect is partly remedied by an excellent collection of examples at the end of the book.

The theory of the quadratic complex is naturally the most important part of the book—the linear complex is too well known, and the higher complexes too difficult to deal with, to illustrate the methods of the subject. The author has devoted six ample chapters (vi.–xi.) to this theory. Chapter vi. deals mainly with the singular surface, which is remarkable in all complexes as being both the locus of singular points and the envelope of singular planes. Two proofs of the identity of this locus and envelope are given, one depending on von Staudt's theorem concerning a tetrahedron, and the other on infinitesimal properties. The first is particularly interesting although peculiar to the quadratic complex, because a tetrahedron being the simplest form of the singular surface, von Staudt's theorem is a particular case of a property of Kümmer's quartic from which the result follows; the other proof can be extended readily to any complex (chapter xvii.). The discussion of Kümmer's quartic is the author's own, and will be very welcome to the beginner as being both elementary and direct.

It is curious that an infinite number of quadratic complexes have the same singular surface, the theory being similar to that of confocal quadrics. Such cosingular complexes are discussed in chapter viii., and by developing the idea of corresponding lines in cosingular complexes Mr. Jessop has obtained some very interesting and novel proofs. Another chapter deals with the beautiful classification of quadratic complexes, and contains an exposition of Darboux's proof of the fundamental theorem of Weierstrass on the equivalence of quadratic forms.

In chapter vii. an account of some special complexes is given, the greater part of the space being devoted to the tetrahedral complex; this complex was studied long before the introduction of line coordinates, and lends itself readily to synthetic treatment.

In another part of the book it is shown that a tetrahedral complex can always be found which contains the complete intersection of a quadratic complex and a linear complex. Substantially this important result is due to Kümmer, but the first complete account of it we owe to Caporali.

Only two chapters on congruences appear in the work; this part of the subject is difficult, because the analytical methods are clumsy when applied to such congruences as are not complete intersections of complexes, and the purely synthetic methods of Sturm and others are extremely tedious. Mr. Jessop follows Kümmer on the general principles, and only gives a detailed account of the simplest congruence, namely, that of the second order and the second class.

The latter portion of the book does not strike us as being so attractively arranged as the earlier parts, but the final chapter on the connection of line geometry and differential equations is valuable as an introduction to Lie's theories.

There is no doubt that the book will be a boon to a student of the subject, and that anyone with a taste for geometry will find much that is interesting and something that is new in it. J. H. G.

## OUR BOOK SHELF.

*Geological Rambles in East Yorkshire.* By Thomas Sheppard, F.G.S. Pp. xi+235; 53 illustrations and geological map. (London: A. Brown and Sons, 1903.)

THIS is a pleasantly written and attractive guide to the geology of east Yorkshire, the work of a sturdy local geologist who shows himself to be master of his subject and of the literature past and present. Under his enthusiastic leadership we are taken from Hull to the out-of-the-world promontory of Spurn Head, where we learn many lessons about recent geological changes. Thence we are conducted northwards to Withernsea and Hornsea, examining some of the finest sections in the Boulder-clay of Yorkshire; successive beds of drift with transported mollusca and Scandinavian rocks, deposits with local detritus, and others with rocks from the Cheviots and elsewhere. We see also lacustrine deposits and peat beds, remains of old lakes, of which Hornsea Mere alone appears to survive. Then we are taken on to Bridlington, noted for its shelly "Crag," really a part of the basement Glacial drift, which is now hidden behind a strong sea-wall. The buried cliff of Sewerby, with its basement clay and older mammaliferous deposit yielding *Elephas antiquus*, hippopotamus, rhinoceros, &c., claims attention. From this we pass on to the fine