

others are the fifteen join lines of the six base points. This study is essential in preparation for the topics which follow.

In the latter half appears the main object of this research. In the singular point to be resolved is placed one of the six base points of the plane cubics. Thus on the surface this r -fold point appears as r ordinary points on the corresponding fundamental line. Conscientiously it is proved that other multiple points do not change their essential character by the transformation. For this purpose Jordan's definition of cycle of a plane curve is happily generalized. Then are specified the five loci on the cubic surface which must be avoided in choosing a center for the projection back on the plane, and it is proved that these restrictions are sufficient for the exclusion of new higher singularities.

It should be noted that Dr. Walker takes his start from Noether's reduction of the curve to one at whose singular points the tangents are all distinct. This work is a thoroughly readable presentation of what is probably the most graphic reduction of the higher singularities.

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Die Kegelschnitte des Gregorius a St. Vincentio in vergleichender Bearbeitung. Von KARL BOPP. Mit 329 Textfiguren. *Abhandlungen zur Geschichte der mathematischen Wissenschaften*, XX Heft, 2 Stück, pp. 83-314. Leipzig, B. G. Teubner, 1907.

THE glare of notoriety of Gregorius a St. Vincentio as a circle-squarer has cast his solid achievements into obscurity. At a time when only four of the seven books of the conics of Apollonius of Perga were known in the occident, Gregorius prepared a masterly work on conic sections, the *Opus geometricum*, which was published at Antwerp in 1647. He did not possess the genius of his great contemporaries, Desargues and Pascal. Yet in the endeavor to gain a detailed picture of the progress of geometry of the seventeenth century, one cannot overlook Gregorius a St. Vincentio. Through the researches of Bosmans there has been an enrichment of biographical detail of this man. To make a knowledge of his very diffuse treatise more readily accessible and to point out his relation to ancient writers, as well as his influence on the progress of geometry, Mr. Bopp has prepared the booklet under review. The chief novelty in Gregorius's geometry is the method of transformation