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.

H. S. WHITE.

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

of one conic into another, called *per subtensas* (by chords), which, in the opinion of Bopp, "even now would be serviceable for didactic purposes" (page 307), which "holds *in nuce* the entire analytic geometry of conics" (page 295) and "is fit to place him, Gregorius, among the founders of analytic geometry" (page 309).   While, in our opinion, Bopp claims too much for this method, it is doubtless of historic interest.   To gain an idea of it, take the following example: In subjecting the parabola to the transformation "by chords," Gregorius in one place draws a chord from the vertex to any point of the parabola and takes the length of this chord as the ordinate of a point having the same abscissa as the chosen point on the parabola.   This new point lies on the equilateral hyperbola whose transverse axis lies in the geometric axis and is equal to the latus rectum of the parabola.   By this process the hyperbola can be constructed by points.   It is shown how to derive, *per subtensas*, the hyperbola from the ellipse and also how the hyperbola may be transformed into itself.   Similarly for the other conics.

FLORIAN CAJORI.

Annuaire du Bureau des Longitudes pour l'An 1908.   Paris, Gauthier-Villars.

THE *Annuaire* has been published continuously since 1796, and the present volume is the 112th of the series.   This publication has been so often reviewed in the " Shorter Notices " that a notice of the special features for the current year is sufficient. In accordance with the plan adopted in 1904, it contains the tables and explanations of physical and chemical constants, those of geographical and statistical constants being inserted only in the odd-numbered years.

The special articles at the end of the volume are five in number.   The first and longest is a popular account, by M. G. Bigourdan, of the methods used for obtaining the parallaxes and distances of the heavenly bodies.   The author adopts a chronological treatment and gives a fairly complete historical summary without at any time wearying the reader.   M. Deslandres gives an account of the meetings at St. Louis, Oxford, and Meudon of the international union for solar research, from which it is easy to see how the systematic study of a branch of physics may elevate the subject into a science.   The observatory of Montsouris in France exists for educational purposes only : M. Guyon explains its methods and equipment.   Many