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

geographers and travellers have learnt there the practical astronomy necessary to those who explore far from the beaten tracks. One of its features is the absence of any regular classes; those who go there to learn can have a lesson at any time and the lesson is made to suit the special needs of the pupil. The last two articles are obituary notices of M. Loewy by H. Poincaré; and of C. Trépied by M. Loewy, written shortly before the sudden death of the latter.

ERNEST W. BROWN.

*Die Zustandsgleichung der Gase und Flüssigkeiten und die Kontinuitätstheorie.* Von J. P. KUENEN. Braunschweig, Vieweg und Sohn, 1907. x + 241 pp.

KUENEN'S volume on the equation of state of gases and fluids is one of the twenty monographs already printed by Vieweg and Son under the general title "Die Wissenschaft." It must be obvious to all that the subject of this particular volume is one which lends itself well to treatment in a separate monograph. The main outlines of the theory of corresponding states are given in many books, and no book which has to do with gases or fluids can get on without the equation of state; but the details of those theories and their agreement or disagreement with the results of the hundreds of experiments which have been performed since they were broached are not to be found collected in general texts and require for their satisfactory treatment a monograph like this.

The first five chapters, of about ten pages each, may be said to be of a heuristic and qualitative nature. The author traces the history of the rise of observations on the phenomena of condensation and on the existence of some principle of continuity between the different states of matter. He touches upon the kinetic theory sufficiently to show the justification of Boyle's law from that point of view and to indicate how van der Waals was led to his equation. After obtaining that equation, the author goes on to a careful explanation of phenomena of condensation and of the principle of continuity from the basis furnished by the equation. At about this point there begin to appear numerous evidences of the great care with which matters are to be set forth in their true light, and of the conscientious criticism with which the author is to expound the relation between experiment and theory. For instance, it is pointed out that although van der Waals's equation may be de-