ties of the conic, of the range or pencil of conics, of conics "harmonically circumscribed," or apolar, to a given conic; of the quadric, of the range or pencil of quadrics, and of quadrics and cubic curves "harmonically circumscribed" to a quadric.

The remaining transformations are handled in the last chapter (Chapter VI.) in briefer fashion; and the book ends with seventy exercises whose sources are not stated. The author has carried out his intention artistically and, given that he is addressing *intelligences d'élite*, excellently.

The actual titles of foreign journals should be given. "Ann. de Math." might be an American, a German, or an Italian periodical.

I see no reason for calling a circle discovered by La Hire "cercle de Monge" (p. 64). On the other hand the orthoptic sphere of p. 107 might fairly be called "Sphère de Monge." On this latter page the reference of the footnote should be to No. 86, not No. 80.

The "transformation par rayons vecteurs réciproques" of p. 11 is finally called inversion. It is attributed to Bellavitis (1836). Some assign it to Plücker (1831).

A smaller point of history may also be raised. An interesting theorem occurring three times in the book under different forms (pp. 116, 132, 138) is in effect as follows: that the tangents at the points where a tangent of an asteroid (hypocycloid of class 4) meets the curve again meet on the cusp circle. This theorem is attributed to Laguerre. R. A. Roberts once told me that the theorem stated in the correlative form for the lemniscate, was well known in Dublin and was there attributed to Casey. It would be worth while to ascertain whether Casey anticipated Laguerre.

F. MORLEY.

Opinions et Curiosités Touchant la Mathématique d'après les Ouvrages Français des XVIe, XVIIe et XVIIIe Siècles. Par GEORGES MAUPIN. Paris, Carré et Naud, 1898. 199 pp.

THE book seems to be addressed, not to the mathematician, nor to the historian of mathematics, but to the general reader, with the view of entertaining him and creating in him a love for the history of the science. In twenty-seven chapters there has been gathered together from old French writers, mostly unknown to our time, a miscellaneous mass of material relating to the squaring of the circle, the value of mathematical studies, pleas for the study of this science in the French rather than in the Latin language, mathematical pursuits in the universities, the extent to which women should master this subject, and the relation of mathematics to religion. Some topics are given which have nothing to do with mathematics—such, for instance, as the history of a conjurer, the expediency of higher education for women, the danger of long sermons, discussions of copyright and piracy and of gambling.

Here and there are points of antiquarian interest to the mathematician. The pathological effusions and conceits of circle squarers seldom lose their charm. M. Maupin quotes from De Vausenville who addressed his solution "to the monarchs of France, of Europe, and of the World." The French academy of sciences disdainfully rejected the solution and referred the memoir to a special commissioner, called, it seems, "le Commissaire des Enfans perdus." The author was furious at this treatment and wrote a letter to D'Alembert in which he said, among other things, that Charles V. erected a statue to the inventor of the art of salting and packing herring; why not do as much for the discoverer of the quadrature of the circle?

As an illustration of how mathematics was dragged into theological discussion, we may refer to Pardies's demonstration of the existence of God, drawn from the consideration of asymptotic spaces. "The knowledge of asymptotic spaces * * * brings out most clearly the greatness and the spirituality of our soul, for by the light of its spirit alone, penetrating, as it does, beyond the infinite, it unveils most clearly things which no sensory experience can reveal. * * * These spaces, though infinite in length, are equal to a circle or other determinate figure. * * * Of all knowledge which man can acquire through his own reasoning, this comprehension of the infinite is without doubt the most admirable." This power of man, which is independent of the sensory organs, was held to demonstrate the existence of the human soul. "Dare I go still further and say that in this demonstration we find also the proof of the existence of God?"

In another chapter of the book is given Varignon's quasi-mathematical argument of the possibility of the real presence of Christ's body in the eucharist. No doubt this seems very strange discourse to modern mathematicians who are fond of speaking of their science as "die absolut klare Wissenschaft," who habitually resent attempts to drag metaphysical speculation into mathematics and are little giving to applying mathematics to theology.

Readers familiar with the name of François Barrême, the arithmetical writer of the seventeenth century, who enjoyed in France much the same popularity as did Adam Riese in Germany, Edward Cocker in England, and Nicholas Pike in the United States, will be interested in the facsimile reproduction of the richly ornamented title page of his arithmetic of 1761, and in his dedicatory verses and other poetical outbursts.

FLORIAN CAJORI.

La Mathématique: Philosophie, Enseignement. Par C. A. LAISANT. Paris, Carré et Naud, 1898. 292 pp.

THIS book is intended for teachers and students of mathematics who are not specialists in this science. It deals with the philosophy and teaching of mathematics, and without much pretension to originality, presents the subject in an attractive and instructive manner. Separate chapters are given to arithmetic, algebra, calculus, theory of functions, geometry, mechanics, and to the practical application and the teaching of these subjects. The author does not discuss methods of teaching in detail, but wisely confines himself to general principles. The book gives a good general idea of mathematical instruction in France.

The author refers repeatedly to Comte's philosophy of mathematics and it is interesting to observe that he is compelled to abandon Comte's definition of mathematics, as the science which deals with "the indirect measurement of magnitudes." M. Laisant points out that Comte's definition does not include "the notion of order, which is inherent in mathematics to the same degree as measurement," and warns the reader against such a definition as carrying with it "a certain confusion which is not without danger." This point is just now of especial importance to us in the United States; for in the West certain theories of teaching arithmetic are being promulgated which assume that all mathematics deals solely with ratio and measurement and that the number concept is primarily and purely metrical. M. Laisant, in his discussion of number, does not find its origin primarily in measurement, but bases it on the cognition of a group of objects which, by mental abstraction, are considered alike. The primary number idea is non-metrical. On this point modern mathematicians are unanimous, and it is a sign of danger when the elementary teachers go in a direction diametrically opposite to the advanced workers and, misled by wrong conceptions, write textbooks which give an unnatural and one-sided develop-