process of solution. To further the new view of what is desirable as it has been planned for French schools, the book under review was written.

The introduction of over one hundred pages clears up the notions of the student acquired in his secondary school work. These are usually vague and half-forgotten, and in most cases in such state that the student "has no desire to continue nor does he see any use for what he has already learned." After this review of first principles, the real advance begins and proceeds in a delightfully graceful manner from the consideration of the important conclusions that may be drawn from elementary identities, into the rise and solution of the quadratic equation; thence into coordinates, functions, limits, derivatives, and integrals. The intuition is constantly appealed to and nowhere is there difficulty for any student to follow the easy grade the course pursues. The last chapter, on astronomy, leaves the student face to face with one of the boundless realms he may enter through the mathematical door.

One can but feel that a student who has had such a course as this will have more genuine love and enthusiasm for continuing his mathematical studies than one who has been drilled in the conventional way. The original (or this translation or, let us hope, an English translation) ought to be in the hands of at least every teacher of elementary mathematics.

JAMES BYRNIE SHAW.

Komplex-Symbolik. Eine Einführung in die analytische Geometrie mehrdimensionaler Raüme. Von ROLAND WEITZENBÖCK. Leipzig, Göschen (Sammlung Schubert, LVII), 1908. 191 pp.

THE real subject of this little volume is line geometry in three and higher dimensions. The treatment however is not according to the old familiar methods but by the use of symbolic notation. The symbolism is founded on that of Clebsch, with which the author states that the reader should be familiar in order to follow this book with ease. The reviewer also wishes to emphasize this need of reading something on symbolic notation before undertaking this book. The symbolism however is sufficiently developed so that one can readily understand it, but a previous knowledge makes the reading more enjoyable. The only other attempt known to the reviewer to treat the subject of line geometry symbolically is that of E. Waelsch ("Zur Invariantentheorie der Liniengeometrie," *Sitzungsberichte der k. Akademie der Wissenschaften*, Wien, 1889). The author states that he developed the subject without knowledge of Waelsch's work so that there naturally is divergence of treatment.

In many places the author has not made his meaning clear, and this coupled with frequent typographical errors makes the reading rather difficult. But after one has gone through with it the point of view gained is well worth the trouble.

Two kinds of symbols are defined, viz., ordinary and complex. Ordinary symbols are those which obey the commutative law of multiplication, complex symbols are those which do not. The ordinary coefficients are of the first kind, and the symbols used to represent the line coordinates are of the second kind. Thus for line coordinates we have

$$p_i p_k = p_{ik} = -p_{ki} = -p_k p_i.$$

The quantities p_i and p_k have no meaning except as symbols. After these definitions the general properties of complex symbols are discussed and applied to the linear and quadratic complex in three dimensions and to finding the invariants, covariants, and contravariants of systems of lines.

Then follows the discussion of linear systems of lines in higher dimensions. Here the author has contributed much new material. After reading the discussion of the linear complex in s_4 one appreciates how much more direct and simple is the treatment of the same subject by Castelnuovo. But nevertheless after the symbolism is built up it enables one to see much that might otherwise escape him.

Throughout the book the author has made good use of the idea of defining a line, curve, or in higher dimensions, a plane, etc., by the system of lines which cut it. This has a decided advantage for certain problems, since a single equation then represents the line, curve, etc.

The book closes with an excellent chapter outlining a general symbolic analytic geometry and setting forth some of its advantages.

C. L. E. MOORE.

Analytische Geometrie des Punktpaares, des Kegelschnittes und der Fläche zweiter Ordnung. Zweiter Teilband. Von Dr. OTTO STAUDE. Leipzig and Berlin, Teubner, 1910. iv + 452 pp., with 47 figures.