entheorie 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.

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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.