

of presenting the subject to the immature student, for we believe that very few of the latter ever become interested at the beginning in geometry which is only analytic.

The subject of change of axes is rather unsatisfactorily treated. In the first place it is left almost to the end of the book, and thus the student is deprived of the use of a powerful tool for simplifying his problems and for avoiding what Professor Scott designates "algebraic gymnastics." Secondly the formulas of transformation are unrigorously derived, holding necessarily only for the special figures of the book. Finally all examples are worked by comparison with the general case *i. e.*, the general equation of the conic is transformed and its new coefficients found and these are used for the special cases. This undoubtedly gives good practical results; but the student would soon lose sight of what he was doing and the *raison d'être* of his formulas.

One other fault of the book appears to us to be that as a text-book it contains so many ideas and methods that it would be confusing to any student; *e. g.*, under diameters and reciprocal polars the same examples are worked in detail in three different ways. This makes the book invaluable for our libraries; but if we judge the young student aright, the study of these different methods would tend to confuse what ideas he might successfully gather from the most simple and hence best method of attacking the problem.

E. GORDON BILL.

Grundlagen der Geometrie. Von DAVID HILBERT. Dritte Auflage. Leipzig, Teubner, 1909. vi + 279 pp.

THE present edition of Hilbert's celebrated treatise on geometry appears as a seventh volume in a series of essays, "Wissenschaft und Hypothese," whose first volume is a translation of Poincaré's well known book bearing the latter title. It differs but little from the second edition. Two reprints of papers by Hilbert, "Ueber den Zahlbegriff" * and "Ueber die Grundlagen der Logik und Arithmetik," † appear as appendices VI and VII respectively; also additional references to investigations of other authors are inserted.

Since very full consideration has been given Hilbert's book in the BULLETIN ‡ and elsewhere § the reviewer must refrain

* *Jahresbericht der Deutschen Mathematiker-Vereinigung*, vol. 8 (1900).

† *Verhandlungen des III Internationalen Kongresses in Heidelberg*, 1904.

‡ See vol. 6, p. 287; vol. 9, p. 158; vol. 10, p. 1.

§ Cf. E. B. Wilson, *Archiv der Mathematik u. Physik* (3), vol. 6 (1904), p. 104.

from any lengthy discussion. Some of the logical phases of Hilbert's axioms are instructively pointed out in a controversy between Frege and Korselt in the *Jahresbericht der Deutschen Mathematiker-Vereinigung*.*

A. R. SCHWEITZER.

Vorträge über den mathematischen Unterricht an den höheren Schulen. KLEIN-SCHIMMACK. Teil I. *Von der Organisation des mathematischen Unterrichts.* Leipzig, 1907, pp. ix + 236.

PROFESSOR KLEIN has for years been calling attention to the fact that it is the duty of the universities to furnish instruction not only in the subject matter of mathematics but also in the questions relative to the teaching of the subject, since teaching is the profession to which the great majority of the students are looking forward; and in his own university (Göttingen) he has admirably been putting into practice what he preaches. The present volume makes accessible to the wider public the substance of a course of lectures thus delivered at Göttingen in 1904-5.

It is a work that at once commanded thoughtful attention in all quarters of the nation for which it was especially intended, but it also deserves and will receive careful study far beyond the national confines.

The work is divided into the following sections, whose titles give a general idea of its plan and scope:†

Introduction, pages 1-9; I. Elementary schools, 10-18; II. The six lower classes ‡ of the (boys') higher schools, 19-43; III. Girls' schools and trade schools, 44-66; IV. The historical development of instruction in mathematics in the German higher schools, 67-99; V. The three upper classes § of the higher schools according to the curricula of 1901, 100-126; VI. Propositions for reform in the upper classes of the higher schools, 127-159; VII. The universities and technical schools, 158-189; Conclusion, 189-190; Appendix (containing re-

* See vol. 12 (1903), pp. 319, 368, 402; vol. 15 (1906), pp. 293, 377, 423; vol. 17 (1908), p. 98.

† With each numbered title, except No. IV, the words "mathematics in" are of course implied.

‡ In mathematics these six classes correspond roughly to our grades 4 to 8, and the first year of the high school.

§ In mathematics these classes correspond roughly to the second and the third year of the high school and the freshman year in college.