Serret's Lehrbuch der Differential- und Integralrechnung. Vierte und fünfte Auflage, zweiter Band, bearbeitet von GEORG SCHEFFERS. Leipzig, Teubner, 1911. xiv+639 pp.

THE present edition (or let us say issues, since it seems to be dual!) is a reprint, with slight alterations, of the third. Besides the half dozen paragraphs listed in the preface there are three or four more that have undergone some considerable degree of remodelling. This adds nine pages to the bulk of the book. (The convenience of the student has been consulted, in making these alterations, by retaining, with few exceptions, the old paragraph numbering.) Beyond this the changes are those of phraseology.

The novelty of the present edition is an appendix of 46 pages of historical notes—to both the first and second volumes. It is purposed to supply the third volume also, whenever a new edition becomes necessary, with a like apparatus. These notes are in response to wishes often expressed and are welcome. They seem particularly full on matters of mathematical nomenclature, notation, symbols. The desirable custom has been followed of adding to the name of each (no longer living) author the years of his birth and death.

The reference on page 447 to *page* 405 should be to the paragraph of that number (*No.* 405).

FRANK IRWIN.

Ueber die Theorie benachbarter Geraden und einen verallgemeinerten Krümmungsbegriff. Von W. FRANZ MEYER. Leipzig und Berlin, Teubner, 1911. xi+152 pp.

THIS supplement to the ordinary text-book on differential geometry has, as its fundamental idea, a generalization of the notion of curvature of a space curve obtained by replacing the tangent at a point of the curve by an arbitrary line through that point. The idea is not new. Articles dealing with certain phases of the subject had appeared five years before the publication of this book. From time to time other papers were published by the author and his students and various other writers. Here these results are exhibited in their relations to one another and are supplemented by new material.

The book opens with a concise treatment of the moving trihedral, curvature, torsion, the Frenet formulas, etc., with reference to an arbitrary line g through a point of the space curve. Then follows a systematic study of the shortest distances associated with two neighboring trihedrals. From convenient forms for the two principal formulas for the shortest distance between two skew lines are deduced the shortest distances (1) between two neighboring positions of g, (2) between a point P of the space curve and the line of striction of the ruled surfaces formed by the lines g, and (3) between P and the "normal plane" of a neighboring point on the curve. Six other formulas are obtained by substituting for g the binomial and the principal normal. The relations among these nine distances become noteworthy when the general trihedral is replaced by the canonical. Another special case is that in which g is required to be perpendicular to the tangent to the curve. This case becomes more important when the further restrictions are imposed that the curve shall lie on a certain surface and that g shall fall along the positive direction of the normal to the surface at the point. An appendix, which occupies one-third of the book, deals with generalized curvature in R_n and with the invariant representation in R_3.

E. B. COWLEY.

Grundlagen der Geometrie. Von DAVID HILBERT. Fourth edition. Leipzig, Teubner, 1913. vi+258 pp.

THE system of axioms of geometry presented in this new edition of Hilbert's classical work differs from that given in the third edition (1909) in regard to the third group of axioms, those of congruence, the number of which is now reduced from six to five. In the third edition, axiom III: 5 reads: When an angle (h, k) is congruent to both the angle (h', k') and the angle (h'', k''), then the angle (h', k') is congruent to the angle (h'', k''). In the present edition, this is now stated as theorem 10, and for a proof based upon the axioms in groups I and II and the remaining five axioms in group III, the reader is referred to a paper by A. Rosenthal: "Vereinfachungen des Hilbertschen Systems der Kongruenzaxiome," *Mathematische Annalen,* volume 71 (1912), pages 257–274.

A few other, but relatively unimportant, changes have been made in the text, and references to recent literature have been added.

T. H. GRONWALL.