# SHORTER NOTICES

*Geschichte der Elementarmathematik.* By Johannes Tropfke. Berlin and Leipzig, Walter de Gruyter. Bd. V: *Ebene Trigonometrie. Sphaerik und Sphaerische Trigonometrie.* i+185 pp. 1923. Bd. VI: *Analysis. Analytische Geometrie.* i+169 pp. 1924.

The fifth and sixth volumes of the revision of Tropfke's history of elementary mathematics maintain the high standard set by the first four volumes*. Here is the same wealth of well-arranged material, the same concise and yet vivid style, the same care in evaluating all the contributions of previous workers in the field. The revision includes large amplifications, as the topics contained in these two volumes of 354 pages were covered in 251 pages of the same size in the first edition. The number of references to the literature in the form of footnotes has been increased from 971 to 1922.

The topics are: Vol. 5, plane trigonometry, pp. 3–98; spherical geometry and trigonometry, pp. 101–185; Vol. 6, series, pp. 3–55; compound interest, pp. 56–62; permutations and probability, pp. 63–74; continued fractions, pp. 74–84; maxima and minima (in elementary geometry), pp. 84–91; analytic geometry, pp. 92–169.

The discussion of analytic geometry is a notable example of the improvement introduced in the new edition. The algebraic-geometric problems of al-Khowarizmi and Abu Kamil are given in some detail; the descriptions of Descartes's *Géométrie* and of Fermat's *Isagoge* have been made somewhat fuller and clearer; and the influence of Descartes's work upon his contemporaries and successors has been traced in a more satisfactory manner.

A detail that is not without general interest is in reference to "Heron's formula" for the area of a plane triangle in terms of its sides: $F=\sqrt{s(s-a)(s-b)(s-c)}$. In the revised edition, Tropfke accepts the statement of an Arab writer of the 11th century† that this formula is not original with Heron, but is due to Archimedes. Heath in his *History of Greek Mathematics*‡ also accepts this statement. In spite, however, of these excellent precedents, and of the fact that there is obviously nothing inherently improbable in the ascription to Archimedes, the reviewer would prefer to await more conclusive evidence before rejecting the tradition which is supported by so many ancient writers, because of this one contrary testimony.

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* Reviewed in this BULLETIN, Vol. 29 (1923), pp. 476–477.

† BIBLIOTHECA MATHEMATICA, (3), vol. 11 (1910–11), p. 39.

‡ Vol. 2, p. 322.

There are a few misprints; in volume 5, p. 61, lines 15 and 16, sin $2\alpha$ and cos $2\alpha$ schould be sin $\alpha$ and cos $\alpha$ respectively; p. 74, line 4 from end, Gegenseiten should read Gegenwinkel; and p. 85, line 16, 1675 should be 1765.

The seventh and final volume is to contain Stereometry and a complete index. The appearance of this index will be impatiently awaited, as it will increase the value of the set many fold. Even as it is, the six volumes are indispensable for the teacher or student of the history of elementary mathematics.

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*Principles of Geoemtry.* By H. F. Baker. Vol. II: *Plane Geometry, Circles, Non-Euclidean Geometry.* Cambridge University Press, 1922. xv + 243 pp.

This book, in continuation of the first volume, aims to present the main theorems of plane geometry and to develop logically the results of the principles explained in the first volume. In both purposes the author has succeeded admirably.

The preliminary chapter of the present text reviews in a brief manner enough of the matter of the first volume to enable a reader to use the present volume without reference to the first one, provided he has an elementary knowledge of projective geometry. In both volumes the treatment is first synthetic. The fundamental notation is that of projective, or (as the author calls them) related ranges. The notions of distance and congruence are not assumed. These notions and coordinate systems are developed later with a study of the logical principles underlying them.

In chapter one of the present volume, the general properties of conics are deduced from their definition as the locus of the intersection of the corresponding rays of two projective pencils and a wealth of theorems are presented.

In chapter two the relation of geometric figures to two given points of reference are studied. Let us assume any two points $I$ and $J$ as the absolute. Then if a line $AB$ meets the line $IJ$ in a point $K$, the point $C$ which is the harmonic conjugate of $K$ with respect to $A$ and $B$ is the midpoint of $AB$. Two lines which meet on $IJ$ are parallel, and two lines are perpendicular if they meet $IJ$ in two points which are harmonic conjugates with respect to $I$ and $J$. A circle is a conic through $I$ and $J$. From these definitions the usual properties of circles are deduced and a discussion of coaxial circles, inversion on a circle and the like are given. Similarly, projective definitions of foci of a conic, of a rectangular hyperbola, of a parabola and the like may be given, and the so-called metrical properties of conics obtained.