Mathematische Streifzüge durch die Geschichte der Astronomie. By P. Kirchberger. Mathematische-Physikalische Bibliothek, Bd. 40. Leipzig, Teubner, 1921. iv + 54 pp.

Some of the difficulties of publication and sale in connection with German works are seen in the case of this worthy addition to the Teubner list,—one of the small monographs of the type that was intended to and did popularize science before the war, and that sold in those days for a mark or less, often in a cloth binding. This particular number, like others at the present time, appears in paper binding, with a nominal price of 2 Marks in Leipzig, but with the announcement that there is also a Teuerungszuschlag of 120% for home purposes, with a Bewilligung stamp saying that the value is 3 Marks 30 Pf., and with an accompanying statement that the price of the book to an American buyer is 10 Marks,—all of which is an interesting problem for the economist.

As to the work itself, it maintains the high intellectual standard usually found in German booklets of this class. It is written by one who holds professorial rank in the Leibniz-Oberrealschule at Charlottenburg, and it shows that scholarly ideals still prevail in spite of post-bellum difficulties.

Dr. Kirchberger has divided his work into six chapters, in each of which he has considered the essential features which mathematics has contributed to the progress of astronomy. The general topics are as follows.

I. Early history to the time of Hipparchus, including (a) the first steps in the making of a system of chronology, together with early traces of the idea of a continued fraction; (b) astronomical geography, as in the geodetic work of Eratosthenes; (c) the Greek contributions to measurements relating to the sun and the moon, as in the finding of the supposed size of and distance to the sun by Aristarchus.

II. The planetary theories of Ptolemy, Copernicus, and Tycho Brahe, including Ptolemy's theory of epicycles and the effect of improved methods of observation and computation upon the work of the sixteenth century.

III. Kepler, with a résumé of his leading mathematical contributions to astronomy, and with attention to the fact that he looked upon the latter science as a branch of physics rather than a part of geometry.

IV. Newton, with especial reference to his theory of gravity.

V. From Halley to Bessel, including particularly the de-

velopment of the modern ideas of parallax and aberration and with special attention to the contributions of Lacaille, Lalande, and Römer.

VI. Modern problems.

The work is, of course, merely the briefest kind of survey. Only forty-one names are mentioned, and under the prominent names there could not be, under the limitations imposed, more than a mere indication of the work accomplished by each. Nevertheless, for general students of mathematics and of astronomy, the book will furnish some interesting reading and some valuable information. There is a helpful bibliography, mostly of German sources, but including several translations from the English and French.

DAVID EUGENE SMITH.

Natural Tangents. By Emma Gifford. Manchester, England, 1920. iv + 90 pp.

It is now seven years since Mrs. Gifford issued her table of natural sines to every second of arc and to eight places of decimals. This appeared in the spring of 1914, before the war began. The demands upon the time and strength of everyone in England were so great during the years that followed that Mrs. Gifford's projected table of natural tangents was greatly delayed, and the present volume is only the beginning of a work that will be as complete as was the former one. The table extends only to 15°, but the progress will now be more rapid and we may hope soon to see the work completed.

Mrs. Gifford has taken the natural tangents for every 10″ from the *Opus Palatinum* of Rheticus, published in 1596. She has then found the tangents to 1″ through interpolation by the aid of a calculating machine. The computation was in each case carried to ten places for the purpose of establishing the eighth place. The arrangement is that of the Chambers logarithmic tables, which is more convenient than the semi-quadrantal plan commonly found in this country, although it makes the book more bulky.

Mrs. Gifford is so well known as a careful computer that the work will be welcome to all who have need for an eight-place table of natural tangents. Such a table is suggestive of the diminishing relative importance of the logarithm with the rapid improvement in mechanical calculation.

DAVID EUGENE SMITH.