

It is hardly necessary to remark that such a brief presentation of the subject cannot be critical in its nature. To some extent this defect is remedied by the brief bibliography at the end, and by a list of source material.

DAVID EUGENE SMITH.

*Methodologisches und Philosophisches zur Elementar-Mathematik.* Von G. MANNOURY. Haarlem, P. Visser Azn., 1909. 276 pp.

THERE appear from time to time, and in various countries, works of more or less merit that relate to the border line or the neutral ground between mathematics and philosophy, not attempting to eradicate existing boundaries, but seeking to show the relations that continually appear when one considers the two regions. We find the same thing on the other side of mathematics, where it borders upon the various physical sciences, and at the present time this region is particularly in the educational limelight. From the standpoint of the lover of pure science the former domain is the more interesting and important, while to him whose interests are chiefly in the utilities the latter has more significance.

Among the writers in our language who have of late contributed most successfully to the study of the borderland of philosophy and mathematics Bertrand Russell is perhaps the best known. In France M. Couturat has taken a prominent position, with the late lamented Poincaré writing with equal vigor in both regions. In Italy the writings of Peano, Pieri, and Veronese are well known, and other countries have contributed their quota to the study. It is, therefore, a helpful work that Dr. Mannoury has undertaken, to compile the views of various leading contributors to the study, while at the same time setting forth his own.

The work is divided into two parts, the first having to do with the foundations of arithmetic considered in its broadest sense, and the second with those of geometry. Under the former are considered in order the concepts of unity and multitude; of number, finiteness and infinity; of the distinctive fundamental principles of arithmetic; of the extension of the number concept and the principle of permanence; and of the irrational. As is often the case with continental writers the principle of permanence is attributed to Hankel, whereas Peacock introduced it in his Algebra nine years before Hankel

was born, and made much of it in his Treatise on Algebra in 1842. In the second part of the work the author begins with a dissertation on mathematical logic, a subject that has attracted so many writers in the last half century, and in the treatment of which the influence of Peano and Couturat is manifest. Chapter II treats of geometrography and the straight line, starting with Lemoine's work of twenty-five years ago and closing with the contributions of Poincaré and Russell. Chapter III develops the theory of non-euclidean geometry, and then shows the significance of various historical attempts to demonstrate the Euclid postulate or to found a geometry independent of this assumption. The work closes with a general discussion of the space concept.

Readers will find the chapters on the number concept and the non-euclidean geometry particularly interesting. As a genuine contribution to theory the book will be less regarded than as a résumé of the questions involved.

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*Encyclopädie der Elementar-Mathematik.* Von H. WEBER und J. WELLSTEIN. III Band: *Angewandte Mathematik.* Zweite Auflage. Erster Teil: *Mathematische Physik.* Bearbeitet von RUDOLF WEBER. Teubner, Leipzig und Berlin, 1910. 8vo. xiv+536 pages. 12 marks.

THE first edition of this encyclopedia was reviewed in the BULLETIN, volume 10 (1903-4), pages 200-204. In this second edition of the third volume, on applied mathematics, there are extensive changes. The original volume is divided into two; the present one, a treatise complete in itself on mathematical physics, and one to follow on graphics, probabilities, and astronomy. This modification has been made to satisfy many criticisms of the original, some of which deplored the wide omissions in a work that called itself an encyclopedia.

The present volume has three chapters on mechanics: functions of position and direction that appear in physics, analytic statics, and dynamics; two chapters on electric and magnetic fields: electricity and magnetism, and electromagnetism; two chapters on maxima and minima: geometric maxima and minima, and applications to the theories of equilibrium and of capillarity; two chapters on optics: geometric optics, and plane waves.