page 307, for $p\frac{1}{3}a^{\frac{5}{3}}e$ read $p^{\frac{1}{3}}a^{\frac{5}{3}}e$; page 313, for Dictionnary read Dictionary ; page 316, for d read ∂ four times, and three times on page 324 ; page 321, insert *di* after *Bulletino*, as elsewhere.

DAVID EUGENE SMITH.

SHORTER NOTICES.

Abhandlungen zur Geschichte der mathematischen Wissenschaften. 18. Heft. Inhalt ; J. L. HEIBERG, Mathematisches zu Aristotles ; C. H. MÜLLER, Studien zur Geschichte der Mathematik insbesondere des mathematischen Unterrichts an der Universität Göttingen im 18. Jahrhundert ; R. LINDT, Das Prinzip der virtuellen Geschwindigkeiten. Leipzig, B. G. Teubner, 1904. 196 pp. Price, 6 marks.

FROM the standpoint of the history of pure mathematics the first two parts of this volume of the *Abhandlungen* are of great interest and value. The death of Paul Tannery left no one so well prepared to speak with authority upon a question involving both Greek mathematics and literature as Professor Heiberg. Although primarily a student of the classics, this prolific scholar has so long devoted his attention to the ancient mathematicians that he has become one of the great authorities upon their contributions.

The various histories of mathematics have always recognized the impetus given to mathematics by both Plato and Aristotle, by the former in fixing the foundations, and by the latter with reference to the history and the applications of the science. There is, however, a lack of definite information regarding the mathematical contributions of both of these leaders of philosophic thought. If we try to find exactly what Plato contributed to the advance of mathematics, Cantor, Gow, Zeuthen, and even Tannery give answers that are far from satisfactory. For Aristotle this has also been the case, and hence this concontribution of Professor Heiberg is timely and welcome, especially as it throws much light on the work of Plato as well.

The essay opens with a discussion of the sources of information and then by detailed references to the works of Aristotle it shows his influence upon the subsequent work of the Greeks. In particular the influence of this writer upon the Greek mathematical terminology is shown to be much greater than would be suspected from a reading of the standard histories. Even more interesting is the study of various propositions of Euclid in relation to the writings of Aristotle, since no serious effort has been made to trace definitely the origin of the individual theorems of the Elements. Professor Heiberg also calls attention to the fact that certain propositions of Aristotle were not used by the Alexandrian master, including the one relating to the exterior angle sum of a polygon.

We are so apt to think of Göttingen as a mathematical center of the nineteenth century alone, owing largely to the influence of Gauss, that the article by Dr. Müller on mathematics in that university in the eighteenth century will dispel what has come to be a common illusion. The essay was undertaken with the approval of Professor Klein, and to him and his associates the author acknowledges his indebtedness.

Dr. Müller first discusses the general historical problem in mathematics and then devotes a chapter to Halle and Göttingen as the universities of rationalism, and to the mathematics of this great educational period. In this chapter he discusses the scientific work of the universities of the sixteenth and seventeenth centuries in general, and of the early days of Halle and Göttingen in particular. Chapter II considers the mathematics of the period of rationalism at Göttingen, and particularly the work of Segner in pure science and of Penther in the applied field. The third chapter is devoted to the mathematics of the period of Enlightenment (Aufklärung) and chiefly to the work of Kästner and Meister. The work closes with the rise of the new humanism at Göttingen, considering particularly the later work of Kästner and his followers.

The early university courses in mathematics, and the general attitude of the academic world towards this science, are among the most interesting features of the essay. Von Rohr's exposition of Wolf's summary, for example, is very suggestive of the position of mathematics in the eighteenth century. For most Americans, the fact that Kästner (1749) thought a work of one of our countrymen * worthy of translation, is a matter of no little surprise and interest.

DAVID EUGENE SMITH.

* An exposition of the first causes of action in matter, and of the cause of gravitation, by Cadwallader Colden, N. Y., 1745.