SHORTER NOTICES.

Mathematischer Bücherschatz. Systematisches Verzeichnis der wichtigsten deutschen und ausländischen Lehrbücher und Monographien des 19. Jahrhunderts auf dem Gebiete der mathematischen Wissenschaften. Von E. WÖLFFING. I Teil. *Reine Mathematik.* Leipzig, Teubner, 1903. Pp. xxxii + 416. Price 14 Marks.

ONE of the most valuable contributions that can be made in any science is a good bibliography, and the difficulty of making it is commensurate with its value. The preparation of such a work is an attractive field for a bibliophile, and many have been the attempts to enter it, but only a few who have made the venture have accomplished anything of permanent value. How difficult even the masters have found the task is easily seen by any scholar who has studied carefully some portion of the field, for his own bibliography soon becomes far more complete than any other that he consults on that particular domain.

For this reason it is easy to find fault with a work like the one under review. The task is so herculean, the patience needed is so inexhaustible, the scholarship demanded is so extensive, that errors are certain to creep in; errors of the pen, of judgment, of typography, and of knowledge. And recognizing all this, a reviewer should approach his examination of such a work with abundant charity, and with the determination to find the good that is in the book.

Approaching this work in such a spirit, Professor Wölffing is to be thanked for having compiled such an extensive list of books, for having attempted to classify them, and for having given two indexes, one by subjects and one by authors.

A rough estimate shows that there must be about twenty thousand works catalogued, and to have that number of titles arranged in fairly convenient form is helpful. Even more valuable, in many ways, is the preface, in which is given a rather extended list of sources for the construction of a bibliography. Scholars who fail to find what they wish in this work, thus have other sources suggested, which in turn may lead to the information desired.

Not much else can be said for the book. It abounds in errors of every kind, and the author's list of over two hundred

"Verbesserungen" could easily be increased to proportions that would be alarming.

In the first place the classification is not altogether satisfactory, arranged as it is in over three hundred sub-heads. But the arbitrary way in which books have been placed under these heads is inexplicable. For example, under Algorithm are about a dozen works, evidently selected for the sole reason that they chance to have this word in their titles. The list includes an historical sketch of Grammateus, a work on the calculus, a treatise on higher numerical equations, a text-book on arithmetic, and a work on continued fractions. The list of text books is equally ill-considered, some of our most mediocre English and American works appearing, often forgotten lumber of the past, while algebras like those of Newcomb, and Oliver, Wait and Jones, are overlooked. Even Robinson's old algebra, and Olney's works, good text-books in their day, are not mentioned, although Perkins's algebra (Utica, 1842) has a place. The same lack of any well-defined basis of selection is apparent in almost any list that one selects. In the pedagogy of mathematics, for example, if such elementary works as those of Kallas, Harms, and Grass are to have place, why should not Grube, Diesterweg, and Knilling be mentioned? If DeMorgan's work on the study and difficulties of mathematics is to be included, why not Lagrange's lectures on elementary mathematics?

Among the vagaries of classification, Dixon's Foundations of geometry appears under philosophy of mathematics, as published at Cambridge at 6 shillings, although Hilbert's work with the same title is not given in this group. Dixon again appears under principles of geometry, along with Hilbert, but this time as published at Cambridge at 7.2 marks. Comte's Philosophy of mathematics, as translated by Gillespie, appears on page 6 (N. Y., 1851, $1.50), and Gillespie's Philosophy of mathematics (the same American edition) on the following page as published in Leipzig (1852) at 8 shillings. The fact that confusion as to place of publication should occur in the case of New York, London, and Oxford or Cambridge, is natural, as in the case of Dodgson's Pillow problems (referred to New York), but to see English books frequently quoted in dollars, and American books in shillings, strikes an English reader as peculiar.

The incompleteness of the lists is evident on the most cursory

inspection. An examination of the bibliography in Ahrens's Mathematische Unterhaltungen und Spiele, to take a relatively unimportant case, shows how weak is § 313, Mathematische Belustigungen.

The misprints are too numerous to consider, except as types. T. L. Heath appears as R. D. Heath, author of a life of Apollonius, with no mention of his other works. McCormack's translation of Schubert, published at 75 cents, is assigned to MacCormack and the price is given as $3.75. Professor John Dewey appears as A. Dewey, Professor Cajori as Cajory, a good English Euclid as Euclide, H. N. Robinson as H. or N. H. Robinson, and G. A. Wentworth as G. H. Wentworth. Arithmetic appears as arithmetics, "another" as "an other" (page 192), and McLellan as MacLellan (page 8), and the many other errors of this kind in English show that similar ones may be expected in other languages. The same carelessness is seen in the index and the cross references, there being no mention of Lagrange (as indexed) on page 139, the Braunmühl cross reference (page 1) 188 being an error for 181, and the reference to page 357 in the Inhaltsverzeichnis being an error for 358.

Since a definite basis of classification, a careful selection of material, and a minimum of typographical errors are essential if a work of this kind is to be recognized, there can be but one opinion of this attempt of Professor Wölffing, that it will take no rank as an authority in the field of mathematical bibliography.

DAVID EUGENE SMITH.

Elemente der Vektor-Analysis. Von A. H. BUCHERER. Leipzig, B. G. Teubner, 1903. vi + 91 pp.

VECTOR analysis has been attracting to itself each year more and more attention in Germany. Up to the present year no account of the subject had been published in separate form except the bulky classics little suited to the actual needs of the practical physicist. Dr. Bucherer has supplied the deficiency admirably so far as he goes. It is only natural to compare the book with the very similar introductory chapter of Professor Föppl's Einführung in die Maxwell'sche Theorie der Elektricität (1894). In fact the two presentations of vector analysis cover the same number of pages and where Bucherer surpasses in quantity Föppl excels in clearness.

The subjects treated are as usual: scalar and vector products; differentiation with respect to a scalar d/dt and with respect to