In the preceding pages I have endeavored to show the value of the work to the beginner, but this is by no means its only good quality; however space forbids touching on all. On account of the clear and scientific presentation and the numerous, well chosen illustrative examples, I know of no book which, placed in the hand of the beginner, would lead him more surely to a proper appreciation of the infinitesimal calculus.

C. L. E. MOORE.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

SHORTER NOTICES.

Grandeurs Géométriques. J. PIONCHON. Grenoble, A. Gratier et J. Rey. Paris, Gauthier-Villars, 1903. 128 pp.

THIS little volume is one of a series of seventy, constituting the Bibliothèque de l'élève ingénieur of which M. Pionchon is the general editor. This library consists of five sections: mathematics, mechanics, industrial physics, industrial electricity, and industrial economics. Each volume of about 150 pages is to contain an exposition of the fundamental notions, from the theoretical as well as practical point of view, of the subject with which it deals, and is intended to serve as a basis for later more detailed study. This plan we believe is novel and commendable. The serviceableness of the collection will of course depend largely on the way in which the plan is carried out. Judging by the volume before us, we should say that the little library promises to fulfill in a very large measure the hopes of its creator. M. Pionchon has succeeded in presenting in attractive form and logical sequence the definitions and more important properties of the fundamental geometric concepts, and the methods for the evaluation of various geometric quantities.

The author has confined himself to the mere statement of results whenever the proof is long, but is careful to show the interdependence of theorems whenever the relations are simple. He succeeds by this means in keeping alive the interest of the reader, who would soon tire of a mere list of properties and formulas. The ground covered is remarkable considering the elementary character of the treatment and the small amount of space used. We find a treatment, *e. g.*, of the notions of princi-

pal normal, binormal, curvature, torsion, osculating circle, osculating helix, in the case of twisted curves; and in the case of surfaces we find the definitions and more important properties of principal radii of curvature, mean and total curvature, ruled, developable, and minimal surfaces, lines of curvature, etc., subjects, many of them, that an American student of engineering never hears anything about. The book also contains a large number of formulas, which are made easily accessible by means of a good index.

The treatment of some of the subjects could easily be criticised on the score of rigor and some of the propositions appear to be stated with too much generality; but the niceties of modern rigor must not be insisted upon in such an elementary and one might almost say popular exposition, and the inaccuracies we have noted may well be pardoned in view of the general excellence of the whole. The typographical errors that we have noticed are few, and all of such an evident character, that it is quite unnecessary to enumerate them. We believe that M. Pionchon is to be congratulated on writiug a thoroughly serviceable and very readable book.

J. W. YOUNG.

Étude sur les Quantitées mathématiques. Grandeurs dirigées. Quaternions. CLARO CORNELIO DASSEN. Paris, A. Hermann, 1903. vi + 133 pp.

M. DASSEN tells us in the introduction that it has been his object in writing this book, to "clear up and popularize the notions which lie at the foundations of pure mathematics." The author takes the extreme utilitarian view, and will admit into the science no "play of definitions and symbols" which cannot be put to "some practical use," lest he be beguiled into a realm of mere cabalistic hocus-pocus. He admits, however, that some intrinsically useless investigations may have a certain indirect value, and then gives us a hint on the breadth of his mathematical learning as follows: "The so-called non-euclidean geometry, for example, though useless in itself, because it does not correspond to experience, has nevertheless shown itself indirectly useful in proving that the euclidean geometry, the only one that does correspond to experience, is not apodictically true and has hence served to refute the arguments of Kant on the a-priority of the concept of space" (page 2).