one-sided development of our senses, we unconsciously ascribe greater significance to the change involved in raising a mass of water 424 meters high, or throwing it with an initial velocity of 91 meters per second, than we do to the change involved in heating the mass of water enough to raise its temperature by 1° centigrade, although these effects have been proved to be objectively equivalent.

The compact language and modes of thought of vector analysis make possible a very condensed treatment of a very extended field of phenomena. The topics that are covered with considerable fulness of detail are the following: motion of rigid bodies in the air, dynamic reaction, rigid media, acoustics (embracing pure acoustics and vibroscopy), motion of deformable media, ideal fluids, elastic and viscous media, and the doctrine of force, including forces in space, and forces on surfaces.

For those who have not accustomed themselves to the form of thought of vector analysis, the book will offer some difficulties, despite the author's attempt to simplify matters, but the elegance of the new mode of scientific thought will repay the effort needed to overcome the difficulties, which are not great. The book is quite as interesting and informing in its interpretations of the various results of the operations of vector analysis, as for its value as a higher presentation of the theory of motion.

The author has made a worthy and a more than fairly successful attempt to do a laudable scientific service. He seeks to bring into organic union the most powerful mathematical language and form of thought yet devised, and a broad field of scientific ideas demanding precisely this sort of language for its adequate expression. The undertaking is too well carried out to merit anything but commendation. To complain of a few typographical errors would only augment the volume of hysteria for criticism already too rampant in certain quarters among us.

G. W. MYERS.

Text-Book on the Strength of Materials. By S. E. SLOCUM, B.E., Ph.D., Professor of Applied Mathematics in the University of Cincinnati, and E. L. HANCOCK, M. S., Assistant Professor of Applied Mechanics in Purdue University. Ginn and Co., 1906. xii + 314 pp.

THIS is one of the series of mathematical texts that are being issued under the editorial supervision of Professor Percey

F. Smith, of the Sheffield Scientific School. Both as to content and form this new addition is up to the high standard of excellence for which the series has already earned a reputation.

The authors have aimed to make a text-book on the strength of materials, which should represent the best theory and practice and at the same time be elementary enough for junior classes in technical and engineering schools. To this end they have devoted the first part of the book to theoretical discussions for class use, while the second part is a description of the physical properties of materials, with methods of testing, etc., the latter being intended for use as a sort of laboratory manual. To arouse interest in the subject, practical applications are introduced in Part I, for computation; and in Part II, for observation.

The following phases of the subject are stressed: the definition of the moment of inertia as the shape factor; the graphical method of calculating moments of inertia and centers of gravity; the application of the principle of least work; comparison of column formulas, with graphical illustrations of their relation; precise formulas for torsion of shafts of various cross-sections; simple and correct methods for the strength of hooks, links, springs, etc.; simple formulas for the strength of flat plates; elementary discussion of arches, of retaining walls and foundations; and a separate chapter in Part II on the modern use of reënforced concrete.

The question of most serious import to the writer is whether, on the whole, it is better to divide the student's time, which is now usually given to strength of materials alone, between that science and what is commonly taught in a course by itself under the heading Materials of Construction. Briefly, the book seems trying to do too much. Those who, like the writer, have taught strength of materials to junior engineering students have not found the allotted time any too great for that subject alone. As a student, the writer well recalls that the same truth holds for materials of construction. Even with a full course on the latter subject, but little more than a mere beginning can be made. So brief a treatment as is necessitated by making it a subordinate part of a course in strength of materials would hardly furnish a smattering. Both of these subjects are of fundamental importance to prospective engineers, and neither ought to be curtailed to the extent of giving them both in a single course, unless that

course cover an entire year. The practicability of this extension of time is against it. Furthermore, the book does not go into the subject far enough to justify this expenditure of time on the combined course. In the reviewer's opinion, the book has fallen into the inevitable error of too great condensation, viz., superficiality.

The correlation of these two subjects treated is, of course, important. It is also readily admitted that differentiation of subject matters is a necessary part of any true correlation. But the treatment of two subjects separately, one after the other, is not correlating them at all. It is only getting ready for a sound correlation. A real correlation of the subjects would mean furnishing the observational and experimental backing to the theory antecedently, and in close connection with it; and not subsequently and in no particularly close relation to the theory. From the viewpoint of teachability the writer is disposed to question the separation of the subjects, the order of them after they are separated, and the limited scope of both parts of the work.

The work that is given is exquisitely well done. The demonstrations are simple and graphic. It can hardly be maintained that there is either too much or too little illustrating and exemplifying. In these regards the book is unusually well-balanced. Mathematics is used, and freely used, when it helps. So far as the book goes it is mathematical enough to justify the claim to being truly, not naïvely, scientific. Every teacher would find great assistance from it, and many schools will find it well adapted to their purposes and programs.

As a mechanical piece of book-making the text is nothing short of admirable. The cuts — many of them very difficult — the typography, and the arrangement of matter on the page are up to the high standard of the contents of the book.

G. W. MYERS.