the American Museum of Natural History. He was a fellow of the American Association for the Advancement of Science since 1885, and attended the Section of Anthropology. He was also enrolled as a member of the Linnæan Society, the Numismatic and Archeological Society, the Anthropological Society of Washington and the American Geographical Society, as well as being a life member of the Anthropological Society of Paris. At the time of his death he was the oldest living member of the American Ethnological Society.

Mr. Douglass's most recent contribution to the literature of anthropology appeared as Article X. in Vol. VIII. of the *Bulletin of the American Museum of Natural History*. This paper was entitled 'A Table of the Geographical Distribution of American Indian Relics in a Collection exhibited in the American Museum of Natural History, New York,' with explanatory text.

Although suffering from an infirmity of old age, Mr. Douglass was enthusiastic and cheerful to the last. He was a man of great patience, charitable to those who differed from him in opinion and of a gentle and courteous nature.

HARLAN I. SMITH.

SCIENTIFIC BOOKS.

SOME RECENT WORKS ON MECHANICS.

Theoretical Mechanics. An elementary textbook. By L. M. HOSKINS, Professor of Applied Mathematics in the Leland Stanford Junior University. Published by the author, Stanford University Bookstore, agent. 1900. 8vo. Pp. ix + 436.

The Principles of Mechanics. An elementary exposition, for students of physics. By FREDERICK SLATE, Professor of Physics in the University of California. Part I. New York, The Macmillan Company; London, Macmillan and Company, Limited. 1900. 12mo. Pp. x + 299.

Theoretical Mechanics. An elementary treatise. By W. WOOLSEY JOHNSON, Professor of Mathematics, U. S. Naval Academy. New York, John Wiley and Sons; London, Chapman and Hall, Limited. 1901. 12mo. Pp. xv + 424.

Ad. Wernickes Lehrbuch der Mechanik in elementarer Darstellung mit Anwendungen und Übungen aus den Gebieten der Physik und Technik. In zwei Teilen. Erster Teil, Mechanik fester Körper, von DR. ALEX. WERNICKE. Vierte völlig umgearbeitete Auflage. Erste Abteilung, Einleitung—Phoronomie—Lehre vom materiellen Punkte. 8vo. Pp. xv + 314. Zweiter Teil, Flüssigkeiten und Gase, von RICHARD VATER. Dritte völlig umgearbeitete Auflage. 8vo. Pp. xii + 374. Braunschweig, Friedrich Vieweg und Sohn. 1900.

Of the production of books, and g od books, on the science of mechanics the end is not yet in sight. The first three works on our list fall into the same class. Each of them purports to give an elementary exposition only of the science, each is a good specimen of book-making, and each is supplemented by an index. They differ from one another, however, in several important respects; and their characteristic differences reflect clearly, it would appear, the points of view of the authors. Thus, Professor Hoskins has in mind mainly the needs of the progressive and aggressive engineer, and seeks at the same time to avoid the narrower demands of specialists. Professor Slate looks at the subject as a physicist, with a keen appreciation of the broader aspects of the science and the critical examination its principles have received from recent writers like Maxwell, Mach and Love. Professor Johnson, on the other hand, with perhaps a deeper sense of the difficulties to be encountered by the student, is somewhat conservative, and follows more closely the methods which have proved so effective in the works of the great analysts.

Singularly enough, the definitions of mechanics given by these authors are very much alike, and all of them are somewhat old-fashioned. Hoskins says, "*Mechanics* is the science which treats of the motions of material bodies"; Slate says, "The science of Mechanics

is concerned with the physical phenomena involved in motion"; while Johnson says, "Mechanics is the science which treats of the motions of *material bodies*, and the causes of these motions." Definitions of the science, however, are not very important to the elementary student. He must know the subject pretty well before he can appreciate a definition of it. All such definitions as those just cited, need, as their authors doubtless anticipated, much supplementary explanation in the light of the student's enlarged experience.

Professor Hoskins follows the historical development of the subject and gives to statics first place, passing on thence to kinematics and kinetics. Professor Slate adopts the modern, more logical, order of presentation beginning with kinematics. Professor Johnson follows more closely the Newtonian method, starting with dynamics and passing on to statics and kinetics, kinematical principles being explained as needed chiefly. There is much to be said in favor of each of these methods; and for the beginner either method is effective with the aid of a good teacher; but with proper preliminary training the modern method, introduced by Kelvin and Tait, would seem to be most advantageous.

The theory of dimensions, which helps more than anything else to give clearness to ideas in mechanics, is explained and freely used in the works of Professors Hoskins and Slate, but it is unfortunately omitted from the work of Professor Johnson. The need of this theory is shown at several points in the latter work; for example, on p. 126, where the phrase 'intensity of pressure' occurs, and on p. 268, where the equally cumbersome phrase 'intensity of force' occurs. Both of these phrases, which are now happily obsolescent, are here used by the author in a very puzzling way. Commonly 'intensity of pressure' means force divided by area, or stress in the more recent use of the latter term. Commonly, also, 'intensity of force' means force divided by mass, or acceleration. But these are not the senses in which Professor Johnson has used these phrases.

Without constant appeal to the theory of dimensions it is very difficult for the most careful authors to avoid ambiguity of language. Thus, to cite an illustration from the work of Professor Hoskins, take his equation (1), p. 194, specifying simple harmonic motion, namely,

$$\ddot{x} = -kx,$$

wherein the first member means acceleration and x is a distance. The constant k, then, must be the reciprocal of the square of a time. But Professor Hoskins says that k is 'written for the attractive force *per unit mass* at unit distance from 0' (the origin); a statement immediately contradicted and corrected by the theory of dimensions. There is a more refined obscurity in Professor Hoskins' articles 177, 178, wherein the gravitation constant is involved. It appears from these articles that the force of gravitation, like 'electric force' and 'electromotive force,' may be different from the force considered elsewhere in the book.

Nearly all the older works on mechanics are marred by such obscurities as those noted above. The gravitation constant has been erroneously defined by many eminent authors, and some of our best works, in the French and German languages especially, are disfigured by the introduction of forces of more than one species. It is high time that all such obscurities and ambiguities, so easily detected by the theory of dimensions, were banished from mechanics.

In connection with this subject of clear and definite terminology attention should be called to Professor Johnson's revival of the use of the term 'force of inertia' and to Professor Hoskins' use of the term 'effective forces.' These are properly going, if not wellnigh gone, out of fashion. They seem doomed to be replaced by the more suggestive term 'kinetic reaction,' or 'mass reaction.' The word 'inertia' is responsible for a deal of difficulty in mechanics, and it seems well to follow the example set by Maxwell in his Matter and Motion, and use inertia very sparingly, if at all, except in the set phrase 'moment of inertia.' It appears worth while also to note that all the works in question define the term 'stress' in its earlier sense, assigned to it by Rankine. The more recent sense of the word, especially appropriate and useful in elasticity and hydromechanics, is force per unit area; that is, force divided by

area. This rather than the original meaning of the term seems destined to persist.

The work of Wernicke is likewise intended for elementary students, and was evidently prepared for home use especially, since it is printed in German type. It is far too detailed a work, as may be inferred from the title page, not all of which is quoted above, to meet with favor, except in reference libraries on this side of the Atlantic. The authors leave little room for play of the student's imagination and less room for the development of his originality. Everything is explained in extenso, and often in a provokingly complicated or inelegant fashion. The beautifully drawn diagrams convey too much information; and the many numerical examples seem well calculated to obscure rather than to illustrate salient principles. The work is one of the happily passing texts that try to present mechanics with little or no use of the calculus, and thus waste a deal of the student's time. There is much useful information in the volumes, however, and they may prove handy for those who cannot bring an adequate preparation to the subject.

The first volume is devoted to mechanics proper and gives an elementary view of the principles applicable to rigid bodies, with many applications to machinery. The second volume treats of gases and liquids, with applications to pumps, injectors, water motors, ventilators, etc. The second volume is supplied with a good index, but the first volume has none. R. S. W.

Water Filtration Works. By JAMES H. FUERTES, M. Am. Soc. C. E. New York, John Wiley & Sons; London, Chapman & Hall, limited. Cloth, 5 × 8 in. 19 plates and 45 figures in the text. 1901. Price, $2.50.

In this work the author has discussed in a clear and very readable form the theory and practice of water filtration as it stands to-day. As preliminary to the subject proper the author devotes a short chapter to a brief statement of the relation of typhoid fever to polluted water supplies, and discusses the various processes of natural purification and the means of protecting surface waters from pollution. The great value of filtration as a means of purification is also here set forth. Chapter II. deals with intakes and sedimentation basins. The former subject is treated very briefly and mainly with reference to questions pertaining to quality; the latter subject is treated quite fully, as is quite proper in a work on filtration, since clarification by sedimentation is very frequently an important part of the purification process.

Following these two chapters is a full discussion of the subjects of slow sand-filtration and rapid or mechanical filtration, in each case the underlying theory being first set forth and then matters pertaining to the design, construction and operation of works. In Chapter VII. are given the author's conclusions as to the relative advantages of the two systems, together with suggestions as to possible combinations. A few pages are also devoted to a very brief consideration of minor processes of filtration. It was doubtless proper to omit any consideration of household filters, but in a special work of this kind it would seem that a fuller treatment of the use of filters in the removal of color and of iron in solution might have been desirable. A brief chapter on filtered-water reservoirs completes the volume.

A noteworthy feature of the work is the full and valuable data relating to the operation of filter plants and settling basins. The designing engineer will also find convenient the numerous conversion tables and diagrams contained therein. The book is well illustrated by half tones showing interesting phases of construction and operation, and by well-executed cuts of details, particularly of filter-regulating devices. As a whole, the work places before the engineer a good summary of the latest information on this important subject, and at the same time presents the matter in a way to be of interest to the general reader.

F. E. TURNEAURE.

DISCUSSION AND CORRESPONDENCE.

IS IT NOT TIME THAT THE TITLE 'PROFESSOR OF AGRICULTURE' SHOULD GO OUT OF USE?

IN most of our State institutions, known generally as Agricultural and Mechanical Colleges or Land Grant Colleges, we have what is known as the Agricultural Department, together with other Departments of the College, as, for example, the Mechanical, Civil and Electrical Engineering Departments, the Chemical, Bio-