

one must be an odd number while that of the other is twice this odd number when  $s_1 s_2 = s_2^2 s_1^2$ ; but when  $s_1 s_2 = s_2^{-2} s_1^{-2}$  it is only necessary that the order of one is three times that of the other.

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### THE TEACHING OF MECHANICS.

*An Elementary Treatise on Theoretical Mechanics.* By J. H. JEANS. Ginn and Company, 1907. viii + 364 pp.

THERE are few topics in elementary mathematics that are more generally mishandled by the writers of our text books than Newton's three laws of motion. Perhaps it would be more accurate to say that the applications of the laws are generally misunderstood and that consequently the exponents of axioms which form the foundation of the mathematical science of mechanics rarely fail to make some fundamental error which destroys at the outset any hope of a logical development of the subject. The worst cases generally occur in the books which are published under the title "Physics." It frequently happens that the authors have not mastered the meaning of the laws; more frequently they show a want of care in their statements and explanations. In either case the effect on the student must be the same — a nebulous conception of the whole subject and a general impression that one can get along perfectly well in physics or engineering without bothering to understand what facts are directly observed and which can be deduced from the laws of motion. A man who wishes to rise to the higher levels of these professions must know such matters.

Perhaps it will not be altogether out of place to insist here on some points in the teaching in this country of applied mathematics or mathematical physics, whatever be the name we like to give to the science which concerns itself with the application of mathematics to problems in which space, time, and matter are supposed to be related by certain definitely stated laws. At the outset, the subject is a "pure" science in exactly the same way that pure mathematics is so, in that it rests solely on definitions and axioms which have no *necessary* relation to the phenomena of nature. Every problem attacked is an ideal, not an actual problem. The statement of the ideal problem must conform to the laws laid down if it is to fall within the