

DYNAMICS: OLD AND NEW.

- (1) *Leçons sur la Dynamique des Systèmes matériels*. By Prof. E. Delassus. Pp. xii+421. (Paris: A. Hermann et Fils, 1913.) Price 14 francs.
- (2) *The Theory of Relativity*. By Prof. R. D. Carmichael. Pp. 74. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1913.) Price 4s. 6d. net.

(1) THIS volume is the result of an experiment made by the author to improve on the usual methods of introducing students to the study of dynamics. The first respect in which this has been essayed is in presenting the subject from the beginning in a general form, instead of beginning with those problems which are geometrically most simple. Thus the volume has rather the appearance of a treatise on what is usually known as analytical dynamics. But the object which the author has in view is not so much the development of the advanced analytical theory, which becomes largely a study of differential equations, as a unification of method which shall obviate the feeding of the student on a multiplicity of isolated problems in which the dynamical properties are essentially of the same type.

Special attention is paid to the class of systems the equations of motion of which can be integrated by quadratures. An elaborate study is made of two special questions in respect of which the author considers wrong notions to be prevalent. The first of these is the assumption usually made in respect of a unilateral constraint, such as that which occurs when a body rolls or slides on another body, that the constraint will cease to be conformed to at the moment when the force required to maintain it vanishes and changes sign; examples are given in which the assumption that this is true where there is more than one point of contact between two bodies leads to wrong conclusions.

The other point which is called in question is the assumption, which the author considers to be often tacitly made, that if the constraint imposed on a system is realised by means of auxiliary bodies of negligible mass, these auxiliary bodies have no influence on the motion of the system. An example given is that of a heavy particle constrained to move in a horizontal plane by attachment to an axis bearing two weightless wheels which roll and slide respectively on a fixed horizontal plane. It is clear that if the wheels and axis have ever so little inertia and are set in motion with a rotation about the vertical, the particle cannot describe a straight line, but the example points to such an obvious objection to the assump-

tion referred to that it is difficult to believe that as a general rule it has really been commonly asserted.

(2) After reading this careful course on classical dynamics, it is an abrupt transition to the first book published in English on the principle of relativity, and to read of a revision of the fundamental concepts, not only of space and time, but also of mass. Prof. Carmichael sets out to give a popular account of the way in which these magnitudes are regarded by the exponents of this most up-to-date of generalisations, without going into the details of its origin in electrical theory.

The project is well carried through, but it seems doubtful whether even yet the public mind is prepared to face the shock of the postulate (p. 20): "The velocity of light in free space, measured on an unaccelerated system of reference S, is independent of the velocity of S." But less objection seems to be taken to one of the consequences of the assumption of the complete relativity of all physical phenomena, namely, the dependence of the mass of a body upon its velocity, in spite of its reducing the status of Newtonian mechanics to that of an approximate theory.

The reason for this is probably that experiment seems to have demonstrated without doubt that the mass of the electron must be admitted to be variable, and we can find no reason for denying the possibility of the mass of any body varying within the limits of error admitted by astronomical theory.

The real obstacle to the acceptance of the theory of relativity is the carrying over of a conception of space and time, which is based on, or rather part of, Newton's dynamical theory into regions where that theory is certainly no longer tenable in its entirety. Prof. Carmichael's book deals entirely with these fundamental matters and will help to make more familiar a more logical and less metaphysical view of space and time in their physical bearing.

NEW ZEALAND: THEN AND NOW.

- (1) *Camp Fire Yarns of the Lost Legion*. By Col. G. Hamilton-Browne. Pp. xiii+301. (London: T. Werner Laurie, n.d.) Price 12s. 6d. net.
- (2) *Social Welfare in New Zealand*. By Hugh H. Lusk. Pp. viii+287. (London: William Heinemann, 1913.) Price 6s. net.

THESE two books present a most vivid picture of the progress which has occurred in New Zealand during the last fifty years. The