

LEVI-CIVITA ON MECHANICS

Lezioni di Meccanica Razionale. By Tullio Levi-Civita and Ugo Amaldi. Vol. 1, 2d Edition, Vol. 2, parts 1 and 2, 1st Edition. Bologna, Nicola Zanichelli, 1926-30. Pp. 807, 526, 684.

These books take their place along with such treatises as those of Routh, Appell, Budde, Resal, and Lecornu, both in quality and extensiveness. Together they comprise a good many pages. Nevertheless they are limited to the statics and dynamics of particles and rigid bodies. They do not digress extensively into special fields; no matter is set off in small type to invite omission; the principles and methods of mechanics are developed from the more elementary to the more advanced; the applications given are those of which the importance or interest is readily seen. There is no effort at terseness or brevity of expression. The authors are not only able, but are willing to lay the matter fully before the reader. The work is not merely a sequence of mathematical formulas pieced together with a minimum of sentences, whose meaning may, or may not, be fully comprehended by the reader. Equations in the last analysis must be the supporting elements of any work on dynamics. But once the equations have been definitely discovered and accepted, little skill may be required to piece them together in something like a logical sequence. But a person who does this is rather a compiler than an author. The present volumes are a real narrative, interesting and readable, worthy of occupying a high place in a literature already distinguished.

The work opens with a chapter on vector analysis. No work on mechanics can be regarded as fully adequate that shuns the use of vectors where they undoubtedly contribute to clarity and simplicity. In the present case they are used judiciously, appearing here and there throughout the entire work. The introductory chapter develops the subject distinctly as a tool, and one is not led astray through a mere attachment for the subject.

The next five chapters, comprising a total of nearly 250 pages, are devoted to kinematics. They state conspicuously at the start that mechanics presupposes geometry, and adds to this, as its own peculiar fundamental concept the notion of time. Attention is called to the fact that within recent years a great change has taken place in our ideas of time, which formerly was taken as primitive and dismissed at that. Only a page is devoted to the newer relativity aspect of time, but the cardinal idea is set forth, and enough is said perhaps to arouse such interest in the reader as will lead him to consult fuller and special treatments. The plan of developing at the beginning all matters of a kinematical nature, whether they pertain to a particle or a rigid body, has of course a logical advantage. But it has the disadvantage of delaying the real subject, that of dynamics. It is not until more than 300 pages have been read that one encounters the idea of a force; differential equations of motion first occur on page 358. Some of the kinematical ideas that relate to a rigid body are not simple. It is likely that even an attentive reader will find it necessary, when he finally reaches the dynamics of the rigid body, to study again such a question as that of the angles of Euler, quite as if it were all new material.