Cours de Mécanique Rationnelle. By J. Chazy. Tome I: Dynamique du Point Matérial. Paris, Gauthier-Villars, 1933. 392 pp.

This volume presents the first part of the course given by Professor Chazy of the Faculté des Sciences de Paris since 1928. Except for the subject of kinematics, it covers essentially the requirement for the Certificat de Mécanique Rationnelle.

The first chapter is devoted to the theory of vectors and develops the necessary algebra and calculus of vectors. Throughout the rest of the book vector methods are used exclusively.

The course is a logical development of newtonian mechanics, although the name of Newton is not mentioned in connection with the fundamental assumptions. To begin with, two systems of axes are defined as follows. The system of axes of Copernicus is a system of axes of coordinates of which the origin is the center of gravity of the solar system and the directions of which are fixed with respect to the fixed stars. A system of axes of Galileo is any system of axes having uniform rectilinear translation with respect to the axes of Copernicus. It follows that the acceleration of a moving point is the same with respect to either the axes of Copernicus or the axes of Galileo.

After making these definitions, the author then states four principles:

I. The principle of inertia or the principle of Kepler. An isolated material particle has uniform rectilinear motion, or zero acceleration.

II. The principle of Galileo or of initial conditions. At a given instant the points of a material system may be placed in given positions with given velocities; the later motions of the system, and in particular the initial accelerations, are completely determined.

III. The principle of the equality of action and reaction.

IV. The principle of the composition of forces (parallelogram law).

It is the second of these principles that appears to be unusual. It amounts to saying that the rectilinear motion of a single point is determined by a differential equation of the second order of the form $x''=f(x, x', t)$, together with arbitrary initial values of x and x'. In justification of this statement as a fundamental assumption, the author points out that there was a period in history when it was maintained, in effect, that the equation should be of the form $x'=f(x, t)$ and, on the other hand, it is conceivable a priori that the equation might have the form $x'''=f(x, x', x'', t)$.

If one were disposed to insist on satisfactory statements of fundamental principles before proceeding further, he might never get beyond the second chapter. But, having accepted the dynamical equations for the motion of a material particle, he will find in the remainder of the book a clear presentation of the usual topics. Particularly good is the discussion of various types of motion from the qualitative point of view.

It would appear to be impossible to lecture on theoretical mechanics without solving some specific problems by way of illustration. The author has, however, cut the number to a minimum and there are no problems in the text to be solved by the student. An appendix contains the questions given in the examinations for the Certificat de Mécanique Rationnelle de la Faculté des Sciences de Paris from June, 1928, to June, 1932, inclusive.

W. R. LONGLEY