SCIENCE

A WEEKLY JOURNAL DEVOTED TO THE ADVANCEMENT OF SCIENCE, PUBLISHING THE OFFICIAL NOTICES AND PROCEEDINGS OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

FRIDAY, JANUARY 15, 1909

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MSS. intended for publication and books, etc., intended for review should be sent to the Editor of SCIENCE, Garrison-on-Hudson, N. Y.

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE PROBLEM OF SEVERAL BODIES: RECENT PROGRESS IN ITS SOLUTION[1]

I

THE DIFFERENTIAL EQUATIONS AND THEIR TRANSFORMATIONS

WHITTAKER has formulated the classic problem of three bodies as follows: Three bodies attract each other according to the Newtonian law so that between each pair of particles there is an attractive force which is proportional to the product of the masses of the particles and the inverse square of their distances apart: they are free to move in space and are initially supposed to be moving in any given manner; to determine their subsequent motion.

In mathematical phraseology the problem is to integrate a certain system of the eighteenth order of differential equations which at present are usually written in the so-called canonical form

$$dx_i = \frac{\partial F}{\partial p_i}\,dt, \quad dp_i = -\frac{\partial F}{\partial x_i}\,dt,$$

in which t is the time, x_i a coordinate, p_i a component of momentum, and F a certain function of all the x_i and p_i.

In recent investigations, especially those originating in the researches of Poincaré, the canonical equations are preferred to other types because of their simplicity of

[1] Abstract of the address of the vice-president and chairman of Section A—Astronomy and Mathematics—American Association for the Advancement of Science, Baltimore, 1908.