THE STRUCTURE OF THE ÆTHER.

BY DR. H. BATEMAN.

(Read before the American Mathematical Society, February 28, 1914.)

§ 1. *Introduction.*

In Maxwell's electromagnetic theory of light the broad view is taken that waves of light are manifestations of certain electromagnetic phenomena in the æther which are included in the general class of processes capable of being described by means of the partial differential equations

$$\text{rot } M = -\frac{i}{c}\frac{\partial M}{\partial t}, \quad \text{div } M = 0. \tag{1}$$

In these equations M denotes the complex vector $H + iE$, the vectors E and H represent the electric and magnetic intensities respectively, c is a constant which is usually called the velocity of light, and rot M denotes the complex vector whose components are of type

$$\frac{\partial M_z}{\partial y} - \frac{\partial M_y}{\partial z}$$

when right-handed rectangular axes are used.

In the extensions of the theory which have been made by H. A. Lorentz* and Sir Joseph Larmor,† it is recognized that the fundamental equations (1) must not be regarded as holding for all real values of the variables x, y, z, t; the exceptional domains or singular points are, moreover, regarded as instrumental in the production of waves or disturbances in the æther.

The hypothesis generally adopted by Lorentz is that there are exceptional domains, which, when viewed at any instant, consist of an enormous aggregate of small closed regions. These domains are supposed to be occupied by electricity

* *Archives néerlandaises*, vol. 25 (1892); *Amsterdam Proceedings* (1902), p. 305.

† *Phil. Trans.* A, vol. 185 (1894), p. 719; vol. 186 (1895), p. 695; Æther and Matter, Cambridge (1900).