

or the wave theory of electricity, to deal with the problem of ether and matter? In this combined scheme what and where were the electric charges or units?

57.
What are electric charges?

On the Continent the labours of Prof. H. A. Lorentz of Leyden, and the almost simultaneous memoir of Von Helmholtz, approached this subject from the side of certain optical problems, notably the vexed question whether the luminiferous ether is stagnant, or participates in the movements of ponderable matter through it, and the phenomena of dispersion. These writings have formed the beginning of a long series of theoretical and experimental researches, which are by no means concluded. In this country we must chiefly consult the many and highly interesting writings of Dr Larmor for a fundamental discussion of the numerous problems involved. At the same time we find there a very thorough criticism, appreciation, and embodiment of the many scattered suggestions and contributions of English and Continental thinkers. Dr Larmor starts from a beginning which is peculiar to him. He finds among the older theoretical discussions of the nature of the luminiferous ether one¹ which will permit of such an

58.
Dr Larmor's position.

essay "On Ether and Matter," and W. Wien has quite recently introduced it for discussion at the "Deutsche Naturforscherversammlung" (Düsseldorf, 1898, Bericht i. p. 49). On the occasion of this discussion, Prof. Lorentz said: "Ether, ponderable matter, and, we may say, electricity, are the building stones out of which we compound the material world, and if we only knew whether matter, in its motion, carries the ether with it or not, a way would have opened by which we could pen-

etrate a little deeper into the nature of those building stones and their mutual action" (*loc. cit.*, p. 56).

¹ The historical traditions of Dr Larmor's theory seem to lie in what may be called the Dublin school of mathematical physics, with the great names of Rowan Hamilton (vector analysis), MacCullagh, and, in recent times, the much lamented G. F. Fitzgerald. "The form under which the atomic electric theory is introduced in Dr Larmor's latest essay