

Faraday are used merely for the sake of describing and calculating in the simplest manner phenomena which had been experimentally discovered: no attempt was made to explain physically how these actions come about. In fact, under the hands of Thomson the conceptions of Faraday were formulated as Dalton's atomic theory had been elaborated by chemists in the first half of the century, for the purpose of symbolically representing and calculating observed phenomena.

But the "lines of force" of Faraday were not to remain a mere symbolical representation, any more than Dalton's atoms were to remain merely counters of a chemical arithmetic. Both theories were to be raised to the rank of physical theories. What the kinetic theory of gases did for the atomic theory was done for Faraday's symbolism by the researches of Clerk Maxwell. And as the fact that the molecules of matter could be really counted, and their distances and velocities measured, gave life and actual meaning to the atomic view of natural phenomena,

47.  
Clerk  
Maxwell.

In his early geometrical researches he worked in ignorance of the remarkable 'Traité' of Poncelet, which had been published in 1822 (*loc. cit.*, vol. i. p. 594, &c.): even the writings of his countryman Möbius were unknown to him. Still more extraordinary was his comparative unacquaintance with the electrical measurements and theories which dominated German research when he commenced his physical labours, and which emanated from the school of Gauss and Weber. But he was equally ignorant of the purely mathematical theories of Poisson and Thomson, which, as he himself candidly confessed, might have saved him

from important errors (*loc. cit.*, vol. ii. p. 460), and which were later made more widely known in Germany by the excellent treatise of his pupil Beer ('*Einleitung in die Elektrostatik*,' &c., Braunschweig, 1869), posthumously edited by Plücker himself. The fact that Plücker was not influenced by the spirit of Weber's researches probably made him more appreciative of Faraday's purely physical methods. In such names as Beer, Clebsch, Klein, Fessel, Geissler, and Hittorf, Plücker counts an illustrious array of pupils and fellow-workers. See Clebsch's characteristic of Plücker, *loc. cit.*, vol. i. p. xii, &c.