

All changes of these states, and all phenomena dependent thereon, are therefore consequences of these interactions. But bodies exert such mutual actions when in contact as well as from a distance, and it was evident that a beginning had to be made with the latter in order to gain a clue for the investigation of the former; this being especially needful whenever the spatial relations of bodies escape observation, as is the case with bodies which are in contact. And so it has really happened, inasmuch as a beginning was made by examining the mutual action of cosmic bodies—*i.e.*, with the phenomena of gravitation. To this first field of research—*viz.*, the phenomena of gravitation—there was then added the investigation of electric and magnetic interactions, as next to gravitation these are the only actions which take place from one body to another at measurable distances,—these actions being themselves measurable. Now for a long time Newton's doctrine of gravitation furnished the leading idea for nearly all theories of electricity and magnetism, till a new clue was gained through Oersted's and Ampère's discoveries

the form of a velocity. It had for Weber a theoretical as well as a practical meaning, for it enabled him to effect a connection between the electro-magnetic and the electro-static or absolute system of measurements. When he succeeded in measuring this quantity, it was found that the figure for the constant, which meant a velocity, was practically the same as that for the velocity of the propagation of light. Weber himself does not seem to have attached any physical meaning to this coincidence: later he and Kirchhoff remarked that under cer-

tain conditions an electrical wave-motion might take place in an electrical conductor, and that the velocity of the propagation of this would coincide with that of light (see Kirchhoff in 'Annalen der Physik und Chemie,' 1857; and Weber, 'Electrodyn. Maasbest.,' 1864). It was reserved for Clerk Maxwell to point to the real physical interpretation of Weber's constant. Of this I shall speak in a later chapter (see Maxwell's memoir 'On Physical Lines of Force,' 1862, reprinted in 'Scientific Papers,' vol. i.)