phenomena, or even for such processes as happen continually under our eyes and our hands, this universal law of gravitation has practically done nothing. The action of gravitation alone between masses which we can manipulate directly is so weak that it takes the very finest instruments to detect it at all, and at molecular distances it is so immeasurably small that it is hardly conceivable how it can explain the existence of those enormous forces with which we here have to deal.[1] If

&c.—more or less in the dark (see 'Mathematische Annalen,' vol. xi. p. 323). From a philosophical point of view these discussions, in which many other eminent leaders of scientific thought took part, are of great interest and importance, as they bear upon the value of mathematical formulæ in physical research, upon the definition of laws of nature, the extent of their applicability, the correct lines of future research, the use of analogies in the formation of physical theories, &c. I therefore refer here to the literature of the subject: Tait, 'Sketch of Thermodynamics' (1868, pp. 57, 76); Thomson and Tait, 'Natural Philosophy' (1st ed., p. 311); Carl Neumann, 'Die Principien der Electrodynamik' (Tübingen, 1868); Helmholtz in various memoirs from 1872 onwards, all collected in 'Wissenschaftliche Abhandlungen' (vol. i. pp. 545, 636, 774, &c.) and in 'Vorträge und Reden' (vol. ii. Faraday Lecture); Carl Neumann, 'Mathematische Annalen' (vol. xi. p. 318). See also Riecke on 'Wilhelm Weber' (Göttingen, 1892), and Clerk Maxwell, 'Electricity and Magnetism,' (vol. ii. last chapter); 'Elementary Treatise on Electricity' (p. 51).

[1] An interesting speculation as to whether the Newtonian formula of gravitation is capable of explaining cohesion and capillary attraction will be found in Thomson's (Lord Kelvin's) paper to the Royal Society of Edinburgh (1862), and in his lecture before the Royal Institution (1866), on Capillary Attraction, both reprinted in the first volume of 'Popular Lectures and Addresses.' He there shows that if we combine Newton's law with the assumption of an ultimate heterogeneousness of matter,—as is demanded in the so-called atomic theory used in chemistry,—the mass of ultimate portions of matter at vanishing distances, or what is called in contact, may give rise to molecular forces of attraction of any magnitude; since the Newtonian attraction depends on two data—the distance and the density (or mass) of attracting particles. He concludes by saying that "it is satisfactory to find that, so far as cohesion is concerned, no other force than that of gravitation need be assumed" (p. 63). It does not seem that this view, which was also held by Sir John Herschel, is generally adopted by physicists (see Todhunter and Pearson, 'History of the Theory of Elasticity,' vol. i. p. 418, &c.; vol. ii. art. 1650). Another interesting speculation arose out of the discussion over Weber's law. One of the objections started by Helmholtz against Weber's law was that, under certain conditions,