former applying them to the measurement of the magnetic forces of the earth, the latter to that of the forces exerted by currents of electricity—*i.e.*, by electricity which is not at rest but in motion. As I have already stated, the measurements of Coulomb confirmed the prevalent notion that action at a distance, varying inversely as the square of the distance, and directly in the proportion of the quantities of the acting substance, was a universal formula or law of nature.[1] The idea

[1] Coulomb's exact measurements of the attraction and repulsion at a distance of electrified bodies and of magnets were published during the years 1784 to 1789 in seven memoirs presented to the Paris Academy of Sciences. They are conveniently collected, together with some other memoirs of Coulomb, Poisson, and others on kindred subjects, in the first volume of the 'Collection de Mémoires relatifs à la Physique,' published in 1884 by the Société française de Physique. Coulomb made use of the torsion-balance and the proof-plane, the actions of which he carefully examined. He confirmed the law, which had been vaguely or approximately expressed by various writers before him, that electrified bodies act on each other with a force which is proportional to the inverse square of their distances. This he did by direct measurements of the repulsion of small electrified bodies in the torsion-balance (1785, 1st Mémoire). He then extended his measurements by an indirect method to the action of electrified bodies of larger size and to magnets (2nd Mémoire). He also defined what is meant by quantity and density of electricity and magnetism, and showed how these could be measured and how the action of electrified bodies and magnets depended on the more or less of these quantities. Coulomb's researches contain experiments of great delicacy. Although the laws which bear his name appear so simple when written down, the phenomena they represent are most complicated, as in the case of electricity the effect of electrical influence, called by Faraday induction, and in the case of magnetism the presence of the earth's magnetism, and the fact that we have never to do with one kind of magnetism but always with two states, destroys all chance of exhibiting experimentally the simple case represented by the mathematical formula. It was therefore necessary to consider this formula as being merely a convenient description of the elementary action of supposed isolated quantities of electricity and magnetism, and by a process of summation to deduce mathematically the actual effects for such cases of interaction as are actually observable in the laboratory. It was especially the phenomena of the distribution of electricity on the surface of electrified bodies of simple shape and the distribution of magnetic forces in the neighbourhood of magnets which had to be calculated and measured. In physical astronomy a similar course of reasoning and observation combined had verified