48. His series of works on the theory of electricity.

tionary series of works, 'On Faraday's Lines of Force,' was published in December 1855. The series was completed by the appearance in 1873 of his great work on 'Electricity and Magnetism,' which has formed the centre of a large literature to which all the scientific schools of Europe and America have contributed. Historically, Maxwell brought together two distinct and very fruitful lines of reasoning, due to Faraday and Thomson.[1] He was impressed with the desideratum of every physical theory bearing on any large class of phenomena—viz., that it must be mathematical and physical at the same time. His own theory had to embrace and unite all the purely arithmetical and geometrical regularities which had been discovered, and which at that time were known to describe correctly the facts of electric, mag-

"poaching upon Thomson's electrical preserves." In the preface to the treatise on electricity and magnetism, he refers to the apparent discrepancy between the views of Faraday and the mathematicians, and he states that he had arrived at "the conviction that this discrepancy did not arise from either party being wrong. I was first convinced of this," he proceeds, "by Sir William Thomson, to whose advice and assistance, as well as to his published papers, I owe most of what I have learned on the subject.

[1] In a different reference we may say that Maxwell's theory was prepared by three independent lines of research, starting respectively in France, Germany, and England: (1) The investigation of the actions at a distance of electrified and magnetised bodies, and of electric currents, which found mathematical expression in the formulæ of Coulomb and Ampère. The full significance and capabilities of the formulæ of electrostatic and magnetic action had been demonstrated by Thomson, who especially showed that these relations were not necessarily confined to the physical theory which had been elaborated on the Continent, but that, *mutatis mutandis*, they lent themselves equally well to the physical ideas of Faraday. (2) The exact measurements of magnetic, electro-dynamic, and galvanic action started by Ohm and Gauss in Germany, and much extended by Weber. (3) The idea of physical lines of force, filling space and representing action through contiguous particles, not at a distance, elaborated by Faraday. These three lines of research were brought together in the theory of Maxwell, which in the beginning professed to be only a mathematical but ended by being a physical theory.