

the equal reaction which necessarily accompanies this action acts oppositely to the action, not in the same line, but in a parallel line, at the other extremity of the distance; thus forming a primitive *couple*, to use a technical expression borrowed from mechanics. To this Ampère objected,<sup>4</sup> that the *direct* opposition of all elementary action and reaction was a universal and necessary mechanical law. He showed too that such a couple as had been assumed, would follow as a *derivative* result from his theory. And in comparing his own theory with that in which the voltaic wire is assimilated to a collection of transverse magnets, he was also able to prove that no such assemblage of forces acting to and from fixed points, as the forces of magnets do act, could produce a continued motion like that discovered by Faraday. This, indeed, was only the well-known demonstration of the impossibility of a perpetual motion. If, instead of a collection of magnets, the adverse theorists had spoken of a magnetic *current*, they might probably interpret their expressions so as to explain the facts; that is, if they considered every element of such a current as a magnet, and consequently, every point of it as being a north and a south point at the same instant. But to introduce such a conception of a magnetic current was to abandon all the laws of magnetic action hitherto established; and consequently to lose all that gave the hypothesis its value. The idea of an electric current, on the other hand, was so far from being a new and hazardous assumption, that it had already been forced upon philosophers from the time of Volta; and in this current, the relation of *preceding* and *succeeding*, which necessarily existed between the extremities of any element, introduced that relative polarity on which the success of the explanations of the facts depended. And thus in this controversy, the theory of Ampère has a great and undeniable superiority over the rival hypotheses.

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## CHAPTER VII.

### CONSEQUENCES OF THE ELECTRODYNAMIC THEORY.

IT is not necessary to state the various applications which were soon made of the electro-magnetic discoveries. But we may notice one

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<sup>4</sup> Ampère, *Théorie*, p. 154.