

electricity ; to which we may add, the connexion of electricity with magnetism and with chemistry ;—a vast field, as yet dimly seen. Now, even with regard to the simplest of these questions, the cause of the retention of electricity at the surface of bodies, it appears to be impossible to maintain Coulomb's opinion, that this is effected by the resistance of air to the passage of electricity. The other questions are such as Coulomb did not attempt to touch ; they refer, indeed, principally to laws not suspected at his time. How wide and profound a theory must be which deals worthily with these, we shall obtain some indications in the succeeding part of our history.

But it may be said on the other side, that we have the evidence of our senses for the reality of an electric fluid ;—we see it in the spark ; we hear it in the explosion ; we feel it in the shock ; and it produces the effects of mechanical violence, piercing and tearing the bodies through which it passes. And those who are disposed to assert a real fluid on such grounds, may appear to be justified in doing so, by one of Newton's "Rules of Philosophizing," in which he directs the philosopher to assume, in his theories, "causes which are true." The usual interpretation of a "*vera causa*," has been, that it implies causes which, independently of theoretical calculations, are known to exist by their mechanical effects ; as gravity was familiarly known to exist on the earth, before it was extended to the heavens. The electric fluid might seem to be such a *vera causa*.

To this I should venture to reply, that this reasoning shows how delusive the Newtonian rule, so interpreted, may be. For a moment's consideration will satisfy us that none of the circumstances, above adduced, can really prove material currents, rather than vibrations, or other modes of agency. The spark and shock are quite insufficient to supply such a proof. Sound is vibrations,—light is vibrations ; vibrations may affect our nerves, and may rend a body, as when glasses are broken by sounds. Therefore all these supposed indications of the reality of the electric fluid are utterly fallacious. In truth, this mode of applying Newton's rule consists in elevating our first rude and unscientific impressions into a supremacy over the results of calculation, generalization, and systematic induction.<sup>16</sup>

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<sup>16</sup> On the subject of this Newtonian Rule of Philosophizing, see further *Phil. Ind. Sc. B. xii. c. 13*. I have given an account of the history and evidence of the Theory of Electricity in the *Reports of the British Association* for 1835. I may seem there to have spoken more favorably of the Theory as a Physical