is extremely difficult to conceive any arrangement of the particles of bodies by which such motions can mechanically be produced; and this difficulty is the greater, because some fluids and some gases impress a circular polarization upon light; in which cases we cannot imagine any definite arrangement of the particles, such as might form the mechanism requisite for the purpose. Accordingly, it does not appear that any one has been able to suggest even a plausible hypothesis on that subject. Yet, even here, something has been done. Professor Mac Cullagh, of Dublin, has discovered that by slightly modifying the *analytical expressions* resulting from the common case of the propagation of light, we may obtain other expressions which would give rise to such motions as produce circular and elliptical polarization. And though we cannot as yet assign the mechanical interpretation of the language of analysis thus generalized, this generalization brings together and explains by one common numerical supposition, two distinct classes of facts;—a circumstance which, in all cases, entitles an hypothesis to a very favorable consideration.

Mr. Mac Cullagh's assumption consists in adding to the two equations of motion which are expressed by means of second differentials, two other terms involving third differentials in a simple and symmetrical manner. In doing this, he introduces a coefficient, of which the magnitude determines both the amount of rotation of the polarization of a ray passing along the axis, as observed and measured by Biot, and the ellipticity of the polarization of a ray which is oblique to the axis, according to Mr. Airy's theory, of which ellipticity that philosopher also had obtained certain measures. The agreement between the two sets of measures[12] thus brought into connexion is such as very strikingly to confirm Mr. Mac Cullagh's hypothesis. It appears probable, too, that the confirmation of this hypothesis involves, although in an obscure and oracular form, a confirmation of the undulatory theory, which is the starting-point of this curious speculation.

5. *Elliptical Polarization of Metals.*—The effect of metals upon the light which they reflect, was known from the first to be different from that which transparent bodies produce. Sir David Brewster, who has recently examined this subject very fully,[13] has described the modification thus produced, as *elliptic polarization.* In employing this term, "he seems to have been led," it has been observed,[14] "by a

---

[12] *Royal I. A. Trans.* 1836. [13] *Phil. Trans.* 1830.

[14] Lloyd, *Report on Optics*, p. 372. (Brit. Assoc.)