

hypothesis that the transverse vibrations which constitute polarization are perpendicularly transverse to the plane of polarization was confirmed.¹

But Mr. Holtzmann,² who, assenting to the reasoning, has made the experiment in a somewhat different manner, has obtained an opposite result; so that the point may be regarded as still doubtful.

Final Disproof of the Emission Theory.

As I have stated in the History, we cannot properly say that there ever was an Emission Theory of Light which was the *rival* of the Undulatory Theory: for while the undulatory theory provided explanations of new classes of phenomena as fast as they arose, and exhibited a *consilience* of theories in these explanations, the hypothesis of emitted particles required new machinery for every new set of facts, and soon ceased to be capable even of expressing the facts. The simple cases of the ordinary reflexion and refraction of light were explained by Newton on the supposition that the transmission of light is the motion of particles: and though his explanation includes a somewhat harsh assumption (that a refracting surface exercises an attractive force through a *fixed finite* space), the authority of his great name gave it a sort of permanent notoriety, and made it to be regarded as a standard point of comparison between a supposed "Emission Theory" and the undulation theory. And the way in which the theories were to be tested in this case was obvious: in the Newtonian theory, the velocity of light is increased by the refracting medium; in the undulatory theory, it is diminished. On the former hypothesis the velocity of light in air and in water is as 3 to 4; in the latter, as 4 to 3.

But the immense velocity of light made it appear impossible to measure it, within the limits of any finite space which we can occupy with refracting matter. The velocity of light is known from astronomical phenomena;—from the eclipses of Jupiter's satellites, by which it appears that light occupies 8 minutes in coming from the sun to the earth; and from the aberration of light, by which its velocity is shown to be 10,000 times the velocity of the earth in its orbit. Is it, then, possible to make apparent so small a difference as that between its passing through a few yards of air and of water?

Mr. Wheatstone, in 1831, invented a machine by which this could

¹ *Camb. Trans.*, vol. ix. part i. 1849.

² *Phil. Mag.*, Feb. 1857.