

pied with the double refraction of light in crystals of Iceland spar, *i. e.*, with the separation of the pencils of light into two parts, he also discovered, in 1678, that kind of polarization of light which bears his name. The discovery of this isolated phenomenon, which was not published till 1690, and, consequently, only five years before the death of Huygens, was followed, after the lapse of more than a century, by the great discoveries of Malus, Arago, Fresnel, Brewster, and Biot.* Malus, in 1808, discovered polarization by reflection from polished surfaces, and Arago, in 1811, made the discovery of colored polarization. A world of wonder, composed of manifold modified waves of light, having new properties, was now revealed. A ray of light, which reaches our eyes, after traversing millions of miles, from the remotest regions of heaven, announces of itself, in Arago's polariscope, whether it is reflected or refracted, whether it emanates from a solid, or fluid, or gaseous body; announcing even the degree of its intensity.† By pursuing this course, which leads us back through Huygens to the seventeenth century, we are instructed concerning the constitution of the solar body and its envelopes; the reflected or the proper light of cometary tails and the zodiacal light; the optical properties of our atmosphere; and the position of the four neutral points of polarization‡ which Arago, Babinet, and Brewster discovered. Thus does man create new organs, which, when skillfully employed, reveal to him new views of the universe.

Next to polarization I should name the *interference* of light, the most striking of all optical phenomena, faint traces of which were also observed in the seventeenth century—by Grimaldi in 1665, and by Hooke, although without a proper understanding of its original and causal conditions.§ Modern times owe the discovery of these conditions, and the clear insight into the laws, according to which, (unpolarized) rays of light, emanating from one and the same source, but with a different length of path, destroy one another and produce darkness, to the successful penetration of Thomas Young. The laws of the in

* On the important law discovered by Brewster, of the connection between the angle of complete polarization and the index of refraction, see *Philosophical Transactions of the Royal Society for the Year 1815* p. 125-159.

† See *Cosmos*, vol. i., p. 39 and 52.

‡ Sir David Brewster, in Berghaus and Johnson's *Physical Atlas*, 1847 Part vii., p. 5 (*Polarization of the Atmosphere*).

§ On Grimaldi's and Hooke's attempt to explain the polarization of soap-bubbles by the interference of the rays of light, see Arago, in the *Annuaire* for 1831, p. 164 (*Brewster's Life of Newton*, p. 53).