this part of optics. "To Bartholin we owe the knowledge of double refraction; to Huyghens, that of the accompanying polarization; to Malus, polarization by reflection; to Arago, depolarization." Sir D. Brewster was at the same time engaged in a similar train of research; and made discoveries of the same nature, which, though not published till some time after those of Arago, were obtained without a knowledge of what had been done by him. Sir D. Brewster's *Treatise on New Philosophical Instruments*, published in 1813, contains many curious experiments on the "depolarizing" properties of minerals. Both these observers noticed the changes of color which are produced by changes in the position of the ray, and the alternations of color in the two oppositely polarized images; and Sir D. Brewster discovered that, in topaz, the phenomena had a certain reference to lines which he called the *neutral* and *depolarizing* axes. M. Biot had endeavored to reduce the phenomena to a law; and had succeeded so far, that he found that in the plates of sulphate of lime, the place of the tint, estimated in Newton's *scale* (see *ante*, chap. vii.), was as the square of the sine of the inclination. But the laws of these phenomena became much more obvious when they were observed by Sir D. Brewster with a larger field of view.[2] He found that the colors of topaz, under the circumstances now described, exhibited themselves in the form of elliptical rings, crossed by a black bar, "the most brilliant class of phenomena," as he justly says, "in the whole range of optics." In 1814, also, Wollaston observed the circular rings with a black cross, produced by similar means in calc-spar; and M. Biot, in 1815, made the same observation. The rings in several of these cases were carefully measured by M. Biot and Sir D. Brewster, and a great mass of similar phenomena was discovered. These were added to by various persons, as M. Seebeck, and Sir John Herschel.

Sir D. Brewster, in 1818, discovered a general relation between the crystalline form and the optical properties, which gave an incalculable impulse and a new clearness to these researches. He found that there was a correspondence between the degree of symmetry of the optical phenomena and the crystalline form; those crystals which are uniaxal in the crystallographical sense, are also uniaxal in their optical properties, and give circular rings; those which are of other forms are, generally speaking, biaxal; they give oval and knotted *isochromatic* lines, with two *poles*. He also discovered a rule for the tint at each point

[2] *Phil. Trans.* 1814.