

polarized in *opposite* (that is, perpendicular,) planes do not interfere at all.¹⁹ Taking these principles into the account, Fresnel explained very completely, by means of the interference of undulations, all the circumstances of colors produced by crystallized plates; showing the necessity of the *polarization* in the first instance; the *dipolarizing* effect of the crystal; and the office of the *analysing plate*, by which certain portions of each of the two rays in the crystal are made to interfere and produce color. This he did, as he says,²⁰ without being aware, till Arago told him, that Young had, to some extent, anticipated him.

When we look at the history of the emission-theory of light, we see exactly what we may consider as the natural course of things in the career of a false theory. Such a theory may, to a certain extent, explain the phenomena which it was at first contrived to meet; but every new class of facts requires a new supposition,—an addition to the machinery; and as observation goes on, these incoherent appendages accumulate, till they overwhelm and upset the original framework. Such was the history of the hypothesis of solid epicycles; such has been the history of the hypothesis of the material emission of light. In its simple form, it explained reflection and refraction; but the colors of thin plates added to it the hypothesis of fits of easy transmission and reflection; the phenomena of diffraction further invested the particles with complex hypothetical laws of attraction and repulsion; polarization gave them sides; double refraction subjected them to peculiar forces emanating from the axes of crystals; finally, dipolarization loaded them with the complex and unconnected contrivance of moveable polarization; and even when all this had been assumed, additional mechanism was wanting. There is here no unexpected success, no happy coincidence, no convergence of principles from remote quarters; the philosopher builds the machine, but its parts do not fit; they hold together only while he presses them: this is not the character of truth.

In the undulatory theory, on the other hand, all tends to unity and simplicity. We explain reflection and refraction by undulations; when we come to thin plates, the requisite “fits” are already involved in our fundamental hypothesis, for they are the length of an undulation; the phenomena of diffraction also require such intervals; and the intervals thus required agree exactly with the others in magnitude,

¹⁹ *Ann. Chim.* tom. x.

²⁰ *Ib.* tom. xvii. p. 402.