

be shown to be a necessary consequence of the assumed principle, by very simple reasoning, which I shall give in a general form in a Note.²⁴

This reasoning is capable of being presented in a manner quite satisfactory, by the use of mathematical symbols, and proves that Leslie's law of the sines is rigorously and mathematically true on Fourier's hypothesis. And thus Fourier's theory of *molecular extra-radiation* acquires great consistency.

Sect. 8.—Discovery of the Polarization of Heat.

THE laws of which the discovery is stated in the preceding Sections of this Chapter, and the explanations given of them by the theories of conduction and radiation, all tended to make the conception of a material heat, or *caloric*, communicated by an actual flow and emission, familiar to men's minds; and, till lately, had led the greater part of thermotical philosophers to entertain such a view, as the most probable opinion concerning the nature of heat. But some steps have recently been made in thermotics, which appear to be likely to overturn this belief, and to make the doctrine of emission as untenable with regard to heat, as it had been found to be with regard to light. I speak of the discovery of the polarization of heat. It being ascertained that rays of heat are polarized in the same manner as rays of

²⁴ The following reasoning may show the connexion of the law of the sines in radiant heat with the general principle of ultimate identity of neighboring temperatures. The equilibrium and identity of temperature between an including shell and an included body, cannot obtain upon the whole, except it obtain between each pair of parts of the two surfaces of the body and of the shell; that is, any part of the one surface, in its exchanges with any part of the other surface, must give and receive the same quantity of heat. Now the quantity exchanged, so far as it depends on the receiving surface, will, by geometry, be proportional to the sine of the obliquity of that surface: and as, in the exchanges, each may be considered as receiving, the quantity transferred must be proportional to the sines of the two obliquities; that is, to that of the giving as well as of the receiving surface.

Nor is this conclusion disturbed by the consideration, that all the rays of heat which fall upon a surface are not absorbed, some being reflected according to the nature of the surface. For, by the other above-mentioned laws of phenomena, we know that, in the same measure in which the surface loses the power of admitting, it loses the power of emitting, heat; and the superficial parts gain, by absorbing their own radiation, as much as they lose by not absorbing the incident heat; so that the result of the preceding reasoning remains unaltered.