

duction, in their ultimate analytical form, were almost identical with the laws of motion of fluids. Fourier's principle also, that the radiation of heat takes place from points below the surface, and is intercepted by the superficial particles, appears to favor the notion of material emission.

Accordingly, some of the most eminent modern French mathematicians have accepted and extended the hypothesis of a material caloric. In addition to Fourier's doctrine of molecular extra-radiation, Laplace and Poisson have maintained the hypothesis of *molecular intra-radiation*, as the mode in which conduction takes place; that is, they say that the particles of bodies are to be considered as *discrete*, or as points separated from each other, and acting on each other at a distance; and the conduction of heat from one part to another, is performed by radiation between all neighboring particles. They hold that, without this hypothesis, the differential equations expressing the conditions of conduction cannot be made homogeneous: but this assertion rests, I conceive, on an error, as Fourier has shown, by dispensing with the hypothesis. The necessity of the hypothesis of discrete molecular action in bodies, is maintained in all cases by M. Poisson; and he has asserted Laplace's theory of capillary attraction to be defective on this ground, as Laplace asserted Fourier's reasoning respecting heat to be so. In reality, however, this hypothesis of discrete molecules cannot be maintained as a physical truth; for the law of molecular action, which is assumed in the reasoning, after answering its purpose in the progress of calculation, vanishes in the result; the conclusion is the same, whatever law of the intervals of the molecules be assumed. The definite integral, which expresses the whole action, no more proves that this action is actually made of the differential parts by means of which it was found, than the processes of finding the weight of a body by integration, prove it to be made up of differential weights. And therefore, even if we were to adopt the emission theory of heat, we are by no means bound to take along with it the hypothesis of discrete molecules.

But the recent discovery of the refraction, polarization, and depolarization of heat, has quite altered the theoretical aspect of the subject, and, almost at a single blow, ruined the emission theory. Since heat is reflected and refracted like light, analogy would lead us to conclude that the mechanism of the processes is the same in the two cases. And when we add to these properties the property of polarization, it is scarcely possible to believe otherwise than that heat consists in trans-