### *Sect. 2.—Introduction of the Doctrine of Radiation.*

A HOT body, as a mass of incandescent iron, emits heat, as we perceive by our senses when we approach it; and by this emission of heat the hot body cools down. The first step in our systematic knowledge of the subject was made in the *Principia*. "It was in the destiny of that great work," says Fourier, "to exhibit, or at least to indicate, the causes of the principal phenomena of the universe." Newton assumed, as we have already said, that the rate at which a body cools, that is, parts with its heat to surrounding bodies, is proportional to its heat; and on this assumption he rested the verification of his scale of temperatures. It is an easy deduction from this law, that if times of cooling be taken in arithmetical progression, the heat will decrease in geometrical progression. Kraft, and after him Richman, tried to verify this law by direct experiments on the cooling of vessels of warm water; and from these experiments, which have since been repeated by others, it appears that for differences of temperature which do not exceed 50 degrees (boiling water being 100), this geometrical progression represents, with tolerable (but not with complete) accuracy, the process of cooling.

This principle of radiation, like that of conduction, required to be followed out by mathematical reasoning. But it required also to be corrected in the first place, for it was easily seen that the rate of cooling depended, not on the absolute temperature of the body, but on the excess of its temperature above the surrounding objects to which it communicated its heat in cooling. And philosophers were naturally led to endeavor to explain or illustrate this process by some physical notions. Lambert in 1755 published[5] an *Essay on the Force of Heat*, in which he assimilates the communication of heat to the flow of a fluid out of one vessel into another by an excess of pressure; and mathematically deduces the laws of the process on this ground. But some additional facts suggested a different view of the subject. It was found that heat is propagated by radiation according to straight lines, like light; and that it is, as light is, capable of being reflected by mirrors, and thus brought to a focus of intenser action. In this manner the radiative effect of a body could be more precisely traced. A fact, however, came under notice, which, at first sight, appeared to

[5] *Act. Helvet.* tom. ii. p. 172.