

verse vibrations; for no wise philosopher would attempt an explanation by ascribing poles to the emitted particles, after the experience which Optics affords, of the utter failure of such machinery.

But here the question occurs, If heat consists in vibrations, whence arises the extraordinary identity of the laws of its propagation with the laws of the flow of matter? How is it that, in conducted heat, this vibration creeps slowly from one part of the body to another, the part first heated remaining hottest; instead of leaving its first place and travelling rapidly to another, as the vibrations of sound and light do? The answer to these questions has been put in a very distinct and plausible form by that distinguished philosopher, M. Ampère, who published a *Note on Heat and Light considered as the results of Vibratory Motion*,² in 1834 and 1835; and though this answer is an hypothesis, it at least shows that there is no fatal force in the difficulty.

M. Ampère's hypothesis is this; that bodies consist of solid molecules, which may be considered as arranged at intervals in a very rare ether; and that the vibrations of the molecules, causing vibrations of the ether and caused by them, constitute heat. On these suppositions, we should have the phenomena of conduction explained; for if the molecules at one end of a bar be hot, and therefore in a state of vibration, while the others are at rest, the vibrating molecules propagate vibrations in the ether, but these vibrations do not produce heat, except in proportion as they put the quiescent molecules of the bar in vibration; and the ether being very rare compared with the molecules, it is only by the repeated impulses of many successive vibrations that the nearest quiescent molecules are made to vibrate; after which they combine in communicating the vibration to the more remote molecules. "We then find necessarily," M. Ampère adds, "the same equations as those found by Fourier for the distribution of heat, setting out from the same hypothesis, that the temperature or heat transmitted is proportional to the difference of the temperatures."

Since the undulatory hypothesis of heat can thus answer all obvious objections, we may consider it as upon its trial, to be confirmed or modified by future discoveries; and especially by an enlarged knowledge of the laws of the polarization of heat.

[2nd Ed.] [Since the first edition was written, the analogies between light and heat have been further extended, as I have already stated. It

² *Bibliothèque Universelle de Genève*, vol. xlix. p. 225. *Ann. Chim.* tom. lvii. p. 434.