

law of relative loss and gain, the exact compensation of forces, of the real conservation of energy. Heat is an element that sooner or later must engage the attention of the student. Naturally the latter will feel that to make satisfactory progress in this study it is important to begin by obtaining some knowledge of the nature of heat as well as of the sources which produce it.

Here at the outset, a difficulty blocks the way. It does not seem possible as yet to obtain any definite idea of the nature of heat. However, the effort to clear away the problem shows itself in two ingenious theories. One, styled the emission theory, accounts heat a subtle imponderable fluid which passes from one body to another. Each molecule of a body possesses its own atmosphere, composed of this fluid. These heat atmospheres, by their very nature, are in continual movement. Their flow or entrance into our bodies produces the sensation of warmth; their ebb or egress, the contrary feeling of cold.

According to the other theory, the undulatory, the molecules of bodies are in a state of constant and rapid oscillation or vibration. Whatever accelerates their movements raises the temperature of the bodies to which they belong. By these vibrations is disturbed the outlying ether—that imponderable elastic fluid which as Physicists conceive it, occupy the inter-molecular spacings, as well as all space. The ether at once transmits the agitation given it across space to the molecules of neighboring bodies. These latter immediately reveal the reception of the new energy in also growing warmer.

Of the two theories, the undulatory is the one most in favor with scientists. It seems to explain best the phenomena all simple bodies, and most compound ones exhibit, when they are passed through the three stages, the solid, liquid, and gaseous and reversely. In every body there is heat, in different degrees to be sure. In solids the molecules are in a state of vibration, but not to such an extent as to overcome the force of affinity which retains the molecules in certain fixed positions in regard to one another. In consequence, a solid possesses the independent shape given it by nature or art. Nevertheless, the attraction of affinity may and often does yield to increase of heat. The parts of the