

In answer to the question, What is understood by the doctrine of conservation? a better answer cannot be given than the following, extracted from a book called "Faraday as a Discoverer," and appended by Prof. Tyndall to his treatise, "*Heat a Mode of Motion.*" It is as follows: "Of the inner quality that enables matter to attract matter, we know nothing; and the law of conservation makes no statement regarding that quality. It takes the facts as they stand, and affirms only the constancy of *working power*. That power may exist in the form of MOTION; or it may exist in the form of FORCE, *with distance to act through*. The former is dynamic energy, the latter is potential energy; the constancy of the sum of both being affirmed by the law of conservation. The *convertibility* of natural forces consists solely in transformations of dynamic into potential, and of potential into dynamic energy, which are incessantly going on. In no other sense has the convertibility of force at present any scientific meaning."

The following quotation from Tyndall's "*Heat a Mode of Motion*," will illustrate the application of the principle to a special case:—"Suppose a certain amount of heat to be imparted to this lump of lead, how is that heat disposed of within the substance? It is applied to two distinct purposes: it performs two different kinds of work. One portion of it excites that species of motion which augments the temperature of the lead, and which is sensible to the thermometer; but another portion of it goes to force the atoms of lead into new positions, and this portion is *lost as heat*. The pushing asunder of the atoms of the lead in this case, in opposition to their mutual attractions, is exactly analogous to the raising of our weight in opposition to the force of gravity, a loss of heat in both cases being the result. Let me try to make the comparison between the two actions still more strict. Suppose that a definite amount of force is to be expended upon our weight, and that this force is divided into two portions, one of which is devoted to the actual raising of the weight, while the other is employed to cause the weight as it ascends to oscillate like a pendulum, and to *oscillate* moreover with gradually augmented width and rapidity; we have then the analogue of that which occurs when heat is imparted to the lead. The atoms are pushed apart, but during their recession they vibrate with gradually augmented intensity. Thus, the heat communicated to the lead resolves itself in part into atomic potential energy, and in part into actual energy, which may be regarded as a kind of atomic music.