

But although matter may exist in this extremely minute form, and be divisible, there is a limit beyond which it cannot be divided; there are ultimate particles of matter. Every substance, therefore, consists of a number of ultimate particles, which are united together by some force, and that force is called cohesion. If there were not some power by which the molecules could be bound together, all matter must exist in loose unconnected parts, and none of the states of matter now observed could ever have been brought into being. But this cohesive force is not equally powerful in all circumstances; and it is for this reason that matter may exist as a solid, a liquid, or a gas. It is strongest in solids, though the particles of all solids are not combined by forces of the same intensity. There are substances, the molecules of which appear to have a large sphere of attraction, and hence they possess the property of elasticity. India-rubber, as a familiar example, may be drawn out to a great length, which must cause a separation of the particles to a much greater distance than they ordinarily assume; but, as soon as the force which separates them ceases to act, they are again drawn to each other, and appear to assume their original position. The same force may be applied to the metals, but extension cannot be produced; and, if the power be increased until it overcomes the cohesion, fracture is the result, not elasticity. From this simple experiment, then, we may learn that the force of cohesion varies in solid bodies, in some instances having so large a sphere as to admit of great expansibility, in others a smaller sphere but greater power, varying in both these characters according to the nature of the ultimate particles.

Solidity is an accidental circumstance, if we may so denominate a state that is governed by fixed and immutable laws. These laws, however, are not of such a nature as to prevent a solid from taking any other form; but we find, on the contrary, that, under different conditions, it may become a liquid or a vapour. In the production of these changes, heat is the primary agent; entering among the elementary particles of a substance, it becomes, in fact, a part of it; and if that substance be, in a solid state, a simple body, of which a doubt may be entertained, it is no longer so when it takes the liquid or vaporous condition, but is a compound of an element and caloric. The parts of a solid are supposed to have a fixed and permanent position, so that the movement of one