

gradually, from a shapeless mass of albumen, a living being is built up. To effect this force is required; on the other hand force is known to be given out. Moreover we know that on the one hand it is *gradually* liberated; and on the other required at *somewhat the same rate*. Surely the conclusion forced upon us is that the force here evolved is applied when force is known to be used—rather than say, here force is annihilated; there created—or here force becomes latent; there it is roused from its dormant state. For is it not unphilosophical to suppose a cause which is more than adequate to produce an observed effect?

Now after the young bird is liberated from the shell, if it be weighed and the shell with it, it will be found to contain considerably less matter than did the egg from which it proceeded; we have seen where that matter has gone. And if the tissues of the young bird be analysed they will be found to contain, at least some of them, molecules such as hemato-fibrine =  $C^{298} H^{228} N^{40} S^2 O^{92}$ ), more complex, less stable, and held together by a weaker affinity, than were those of the original constituents of the egg, thus displaying (besides the morphological and histological transformations that have taken place,) the results of the expenditure of force. (Law IV.) We have also seen whence that force was derived.

In another place I stated that my idea of the agency of cells, as such, is that they represent the form of matter through which the physical forces pass in their conversion into the vital. Now the form of vital force manifested by cells varies with their structure; and for any one kind of action we must have an appropriate form of cell. But contained in all seeds and eggs capable of life, we have a special form of cell, through which, undoubtedly, the chemical force acts as vital power when it builds up the plant or animal, and which if absent makes the material link incomplete; and the chemical force instead of passing to the vital, is given out in other forms, chiefly as heat. But whether the egg or seed be capable of life or not, still in its decomposition it must result, from the laws laid down, that the same amount of force will be given out by the time that its elements, in either case, have reached the same chemical level.

Now after the young bird or mammal, as the case may be, has used the food laid up for, or supplied to it by the female parent and has to shift for itself, it receives no force from without, as does the plant in a similar situation, and here, and not till we arrive at this point does the difference above mentioned begin, but its food consisting of such matters as being in a state of loose combination readily admit of the evolution of power by entering into greater intimacy of union. (Law III). At the same time, as if this were not sufficient, a free element of pre-eminently strong affinities is taken in by the animal to combine with them, as they run down to form the simple compounds.

But here it may be said that the young animal has not only to furnish energy for the performance of its organic and animal functions—respiration, circulation, locomotion, innervation, &c.,—but also it has to grow; increase in size. Its tissues continually breaking down in the performance of their respective functions, it has to restore them continually, and not only this, has to add steadily to their bulk. Whence comes the supply of force that shall be adequate to these wants? And here we see the purpose of the vegetable kingdom in its relation