Now the function of the vegetable kingdom in relation to the animal, is this; it takes the substances given out by the latter in its excretions or decay, such as water, ammonia, carbonic acid, &c., and certain salts of potash, soda, lime, &c., and from them it reforms the complex organic molecules from whose decomposition they were derived. This is the material view of the matter.

But these complex bodies are of much looser constitution (so to speak) than are the simple bodies they yield on their disintegration, so that for the change effected by the vegetable kingdom force is required, and by and by we shall see whence it is derived; at present we shall consider the first stage of vegetation, namely, germination, which will be seen to be essentially different from the after-growth of the plant, and closely allied to animal vitality.

The seed, then, is placed in the ground, and subjected to the influence of heat and moisture; soon the organized matter contained in it enters into decomposition; some of the albuminous matter becomes a ferment by means of which the starch is converted first into dextrine, and then into sugar, and dissolved. A part however does not stop here, but receiving oxygen from the air passes downwards by a regular process of oxydation to the lowest and most stable condition it can attain, and remains as water and carbonic acid.* In the meantime in the place of the seed we have a young plant, for roots have struck downwards, and a stem bearing leaves upwards. Up to this time no force but heat has acted upon the young plant, and now without light action will cease, unless it be some slight breaking down of tissue in one place and building up in another.

But now let us see from whence came the force which has from the matter contained in the seed built up a regularly organized fabric. To understand this let us weigh the plant thus formed, and supposing we had weighed the seed we shall find—putting out of account any water that may have been absorbed by the young plant—that some of the matter which it contained has disappeared. It will not be found in the earth in the vicinity. A moment's reflection will show us that it has disappeared, chiefly in the form of carbonic acid; for when germination began oxygen was absorbed by the seed, and carbonic acid and water were formed. But carbonic acid and water are much more intimate and stable compounds than those which were broken down in their formation, therefore force must have been evolved in the act of their composition beyond the force that was required to break up the already existing compounds, (Law III).† This force operating through a pre-existing fecundated germ-cell manifests itself as vital force, and in accordance with, and under the direction of the laws of life, builds up the fabric as far as we have seen.

But now, still supposing light to be excluded, the plant comes to a stand-still, it has no force within itself that is capable of adding the dead matter around it

* Gray's "Structural and Systematic Botany," p. 329. Encyclopædia Britannica, 8th ed., Vol. VI. p. 519.

† Compare with the process I am describing the act of combustion of wood; here also we have ternary compounds—almost identical with those in the seed—breaking up and by the addition of oxygen forming the same simple substances as in the other case, every one knows of the force given out here, and that it is entirely due to the operation of law III there can be no doubt.