to its structure. If some of it, from the operation of physical causes, becomes partially decomposed, some of the matter, by means of the oxydation of the rest, thus liberating the necessary force, may be used by the plant, but beyond these very narrow limits its growth cannot go on, and in these operations it is always necessarily losing weight. There is no force outside of it that can help it, heat has done its utmost in furnishing the requisite conditions for the performance of the chemical changes that have so far provided it with force; chemical affinity can now do nothing for it, for every manifestation of this requires a part of its own substance; unless indeed in such cases as the fungi, where the pabulum for the growth of the plant consists, as in the animal kingdom, of organic compounds; here the oxydation of the complex molecules taken into the plant, furnishes both the material for its growth and the force that is to apply that material, and make it part of the structure of the plant.

But now let a ray of light fall on the cotyledons and we shall find it immediately followed by the formation of chlorophyle, the decomposition of carbonic acid and ammonia in contact with the green leaves; water at the same time is absorbed, with which the free carbon unites, forming lignine, starch, sugar, &c., and with these elements, (C H O) the nitrogen of the decomposed ammonia combining, forms acids, neutral substances, mild or acrid bodies, alkaloids, &c., and finally the protenaceous compounds albumen, fibrine, and caseine.

I shall not stop to inquire into the chemical processes by which these bodies are formed, indeed very little is known for certain on the subject except this, that these bodies are built up from the elements of the more simple ones mentioned above—carbonic acid, water, ammonia, salts, &c.—with the constant evolution of oxygen and absorption of light,* and this is perhaps sufficient for our present purpose, as I have not space to enter into minute details; and whether albumen, fibrine, and caseine are formed directly from the liberated elements of water, carbonic acid, ammonia, &c., or what is considered more likely, are formed from bodies which possess a certain degree of complexity, as starch and sugar, by the addition of nitrogen, sulphur, and phosphorus, derived from ammonia, sulphuric acid, &c., or finally, whether we suppose the nitrogen also to be derived from complex bodies such as malamide, ($C^2 H^{10} N^2 O^8$) is of little consequence in the consideration of the question I am now concerned with.

However the process be looked upon we have here again the decomposition of one body, and the formation of another, but in an inverse order, as it were, to that observed in the former case; for whereas in that the body which was formed had more stability than that which was decomposed, and there was in consequence a surplus of force; in this case the body formed is in a much lower state of combination than that decomposed, therefore (Law IV) force has been required, and this force we have seen is supplied in the form of light.

There is another question, in connection with this supply of force to plants, of great interest and importance, but which I think may be best considered when I come to speak of the influence of light and heat on growth and development, where they do not seem to act so directly through the chemical force.

If we pass now to the consideration of animal life, we shall find it to be under

* Encyclopædia Britannica, 8th ed., Vol. IV, p. 519.