energy. Energy is obtained from matter by chemical changes in the matter—for example we thus get heat, electricity, explosions, etc. The greatest and most continuous manifestations of energy come from the substances which are the least stable. Such substances as protoplasm are notably unstable, and chemical changes accompanied by energy are constantly going on in protoplasm. Life is the summation or resultant of all these changes. But can this be true? We may easily so act upon protoplasm that the life in it is destroyed, and yet is protoplasm, and chemical changes go on rapidly in it. But these changes do not constitute life. They soon result in this destruction of the protoplasm. It therefore seems that the relation of life to chemical changes in protoplasm is rather a directive one—life being a power capable of controlling and deciding the kinds of chemical change which may occur in protoplasm. Huxley clearly set forth the difference between living and non-living matter in his famous definition—"Living matter is distinguished by its disintegration by oxidation, and its concomitant reintegration by the intussusception of new matter." Just so! Non-living protoplasm is also continually "disintegrated by oxidation," but there is no "concomitant intussusception of new matter." And so the dead protoplasm is gradually consumed. An alternative explanation of the origin of life is that it was "breathed into" protoplasm from some source of life outside the protoplasm. This statement, although apparently not scientific, has the advantage of being more difficult to disprove chemically than any of the chemical explanations at present offered.

Whatever may have been the origin of protoplasm or of the life force within it, giving it sensation, mobility, power of growth and of reproduction, —there can be no doubt of the present existence of minute masses of protoplasm having these properties. The conditions in which this first protoplasm lived were probably warmth, moisture and possibly light. Only in the presence of some moisture, and a moderate temperature will life continue active in protoplasm. The source of heat in the primitive world was probably the cooling crust of the earth, but eventually light penetrated the atmosphere and reached the living protoplasm. The simplest masses of protoplasm we are able to study are minute spherical, or elongated structures, with a firm boundary or wall, or with a gelatinous envelope. These have two methods of reproducing themselves, the simplest of which is by each merely splitting into two—fission. The other method consists in the material forming one mass breaking into many small parts within the wall. These parts escape through a rupturing of the wall of the parent cell. Each of these new individuals seems to be exactly like all the others, and is independent of all the others, doing for itself whatever is necessary for its life.

In examining the various one-celled plants we are struck by the fact that one great group of them has kept the habit of living each by itself, a distant individual life, while those of the other group adhere to each other in irregular masses, or even form carefully arranged colonies. We note that most of those that retain their independence live in dark, moist, warm situations, often within larger living creatures, and they accentuate their individual liberty by moving slightly from place to place.