and coalesce, and the resulting amoeba swims away as two individuals rolled into one. Now in this case what became of the individuality of each amoeba; did amoeba A eat amoeba B, or vice versa, and is the resulting amoeba a survival of A or of B or of both, or of neither of them? And what becomes of the antithesis of "eating or being eaten," which was so clear and distinct in the highly specialized forms of life, and is so evanescent in the simpler forms? This illustration may serve to teach us how necessary it is to trace things up to their origins, before expressing too confident opinions as to their nature and relations.

Life and Matter.

In the case of the organic or inorganic worlds the proper course obviously is, not to draw conclusions from extreme and highly specialized instances, but to follow *life* downward to its simplest and most primitive form, and to trace *matter* upward to the stage which approaches most nearly to the living form of life. Following matter upward, we find a regular progression from the simple to the complex. Take the diamond, which is one of the simplest of substances, being merely the crystalized form of a single ultimate element, carbon. It is extremely hard and extremely stable. Ascending to compounds of two, three or more elements, we get substances which are more complex and less stable; and at last we arrive at combinations which involve many elements and are most complex. Among these latter substances are some, called colloids, which are neither solid, like crystals, ror fluid, like liquids, but in an intermediate state, like jelly, or the white of an egg, in which the molecules have great mobility and are at a considerable distance apart, so that water can penetrate their mass. These colloids are for the most part very complicated compounds of various elements based on a nucleus of carbon, which from its atom having four poles with strong mutual attractions, is eminently qualified for forming what may be called the inner skeleton of these complex combinations. Colloids of this description supply the last stage of the ascending line from inorganic matter to organic life.

Next, let us trace life downward toward matter. There is a constant sucession from the more to the less complex and differentiated; from man through mammals, reptiles, fishes, and a long chain of more simple forms, until at its end we come to the two last links, which are the same for all animals, all plants, and all forms of animated existence. The last link but one is the cell, the last of all is protoplasm. Protoplasm, called by Huxley "the physical basis of life," is a colorless jelly-like substance, absolutely homogeneous, without structure, in fact a mere microscopic speck of jelly. The cell is the first step in the specialization of protoplasm, the outer layer of which, in contact with the surrounding environment, becomes hardened so as to form a cell-wall, while a portion of the enclosed protoplasm condenses into a nucleus, in which a further condensation makes what is called the nucleolus or second smaller nucleus. This constitutes the nucleated cell, whose repeated subdivision into other similar cells in geometrical progression furnishes the raw material out of which all the varied structures of the world of life are built up. Plants and animals, bones, muscles, and organs of sense, are all composed of modified cells, hardened, flattened or otherwise altered, as the case may require. If we trace life up to its origin in the same individual, instead of in the species, we arrive at the same result. All plants and animals, whether of the lowest or highest forms—fish, reptile, bird, mammal, man—begin their individual existence as a speck of protoplasm, passing into a nucleated cell, which contains in it the whole principle of its subsequent evolution into the mature and completed form. Protoplasm is, therefore, evidently the nearest approach of life to matter; and if life, when the world was in a different chemical condition from what it is now, ever originated from atomic and molecular combinations, it was in this form. To suppose that any more complicated form of life, however humble, could originate from chemical combinations, would be a violation of the law of evolution, which shows a uniform development from the simple to the complex, and never a sudden jump, passing at a bound over intermediate grades. To understand life, we must understand protoplasm; for protoplasm, closely as it approximates to colloid matter, is thoroughly alive. A whole family, the monera, consists simply of a living globule of jelly. Every molecule, as in a crystal, is of homogeneous chemical composition and an epitome of the whole mass. There are no special parts, no organs told off for particular functions, and yet many life-functions —nutrition, reproduction, sensation, and movement—are performed, but each by the whole body. The jelly speck becomes a mouth to swallow, and turning inside out a stomach to digest. It shoots out tongues of jelly to move and feel with, and presently withdraws them. With these attributes it is impossible to deny to protoplasm the full endowment of the lowest class of life, or to doubt that, like the atom in the material world, it is the primary element of organic, or living existence. Given this atom, we can trace up, step by step, the whole evolution of matter; so given the protoplasm, we can trace up the evolution of life by progressive stages to its highest development—man.

Protoplasm.

What is protoplasm? In its substance it is a nitrogenous carbon compound, differing only from other similar compounds of the albuminous family of colloids by the extremely complex nature of its molecules. It consists of five elements, and its average composition is believed by chemists to be 52.55 per cent carbon, 21.23 oxygen, 15.17 nitrogen, 6.7 hydrogen, 1.2 sulphur. Its peculiar qualities, therefore, including life, are not the result of any new and peculiar atom added to the known chemial compounds of the same family but of the manner of grouping and motions of these well-known material elements It has in a remarkable degree the faculty of absorbing water, so that its molecules seem to float in it in a condition of semi-fluid aggregation, which appears essential to the molecular moments which are the cause or the accompaniment of life.

Thus, many seeds if perfectly dry, may remain for months apparently as dead and as unchanging as crystals, to revive into life when moistened. But, in addition to those material qualities in which protoplasm seems to differ only from a whole group of similar compounds of the type of glycerine, by the greater complexity and mobility of its molecules, it has developed the new and peculiar element which is called life, and which has been defined by the late Dr. Oliver Wendell Holmes as "the state of an organized being in which it maintains, or is capable of maintaining its structural integrity by the constant interchange of elements with the surrounding media." In its essence, life is manifested by the faculties of nutrition, sensation, movement and reproduction. As regards nutrition, there is this essential difference between living and non-living matter. The latter, if it feeds and grows at all, does so only by taking on fresh molecules of its own substance on its outer surface, as in the case of a small crystal of ice in freezing water. If it feeds on foreign matter and throughout its mass, it does so only in the way of chemical combination. Living matter, on the other hand, feeds internally, and works up foreign substances, by the process we call digestion, into molecules like its own, which it assimilates, rejecting as waste any surplus or foreign matter which it cannot incorporate It thus grows or decays as assimilation or waste preponderates, remaining always itself. The distinction will be clear if we