

not only in different organisms, but even in one and the same cell.

The term protoplasm was first used by Purkinje (1840) in reference to the formative material of animal embryos; it was taken over by Von Mohl (1846) to designate the substance within the cells of plants; and was extended by Max Schultze (1861) to the animal cell, superseding the equivalent term sarcode.

It may be briefly defined in Huxley's famous phrase as "the physical basis of life", but it is used by different authors in slightly different ways. It is often used as a morphological or topographical term for the physically complex cell-substance; it is often used as a physiological term for the whole cell-substance in so far as that is actively concerned in metabolism, that is for the cell-substance *minus* obviously lifeless inclusions, precipitates, &c.; it is often used to designate an unknown quantity—the genuinely living stuff. A fourth usage, which contrasts protoplasm and nucleus, should be abandoned in favour of the terms cytoplasm and nucleoplasm.

It is at present profitless to attempt to gain a *forced* clearness in regard to protoplasm. The lack of lucidity is not due to lack of logic, but to a scarcity of facts.

In regard to a few facts there is no doubt. Thus it is certain that the material of a cell has a complex structure, but the fact does not help us much. As Prof. Burdon Sanderson says, we must "hold to the fundamental principle that living matter acts by virtue of its structure, *provided* the term structure be used in a sense which carries it beyond the limits of anatomical investigation, *i.e.* beyond the knowledge which can be attained either by the scalpel or the microscope". It is hardly too much to say that a single experiment in "microscopic vivisection", as Prof. Gruber calls it, showing, for instance, that a unit bereft of its nucleus may move and be irritable for a time, but can neither grow nor persist, has been of more physiological moment *as yet* than all the descriptions of cytoplasmic architecture.

One general idea, however, the study of cytoplasmic