

(a) As we have seen, the great gap in Darwinism is the absence of a theory of variation. It is assumed that there has been a continual crop of variations—usually spoken of as fortuitous, indefinite, and small in amount—on which the sickle of natural selection has operated. As to the causes of the crop nothing is said—Darwin simply confessing that the problem was beyond his powers of solution. To Weismann, however, belongs the credit of having taken several bold steps into the darkness. For a time Weismann emphasizes the evolutionary interest of the ancestral Protozoa, which, being more liable to external influences than the higher creatures are, were supposed to have accumulated a sufficient stock of qualities or possibilities to account for all the apparent new departures on the part of their descendants. All variations among Metazoa, in short, were regarded as combinations and permutations of what the Protozoa had acquired.

Then, for a while, Weismann emphasized *amphimixis*—that mingling of qualities which occurs in fertilization at the origin of each new life; and again he added to this another source of change prior to fertilization, namely, in the reducing divisions which take place in the maturation of the ovum, or in the course of spermatogenesis.

Of late, however, Weismann has spoken more frankly in regard to yet another source of variation, although that involved in amphimixis and reducing-divisions is still recognized. He speaks of the primary constituents of the germ having a certain scope for variation among themselves, and supposes a struggle of parts not only in the body, as Roux did in his famous *Kampf der Theile im Organismus*, but in the germ. There is an intra-germinal struggle and selection.

But much more than this. He says: "We are undoubtedly justified in attributing the cause of variation to the influence of changed external surroundings". This means that a change within an animate system must be traceable in the long-run to a change in the larger system of which the organism forms a part, and that certain big environmental changes, *e.g.* of climate