

and from corresponding changes which occur in the protoplasm of the egg which surrounds it, other cells arise by a process of division, and these in their turn also multiply by division. These cells arrange themselves in course of time into layers, which are termed the germinal or embryonic layers. From these layers arise all the tissues and organs of the body, both in its embryonic and adult stages of life. The starting-point of each individual organism—i.e., of each new generation—is therefore the segmentation nucleus. Every cell in the adult body is derived by descent from that nucleus through repeated division. As the segmentation nucleus is formed by the fusion of material derived from both parents, a physical continuity is established between parents and offspring. But this physical continuity carries with it certain properties which cause the offspring to reproduce, not only the bodily configuration of the parent, but other characters. In the case of Man, we find along with the family likeness in form and features a correspondence in temperament and disposition, in habits and mode of life, and sometimes in the tendency to particular diseases. This transmission of characters from parent to offspring is summarized in the well-known expression that "like begets like," and it rests upon a physical basis.

The size of the particles which are derived from the parents, called the male and female pronuclei, the potentiality of which is so utterly out of proportion to their bulk, is almost inconceivably small when compared with the magnitude of the adult body. Further, by the continual process of division of the cells, the substance of the segmentation nucleus is diffused throughout the body of the new individual produced through its influence, so that each cell contains but an infinitesimal particle of it. The parental dilution, if I may so say, is so attenuated as to surpass the imagination of even the most credulous believer in the attenuation of drugs by dilution. And yet these particles are sufficient to stamp the characters of the parents, of the grandparents, and of still more remote ancestors on the offspring, and to preserve them throughout life, notwithstanding the constant changes to which the cells forming the tissues and organs of the body are subjected in connection with their use and nutrition. So marvellous, indeed, is the whole process, that even the recent contributions to exact knowledge on the fusion of the two pronuclei, instead of diminishing our wonder, have but intensified the force of the expression: "*Magnum hereditatis mysterium.*"

In considering the question of how new individuals are produced, one must keep in mind that it is not every cell in the body which can act as a centre of reproduction for a new generation, but that certain cells, which we name germ-cells and sperm-cells, are appropriated to that purpose. These cells, destined for the production of the next generation, form but a small proportion of the body of the animal in which they are situated. They are, as a rule, marked off from the rest of the cells of its body at an early period of development. The exact stage at which they become specially differentiated for reproductive purposes varies, however, in different organisms. In some organisms, as is said by Balbiani to be the case in *Chironomus*, they apparently become isolated before the formation of the germinal layers is completed; but, as a rule, their