

organs, it must be clearly realized that when the ovum divides into two, each daughter cell has conveyed to it biophoric molecules, and that so these biophoric molecules while coincidentally multiplying by the successive division and multiplication of the cells of the growing individual come to be distributed to all the tissues of the body. So far as we can see they pass to the germ cells in an unchanged condition, but in the succession of divisions which give rise to the somatic or body cells, the influences to which the successive generations of cells are exposed in the different parts of the growing embryo differ very greatly. It is due to the difference in position plus the difference in foodstuffs and physical and chemical agencies to which the cells are exposed, that the contained biophores become modified, until eventually, the modification becomes so great that instead of these biophores being able to reproduce the whole individual, they now become capable of controlling the formation of only one particular differentiated order of cell.

Following upon this, the general statement may be made that **the more pronounced the differentiation of a cell, the less is its capacity for reproduction.** Yet there are certain cells that are specialized, and can yet reproduce; but they reproduce only their own differentiated and modified kind, gland cell reproducing gland cell, muscle cell, muscle; and even this multiplication can occur only after the differentiated cell has "undifferentiated" itself again, that is, has reverted to a simpler, less differentiated stage. The cell that has become differentiated, that is, loses the characters it has acquired, and becomes a "vegetative" cell in form, and yet when this cell reproduces, its progeny assume once more the differentiated type characteristic of the adult cell.

### FERTILIZATION

We shall take up very briefly some of the facts concerned with fertilization; that it has not hitherto entered into this text, is due to the fact that growth, adaptation, and cell differentiation can proceed without it; study of the lower invertebrate forms indicates that it is, in them, a means of **rejuvenation** of the biophore, but that among them it is not an essential to the continuance of the species through considerable numbers of generations. In its simplest phase, conjugation is the direct union of two like individuals; but even low down in the scale we begin to find a differentiation between the male and the female germ cell; the male tends to show itself motile, invasive, while the female tends to be passive, chiefly because the cell is loaded with the yolk necessary for the support of the new individual after fertilization. Of this food material the male element or spermatozoön shows little; it consists of a nucleus, a centrosome, and a small amount of cytoplasm which appears chiefly as the flagellar tail; the male cell is, in fact, of a disproportionate smallness.

From a very early date in the development of the individual ovum