Crossing Over Encyclopedia Article

Crossing Over

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Crossing Over

Crossing over is a method of exchange of genetic material during **meiosis**. When **homologous chromosomes** line up, the genes on adjacent arms are aligned in sequence. During the **replication** of genetic material, the enzyme responsible moves onto the homologous arm from the adjacent **chromosome**. Replication continues, but the genetic material of the second chromosome has now been incorporated onto the original chromosome. This site of crossing over is visible as a chiasmata, where one arm forms a bridge over to the adjacent chromosome. This is an important method of rearranging the genetic material within an individual to produce new combinations of genetic material within the gametes.

In some organisms, such as the much-studied fruit fly *Drosophilla* and certain fungi, crossing over has also been shown to occur during **mitosis**. Normally, crossing over occurs equally between the chromosomes. Occasionally, crossing over can be unequal, which can give rise to alterations in the chromosome number by loss of whole chromosomes. Crossing over alters the frequency with which genes on the same chromosome are transmitted together--the farther apart on the chromosome, the greater the chance of a chiasmata occurring between them. As a consequence, the phenomenon of crossing over has proved important in the construction of genetic maps. The longer the chromosome, the greater the chance of several chiasmata occurring. Consequently, the resultant **gamete** will have greater genetic variety. Crossing over can be observed by studying two genes which have previously been shown to be linked (i.e., on the same chromosome).A small percentage of the offspring from matings will show independent assortment as if the genes were on separate chromosomes. The greater the amount of offspring showing none linked transmission the farther apart the genes are on the chromosome although it should be borne in mind that a double cross over event will reverse the effect of a single cross over for two widely separated genes.

Originally, it was thought that crossing over were rare events. Now, it is understood that crossing over is a normal and vital part of meiosis. Due to the rearranging of genetic material, crossing over is an important part in the production of new characteristics and arrangements of characters, and as such it is an important building block of **evolution**.