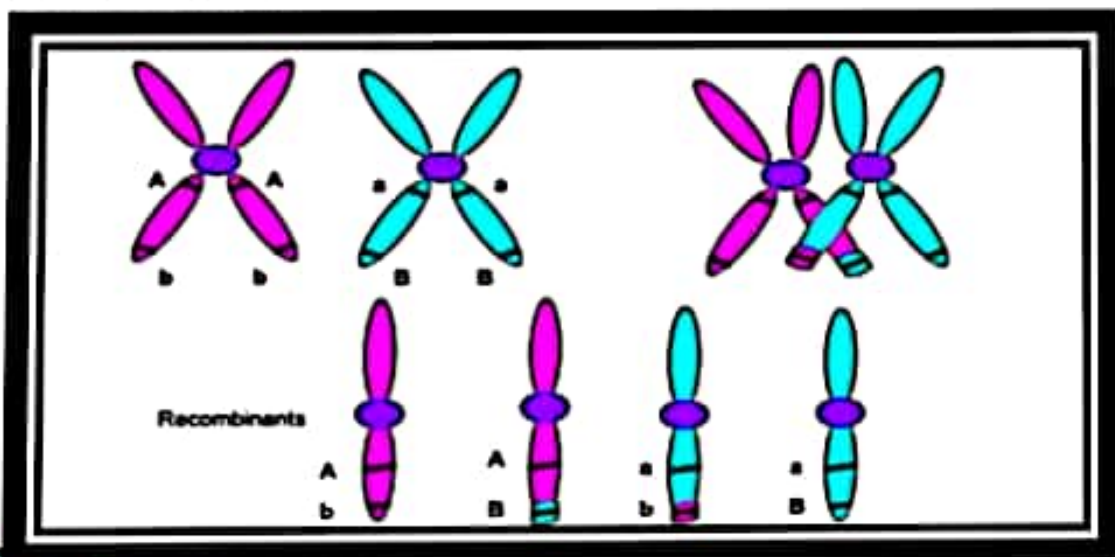


# CROSSING OVER

- ┌ Crossing over or (chromosomal cross over) is the exchange of genetic material between homologous chromosomes that results in recombinant chromosomes



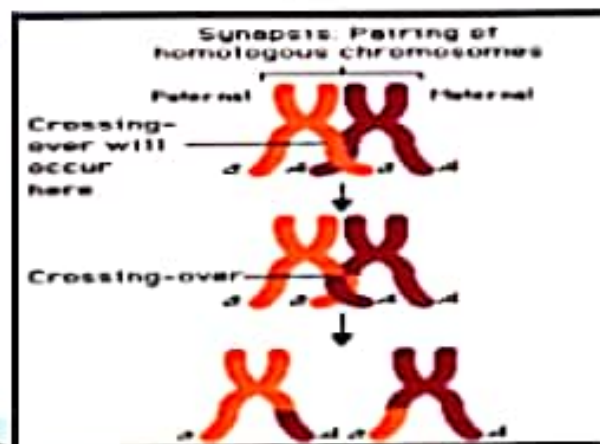
# CROSSING OVER

- || Crossing over occur during meiosis1, and it is the process where homologous chromosomes pair up with each other and exchange different material of there genetic material to form recombinant chromosomes.
- It may also occur during mitotic division which may result in loss of heterozygosity.

# IMPORTANCE

- || Crossing over is important for the normal segregation of chromosomes during meiosis.
- || Crossing over also important for the genetic variation, and this genetic variation occur because of the exchange of genetic material during crossing over, the chromatids held together by centromere are no longer identical.

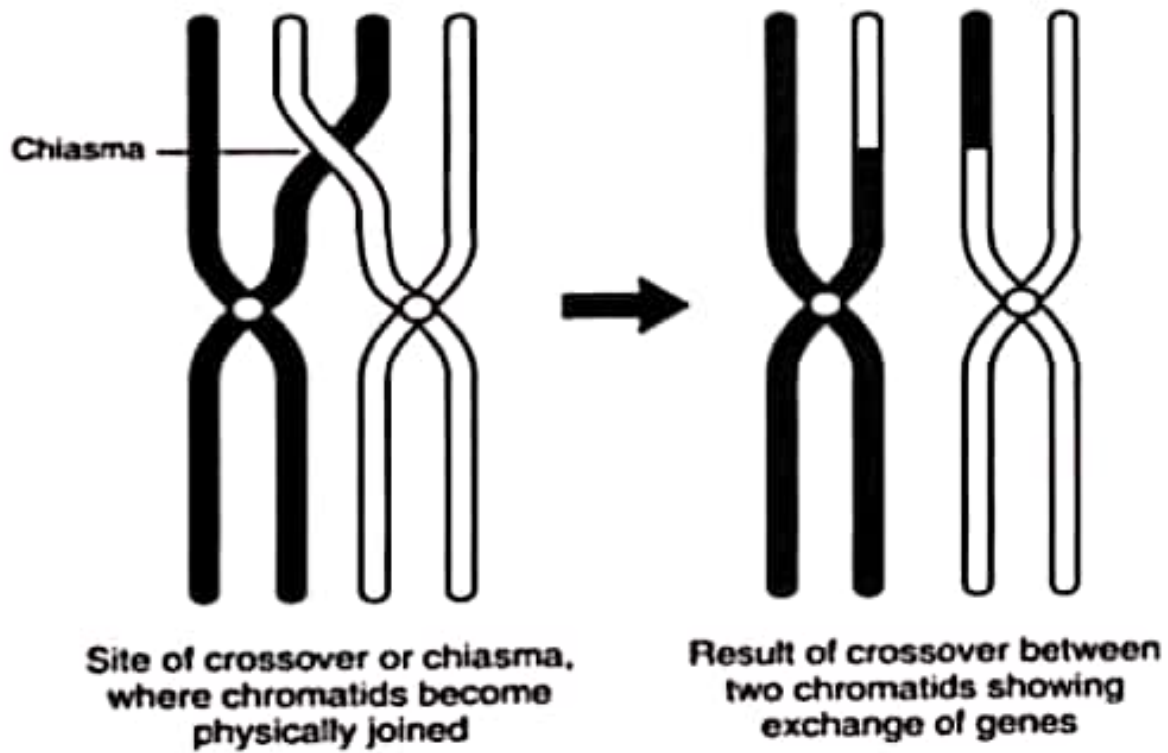
- || So, when chromosomes separated during meiosis II, some of the daughter cell receive daughter chromosome with recombined alleles.
- Due to this genetic recombination offspring have a different set of genes and alleles than there parents



# Crossing over and Chiasmata

- ❑ Chiasmata is the point where two homologous non-sister chromatids exchange genetic material during crossing over during meiosis.
- ❑ Chiasmata becomes visible during diplotene stage of prophase I during meiosis.
- ❑ But actual crossing over occur during previous pachytene stage. When each tetrad which is composed of two pairs of sister chromatids begins to split. Only point of contact is chiasmata.

# Crossing over and chiasmata

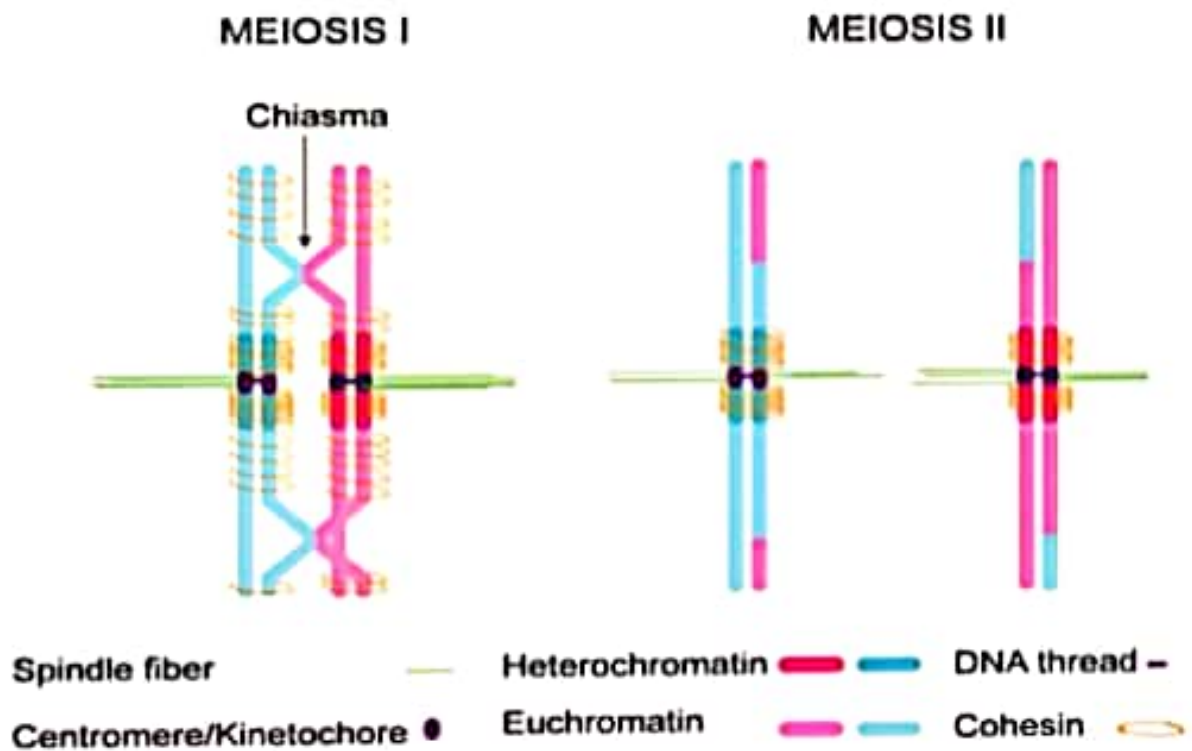


# Types of Crossing over

## || **Single crossing over:**

Chromosomal crossover (or **crossing over**) is the exchange of genetic material between homologous chromosomes that results in recombinant chromosomes. It is one of the final phases of genetic recombination, which occurs during prophase I of meiosis (pachytene) during a process called synapsis.

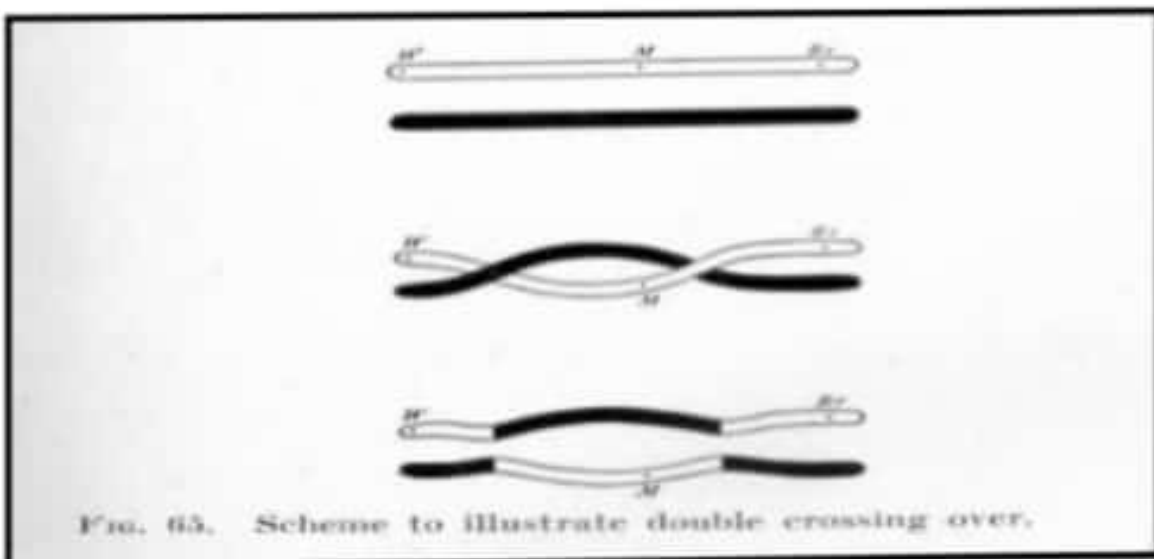
# single crossing over





# Double crossing over

Two simultaneous reciprocal breakage and reunion events between the same two chromatids.



# Factors affecting crossing over

- ▣ Age
- ▣ Sex
- ▣ Temperature
- ▣ Radiation
- ▣ Chemicals
- ▣ Physical distance between genes

# Significance of crossing over

- Crossing over is universal in occurrence, occurs in plants, animals, bacteria, viruses and moulds.
- Meiotic crossing over allows a more independent selection between the two alleles that occupy the positions of single genes, as recombination shuffles the allele content between sister chromatids
- Helps in proving linear arrangement of genes. Recombination does not have any influence on the statistical probability that another offspring will have the same combination. This theory of "independent assortment" of alleles is fundamental to genetic inheritance.

- || Origin of new character
- || Necessary for natural selection, as it increases chances of variation