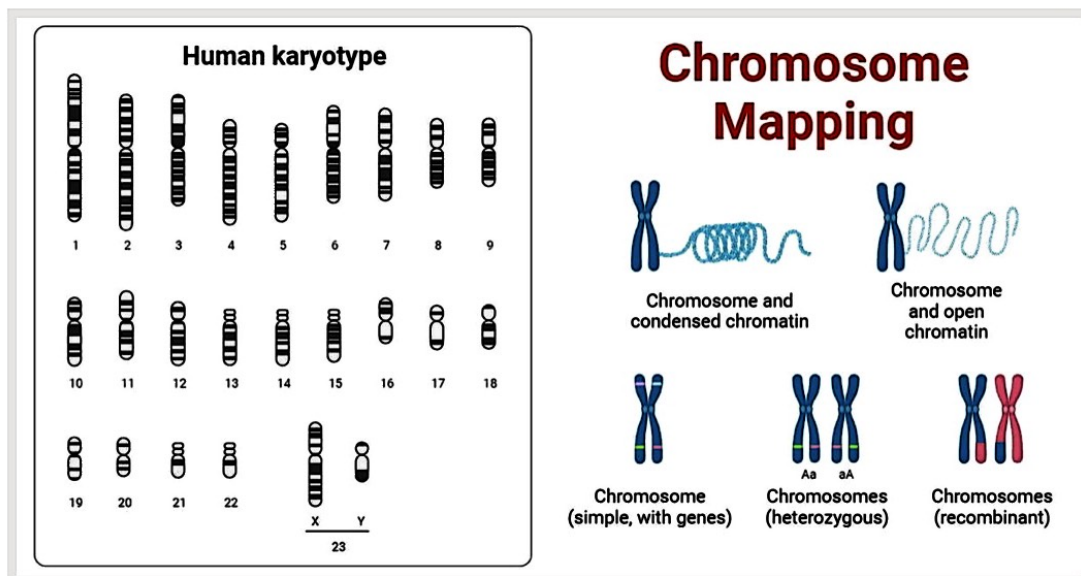


Chromosome mapping means determining the relative positions of **genes** in a chromosome by creating maps that are used to organize and understand genetic information on chromosomes.

These maps show the positions of genes and the distances between them based on a specific scale. Chromosome mapping helps to understand the genome's organization, structure, and function.



Chromosome Mapping

Thomas Hunt Morgan made significant contributions to the modern understanding of chromosome mapping. His experiments with fruit flies provided evidence for

genetic linkage. Morgan's discovery that the white eye gene in *Drosophila* was located on the X chromosome led to the identification and mapping of other X-linked genes. The resulting chromosome map revealed a linear arrangement of genes.

Alfred H. Sturtevant, an undergraduate in Morgan's laboratory, invented the method for mapping chromosomes in 1911 by using the data from crosses with *Drosophila* and exploiting the phenomenon of genetic recombination. By studying the recombination frequency, he estimated the relative distances between genes on the chromosome. Sturtevant's work established the foundation for studying gene organization on chromosomes.

Types of Chromosome Mapping

There are two main types of chromosome mapping techniques: Genetic Mapping and Physical Mapping.

1. Genetic Mapping

- Genetic mapping, also known as linkage mapping, refers to the method used to create genetic maps to estimate the positions of genes in chromosomes.

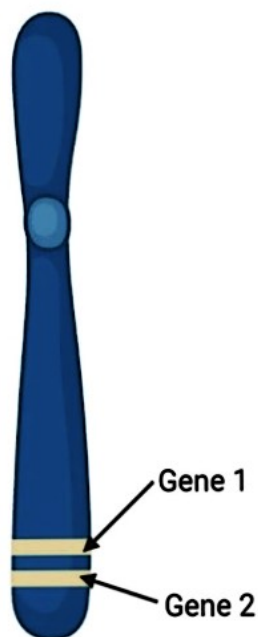
These genetic maps are constructed by analyzing recombination patterns that occur during the crossing over of chromosomes.

-
- Genetic mapping starts by using linkage analysis to study the frequency of recombination between genes.
 - Recombination frequency indicates genetic linkage and helps to determine whether the genes are linked together or not. A centimorgan (cM) is a unit that describes a recombination frequency of 1%.
 - As the distance between two genes increases, the likelihood of recombination occurring also increases, resulting in a higher recombination frequency between them.
-

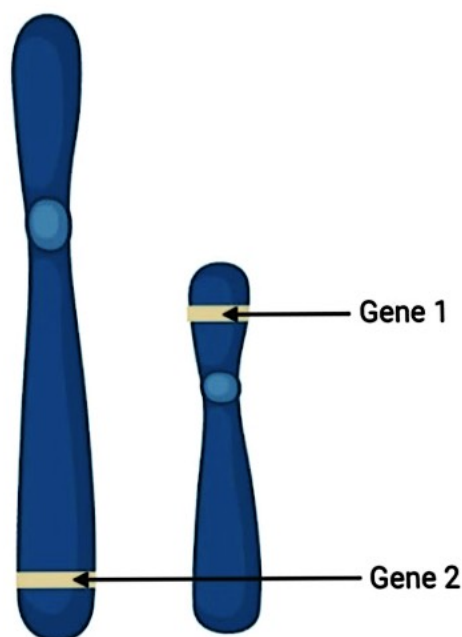
Genetic Linkage and Recombination

- Mendel's law of independent assortment states that pairs of alleles segregate independently. However, upon the rediscovery of Mendel's work, it was known that some pairs of genes were inherited together due to their location on the same chromosome. This phenomenon is known as genetic
-

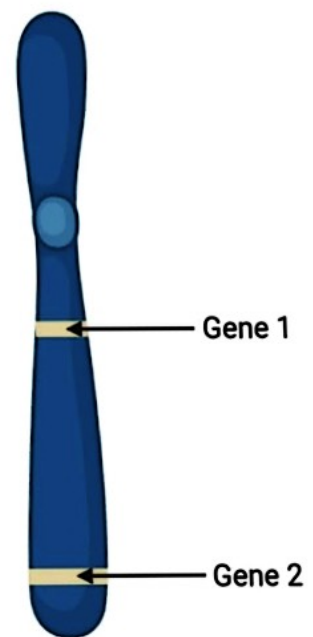
- Linked genes are located close to each other on a chromosome, which increases the chance of them being inherited together. So, the concept of linkage is used to understand the relative positions of genes on a chromosome.
- However, not all genes on a chromosome are necessarily linked. Genes that are located further apart from each other have a higher chance of being separated during recombination.



Linked



Not Linked



Not Linked