

11-5

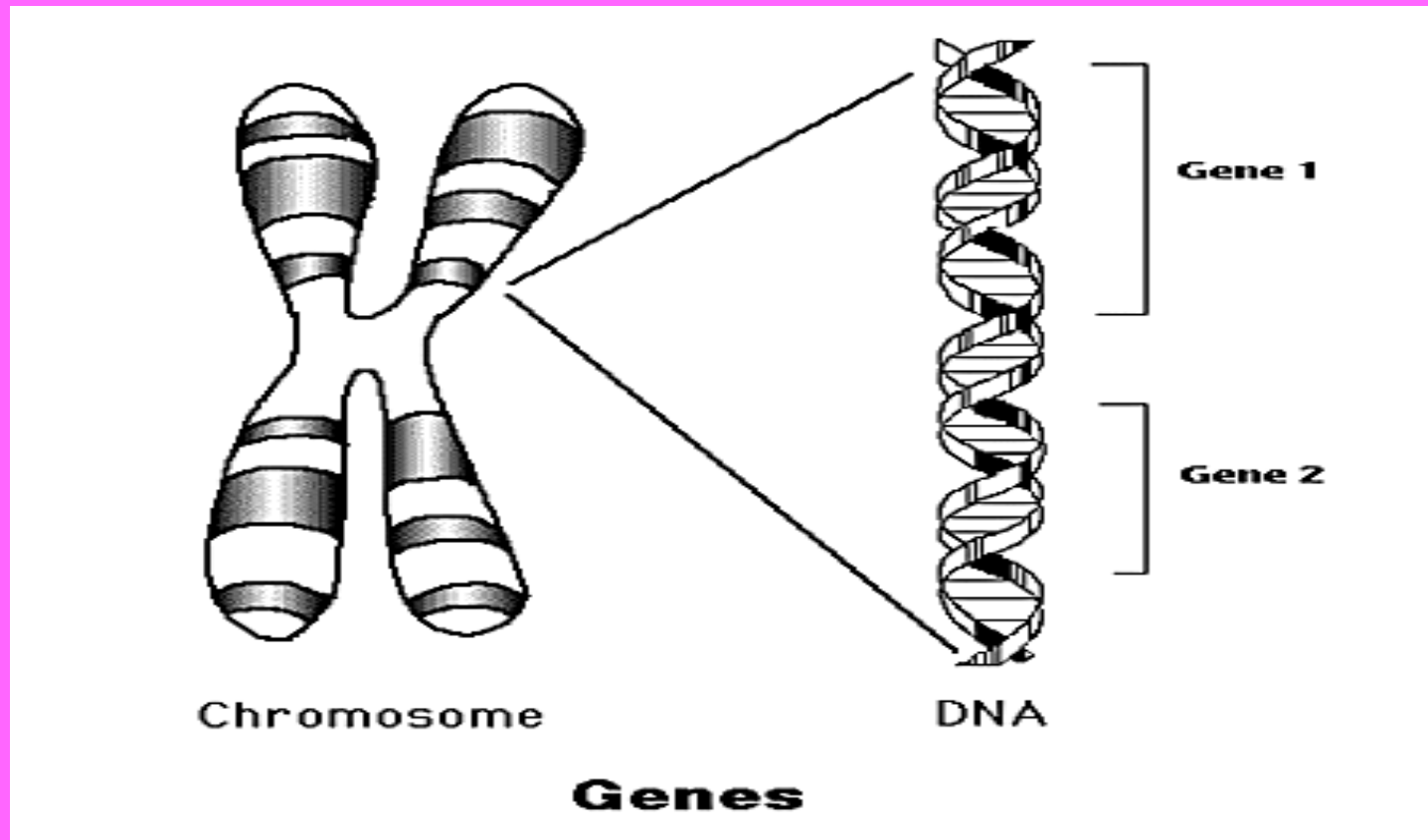
Linkage and Gene Maps



I. Gene Linkage

A. Genes are located on chromosomes.

(Humans have 40,000 genes)



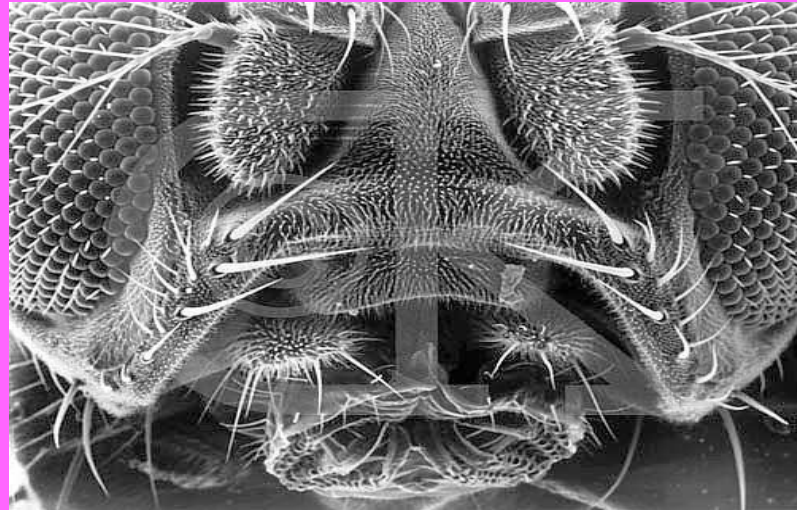
B. During Meiosis, chromosomes assort independently

****See figure 11-15. The 4 chromatids of a tetrad separate during anaphase I and anaphase II, each strand ultimately ending up in different gametes. The way they separate and which cell they end up in the end is completely random.**

In other words, chromosomes assort independently.

What about genes on chromosomes?

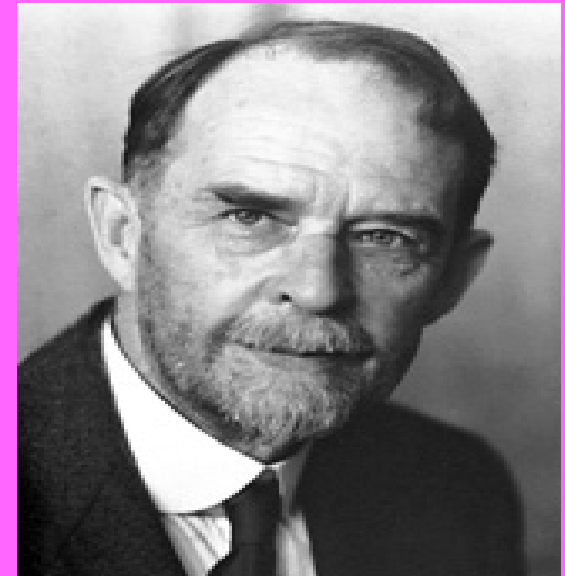
C. Thomas Hunt Morgan worked with fruit flies.



1. He discovered that genes located close each other were “linked” together.

2. He determined that *linked genes* tend to be *inherited together* (not *independently*)- he called them *linkage groups*.

3. Morgan's conclusion- chromosomes assort *independently*, genes do **NOT assort *independently*.**



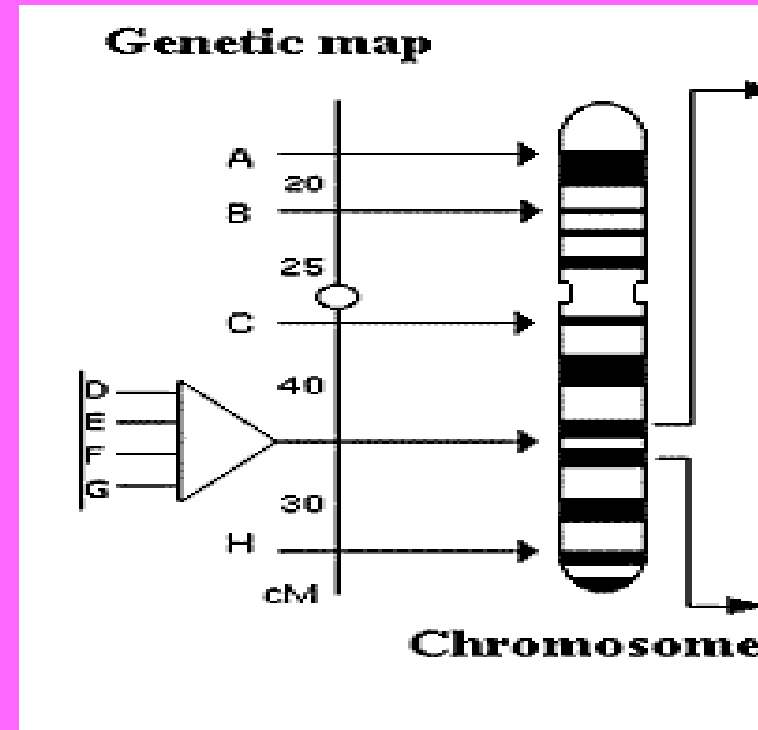
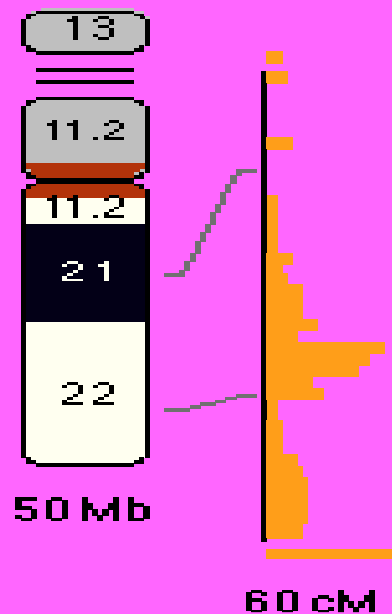
For example:

Not all short people have brown hair, and not all freakishly tall people have blue eyes. This law is always true unless the genes are linked, which basically means that they're located very close together on the same chromosome, and they are almost always inherited together. An example being that red haired people generally also have a very fair complexion 😊

II. Gene Maps

- A. Genes that are linked can be separated by crossing over.***
- B. How often genes are “unlinked” (separated) by crossing over is used to determine gene positions on chromosome.***
- C. Pictures of chromosomes that show where genes are located on the chromosomes are called gene maps.***

1. **If genes are close together on a chromosome, it is *highly unlikely* that they will unlink during crossing over.**



2. **If genes are far apart, they are *more likely* to unlink during crossing over.**

3. Genes are named:

a. For the problems caused by the abnormal allele (gene) not the normal gene.

Ex. colorblind

b. For the person who discovered the disease or disorder

Ex. Alzheimer

c. For the 1st person known to have the disorder.

Ex. Lou Gehrig's disease