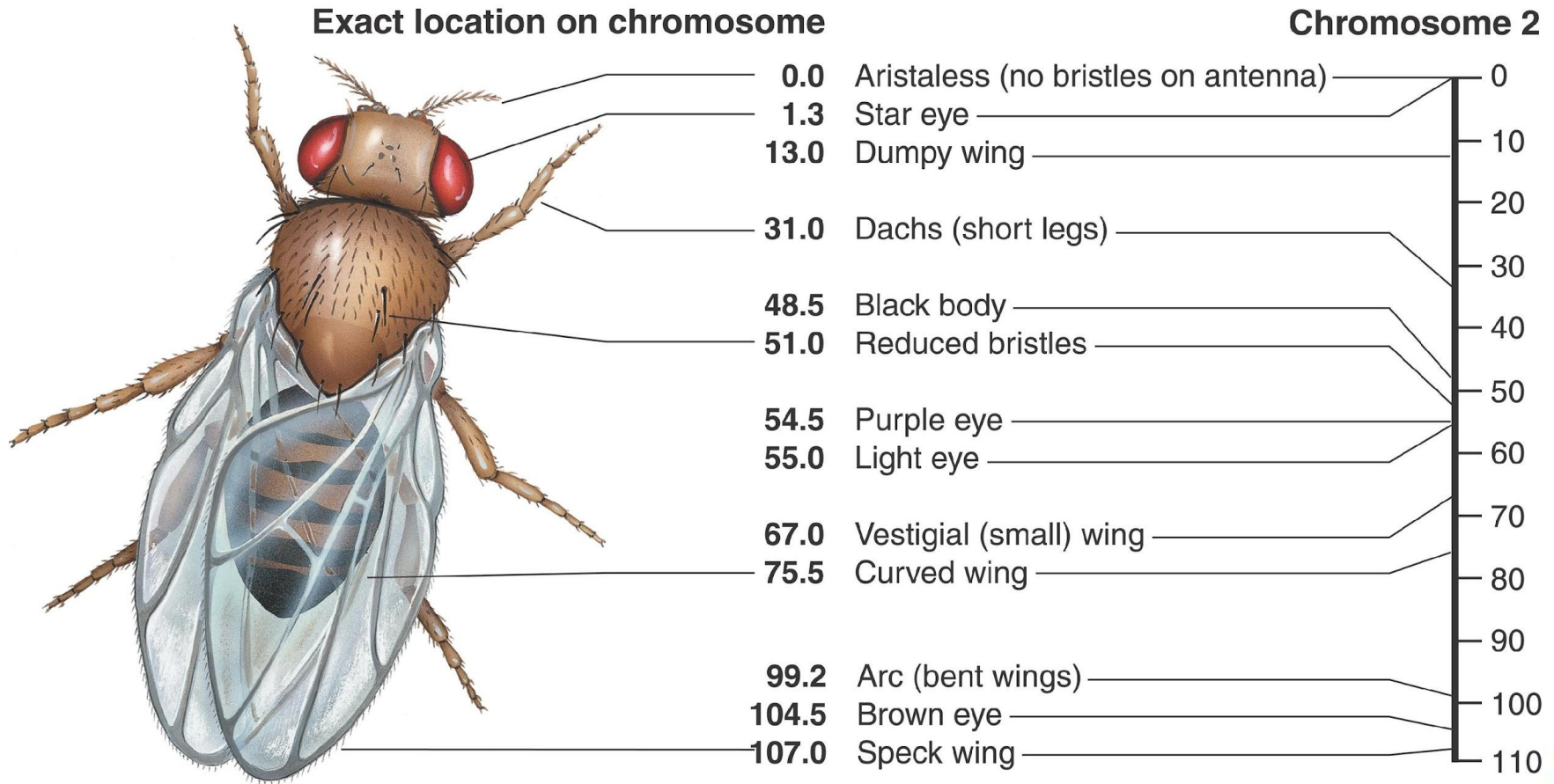


11-5 Linkage and Gene Maps





What structures actually assort independently?

Gene Linkage

Thomas Hunt Morgan's research on fruit flies led him to the principle of linkage.

Morgan discovered that many of the more than 50 *Drosophila* genes he had identified appeared to be “linked” together.

They seemed to violate the principle of independent assortment.

Morgan and his associates grouped the linked genes into four linkage groups.

Each linkage group assorted independently but all the genes in one group were inherited together.

Each chromosome is actually a group of linked genes.

Morgan concluded that Mendel's principle of independent assortment still is true.



Chromosomes assort independently, not individual genes.

Gene Maps

Crossing-over during meiosis sometimes separates genes that had been on the same chromosomes onto homologous chromosomes.

Crossover events occasionally separate and exchange linked genes and produce new combinations of alleles.

Alfred Sturtevant, a student of Morgan, reasoned that the farther apart two genes were, the more likely they were to be separated by a crossover in meiosis.

Recombination frequencies can be used to determine the distance between genes.

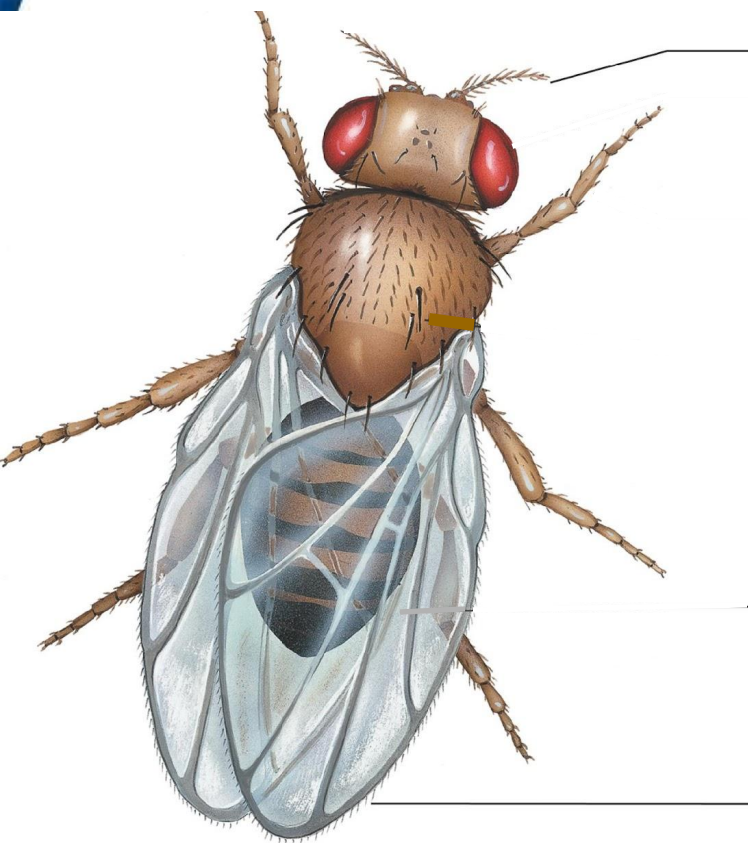
Sturtevant created a **gene map** showing the relative locations of each known gene on one of the *Drosophila* chromosomes.

If two genes are close together, the recombination frequency between them should be low, since crossovers are rare.

If they are far apart, recombination rates between them should be high.

Exact location on chromosome

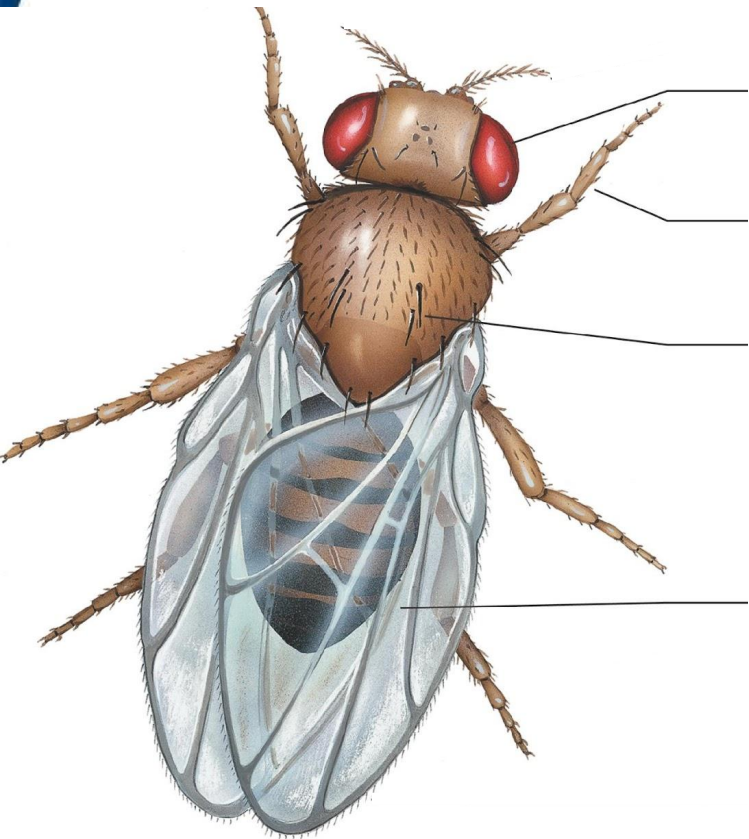
Chromosome 2



Gene Name	Map Position (cM)
0.0 Aristaless (no bristles on antenna)	0
13.0 Dumpy wing	10
48.5 Black body	40
54.5 Purple eye	50
67.0 Vestigial (small) wing	70
99.2 Arc (bent wings)	100
107.0 Speck wing	110

Exact location on chromosome

Chromosome 2



1.3 Star eye

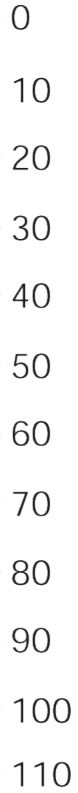
31.0 Dachs (short legs)

51.0 Reduced bristles

55.0 Light eye

75.5 Curved wing

104.5 Brown eye



11-5 Section QUIZ

Continue to:

Section QUIZ

- Or -

Click to Launch:



11-5 Section QUIZ

1 According to Mendel's principle of independent assortment, the factors that assort independently are the

- A** a. genes.
- b. chromosomes.
- c. chromatids.
- d. gametes.

11-5 Section QUIZ

2 A chromosome is actually a group of

- A a. independent genes.
- b. linkage groups.
- c. crossed-over genes.
- d. linked genes.

11-5 Section QUIZ

- 3** Thomas H. Morgan is credited with the discovery of the principle of
- a. segregation.
 - b. independent assortment.
 - A** c. gene linkage.
 - d. dominance.

11-5 Section QUIZ

4 Linkage maps can be produced because the farther apart two genes are on a chromosome,

a. the less likely they are to assort independently.

b. the more likely they are to be linked.

A c. the more likely they are to be separated by a crossover.

d. the less likely they are to be separated by a crossover.

11-5 Section QUIZ

5 If two genes are close together on the same chromosome, they are more likely to

A a. behave as though they are linked.

b. behave independently.

c. move to different chromosomes.

d. belong to different linkage groups.

END OF SECTION