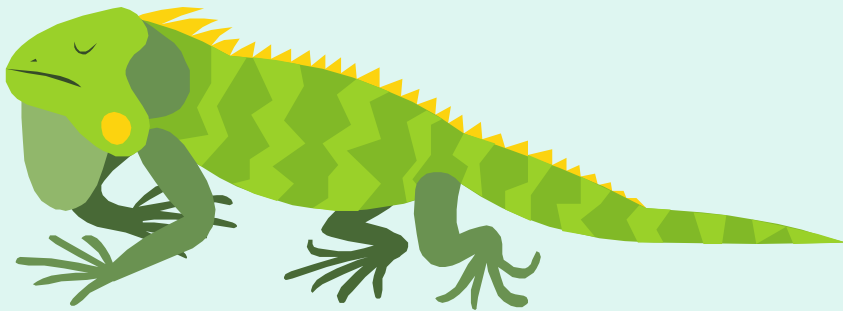


GENETIC EQUILIBRIUM

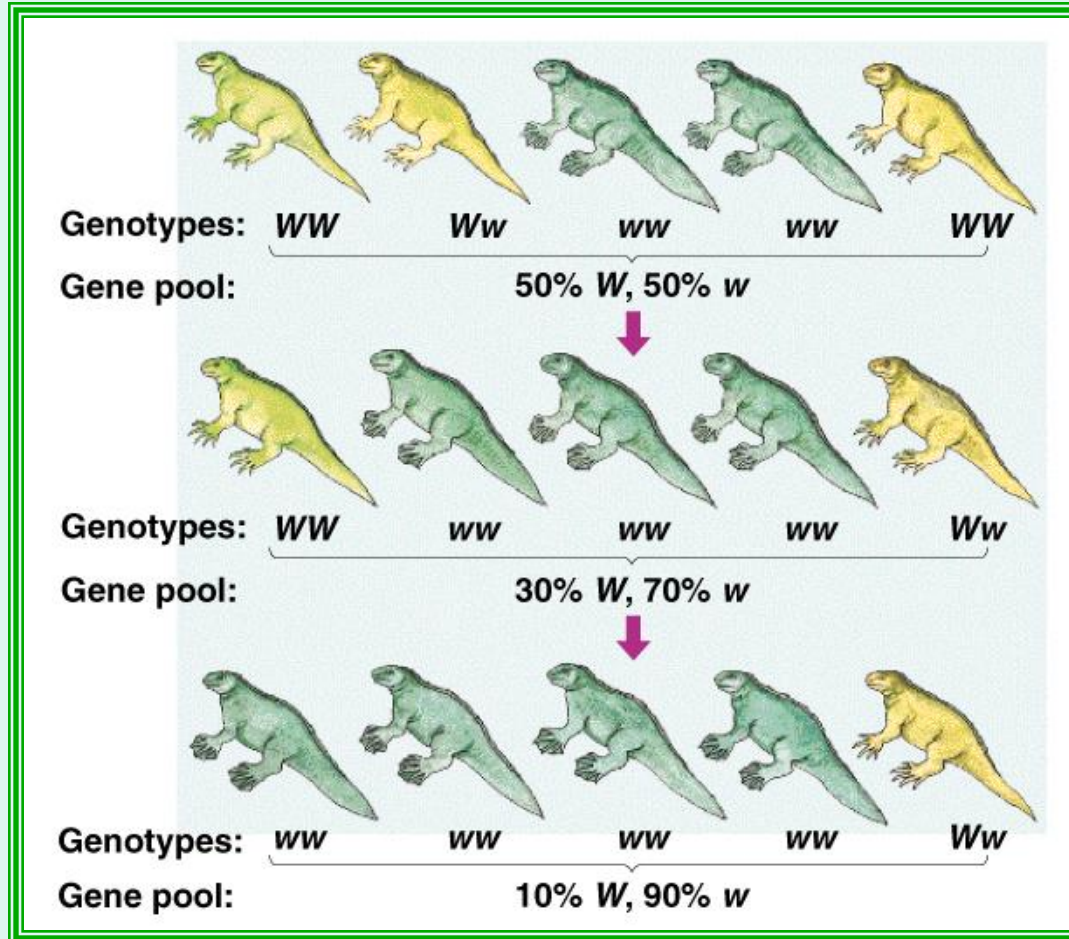
Chapter 16

16-1 Population Genetics

- **Population**= number of organisms of the same species in a particular place at a point in time
- **Gene pool**= total genetic information of a population
- Includes kinds of alleles & percentage of alleles (see next slide)

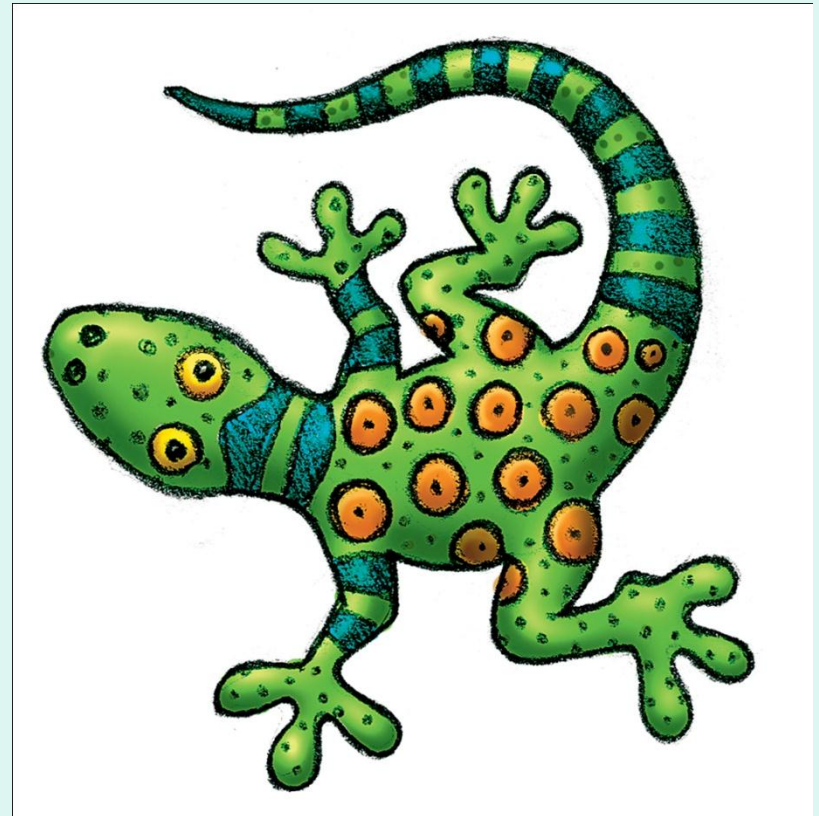


ALLELE FREQUENCY



Causes of Variation

- Random gamete fertilization
- Genetic recombination
- Mutation



Hardy-Weinberg Genetic Equilibrium

- A population is said to be at Hardy-Weinberg equilibrium if it is not changing genetically
- Assumptions
 - No mutations
 - No migration
 - Large population size
 - Random mating
 - No natural selection

Hardy-Weinberg Genetic Equilibrium

- Allele frequencies in a population stays the same (generation after generation) UNLESS it is altered by some external factor
- For evolution to take place, something must upset the genetic equilibrium of a population

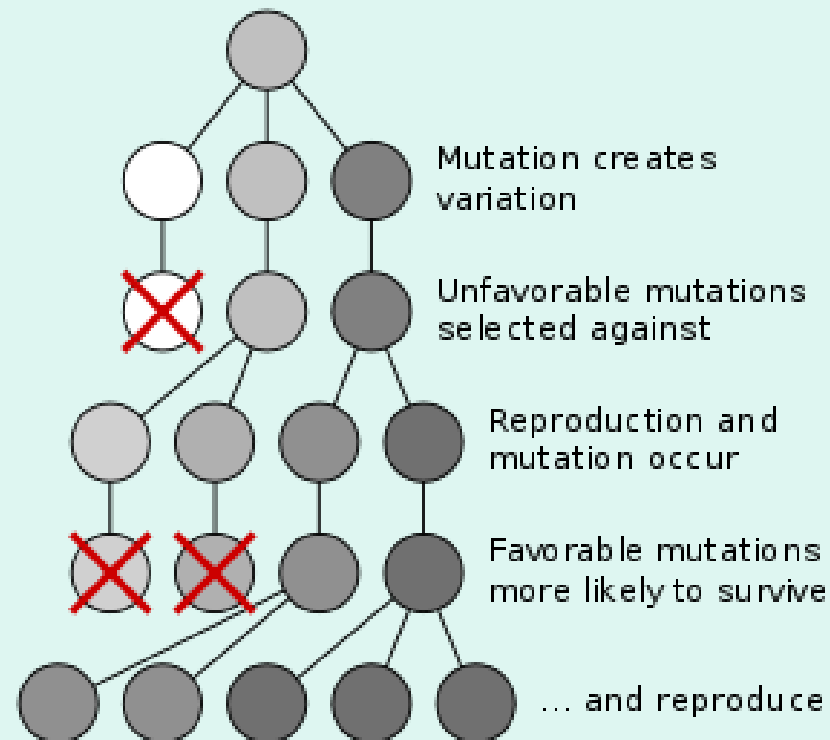
16-2 Processes that Disrupt Genetic Equilibrium

1. Mutation

- Random (beneficial, harmful or no effect)
- Provides source of variation
- Not an immediate effect

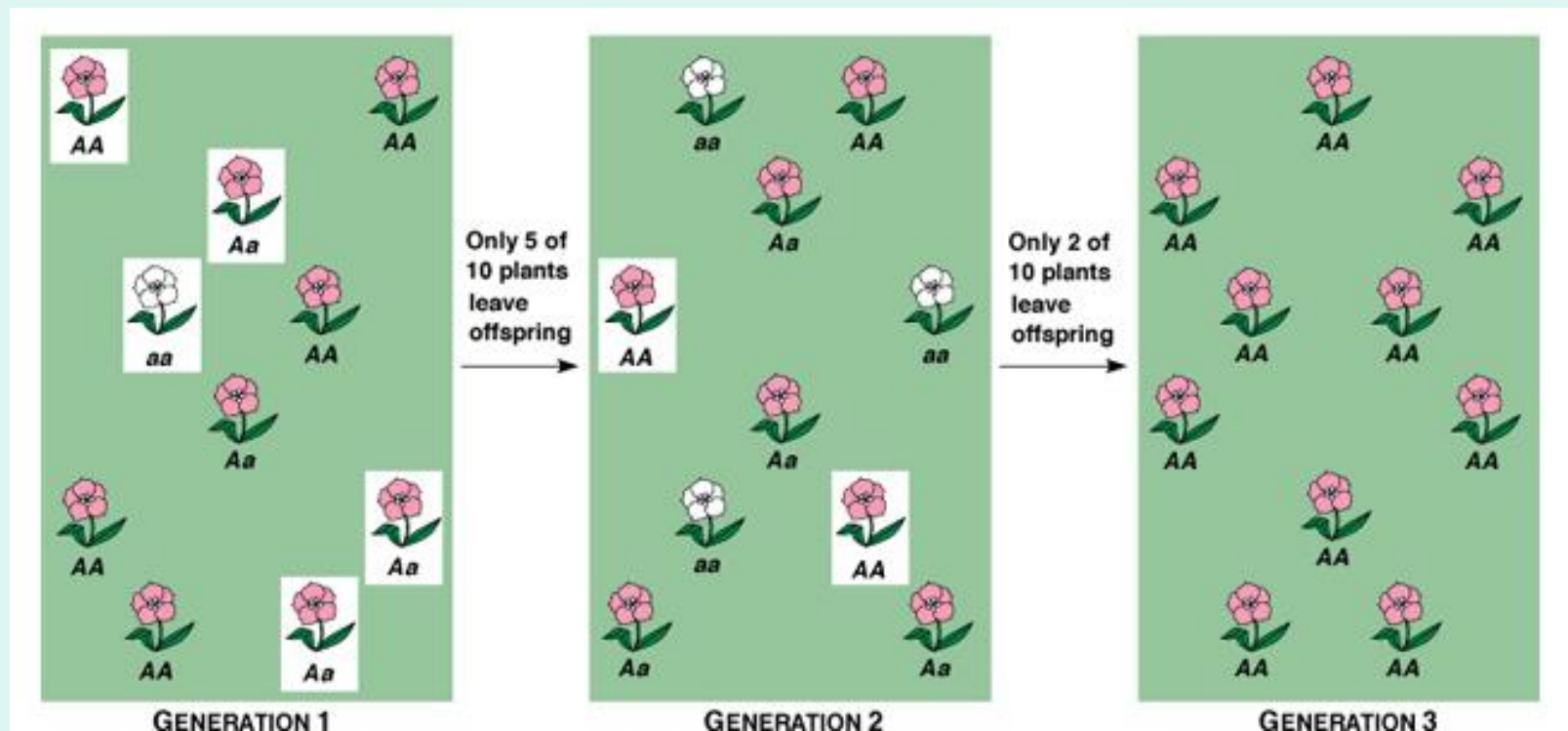
2. Migration- gene flow

- Immigration
- Emigration



Processes that disrupt G.E.

3. Genetic Drift- only in small populations
 - Random loss of alleles due to chance alone
 - Lose allele to mortality → change in proportion

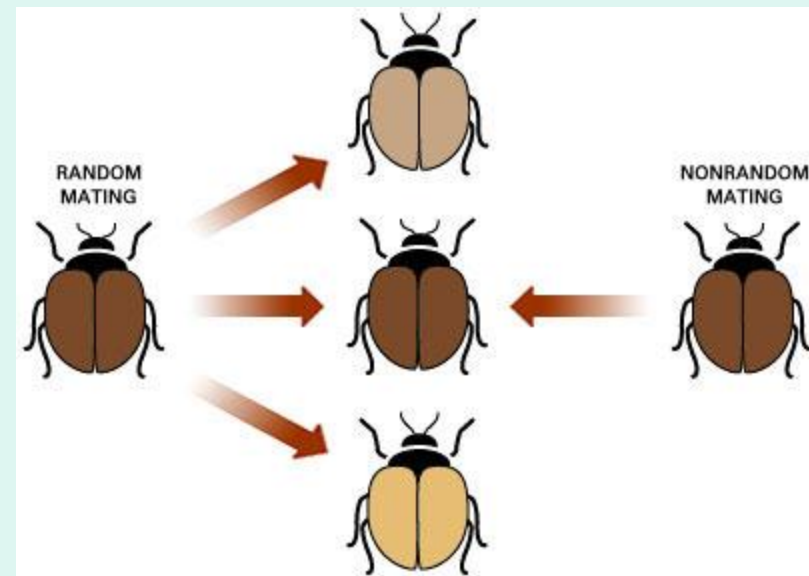


Processes that disrupt G.E.

- More on small populations...
 - Bottleneck effect- natural disasters leave survivors who are not representative of whole population

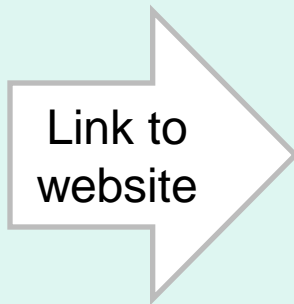
4. Nonrandom mating

- Geographical proximity
- Assortative mating (based on similarity)



Processes that disrupt G.E.

5. Natural selection- some members are more likely to survive and reproduce than others

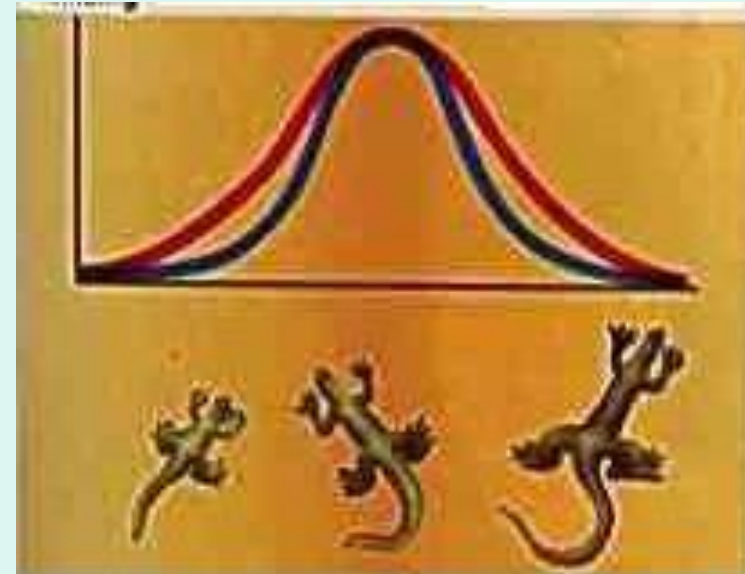


4 types of natural selection next...

Natural Selection

a. Stabilizing

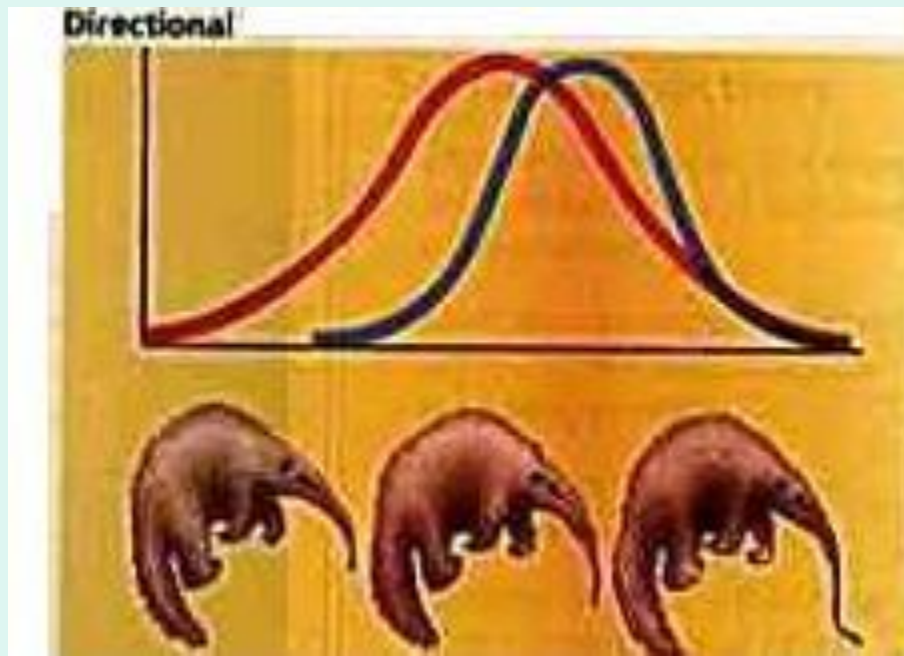
- Average phenotype = highest fitness
- Extremes are eliminated
- Most common type



Natural Selection

b. Directional

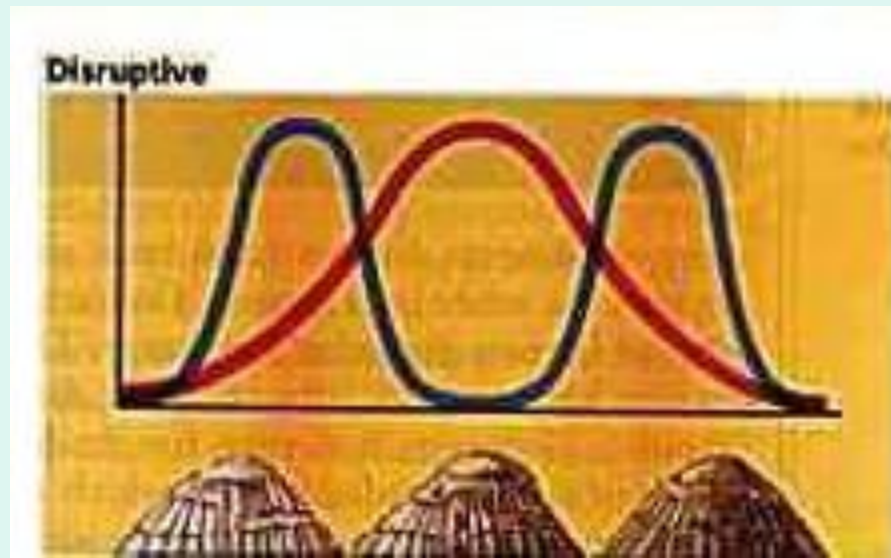
- More extreme trait= highest fitness
- Common trait moves toward one extreme
- Happens in changing environment



Natural Selection

c. Disruptive

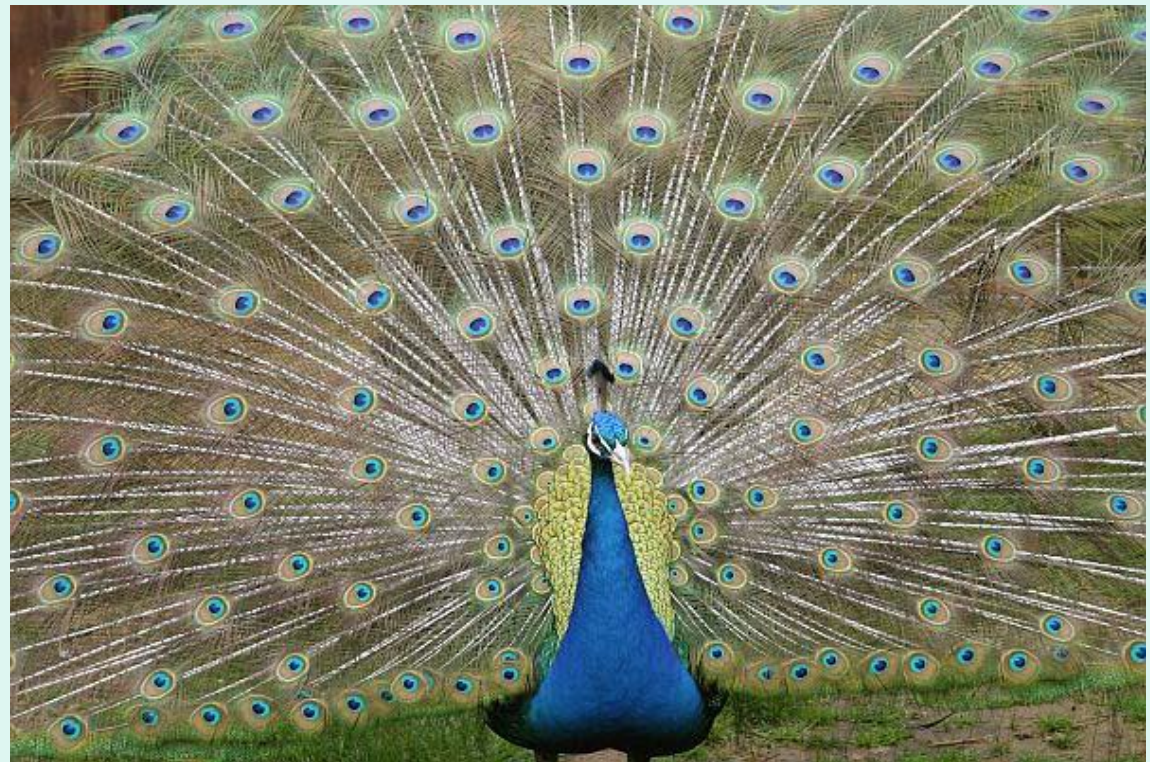
- Either extreme trait = higher fitness than average
- Extreme traits become more common in the population



Natural Selection

d. Sexual selection

- Females choose males based on certain traits



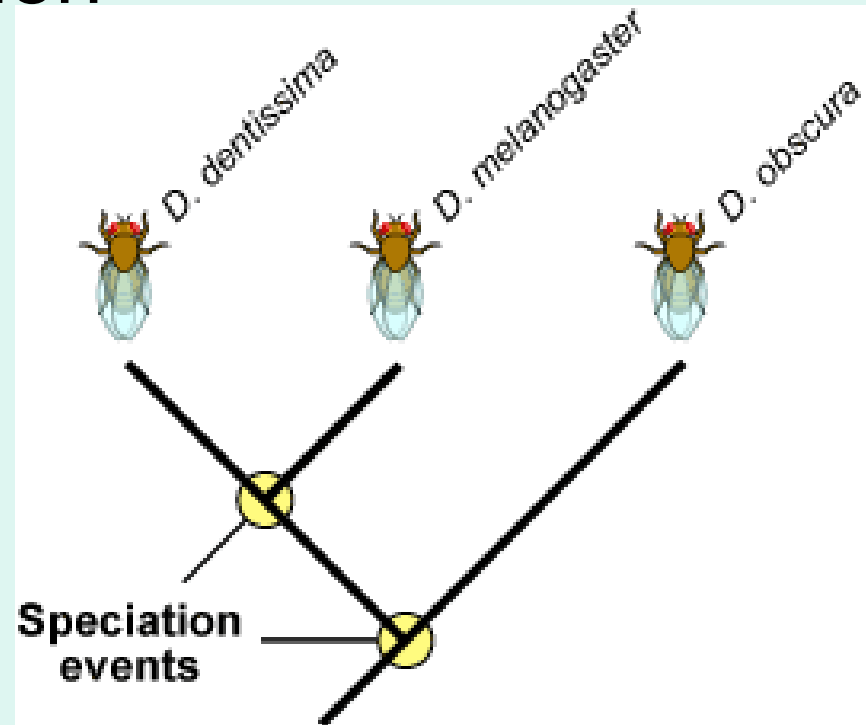
Processes that disrupt G.E.

6. Isolation

- 2 parts of a formerly interbreeding population stop breeding
- 2 types can occur
 - Geographic isolation (physical separation)
 - Reproductive isolation

Geographic isolation or Reproductive isolation

- Can lead to speciation (the formation of a new species)
- Called divergent evolution



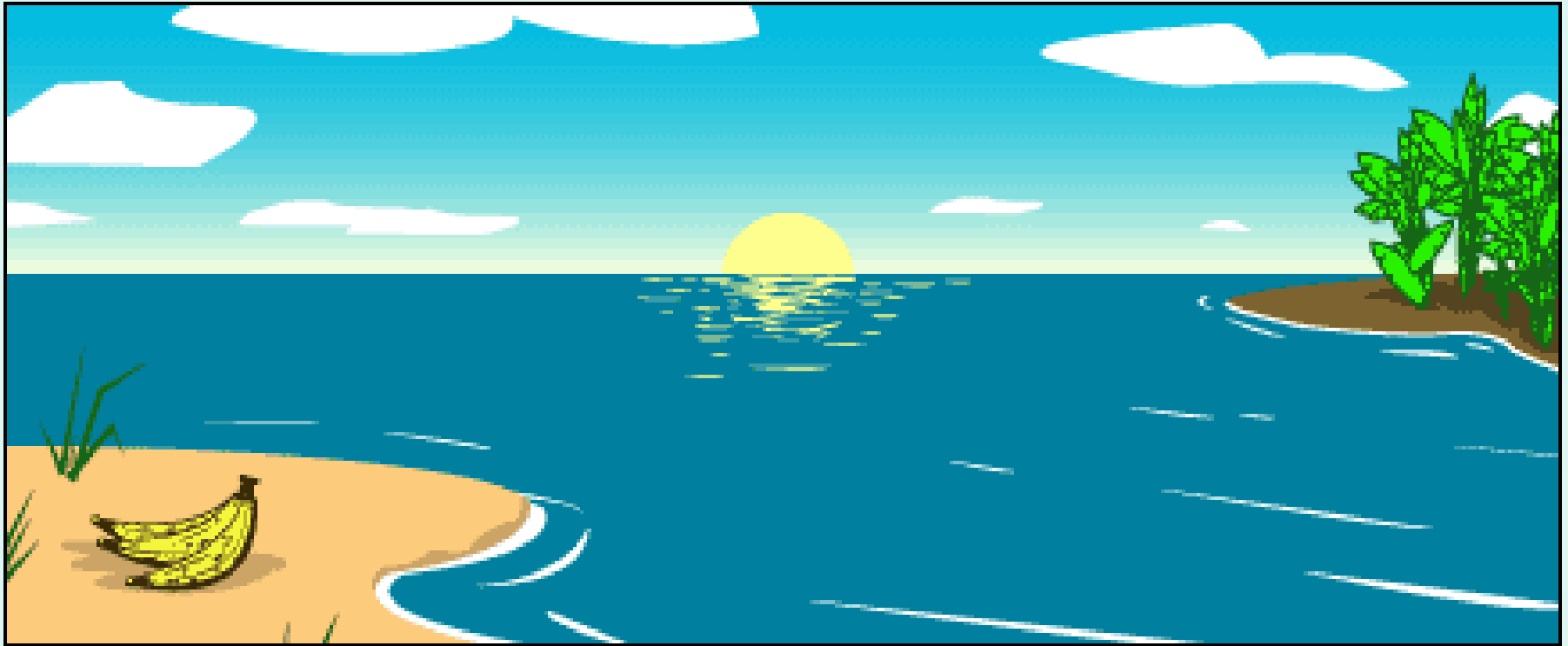
The scene...

- *Drosophila* fruit flies

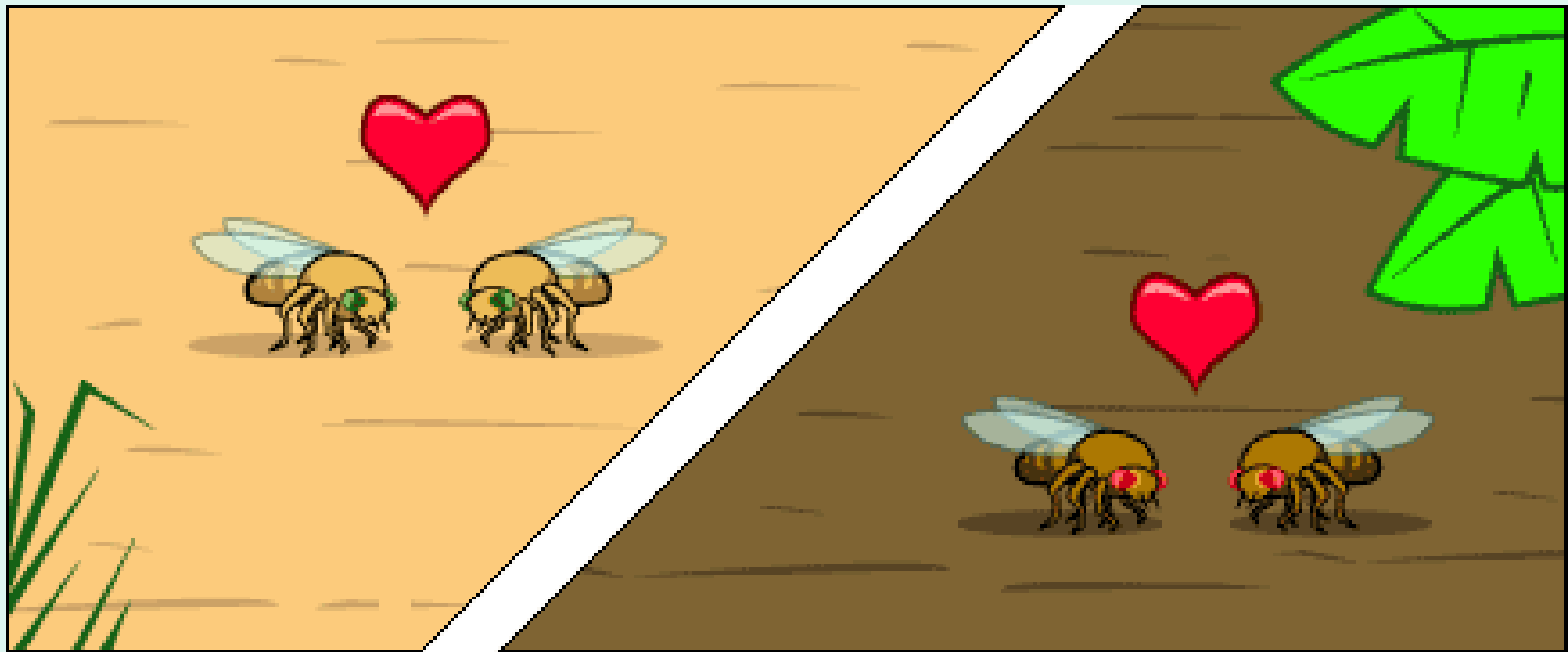


- Disaster strikes...

Conditions are slightly different on
island vs. mainland...



The populations diverge...



So we meet again...



Isolation can lead to speciation

- Formation of a new species
- One species can diverge into two new species (like you just saw with the fruit flies)
- Results in many related populations

Geographic isolation

Kaibab squirrel

- When the Grand Canyon in Arizona formed, squirrels from one species were separated by the giant canyon that they could not cross. After thousands of years of isolation from each other, the squirrel populations on the northern wall of the canyon looked and behaved differently from those on the southern wall. North rim squirrels have white tails and black bellies. Squirrels on the south rim have white bellies and dark tails.



Kaibab squirrel (a subspecies of Aberts) found on the northern rim of the Grand Canyon



•Aberts Squirrel on the southern rim of the Grand Canyon

Types of Reproductive Isolation

- PREZYGOTIC

- Isolation before fertilization

examples:

- **Incompatible behavior**
- **Difference in mating times**
- **Mechanical**

- POSTZYGOTIC

- Isolation after fertilization

examples

- **Incomplete development**
- **Early death**
- **Sterile (infertile)**
- **Chromosomal mismatch**

16-3 Definition of Species

Classification based on:

- **Successful interbreeding in the wild which produces fertile offspring**
- Morphological structures- external structures & appearance
- Molecular structures- genetics
- Behavior

BIODIVERSITY

- Number & variety of living organisms in a given area during a certain period of time

