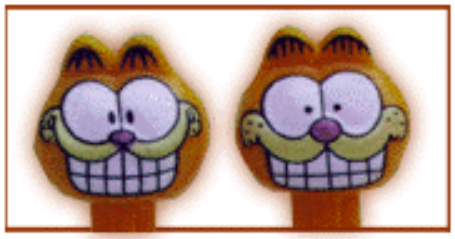
Chapter 23 & 24 Process of Evolution

Pumpkin A, B, C

Pebbles Hair Variation



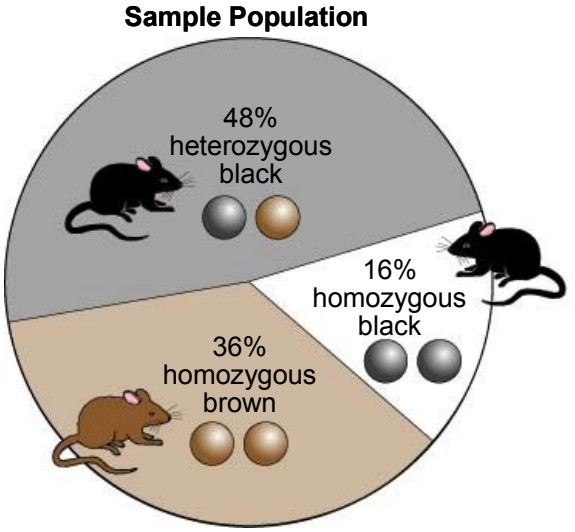
Garfield Nose Variation

I. Population Genetics

- Modern evolutionary theory integrates Darwinian selection and Mendelian freq
  - Chance variations arise in populations.
  - Variations are transmitted from parents to offspring

Chapter 23 Process of Evolution

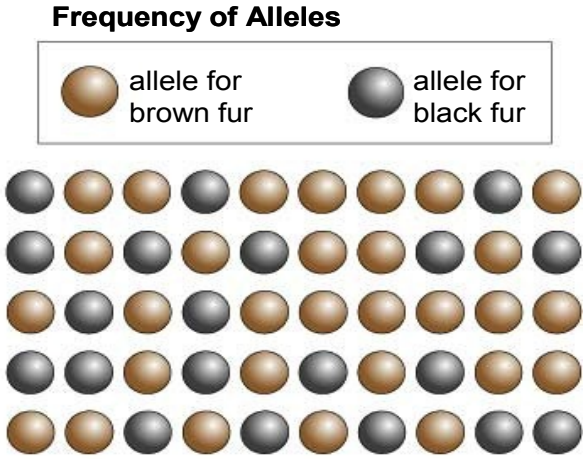
- B. The genetic structure of a population is defined by its allele and genotype frequencies
  - Population= group of organisms which belong to the same species.
  - Gene Pool-The total aggregate of all genes (alleles) in a population at any one time.



Chapter 23 Process of Evolution

Gene Pools

- The **relative frequency** of an allele is the number of times that a gene occurs in a gene pool.
  - This is expressed as a percentage.
  - (40% Black, 60% Brown)
- **Evolution** is any change in the relative frequency in alleles in a population.
  - So evolution would be in action if the relative frequency changed from 40% black to 30%.



Chapter 23 Process of Evolution

C. The Hardy-Weinberg Theorem

$$p^2+2pq+q^2 = 1$$

$$p + q = 1$$

- **It describes a nonevolving population.**
- **It states that in the absence of other factors, the segregation and recombination of alleles during meiosis and fertilization will not alter the overall genetic makeup of a population.**

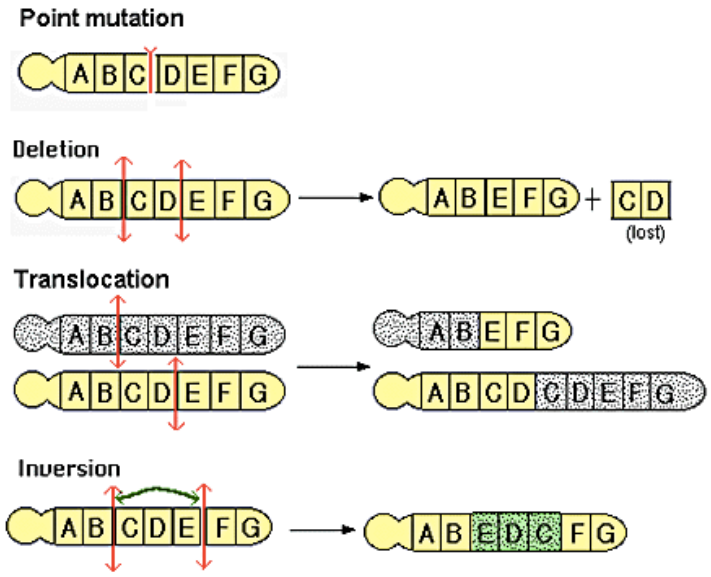
Chapter 23 Process of Evolution

The Hardy-Weinberg Theorem

- 5 Conditions:
  - 1. No mutation
  - 2. No gene flow-isolation from other populations
  - 3. Random mating
  - 4. Large Population = NO genetic drift
  - 5. No natural selection

Real Populations

- Mutations: Mutations happen at a constant rate – they can not be avoided
  - Chromosomal
  - Single gene
- Gene Flow:
  - Immigration
  - Emigration – it happens



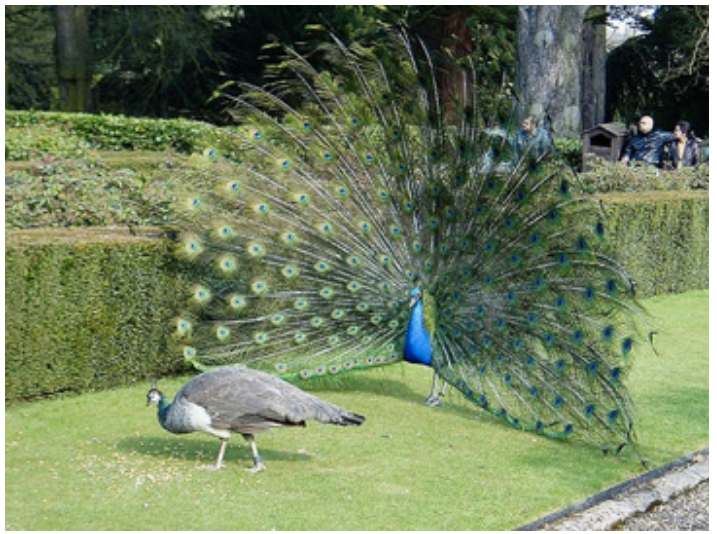
Mutations of Chromosomes

Real Populations

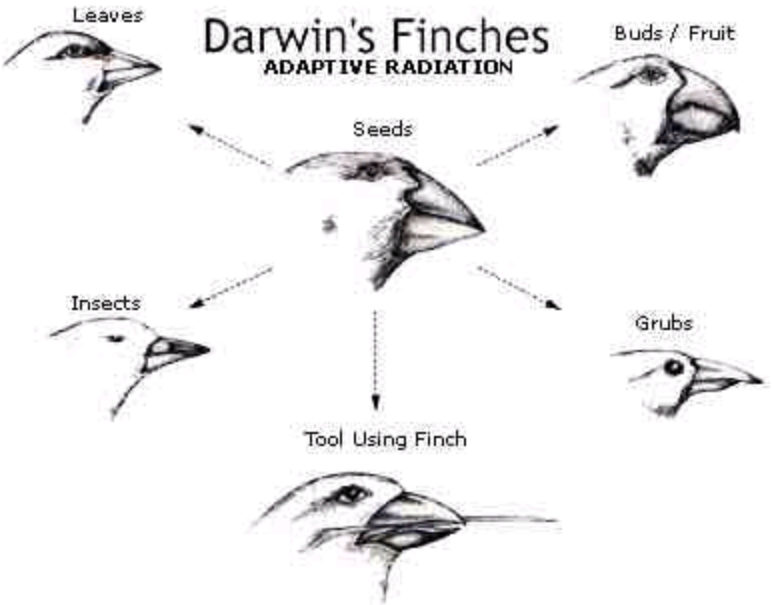
- Genetic Drift: Changes in gene pool of a small population due to chance (2 Factors)
  - Bottleneck Effect: size of population may be reduced by natural disasters, killing organisms nonselectively
  - Founder Effect: few individuals colonize a new habitat.

Real Populations

- Microevolution-a generation-to-generation change in a population's allele or genotype frequencies.
  - Microevolution is caused by mutation, gene flow, nonrandom mating, genetic drift, and natural selection.
  - Sexual selection happens!

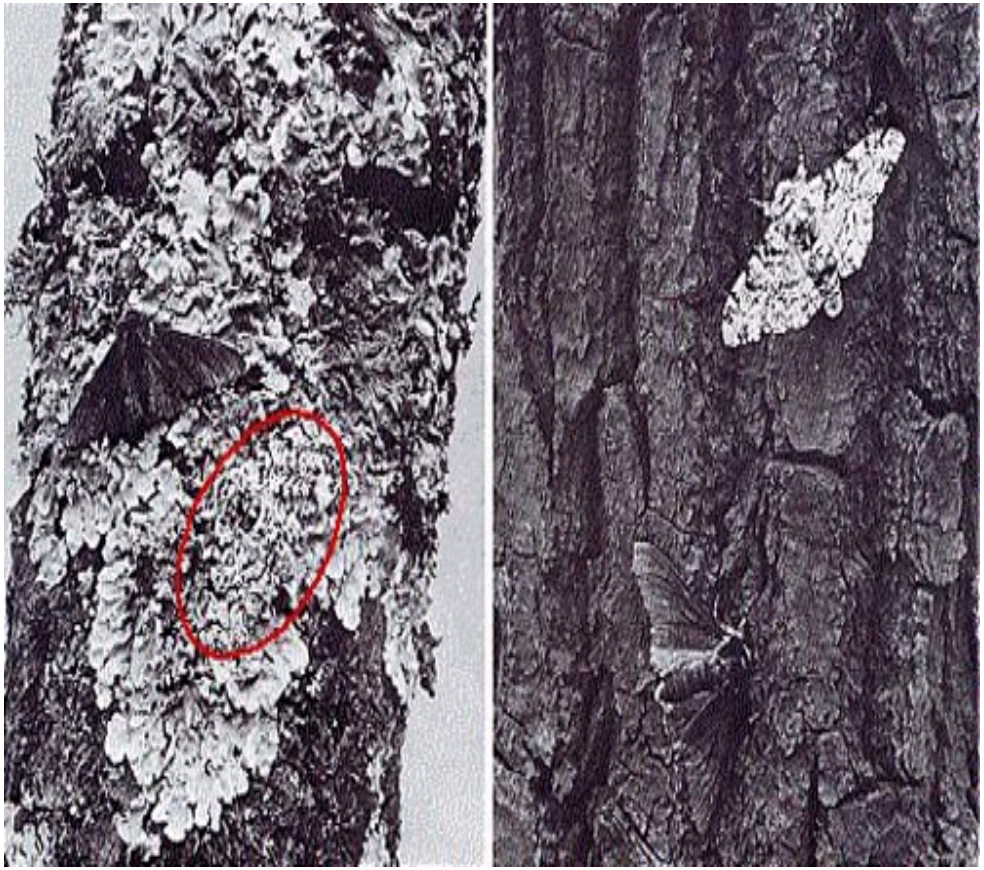


Real Populat



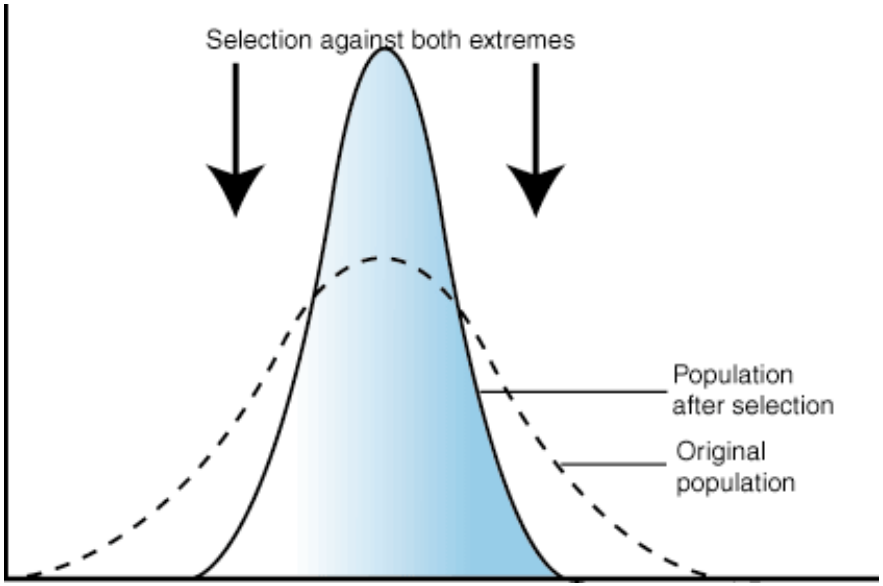
- **Genetic Variation and Natural Selection**
- **Natural Selection**
  - **The process that results in adaptation of a population to the environment.**
  - **Fitness-the extent to which an individual contributes fertile offspring to the next generation.**

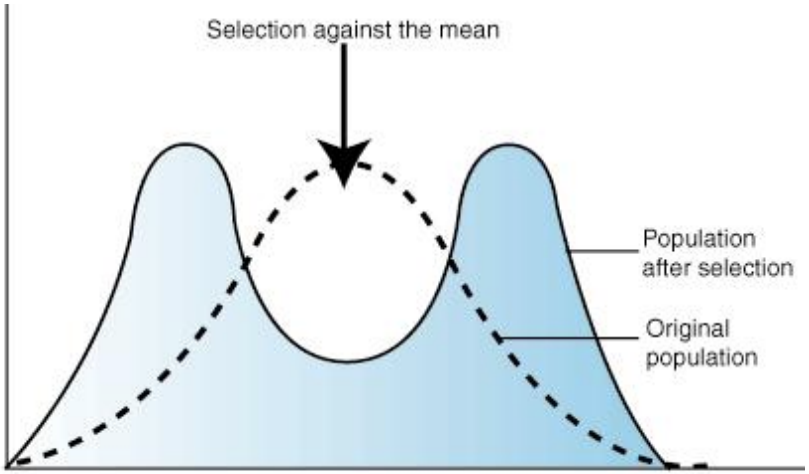
Chapter 23 Process of Evolution

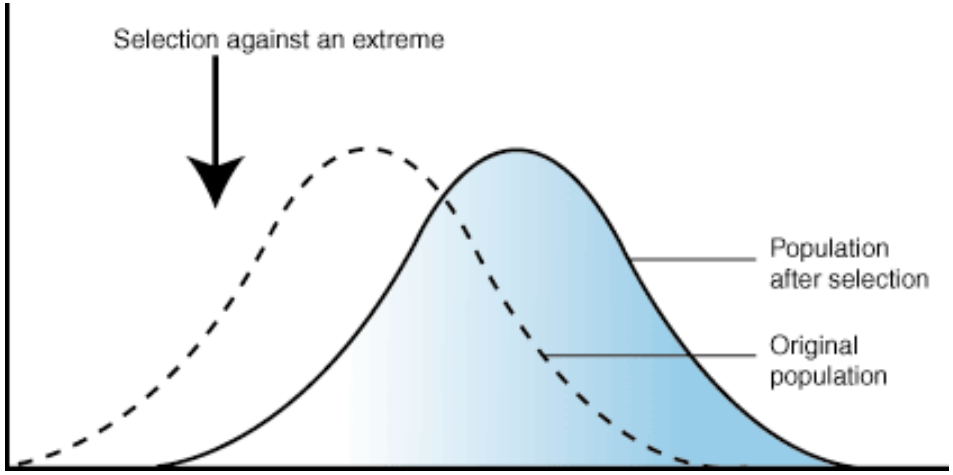


- Genetic Variation and Natural Selection
- Types of Selection
  - Directional Selection
  - Stabilizing Selection
  - Disruptive Selection

Types of Selection







Where is fitness high?
Where is it low?
List examples for each

- Review from Semester 1
  - Adaptive radiation
  - Convergent evolution
  - Divergent evolution
  - Co-evolution

- Maintenance of Variations
    - Forces that promote variation.

Natural Selection cannot fashion perfect organisms.

- ✖ Organisms are locked into historical constraints.
- ✖ Adaptations are often compromises.
  - ✖ examples

Chapter 23 Process of Evolution

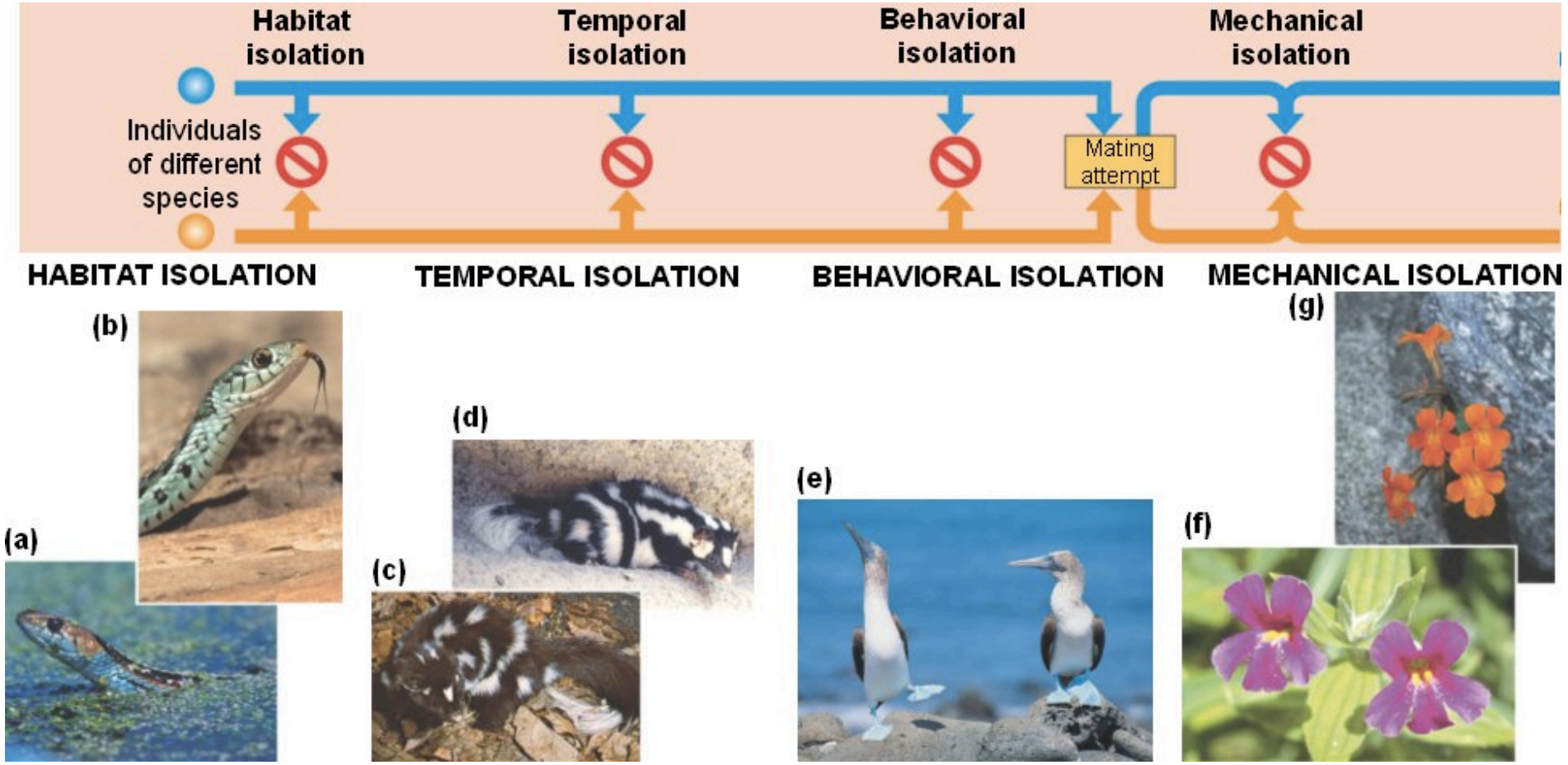
- Not all evolution is adaptive.
- Selection can only edit variations that exist.

Chapter 23 Process of Evolution

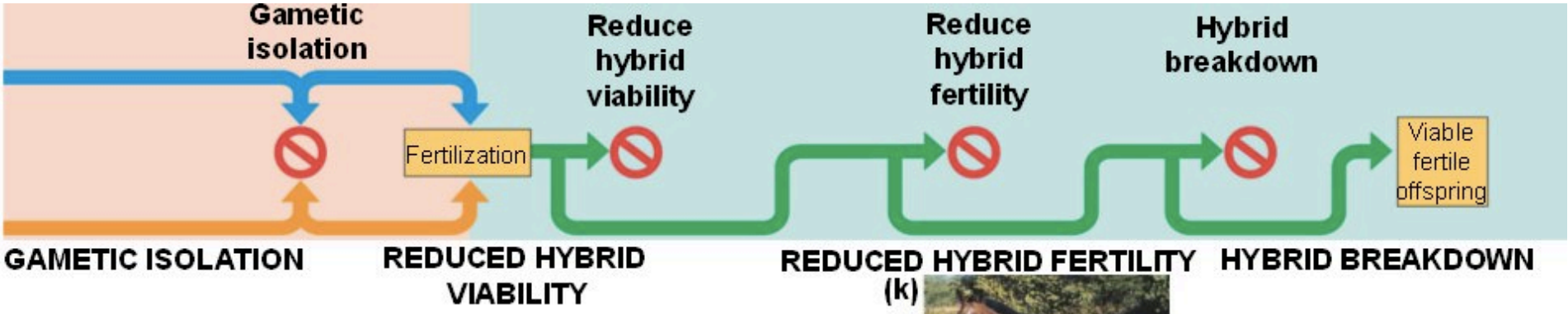
- III. What is a Species?
- A. The biological species concept emphasizes reproductive isolation.
  - – Species become different once they are reproductively isolated from each other
- B. Prezygotic and postzygotic barriers isolate the gene pools of species.
  - Type of reproductive barrier depends on whether they were before or after the formation of zygotes.

  **Define Zygote:

Prezygotic Barriers: barries to eggs being fertilized



Postzygotic Barriers: Egg meets sperm – but…



(h)

(i)

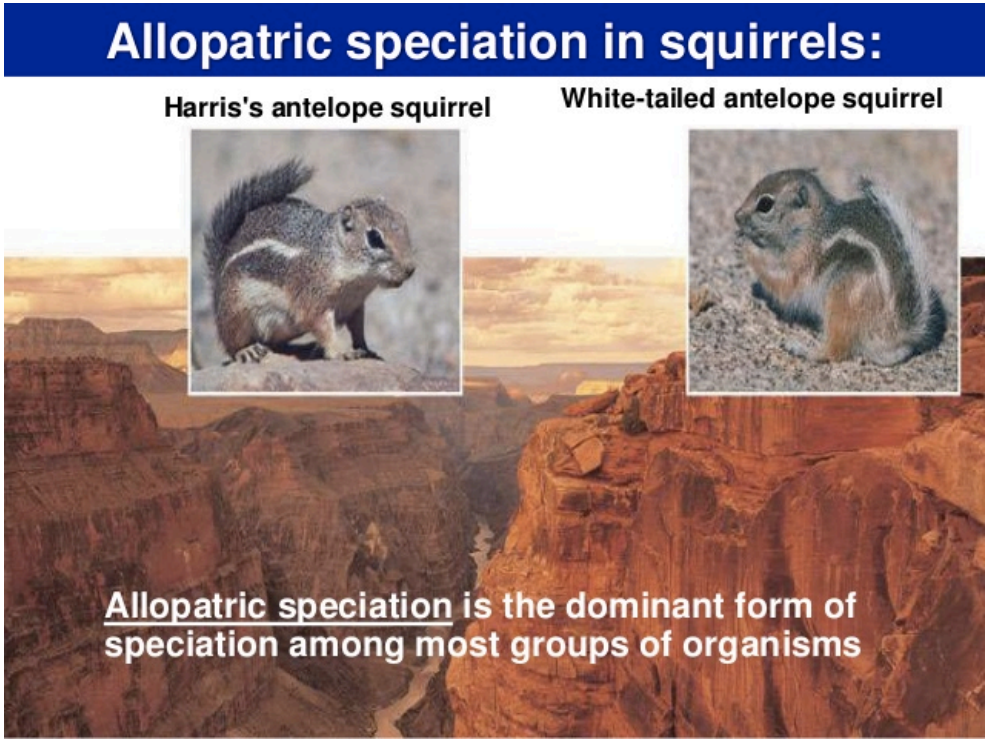
(j)

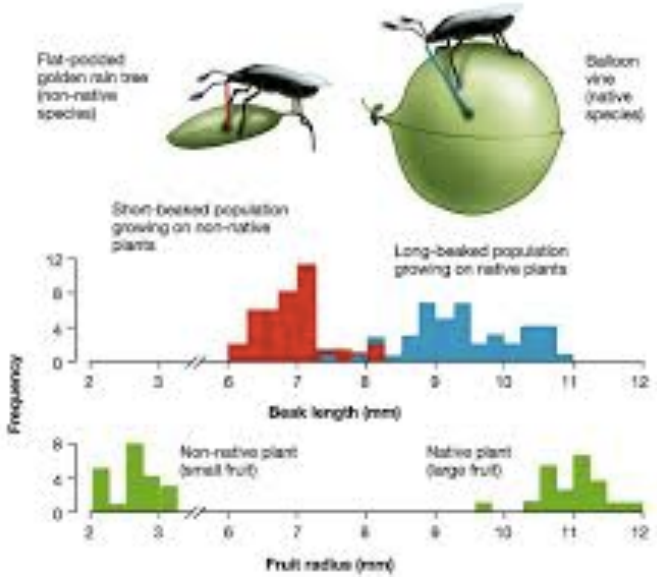
(k)

(l)

(m)

- Adaptive Radiation -the evolution of many diversely adapted species from a common ancestor.
- Modes of Speciation
- A. Two Types
    - 1. Allopatric Speciation 2. Sympatric speciation





Chapter 23 Process of Evolution

- Allopatric Speciation
  - Speciation that occurs when the initial block to gene flow is a geographical barrier that physically isolates the population.
  - Conditions favoring allopatric speciation
  - Dispersal – how they are distributed
  - Variance - the variation in habitat drives the evolution

Chapter 23 Process of Evolution

C. Sympatric Speciation

- Members of a single population develop a genetic difference that prevents them from reproducing with the parent type.

- Niche partitioning
- Sexual selection

- How do you know you have a new species?