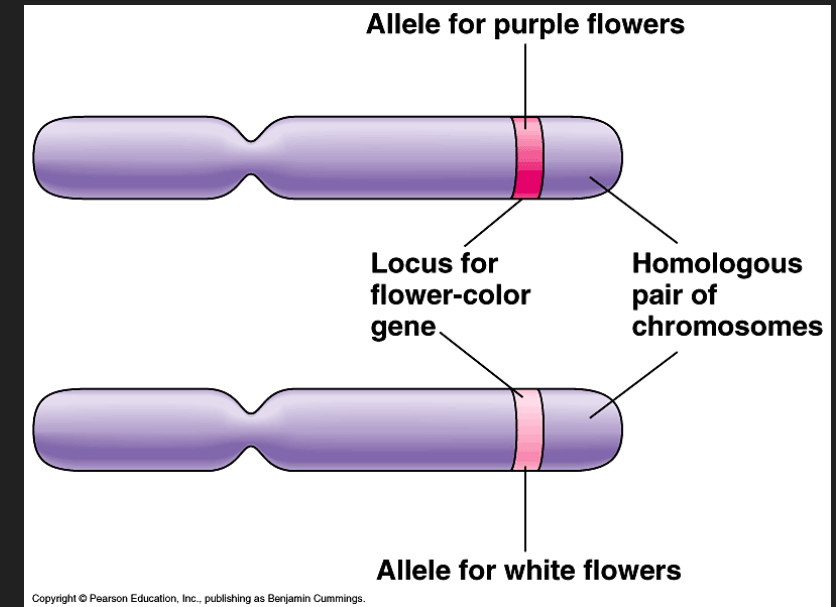


Selection



Genes and Variation

- Although variation in heritable traits was central to Darwin's theory, he did not know how heredity worked!
- During the 1930's biologists connected Gregor Mendel's (Punnet Squares) and Darwin's work (WE WILL LOOK AT THIS IN MORE DETAIL LATER)
 - Genes produce the heritable variation on which natural selection can operate
 - Many genes have at least two forms of alleles



○ Sources

- Recombination of Chromosomes (Meiosis) (Sexual Reproduction)

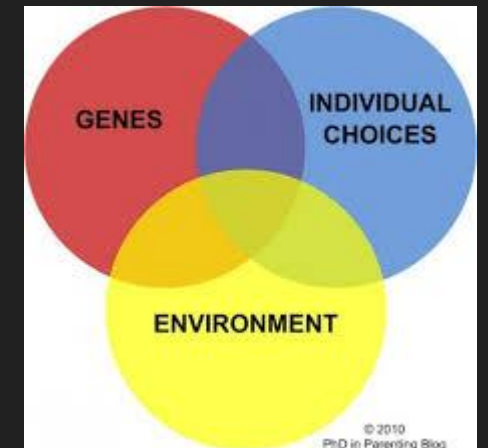
○ Mutation

- any change in a sequence of DNA (base pairs)

- Mistakes in replication, radiation or chemicals

Sexual Reproduction

- Meiosis produces gametes with new combinations of genetic info
- You do not look exactly like your mother or father
- Genetic variation is NOT controlled or directed to any goal, it is RANDOM
- Traits can be influenced by the environment
 - “Nature vs Nurture” debate



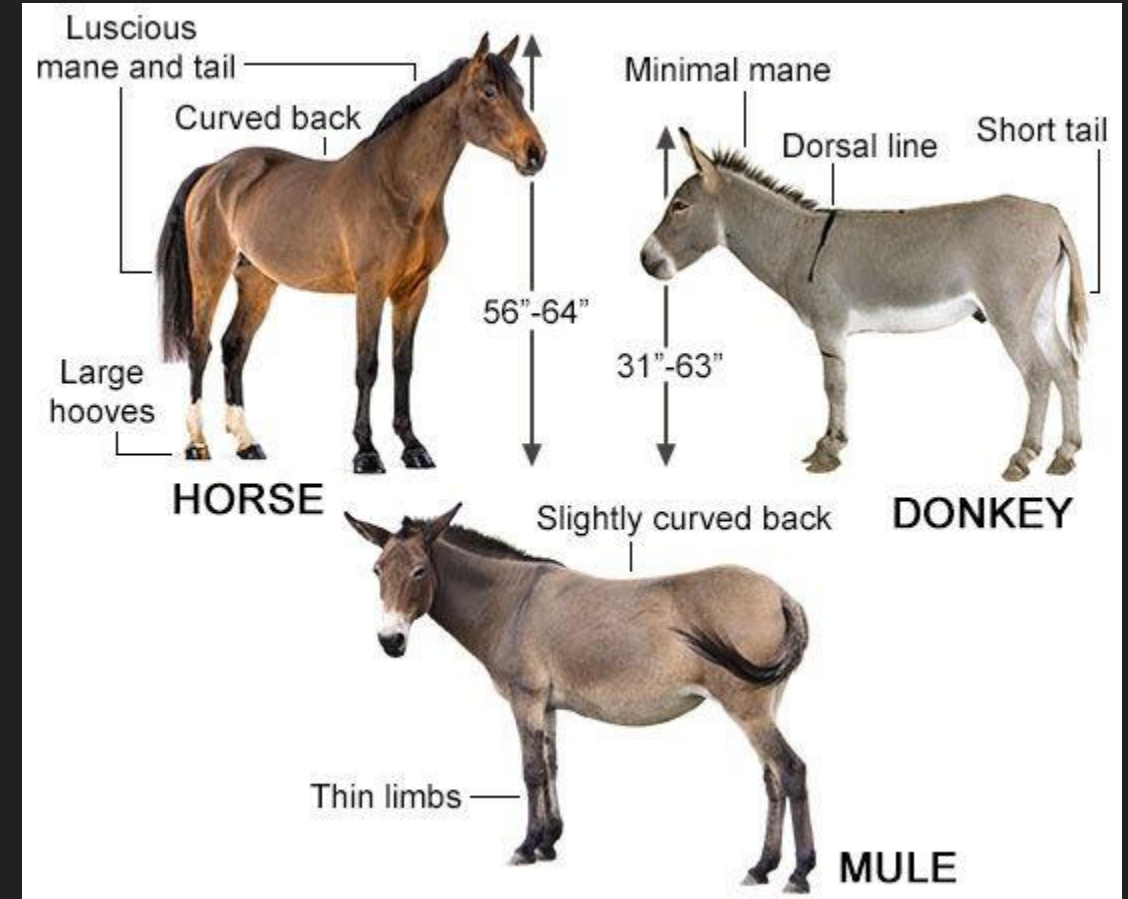
Genetic Variation

- Studied in populations
- Population
 - Collection of individuals of the SAME SPECIES in a given area whose members can breed with each other
 - Ex:
 - Amount of coyotes in Burnaby



What makes something a species?

- A group of similar looking organisms that breed with one another to produce FERTILE offspring in the natural environment
- They share a common gene pool
- Are donkey's and horses the same species?



Gene pool

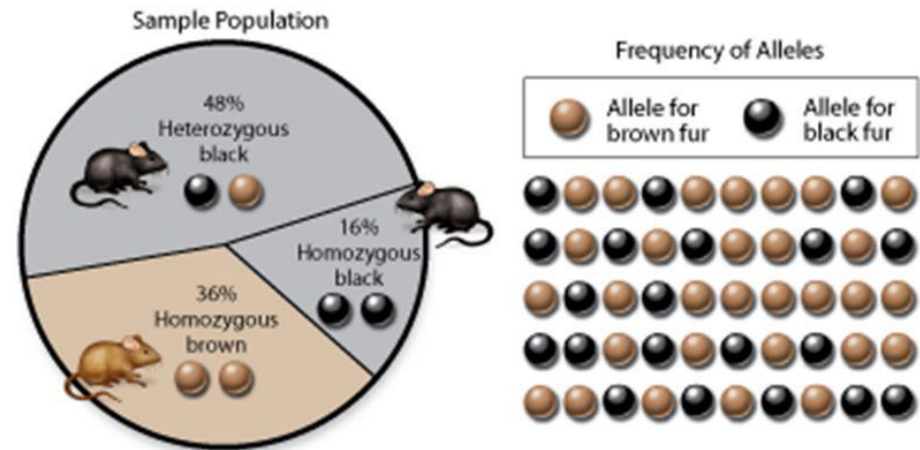
- Since members of a population interbreed they share a common group of genes
- Gene Pool
 - The collection of genes (including all alleles) that are present in a population



Relative Frequency

- The relative frequency of an allele is the number of times that the allele occurs in a gene pool, compared with the number of times other alleles for the same gene occur
- Has nothing to do with whether the allele is dominant or recessive.

Determining Allele Frequency

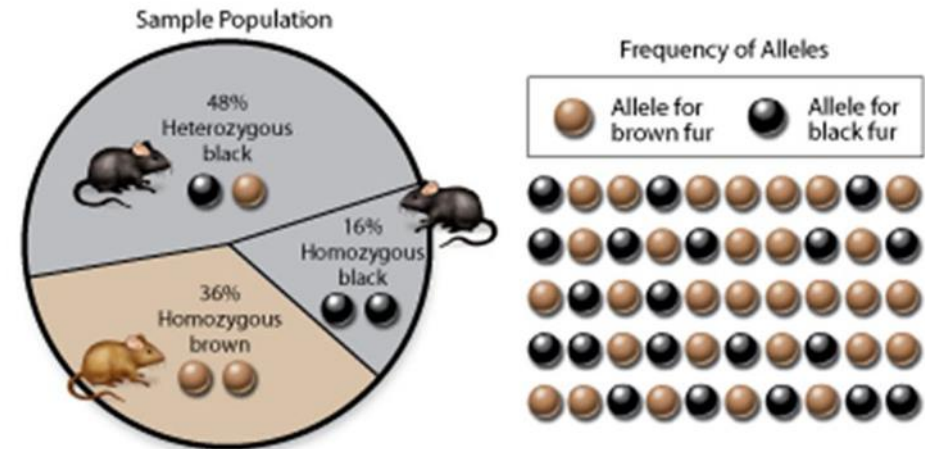


You have a population of 25 mice. How many alleles for coat color are found in this population?

Evolutionary Change

- Another way to define Evolution
 - Any change in the relative frequency of alleles in the gene pool of a population
- If the relative frequency of the B allele in the mouse population changed over time then the population is evolving

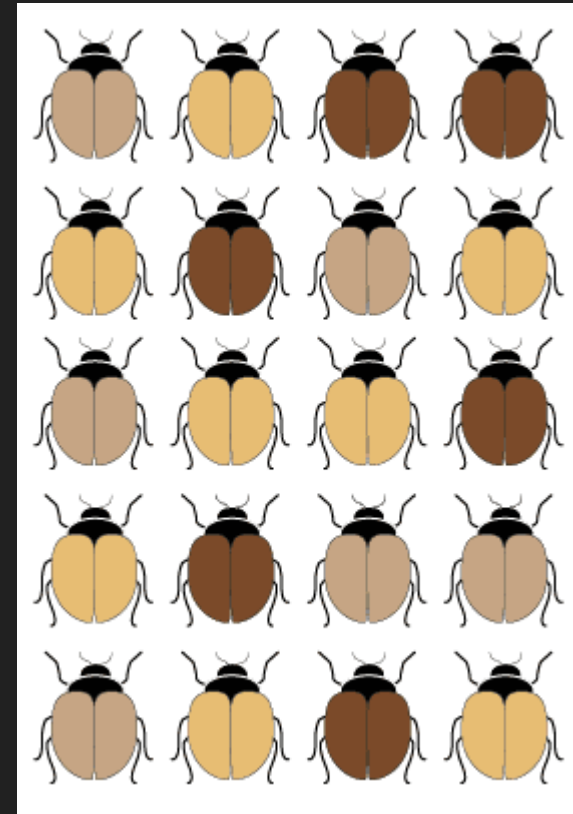
Determining Allele Frequency



You have a population of 25 mice. How many alleles for coat color are found in this population?

Natural Selection

- Never acts directly on genes
 - It is an entire organism, not a single gene, that survives/reproduces or dies without reproducing
 - Acts on the the phenotype (physical and behavioural characteristics)
- Evolution is any change over time in the relative frequencies of alleles in a population
 - Therefore it is populations, not individual organisms that can evolve over time



Phenotypic Variation

- Height

- You can see a range of heights
- Some people are taller, shorter etc.
 - Phenotypic variation: Caused by a combination of genes and environment (ex: nutrition and exercise)
 - If everyone had the same “environmental” situation, variation would be due to genetic differences















Selection on single gene traits

- Can lead to changes in the allele frequencies
- Red eaten by predator
- If a colour change has no effect on fitness, the allele that produces it would not be under pressure from natural selection

16-2 Evolution as Genetic Change → Natural Selection on Single-Gene Traits

Black lizards may warm up faster on cold days. This may give them energy to avoid predators. In turn, they may produce more offspring.

The allele for black color will increase in relative frequency.

Effect of Color Mutations on Lizard Survival			
Initial Population	Generation 10	Generation 20	Generation 30
 80%	 80%	 70%	 40%
 10%	 0%	 0%	 0%
 10%	 20%	 30%	 60%