CONCEPT: ALLELIC FREQUENCY CHANGES

● In real-life genetics, the SAMIR assumptions of Hardy-Weinberg are too _____

Selection

1. **Natural selection** is when organisms with genes that better allow them to survive produce more offspring

□The struggle for survival means that not everyone _____

- Individuals with particular phenotypes will be more apt to survive and pass on their genes

□ There are multiple types of selection

- **Directional selection** moves alleles in one direction until they're fixed in the population or lost

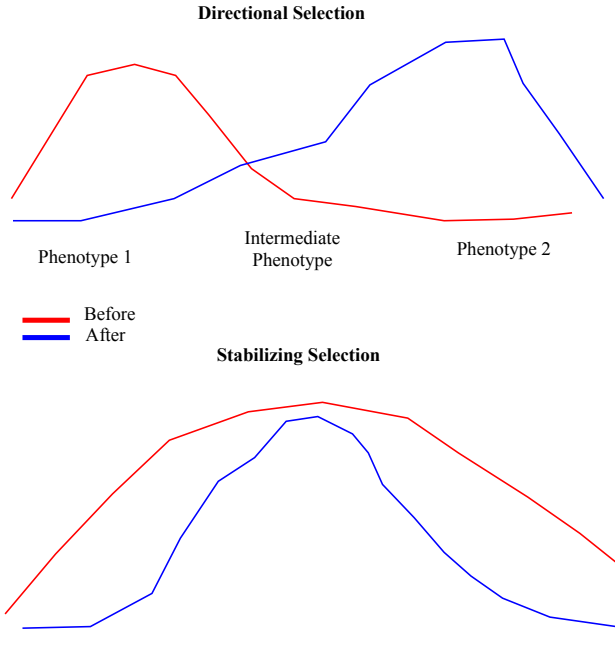
- **Fixed** alleles are found in every organism in the population

- **Positive selection** brigs favorable mutations to a higher frequency

- **Purifying selection** removes harmful mutations

- **Balancing selection** moves population to an equilibrium where both alleles are maintained in population

EXAMPLE:



□ **Fitness** is a measurement of how well an individual's genetic makeup contributed to _____ generations

- **Absolute fitness** is the number of offspring an individual has

- **Relative fitness** is the fitness of an individual relative to another individual

New Alleles and Migration

2. Allelic frequencies are changed by the creation or introduction of _____ alleles

□ Mutation is one major way new alleles are created in a population

- **Mutation rate (μ)** is the rate at which mutations occur in a population

- Can be used to calculate how frequently new alleles will arise

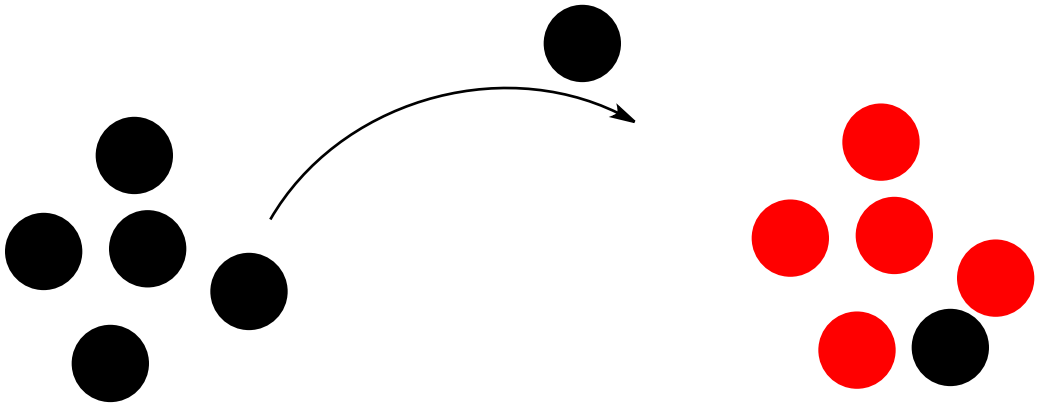
- Formula: $\Delta q = \mu p$ calculates how the mutation rate on allele p causes a change in q freq.

3. **Migration (gene flow)** is the movement of individuals between _____

□ Creates a **genetic admixture** which is a mix of genes in individuals that arose from 1+ subpopulations

- Migration adds genetic variation to the population

EXAMPLE:



Genetic Drift and Non-Infinite Populations

4. Populations are not infinite, which means gametes only contain a sample of alleles present in the parental gene pool

□ Purely by chance, not all alleles will be passed onto the next _____

- But, the more offspring that are produced, the more alleles will be passed on

□ If the gametic sample is small (so small number of gametes are used to produce offspring),

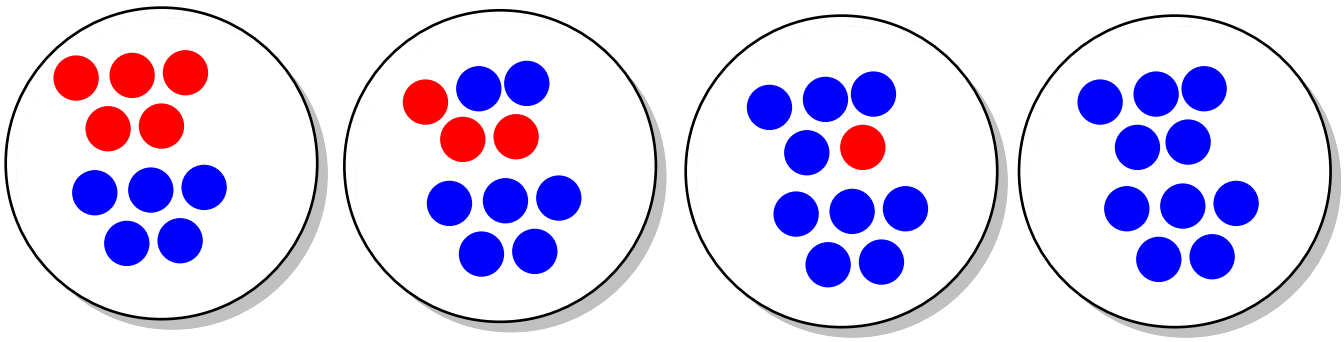
- Then, the greater the change that the gametes composition will deviate from the entire gene pool

- **Sampling error** is a deviation from expected ratio due to limited sample size

□ **Genetic drift** is a change in allelic frequency due to a random disappearance of genes in small populations

- Higher in small populations, and when allelic frequencies are equal

EXAMPLE: Genetic drift over four generations



□ Genetic drift can lead to fixation or loss of an _____

- **Fixation** occurs when all individuals in a population are homozygous for one allele

- Loss is when no individual in a population carries the allele

□ Genetic drift can also be caused by two major occurrences in a population

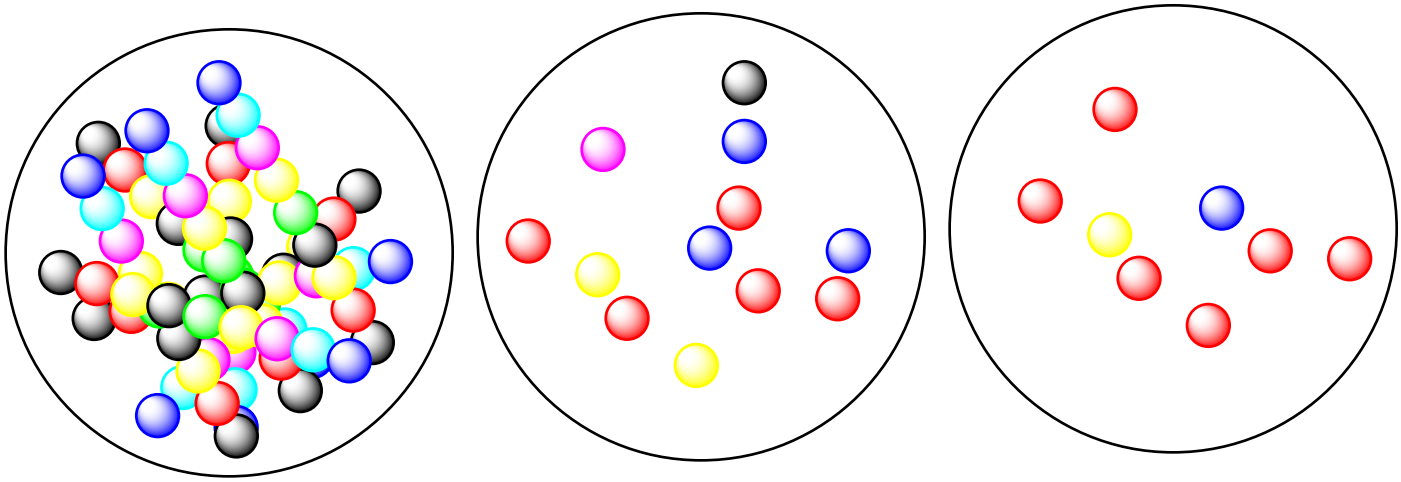
- **Founder effect** occurs when a new population of a much smaller size is formed by a founder

  - The founder doesn't carry every allele at the same frequency as the original population

- **Bottleneck** occurs when there is a contraction in population size which reduces the variation of alleles

  - Can occur in one or over several generations

EXAMPLE: Example of bottleneck effect



Non-random Mating

5. Non-random mating due to _____ occurs in every organism on Earth

□ **Assortative mating** occurs when individuals choose mates based phenotypes

- **Positive assortative mating** occurs when mates are chosen based on similar phenotypes

- **Negative assortative mating** occurs when mates are chosen based on dissimilar phenotypes

EXAMPLE: Female humans prefer the odor of males with different MHC alleles than their own

□ Isolation by distance can also cause non-random _____

- Two populations of the same species separated by large distances likely wont mate

- Therefore genetic variations begin to develop between the populations

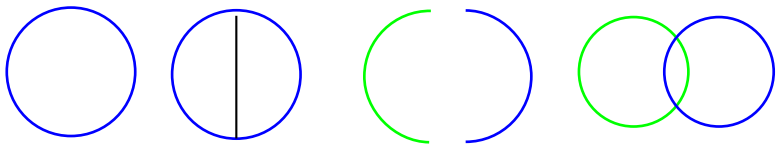
- **Speciation**, which is the creation of a new species, can occur

- Usually occurs upon reproductive isolation

- **Prezygotic** isolation are biological barriers that reduce breeding between populations

- **Postzygotic** isolation is due to infertility or inviability of hybrids created via interbreeding

EXAMPLE:



□ **Inbreeding**, which is the mating between relatives**,** also is a result of non-random mating

- Inbred individuals are much more likely to be homozygous for _____ recessive alleles

  - **Inbreeding depression** can lead to reduction in vigor and reproduction success

  - In plants, inbreeding through self-fertilization can often be positive

- **Inbreeding coefficient (F)** is the probability that 2 alleles in an individual trace back to the same ancestor

- Inbreeding is more common among small populations

EXAMPLE:

Relationship	**Inbreeding Coefficient (F)**
Father/Daughter	25%
Grandfather/Granddaughter	12.5%
Uncle/Niece	12.5
First Cousins	6.25%
Second Cousins	1.56