Chapter 16
Section 2

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Allele Frequencies

Scientists wondered if dominant alleles were more common than recessive alleles.

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Hardy and Weinberg showed that the frequency of alleles and the ratio of heterozygous and homozygous does not change from one generation to the next.

It only changes if there is something that acts on one like a lethal dominant.

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Hardy-Weinberg principle-- states that the frequencies of alleles in a population do not change unless evolutionary forces act on a population

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HW holds true if a population is large enough that its members will not mate with relatives AND as long as evolutionary forces are not acting.

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Five principles of evolution:

Mutation
Gene Flow
Nonrandom mating
Genetic drift
Natural Selection

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Mutation

Most genes only mutate 1 to 10 times per 100,000 cell divisions.

Mutation though is the source of variation.

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Gene Flow

The movement of individual alleles into or out of a population.

Gene flow occurs because immigrants or emigrants add or take alleles.

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Nonrandom Mating

Some individuals prefer to mate with others that live nearby or are of their own phenotype.

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Interbreeding

The entire population of Old Order Amish of Pennsylvania (17,000) are descended from only a few individuals. As a result 13% of the people are homozygous recessive for a rare allele that is a disease with a combination of dwarfism and extra fingers.

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Since the early 1770's
61 cases have been
reported this is about as
many as the rest of the world

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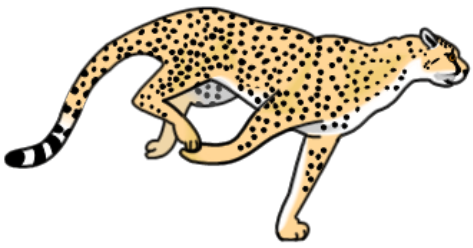
Genetic Drift

A fire or landslide can reduce a large population to a small group. This can have a major effect on a population.



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Natural Selection

The frequency of an allele will change depending on the allele's effects on survival and reproduction.

black moths vs white moths

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Natural Selection acts on phenotypes not on genotypes because it does not change actual alleles.

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Rare recessive alleles cannot be affected until the traits are showed.

This would mean that heterozygous individuals will have to mate to create homozygous recessive alleles.

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For example hemophilia has the potential of causing death from uncontrolled bleeding.

This would remove the homozygous person from the population, but since heterozygotes do not express hemophilia they are not affected and so that condition still exist.

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If a recessive allele is homozygous in only 1 out of 100 then 18 out of 100 will be heterozygotes. So natural selection can only act on 1 out of every 19 individuals that carry the allele.

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Polygenic trait - a trait that influenced by several genes like human height and hair color.

Polygenic traits exhibit a range clustered around an average.

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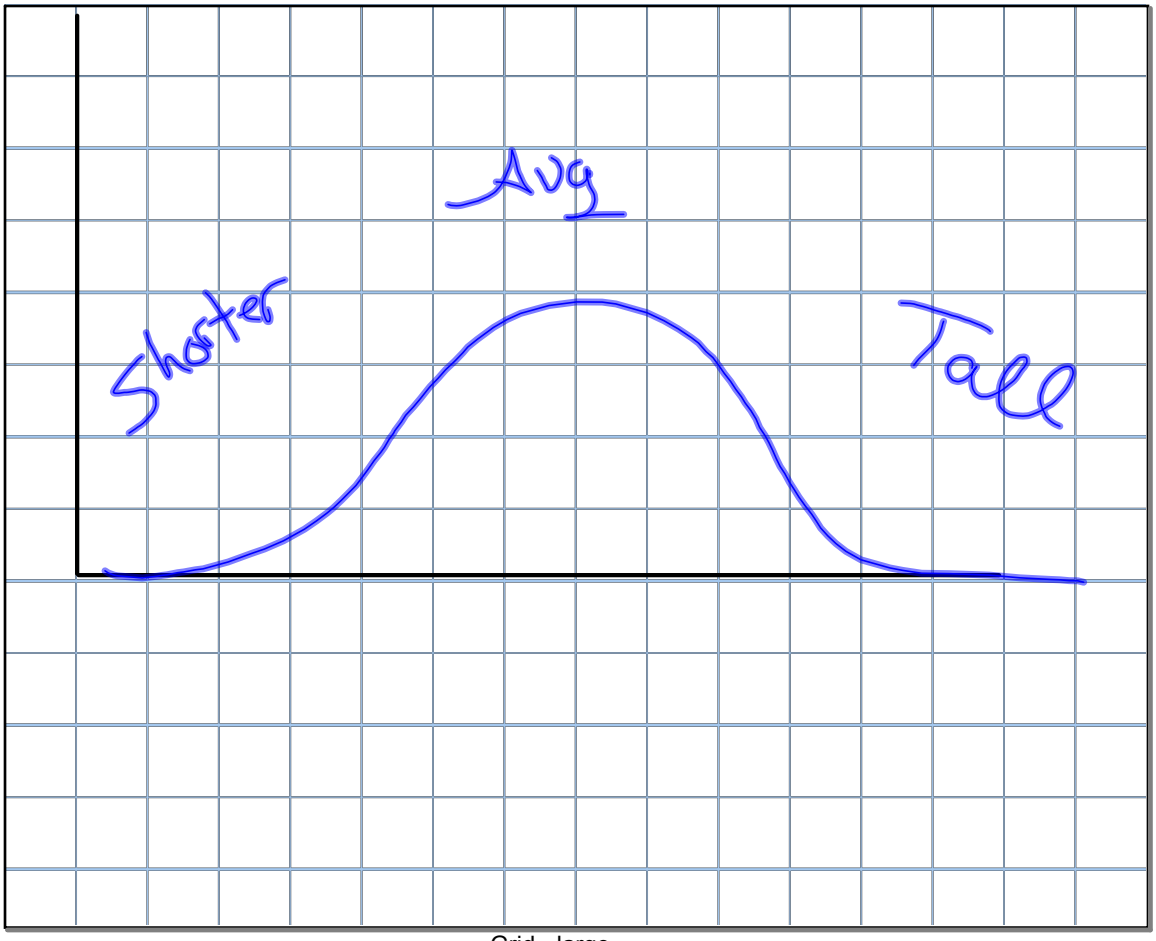

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Normal distribution----
hill-shaped curve with the average as the summit.

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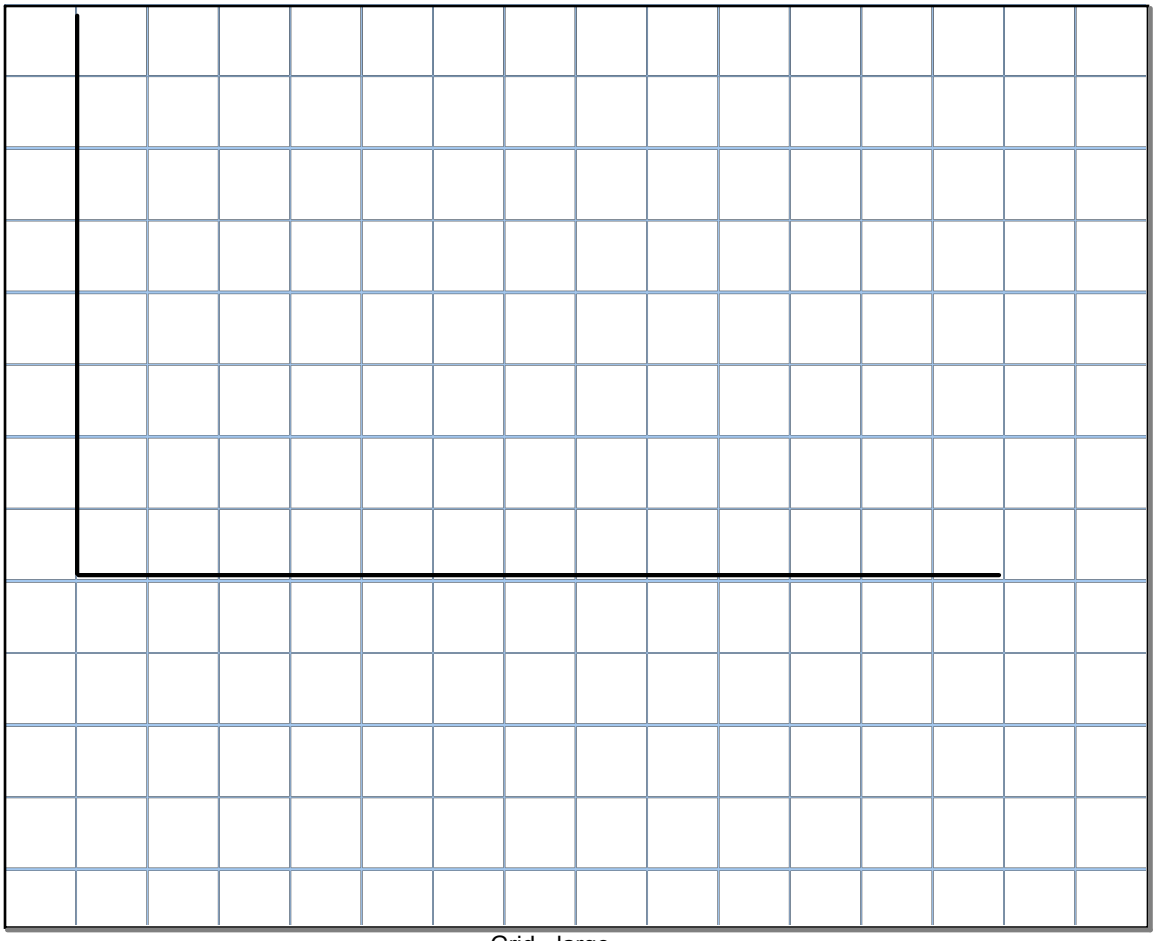

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When selection eliminates one extreme and the selection moves on one direction this is called directional selection. This is also characterized by single-gene traits

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When selection eliminates extremes at both ends of the range, then the frequency of the intermediate increase. This is called stabalizing selection.

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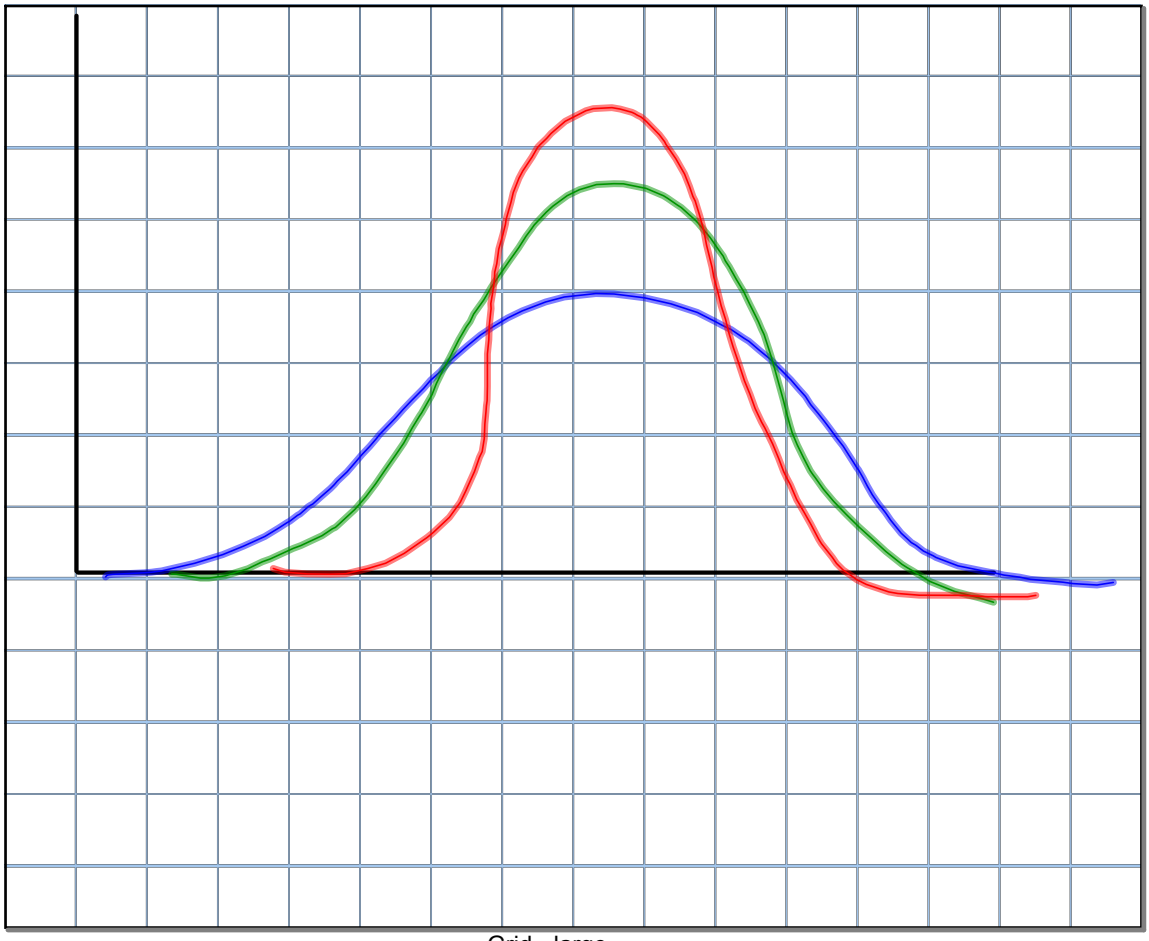

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