NAME ____

Unit 8 Study Guide: Classification & Evolution

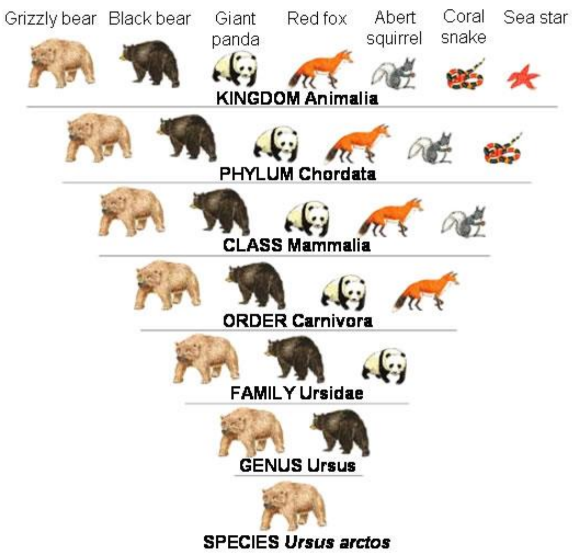
<u>Classification</u>

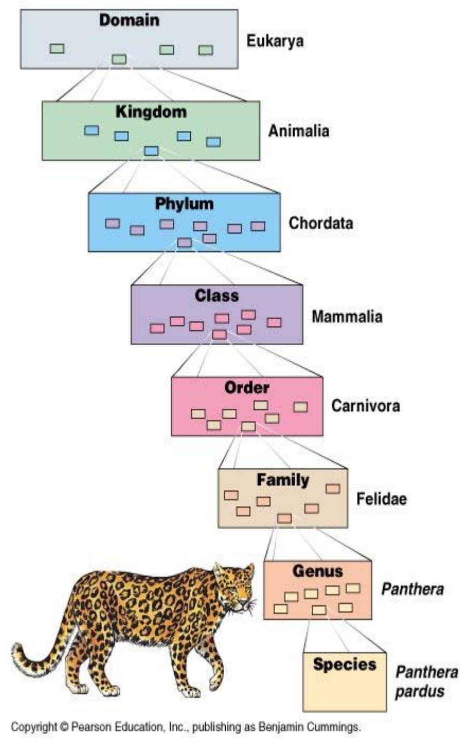
Domain → Kingdom → Phylum → Class → Order → Family → *Genus* → *species*

Eukarya → Animalia → Chordata → Mammalia → Primate → Hominidae → *Homo* → *sapiens*

***Mnemonic: D**UMB →**K**ING →**P**HILIP →**C**AME →**O**VER →**F**OR →**G**OOD →**S**OUP*

___________→___________→__________→__________→__________→__________→___________→___________





Domain is the broadest: Archaea, Bacteria, & Eukarya

Archaea – Archaebacteria: prokaryotes (cells w/o nucleus), live in extreme or harsh environments

Bacteria – Kingdom Eubacteria: prokaryotes (cells w/o nucleus), may be beneficial or pathogens

Eukarya – Eukaryotes: cells have nuclei and membrane-bound organelles

Kingdoms in Eukarya: Protista, Fungi, Plantae, & Animalia

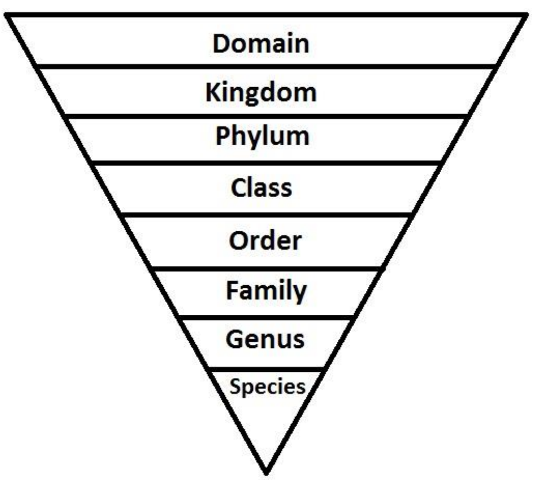
Each Eukarya kingdom has distinguishing characteristics:

Protista – unicellular aquatic eukaryotes; may be autotrophic or heterotrophic

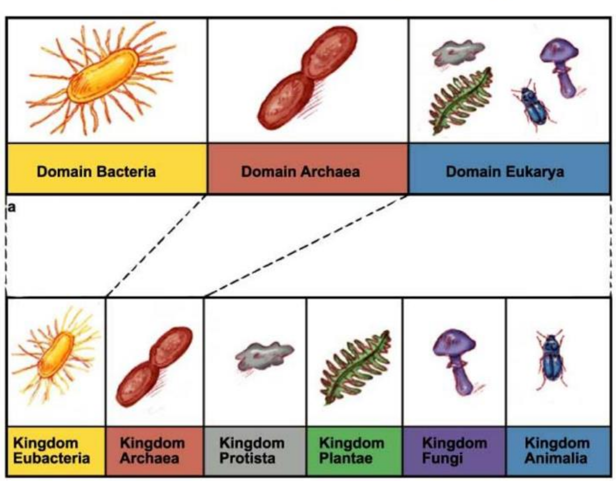
Fungi – multicellular decomposers (except for yeast); heterotrophs that absorb their food; cell walls made of chitin

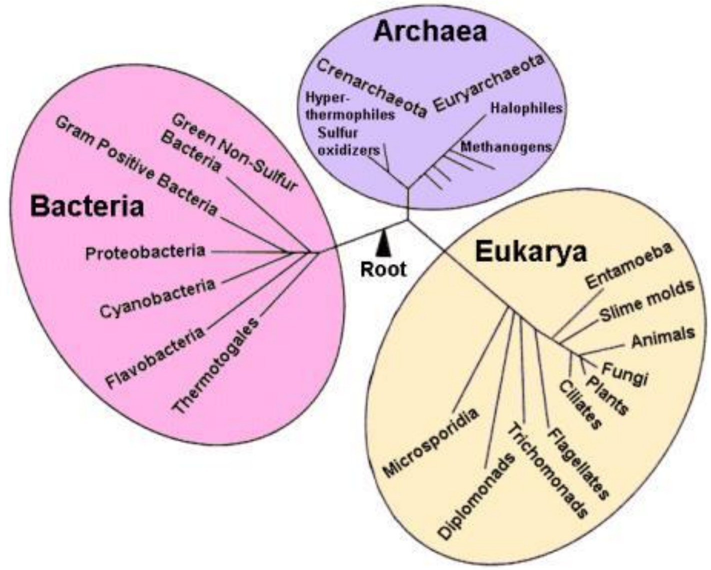
Plantae – multicellular autotrophs; perform photosynthesis; plant cells have cell walls made of cellulose

Animalia – multicellular heterotrophs that ingest their food; cells do not have cell walls



Classification of Living Things





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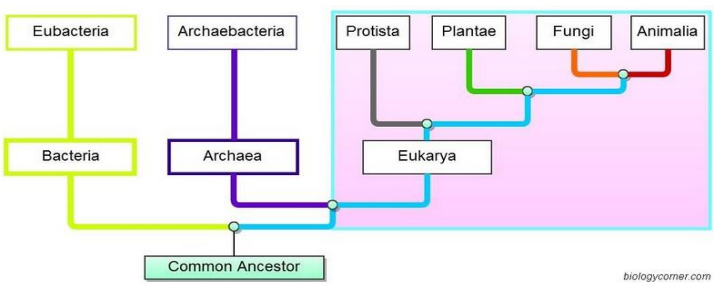
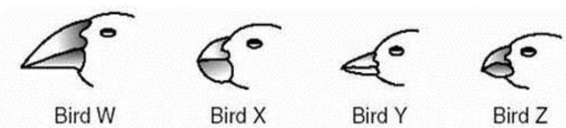
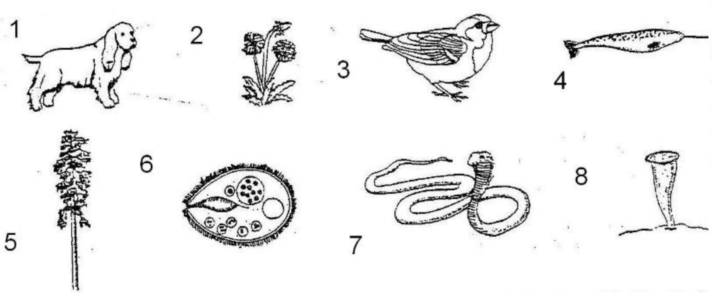
Classification of Living Things							
Domain	Bacteria	Archaea	Eurkarya				
Kingdom	Eubacteria	Archaebacteria	Protista	Fungi	Plantae	Animalia
Cell Type	Prokaryote	Prokaryote	Eukaryote	Eukaryote	Eukaryote	Eukaryote
Cell Structures	Cell walls with peptidoglycan	Cell walls without peptidoglycan	Cell walls of cellulose in some; some have chloroplasts	Cell walls of chitin	Cell walls of cellulose; chloroplasts	No cell walls or chloroplasts
Number Of Cells	Unicellular	Unicellular	Most unicellular; some colonial; some multicellular	Most multicellular; some unicellular	Multicellular	Multicellular
Mode Of Nutrition	Autotroph or heterotroph	Autotroph or heterotroph	Autotroph or heterotroph	Heterotroph	Autotroph	Heterotroph
Examples	Streptococcus, Escherichia coli	Methanogens, halophiles	Amoeba, Paramecium, slime molds, giant kelp	Mushrooms, yeasts	Mosses, ferns, flowering plants	Sponges, worms, insects, fishes, mammals





Dichotomous Key to Representative Birds	
1. a. The beak is relatively long and slender	*Certhidea*
b. The beak is relatively stout and heavy	go to 2
2. a. The bottom surface of the lower beak is flat and straight	*Geospiza*
b. The bottom surface of the lower beak is curved	go to 3
3. a. The lower edge of the upper beak has a distinct bend	*Camarhynchus*
b. The lower edge of the upper beak is mostly flat	*Platyspiza*

<u>Using a Dichotomous Key</u> – a dichotomous key may be used to sort organisms into correct taxonomic groupings using yes or no statements. If the organism has the first characteristic listed, follow the directions. If they have the opposite characteristic, follow a different set of directions. Continue moving through the table until you have classified the organism.



1a. organism with two or four functional legs . . . go to **2**
1b. organism without two or four legs . . . . go to **3**
2a. organism without wings . . . . *Canis familiaris* . . . . .dog
2b. organism with wings . . . . *Passer domesticus*. . . . . . .house sparrow
3a. organism is unicellular. . . . . go to **4**
3b. organism is multicellular . . . . go to **5**
4a. organism swims freely in water . . . .*Balantidium* sp. . . . . .balantidium
4b. organism anchored to substrate . . . . *Stentor* sp. . . . . .stentor
5a. organism is heterotrophic. . . . . go to **6**
5b. organism is autotrophic . . . . go to **7**
6a. organism lives in oceans . . . . *Monodon monoceros*. . . . .narwhal
6b. organism lives on land. . . . . *Ophiophagus hannah* . . . .king cobra
7a. organism is a tree . . . . *Pinus ponderosa* . . . . .ponderosa pine
7b. organism is an herb. *Taraxicum officinale* . . . . .dandelion

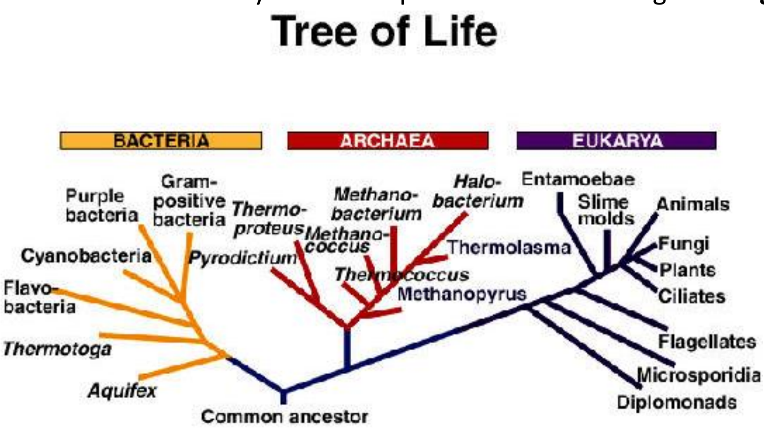
<u>Binomial Nomenclature</u> – 2 name naming system for all organisms (reduces confusion and language barriers among scientists). Always use the Genus & species name for the organism (never just the species name) and *italicize* or <u>underline</u> it. Humans are *Homo sapiens*. The genus name (*Homo*) should be capitalized; the species name (*sapiens*) should be lowercase. The genus name may be abbreviated with the first letter: *H. sapiens*. NEVER refer to humans as *sapiens*; the genus must be included.

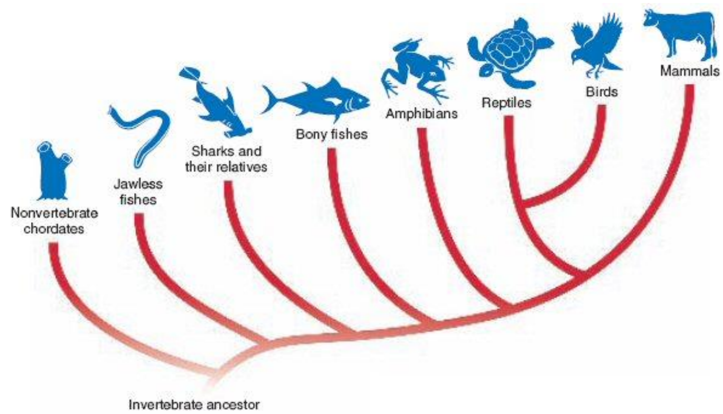
Species

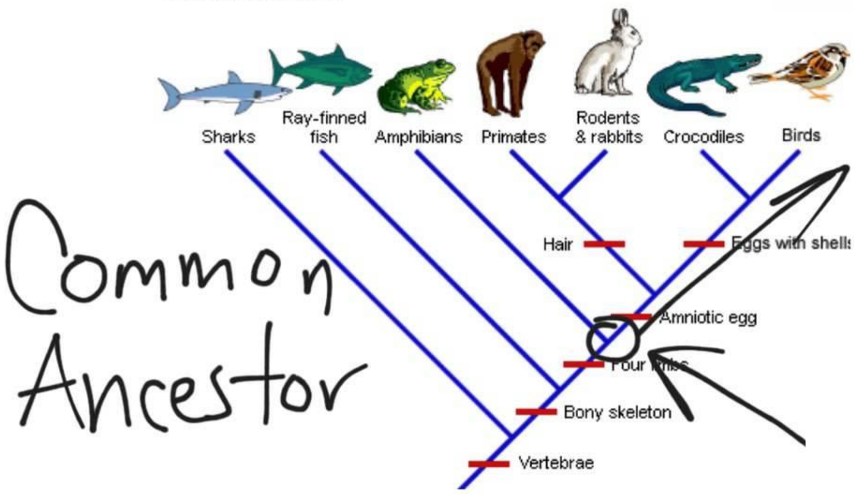
2 organisms are considered to be in the same species if they can breed with each other to produce fertile offspring. 2 organisms that are not the same species (ex: Horse & Donkey) may be able to produce offspring called a Hybrid, but hybrids are always sterile (cannot produce their own offspring).

Evolutionary Relationships

Evolutionary Theory states that all organisms can be traced back to a **common ancestor** (single-celled organism). These evolutionary relationships can be shown using a **cladogram** (aka phylogenetic tree).

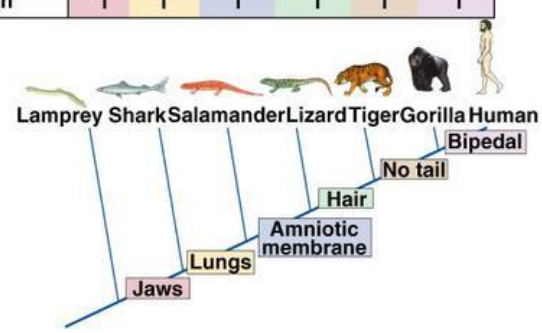






These diagrams are used to analyze features of organisms that are considered "innovations", or newer features that serve some kind of purpose. These characteristics appear in later organisms but not earlier ones and are called **derived characters**.

Traits: / Organism	Jaws	Lungs	Amniotic membrane	Hair	No tail	Bipedal
Lamprey	0	0	0	0	0	0
Shark	1	0	0	0	0	0
Salamander	1	1	0	0	0	0
Lizard	1	1	1	0	0	0
Tiger	1	1	1	1	0	0
Gorilla	1	1	1	1	1	0
Human	1	1	1	1	1	1



Natural Selection

Darwin identified Natural Selection as the mechanism of evolution. Natural Selection is where some alleles (forms of a trait) **provide an advantage** over other alleles. These advantages are called **adaptations**. Adaptations may be physical or behavioral but they MUST be able to be **inherited** AND allow the organism to be **more successful at producing offspring** (passing genes on to the next generation). **Survival of the Fittest** is where organisms that have these advantages are better adapted to their environment and are able to leave more offspring. Over generations of time, this will cause a **shift in the frequency of alleles** so that the advantageous adaptations are more prevalent in the population's gene pool.

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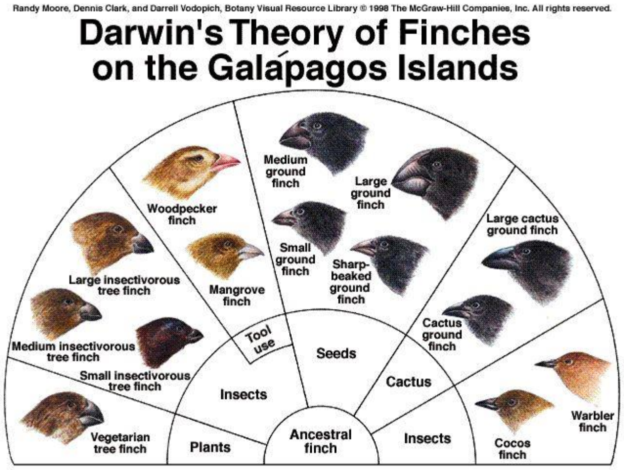
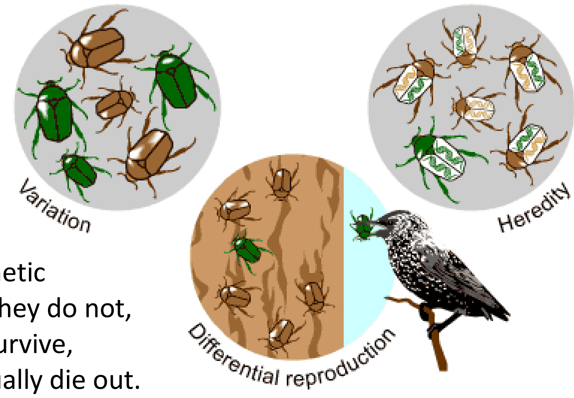
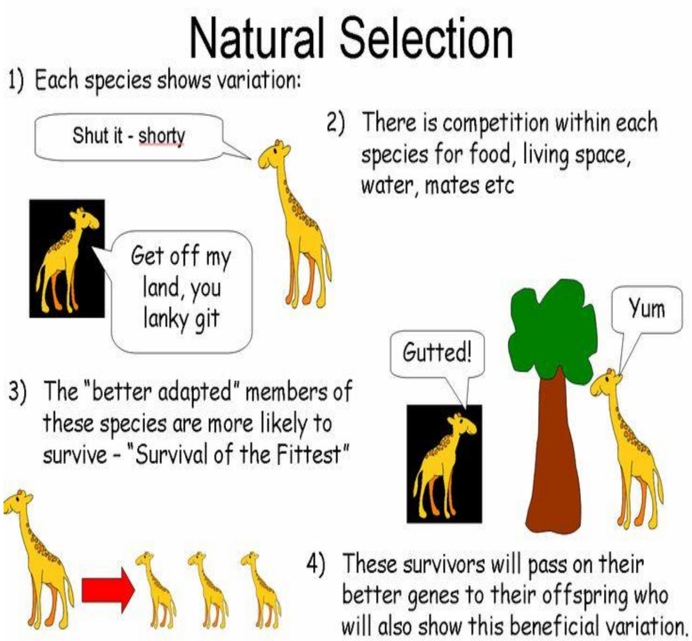
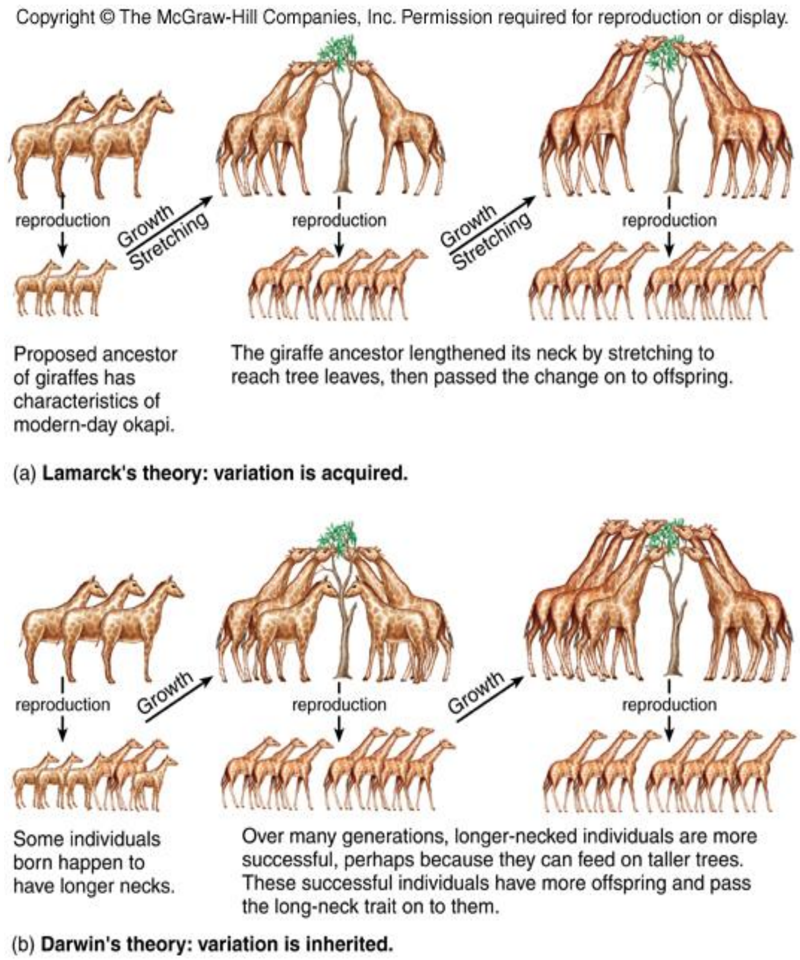


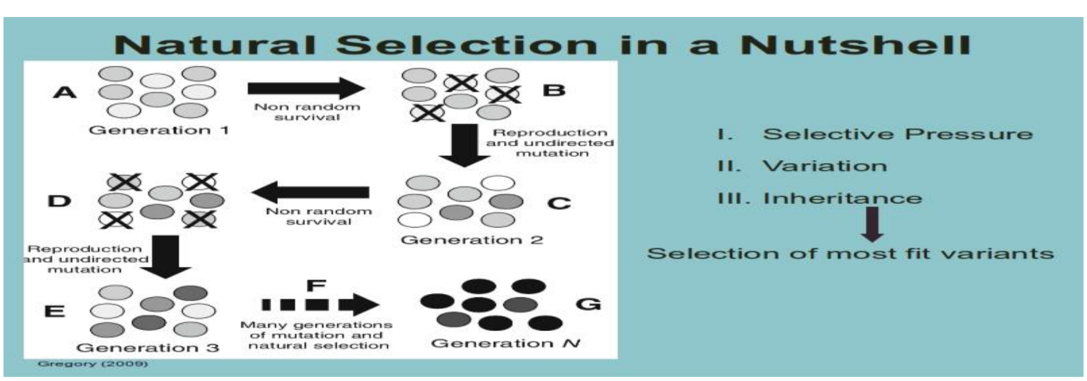
Organisms cannot “choose” to adapt or “acquire” adaptations within their lifetimes; they either have the advantageous phenotype in their genetic code or they don’t. If they do not, they may struggle to survive, reproduce, and eventually die out. (ex: Giraffes did not grow longer necks to reach more food. The giraffes that were born with slightly longer necks were better able to get food, survive, and produce offspring than those with shorter necks; over generations of time there was a directional shift towards longer necks)



Lamarck	Darwin
Use and disuse	Variation
Transmission of acquired characteristics	Inheritance
Increasing complexity	Differential survival
No extinction	Extinction

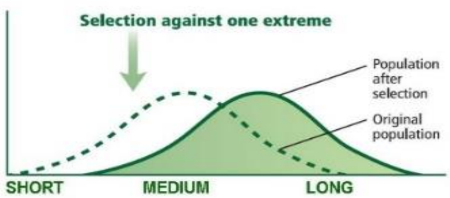




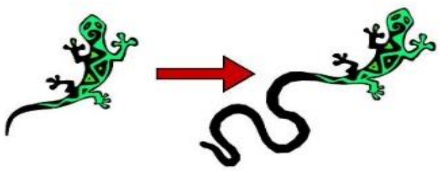


HOW does the trait change?

Directional Selection

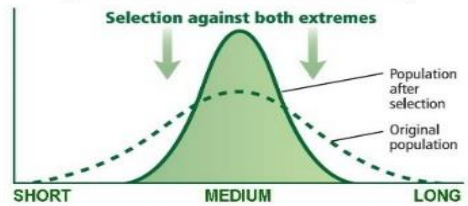


FOR: one extreme trait
AGAINST: the other extreme



EX. Long wiggly tails look like a snake and scare predators. The longer the tail, the more it looks like a snake.

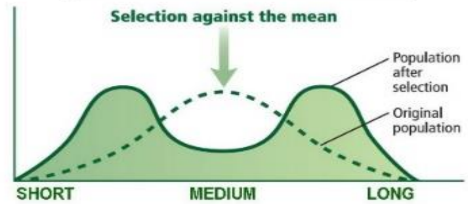
Stabilizing Selection



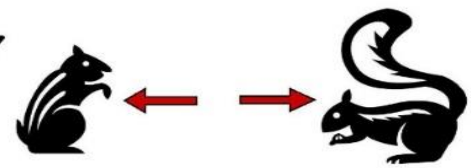
FOR: moderate traits
AGAINST: both extremes

EX. Short tails mess up the cat's balance. Long tails drag on the ground. Medium tails are best.

Disruptive Selection



FOR: both extremes
AGAINST: moderate traits



EX. Short tails help keep predators from catching you on the ground. Long tails are good for balance in the trees. Medium tails don't help.

There are several types of Natural Selection:

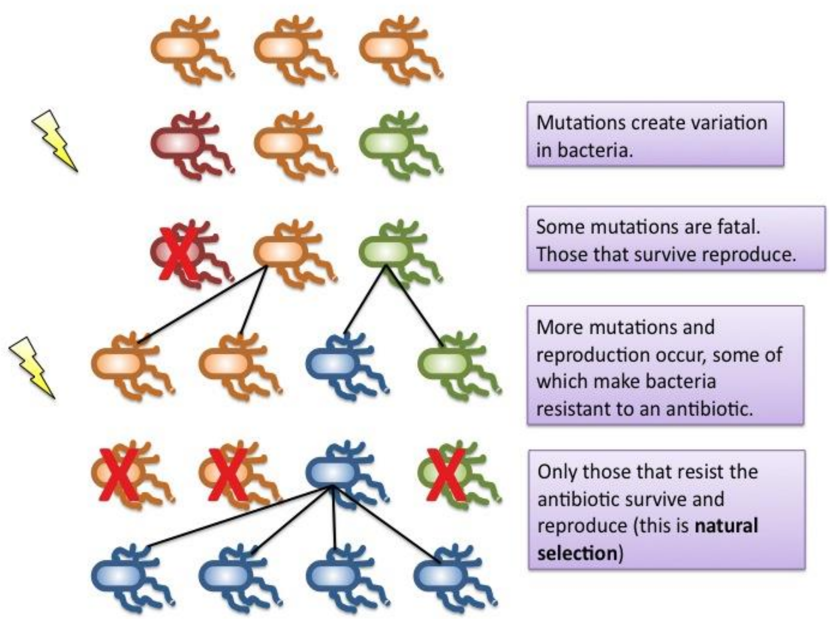
1) **Directional Selection** is where the gene pool shifts in one direction towards the more advantageous phenotype (ex: a particular camouflage pattern provides better protection from predators) while the other phenotypes die out;

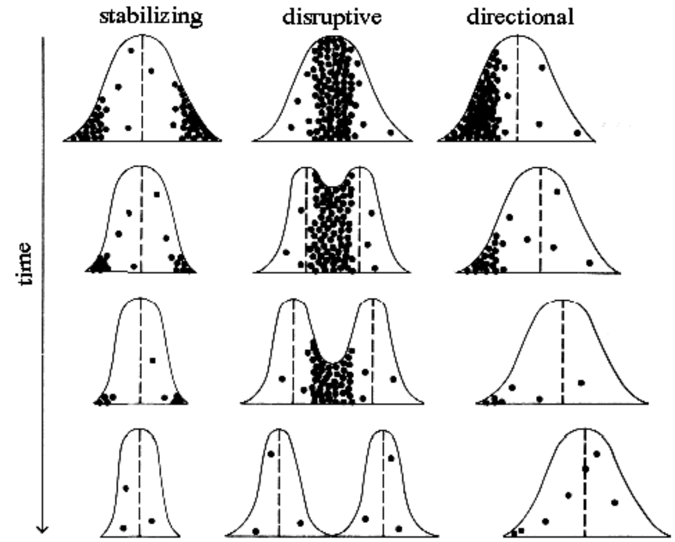
2) **Stabilizing Selection** is where the gene pool is narrowed towards the most intermediate phenotypes and the extreme phenotypes die out;

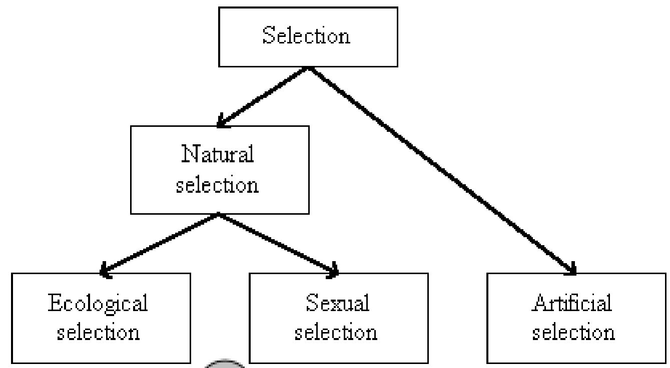
3) **Disruptive Selection** is where the intermediate phenotypes in the gene pool die out and the extreme phenotypes are better suited for survival, there is a shift towards BOTH extremes;

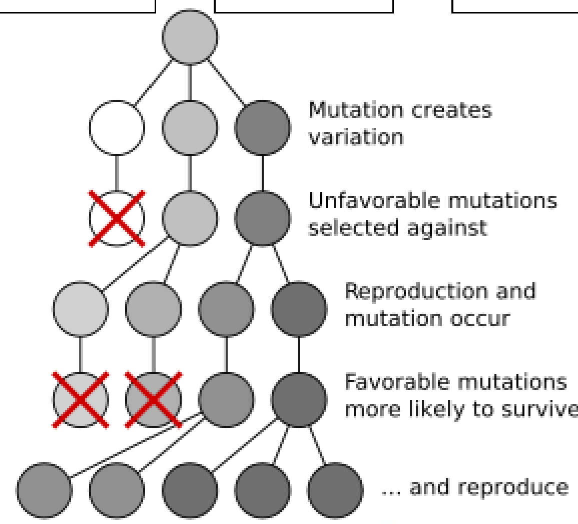
4) **Sexual Selection** is based upon traits that identify mates as having "good genes" (ex: male peacocks that can grow big tails with lots of eyespots are seen as better fit by female peacocks for producing strong offspring even though the tail is cumbersome and provides no other ecological advantage for survival)

5) **Artificial Selection** (selective breeding) is where man chooses which phenotypes are desirable and breeds organisms to make those phenotypes more pronounced

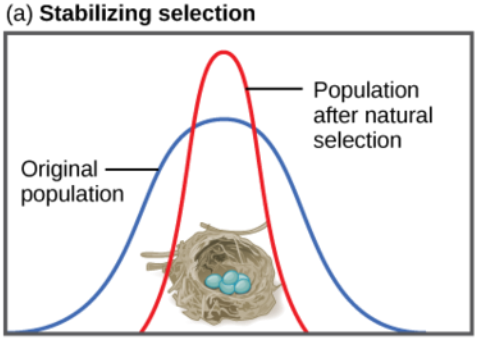






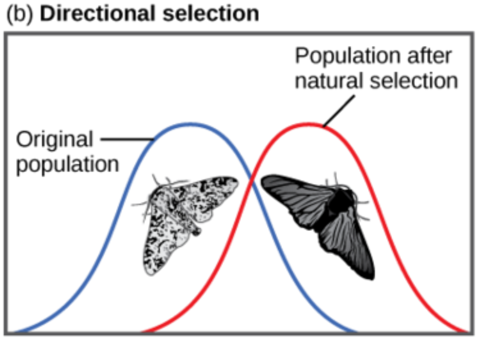


(a) **Stabilizing selection**



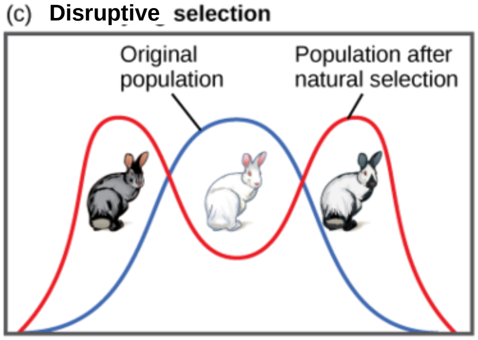
Robins typically lay four eggs, an example of stabilizing selection. Larger clutches may result in malnourished chicks, while smaller clutches may result in no viable offspring.

(b) **Directional selection**



Light-colored peppered moths are better camouflaged against a pristine environment; likewise, dark-colored peppered moths are better camouflaged against a sooty environment. Thus, as the Industrial Revolution progressed in nineteenth-century England, the color of the moth population shifted from light to dark, an example of directional selection.

(c) **Disruptive selection**



In a hyphothetical population, gray and Himalayan (gray and white) rabbits are better able to blend with a rocky environment than white rabbits, resulting in diversifying selection.