

The slide features a light green background with a subtle geometric pattern of overlapping lines. A large white rectangular area occupies the left and center. On the right side, there is a vertical panel with a dark grey top section and a light grey bottom section. The title 'Variation and Selection' is centered in the light grey section in a green, sans-serif font. A thin green horizontal line is at the bottom of the light grey section.

# Variation and Selection

# Part 1: Variation

- ◉ When differences occur among members of the same species.
- ◉ No 2 individuals are exactly alike.
- ◉ These variations are passed onto the next generation.

# Three types of natural selection act on variation:

- 1) Stabilizing Natural Selection
- 2) Directional Natural Selection
- 3) Disruptive Natural Selection

# Stabilizing Natural Selection

- Favours individuals with an average value for a trait and selection against those with extreme values.

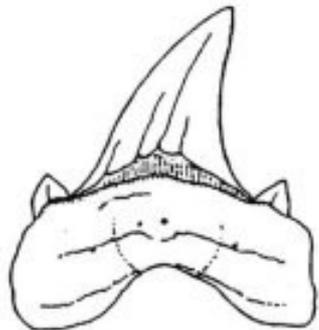
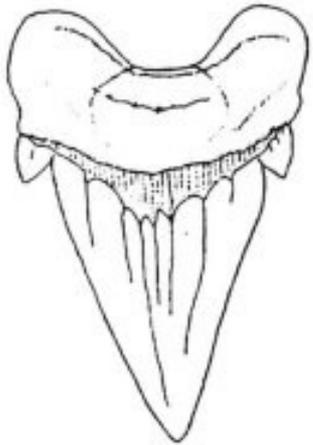
# Examples of Stabilizing Natural Selection

## EXAMPLES

- Human birth weight -Until recent medical advance, infants that were too small tended not to survive and infants that were too large died during birth.
- Sharks and ferns have remained similar for millions of years.

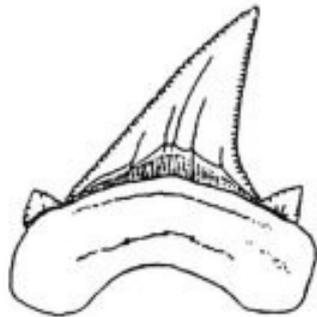
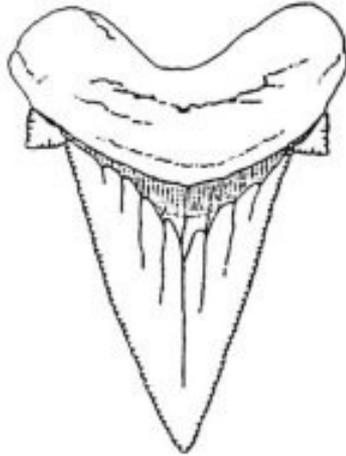
Palaeocene  
~60 Mio.years

*Otodus  
obliquus*



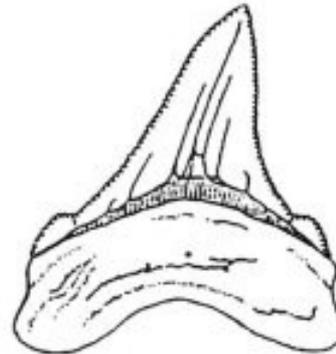
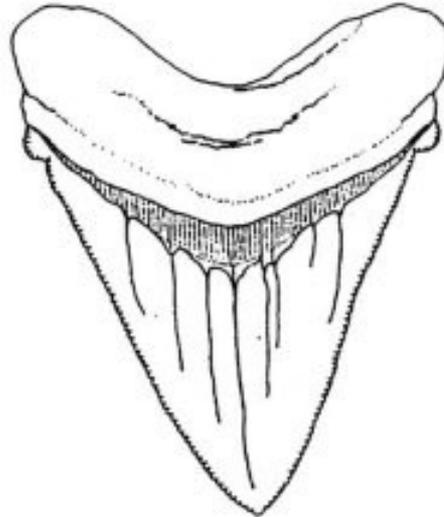
Oligocene  
~ 33 Mio.years

*Carcharocles  
angustidens*



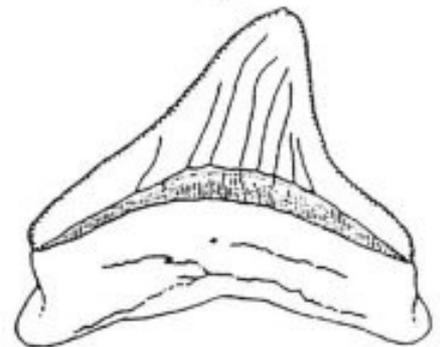
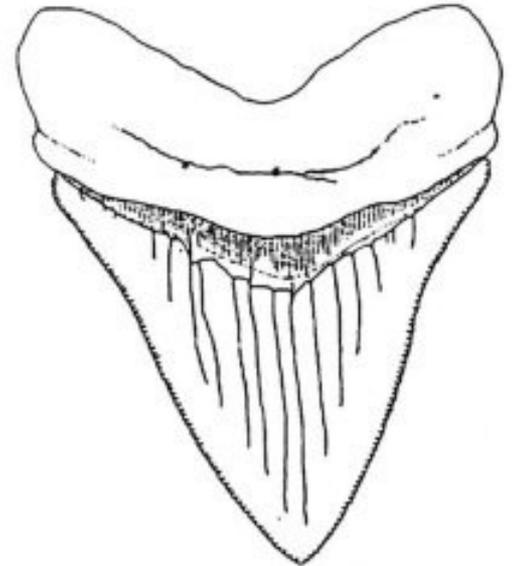
low. Miocene  
~ 22 Mio.years

*Carcharocles  
chubutensis*



middl. Miocene  
~18 Mio.years

*Carcharocles  
megalodon*

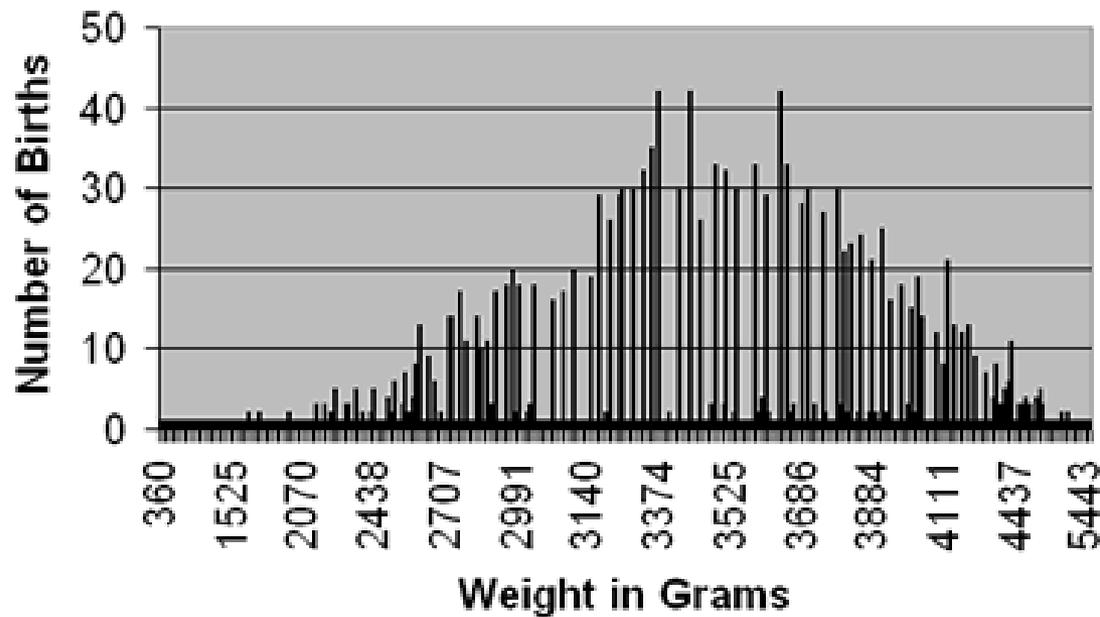




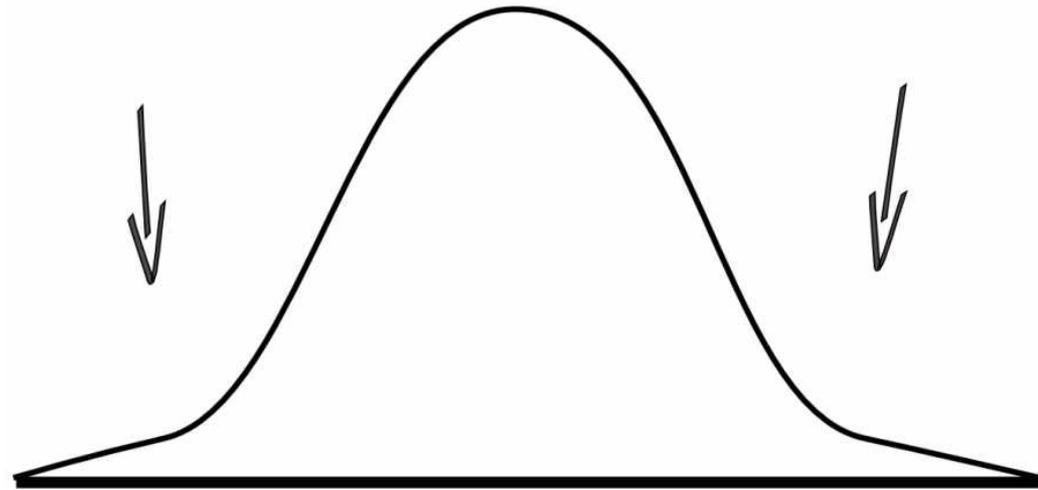
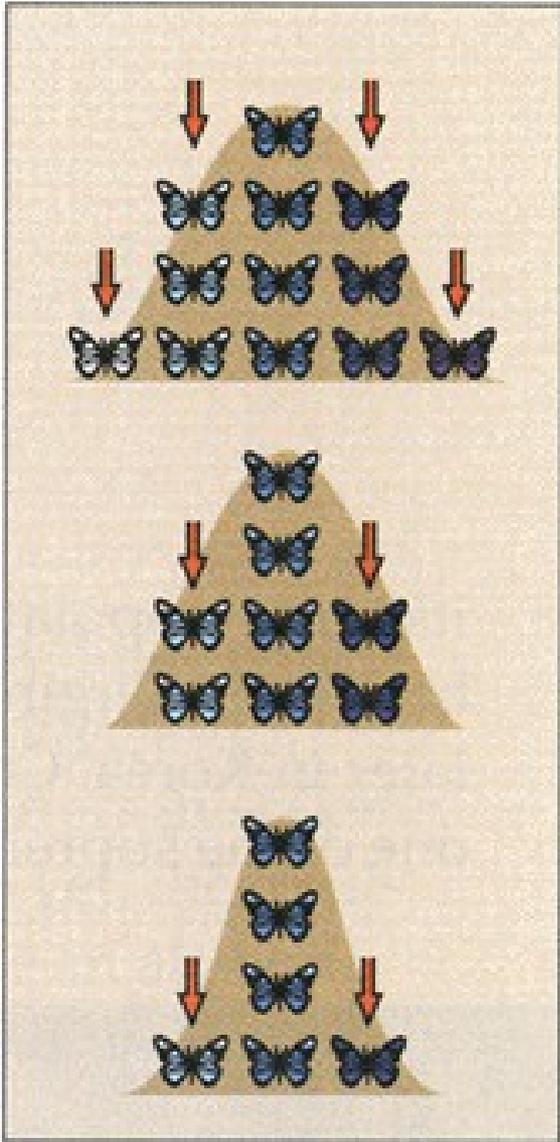
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"The doctors and nurses all said he was the heaviest newborn they'd ever seen."

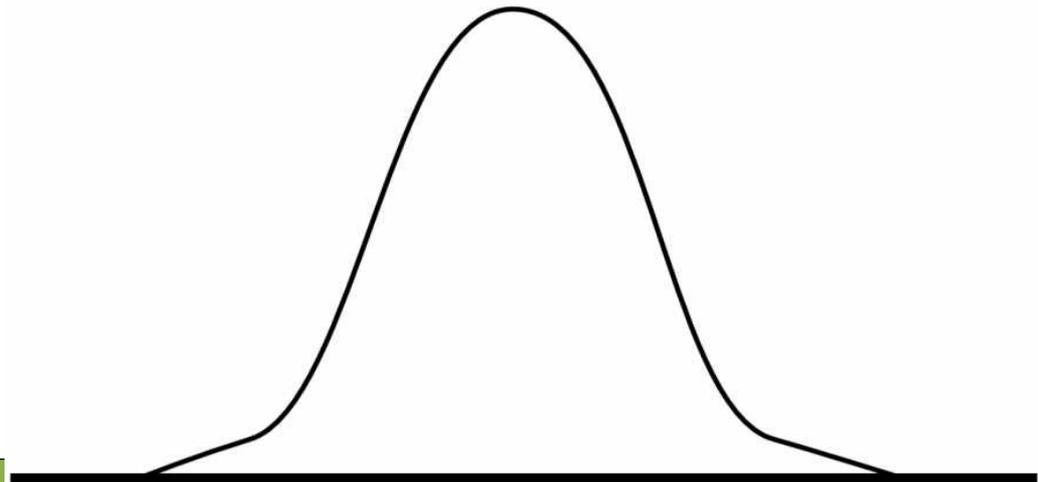
## Distribution of Birth Weights in Merrimack County, 2001



# Stabilizing Selection



Before Selection



After Selection

# Directional Natural Selection

- Favors individuals possessing values for a trait at one extreme of the distribution, and selects against the average and the other extreme.

# Examples of Directional Natural Selection

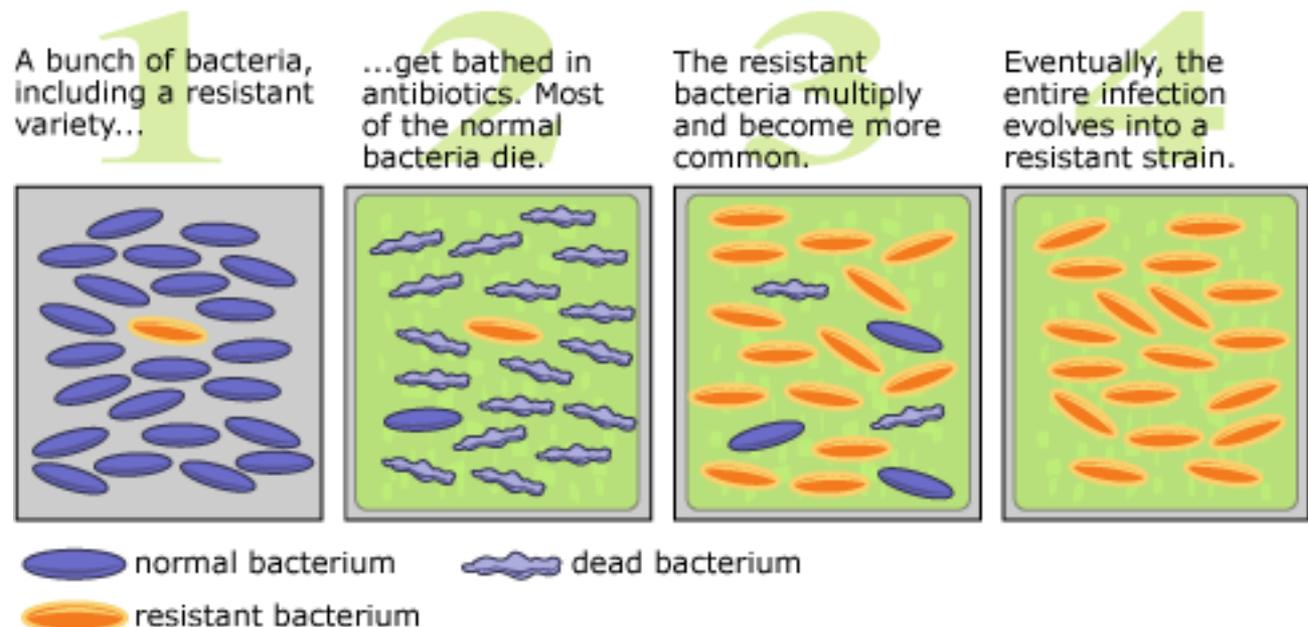
A useful example can be found in the breeding of the greyhound dog. Early breeders were interested in dog with the greatest speed. They carefully selected from a group of hounds those who ran the fastest. From their offspring, the greyhound breeders again selected those dogs who ran the fastest. By continuing this selection for those dogs who ran faster than most of the hound dog population, they gradually produced a dog who could run up to 64km/h (40mph).

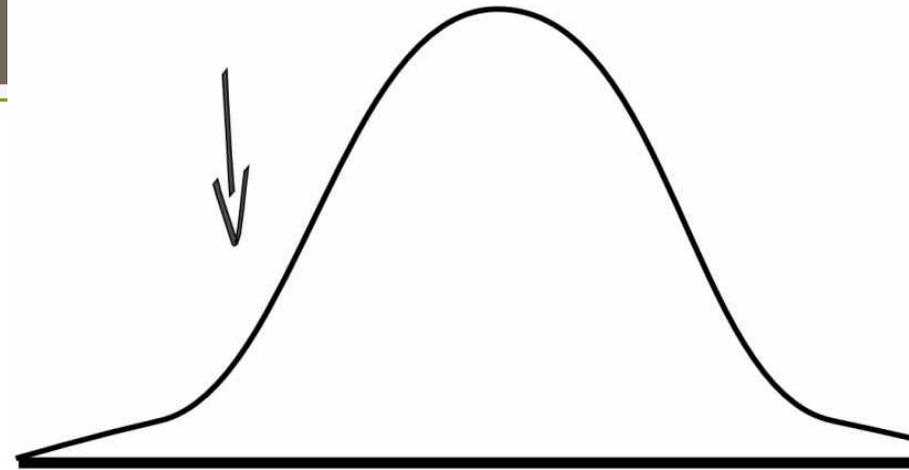
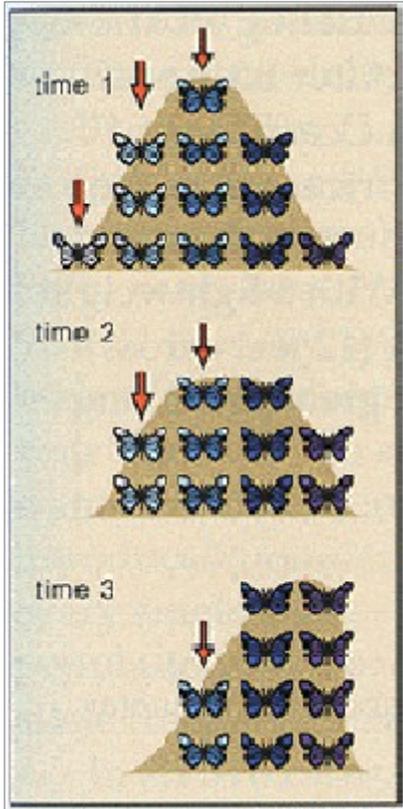
# Greyhounds

# Example of Directional Natural Selection

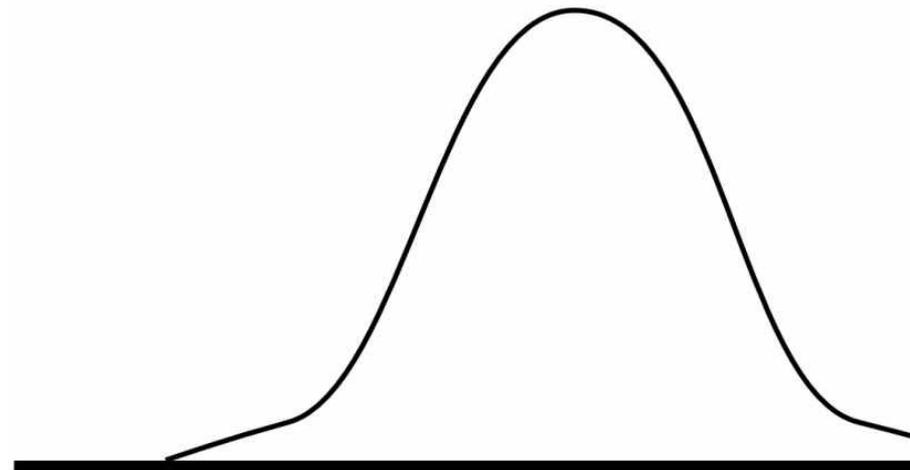
## EXAMPLE

- Antibiotic resistant bacteria –only the bacteria that can tolerate the antibiotic will survive.





Before Selection



After Selection

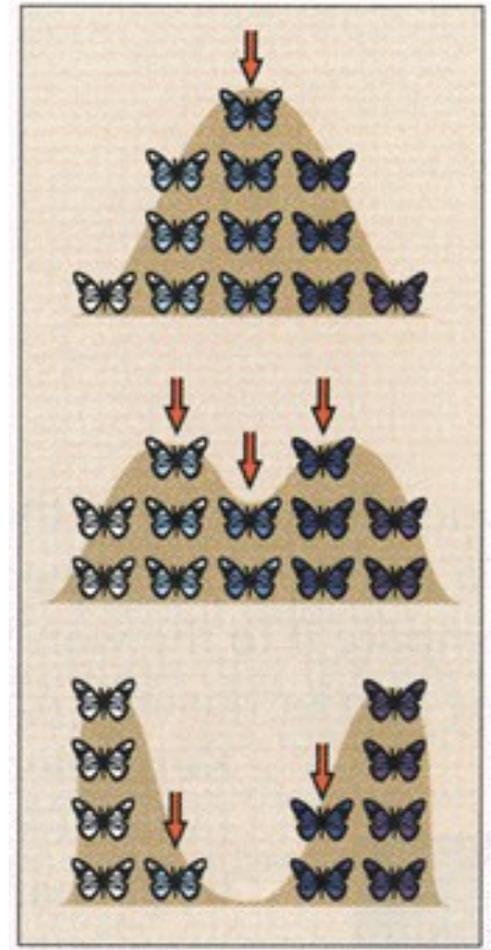
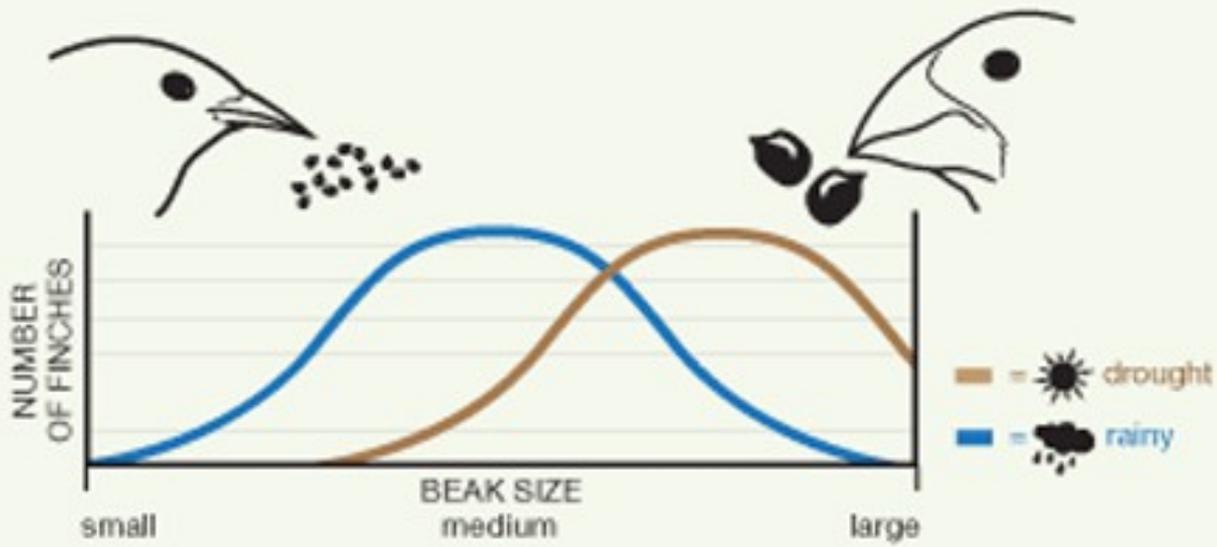
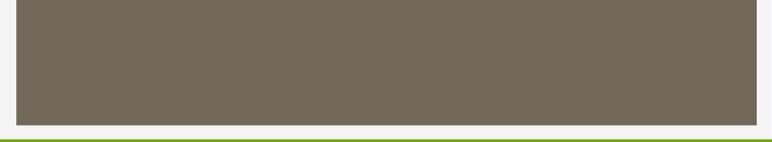
# Disruptive Natural Selection

- Favors individuals at both ends of the distribution and selects against the average.
- Also can be known as diversifying selection.

# Example of Disruptive Natural Selection

## EXAMPLE

- Darwin's Finches!
- Large beaks are good for large seeds, small beaks are good for small seed, but medium beaks are not effective for small or big seeds.

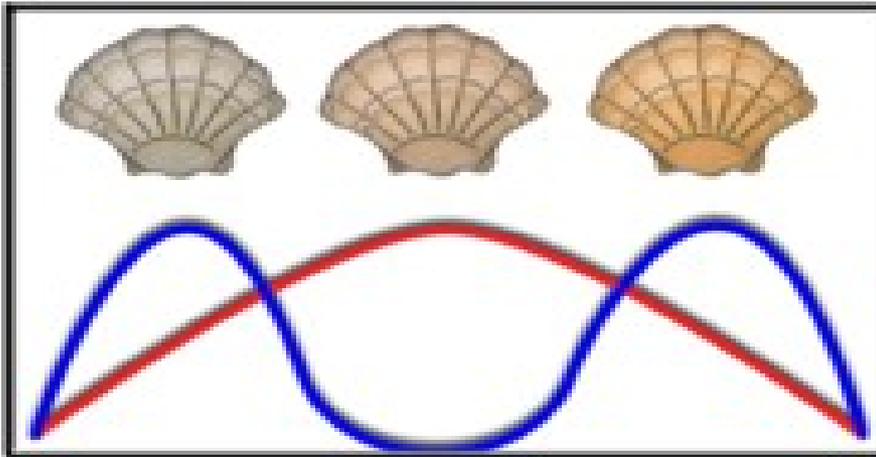


# Example of Disruptive Natural Selection

## EXAMPLE

- Limpets. Marine organisms known as limpets have shell colours that range from white to dark brown. The dark coloured limpets attach to dark coloured rocks in the ocean and the light coloured limpets attach to light coloured rocks. These individuals survive because they are less visible to predators. The intermediate or tan coloured limpets are highly visible and are consumed by predators.

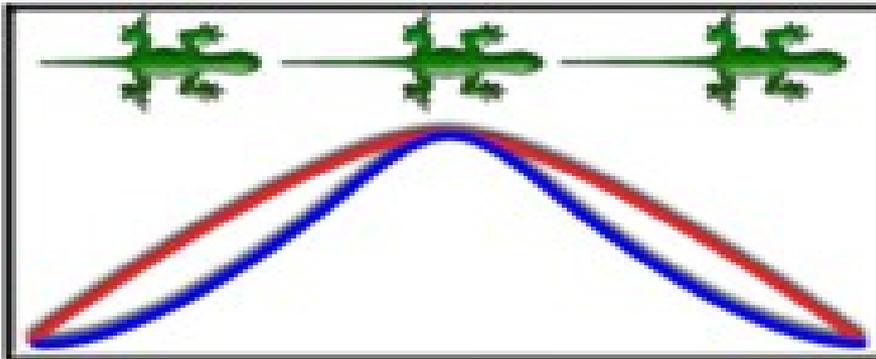
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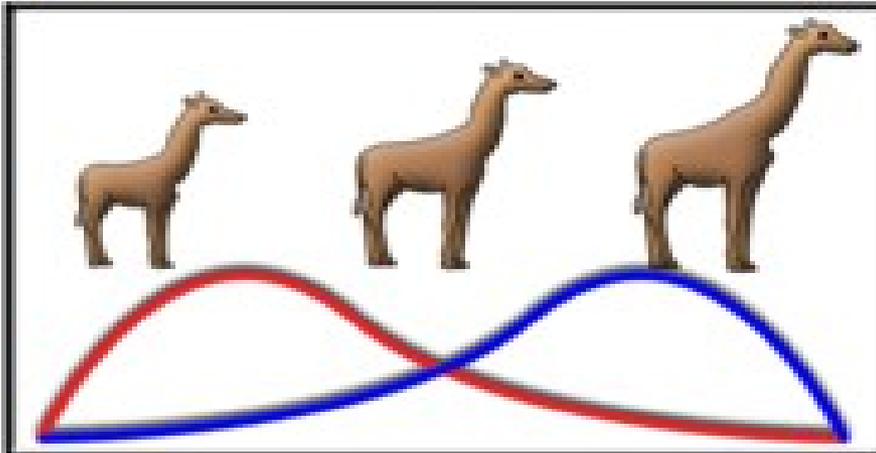
1. Disruptive Selection
2. Stabilizing Selection
3. Directional Selection

— Before  
— After

2



3



# Part 2: Natural Selection vs. Artificial Selection

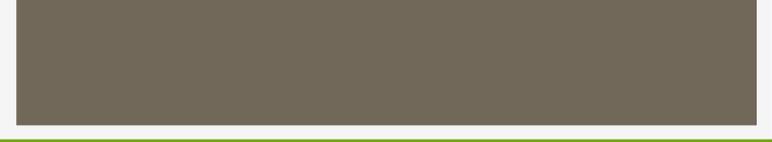
- Natural Selection:
- Is the process by which populations become adapted to their environment.
- Those individuals who are best suited to their environment survive and reproduce

**Natural selection, in a nutshell:**



# Artificial Selection

- The process in which humans direct the differential reproductive success of individuals in a breeding population.
- Breeding of plants or animals that best represent the traits they wish in future generations.
- Examples:
  - Dog Breeding
  - Fruit that ripens earlier (not a GMO)
  - More productive milk cows (not with hormones)



**Broccoli - suppression of flower development**



**Cabbage - suppression of internode length**



**Kale - enlargement of leaves**



**Cauliflower - sterility of flowers**



**Wild mustard**



**Kohlrabi - enhancement of lateral meristems**

# CLASSIC DOG BREEDS

