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DEPARTMENT OF MEDICAL BIOLOGY

# **"ADAPTATION AND NATURAL SELECTION"**

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# *ADAPTATION AND NATURAL SELECTION*

**adaptation or natural selection. Natural selection is a mechanism, or cause, of evolution. Adaptations are physical or behavioral traits that make an organism better suited to its environment. Heritable variation comes from random mutations.**

Biology

ADAPTATION



Natural Selection in action

# Type of natural selection

Biology

# ADAPTATION

Disruptive Selection

Stabilizing Selection

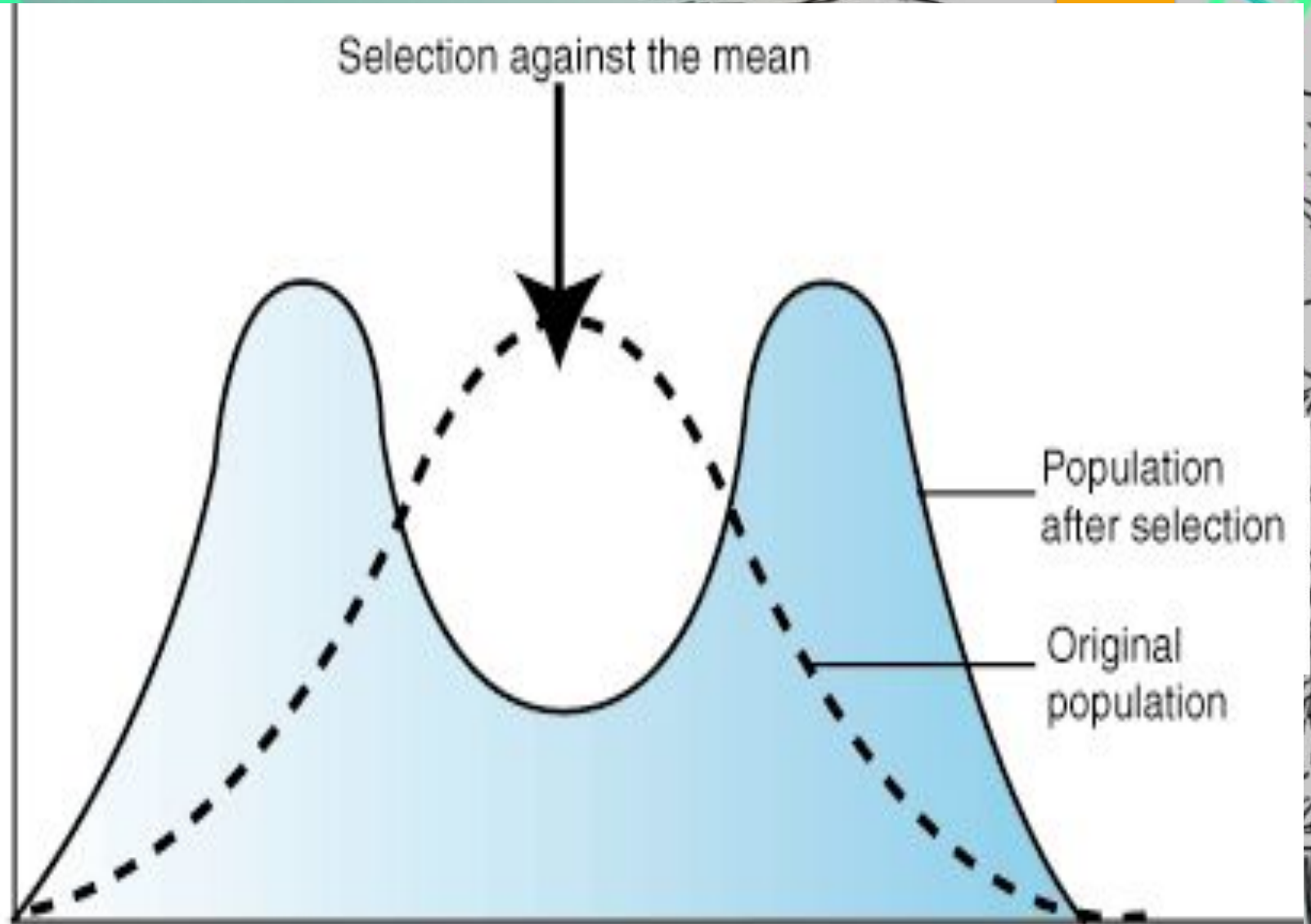
Directional Selection

— Before  
— After



# Disruptive selection

Disruptive selection is a type of natural selection that selects against the average individual in a population. The makeup of this type of population would show phenotypes (individuals with groups of traits) of both extremes but have very few individuals in the middle.



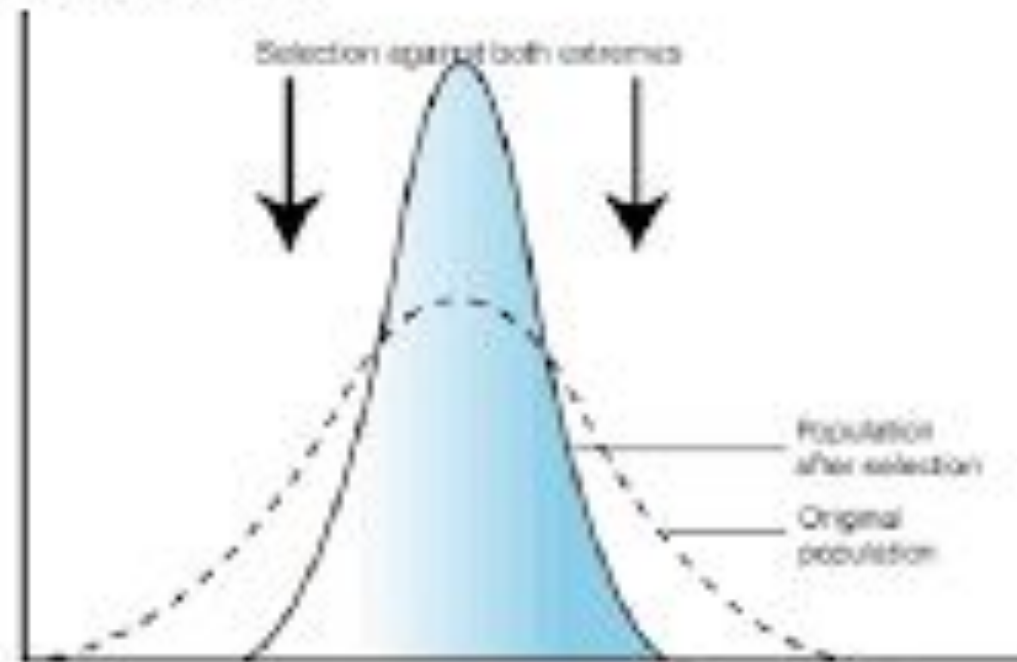
# Stabilizing selection

**Stabilizing selection** happens when extreme phenotypes on both ends of the spectrum are unfavorable. It's easier to understand stabilizing selection by looking at a visual representation

Biology  
AADA

## Stabilizing Selection

- Most Common
- Average survives

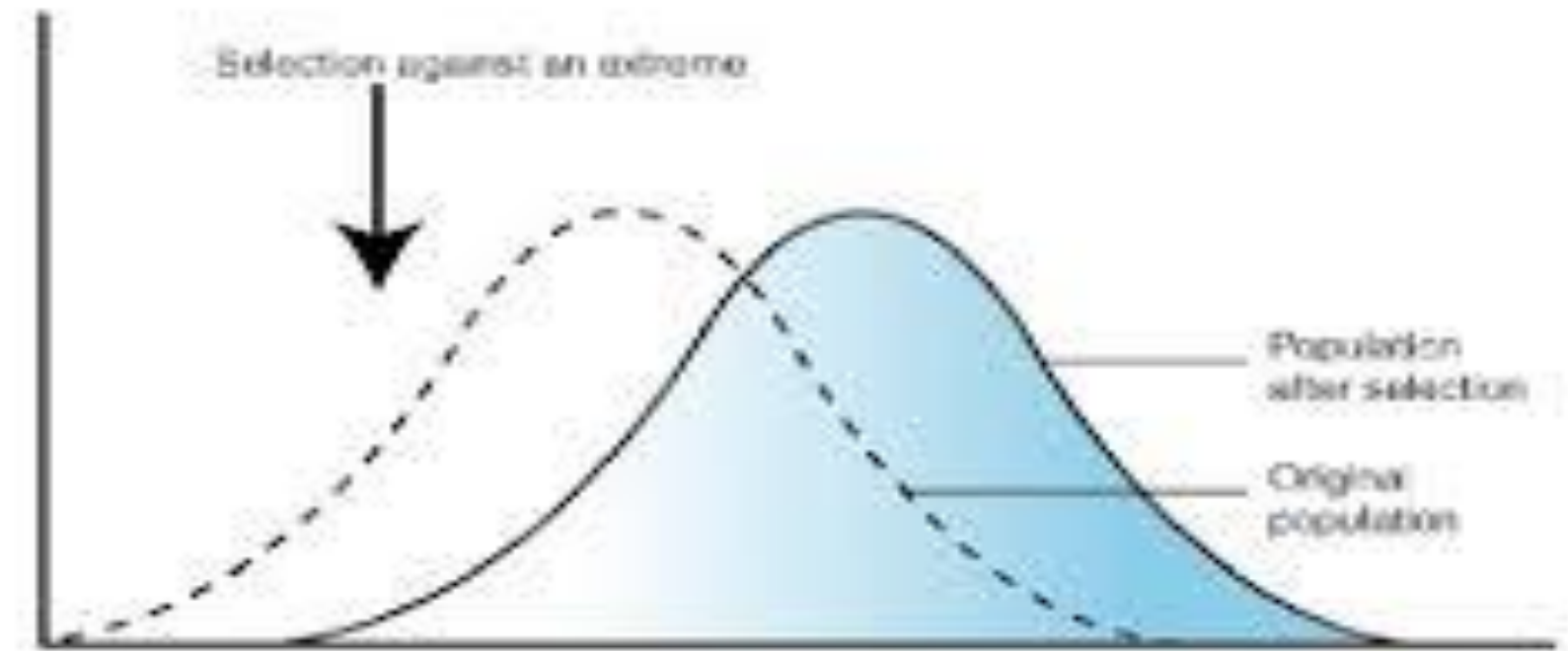


# Directional selection

**directional selection** occurs, phenotypes at one end of the spectrum are selected against, and phenotypes at the other end of the spectrum are selected for.

## Directional Selection

- One extreme trait is favoured



# Example of natural selection

Biology

1. Industrial melanism

2. Drug resistance

3. Sickle cell anemia  
And malaria

4. Malaria's G-6 Pd  
deficiency



# The main features of theory of natural selection

Biology  
1. Overproduction

2. Variation

3. Selection

4. Adaptation

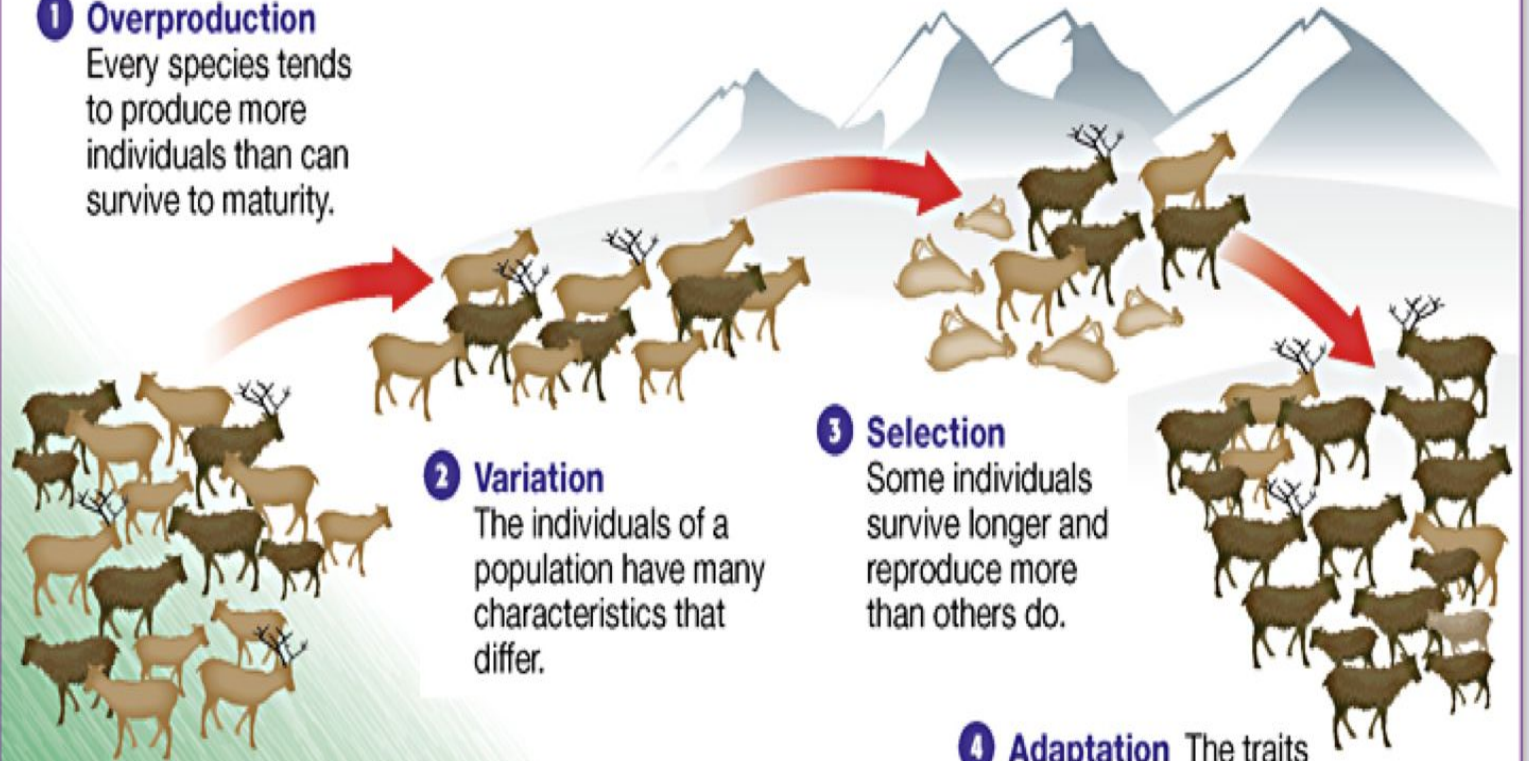
## The Theory of Evolution by Natural Selection

**1 Overproduction**  
Every species tends to produce more individuals than can survive to maturity.

**2 Variation**  
The individuals of a population have many characteristics that differ.

**3 Selection**  
Some individuals survive longer and reproduce more than others do.

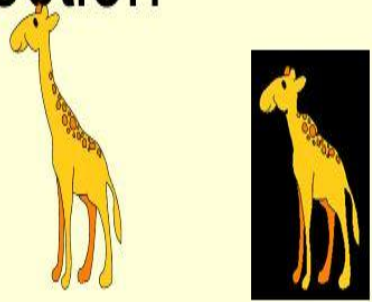
**4 Adaptation** The traits of those individuals that survive and reproduce will become more common in a population.





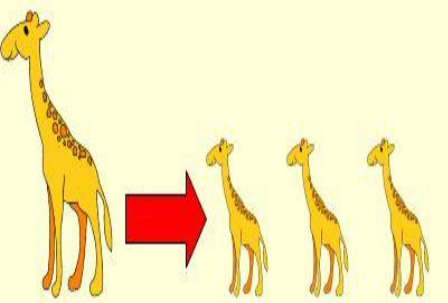
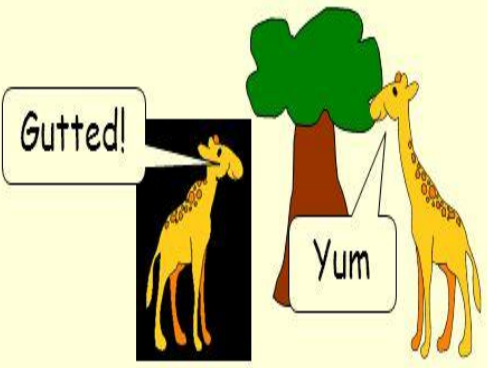
# Natural Selection

1) Each species shows variation:



2) There is competition within each species for food, living space, water, mates etc

3) The "better adapted" members of these species are more likely to survive - "Survival of the Fittest"



4) These survivors will pass on their better genes to their offspring who will also show this beneficial variation.

# "Natural selection Examples"

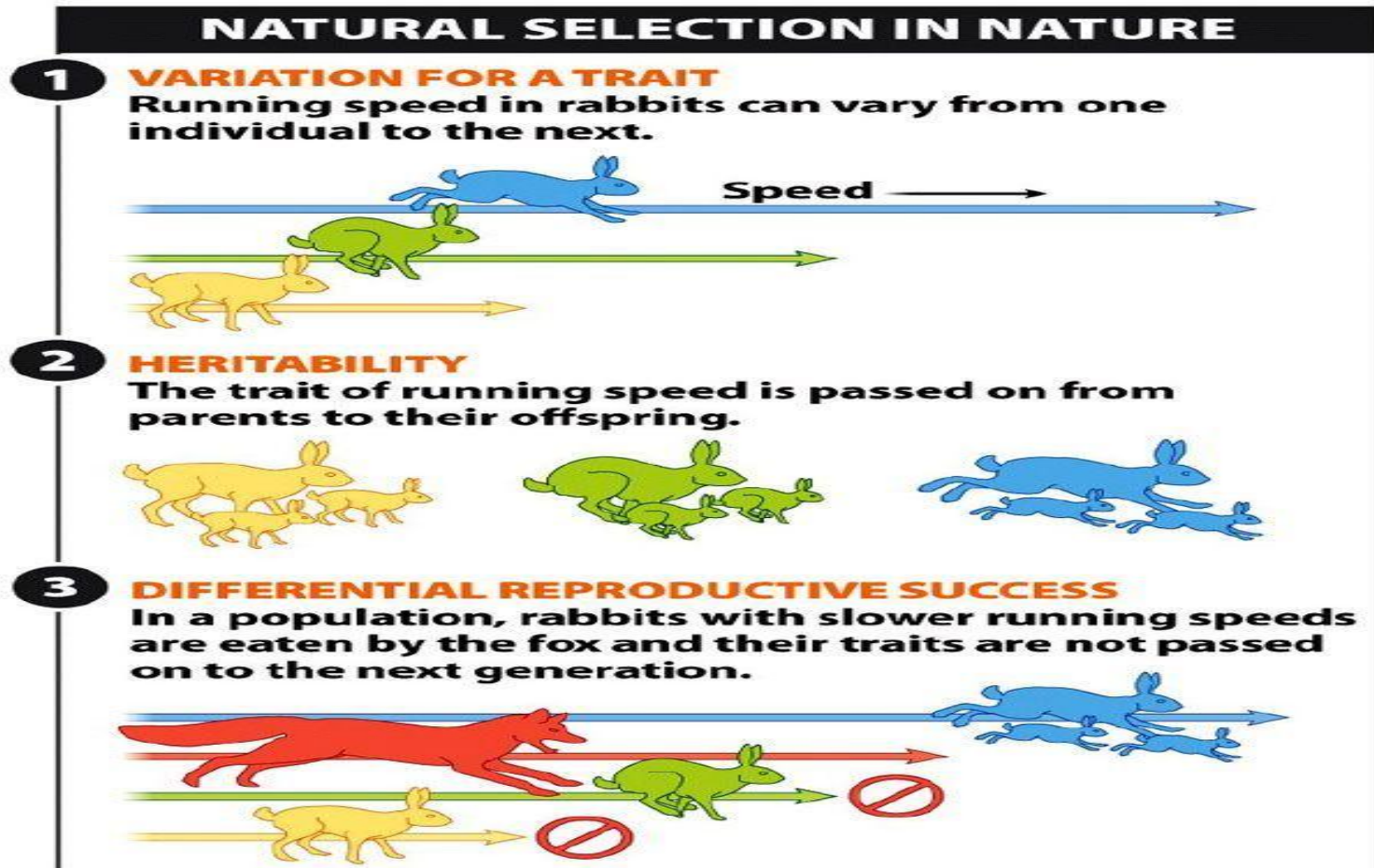


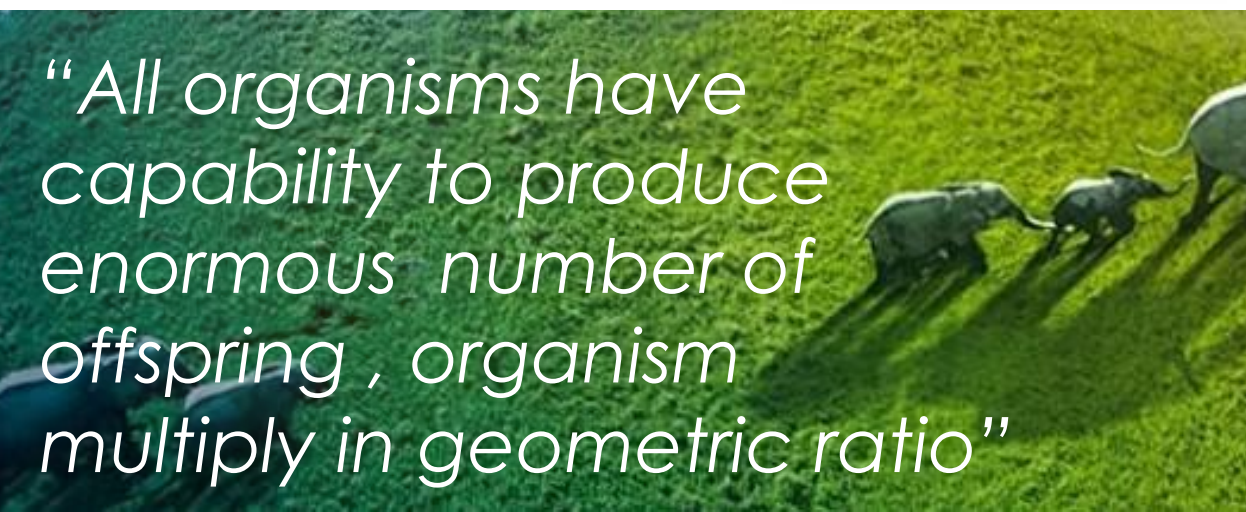
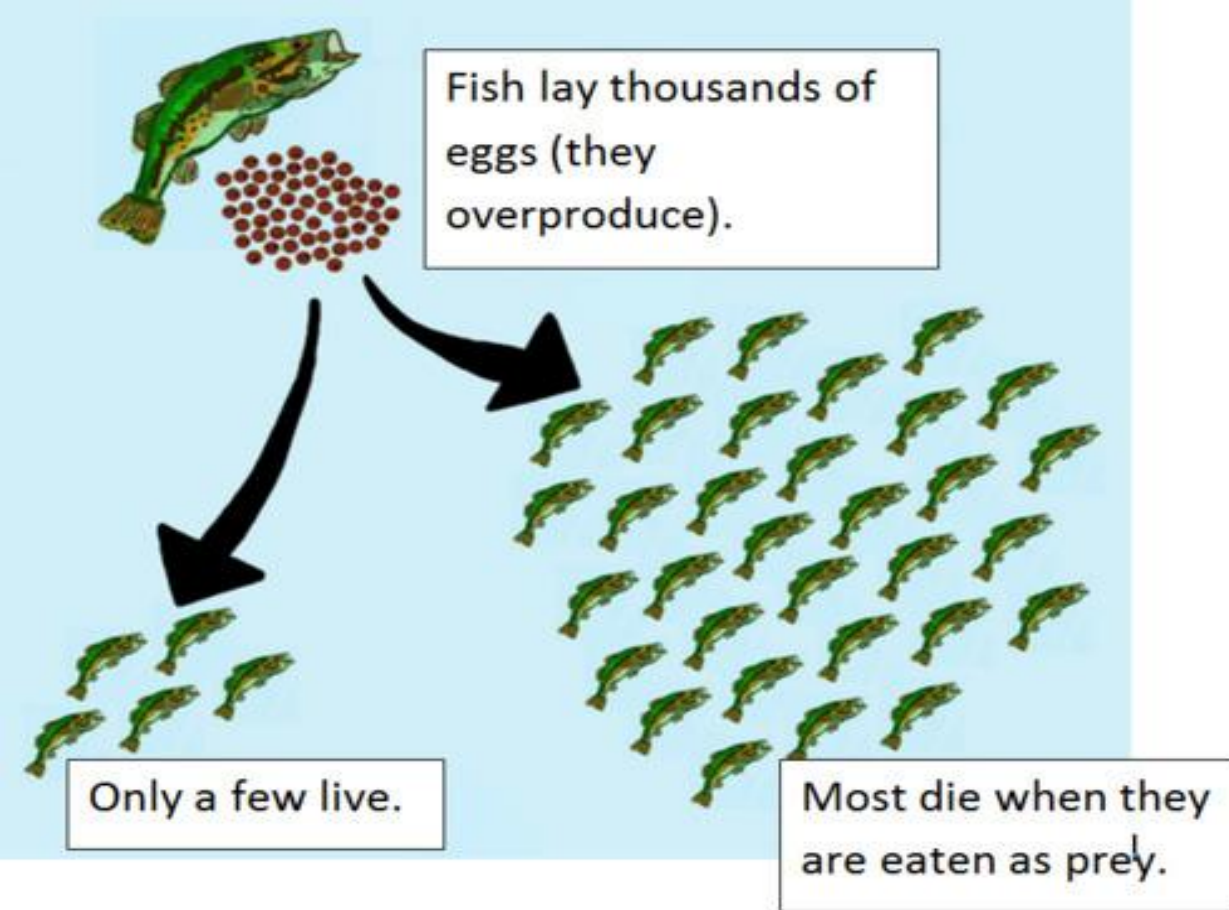
Figure 8-20  
What Is Life? A Guide to Biology  
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# Over production

Natural Selection:

## Overproduction

- More individuals are born than will become adults
- Not all of these baby rats will become adults



# Natural Selection: Struggle to Survive

- An environment might not be able to support all of the individuals born
- Also, many individuals are killed by other organisms
- Only some of the individuals in a population become **adults** and **reproduce**

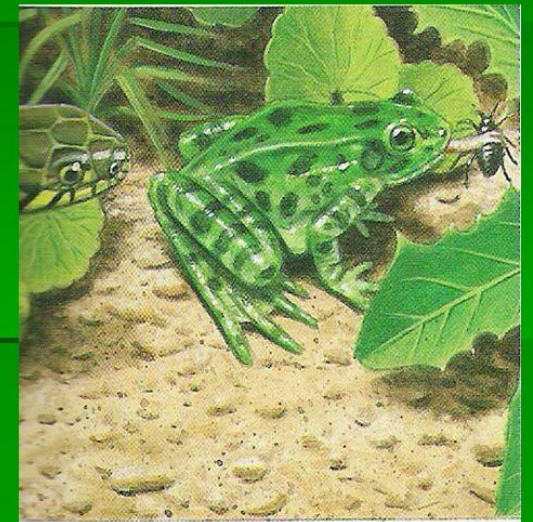


## Struggle to Survive

- If resources were unlimited and there was no threat from predation, there would be less natural selection.
- The struggle to survive results in one organism "besting" another in the competition for resources
  - That takes care of the "Survival of the Fittest" ... but remember, natural selection is not just about survival...

## Struggle to Survive

- Environment
  - Not able to support all of the individuals born
- Individuals
  - Killed by other organisms
  - Do not find mates
  - Only some will become adults and reproduce



# Survival Of the Fittest

## “Survival of the fittest”

- British philosopher Herbert Spencer first used the phrase - after reading Charles Darwin's *On the Origin of Species* (1859) - in his *Principles of Biology* (1864), in which he drew parallels between his own economic theories and Darwin's biological ones, writing “This survival of the fittest” is that which Mr. Darwin has called ‘natural selection.’
- Darwin first used Spencer's new phrase "survival of the fittest" as a synonym for "natural selection" in the fifth edition of *On the Origin of Species*, published in 1869.[1]

Reference:

1 - Citation lost via a soft browse of the web.

Bruce Ratner, Ph.D.  
www.GenIQModel.com

## Survival of the fittest



# PROCESS OF NATURAL SELECTION



Giraffes had necks of varying lengths which are shorter overall than those of modern giraffes.



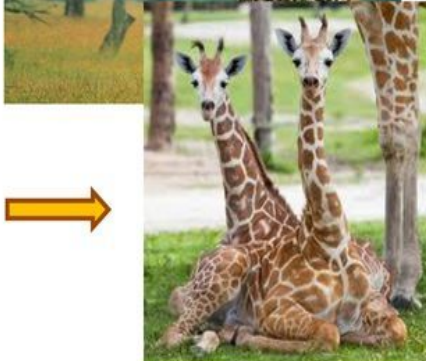
...est necks than



The giraffes with longer necks were more likely to survive to reproduce than those with shorter necks.



The offspring of giraffes with longer necks inherit the genes for a long neck from their parents.



Over thousands of generations the numbers of offspring with longer necks increases.

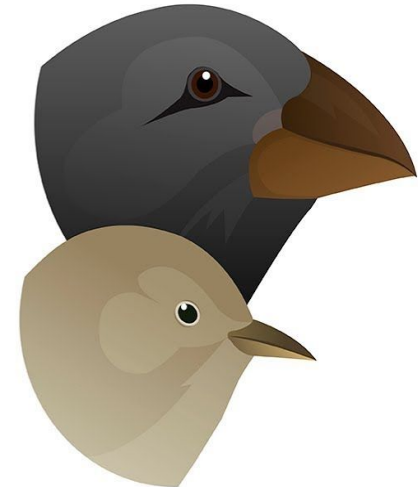


Giraffes still have necks of varying lengths but they are longer overall than those of their ancestors.

This process is called **Natural Selection**

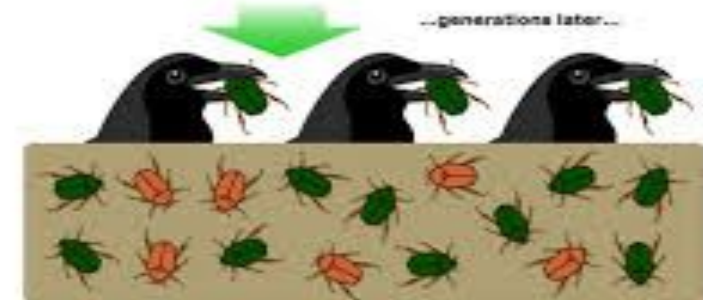
## Natural Selection and Adaptation

## Biology



### Variation and Natural Selection Notes

### Natural Selection Example (Cont.)



How Do Adaptations Come About?

# DIFFERENCE BETWEEN ADAPTATION AND NATURAL SELECTION

*“Natural selection is the mechanism that drives the evolution of adaptations. ... The difference between adaptation and natural selection is that adaptation is the characteristic while natural selection is the mechanism that increases the probability that an advantageous characteristic is passed on and becomes commonplace.”*

## **Adaptation**

A characteristic that allows an organism to survive in its environment.



A long neck to reach food sources in high places.

## **Natural Selection**



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