Darwin's Mechanism of Natural Selection

- Darwin's observations aboard the Beagle provided evidence for his theory of **evolution**.

- He proposed a mechanism for evolution called **natural selection**.

Darwin's Mechanism of Natural Selection

- Natural selection occurs in any situation in which the following 3 conditions occur:

1. More individuals are born than can survive
   - ✔ **Struggle for Existence**

2. There is natural heritable variation
   - ✔ **Variation and Adaptation**

3. There is variable fitness among individuals
   - ✔ **Survival of the Fittest**

The Struggle for Existence

- Darwin realized that if **more** individuals are produced than can survive, members of a population must **compete** to obtain food, living space, and other limited necessities of life.

- Darwin described this as **the struggle for existence**.

Variation and Adaptation

- Darwin knew that individuals have natural **variations** among their heritable traits.

- Any **heritable** characteristic that **increases** an organism's ability to survive and reproduce in its environment is called an **adaptation.**

- Adaptations can involve **body parts or structures**, like a tiger's claws; **colors**, like those that make camouflage or mimicry possible; or **physiological functions**, like the way a plant carries out photosynthesis.

Survival of the Fittest

- According to Darwin, differences in adaptations affect an individual's **fitness.**

- Fitness describes how well an organism can **survive and reproduce** in its environment.

- Individuals with adaptations that are **well-suited** to their environment can survive and reproduce and are said to have **high fitness.**

Survival of the Fittest

- Individuals with characteristics that are **NOT well-suited** to their environment either die without reproducing or leave few offspring and are said to have **low fitness**.

- This difference in rates of survival and reproduction is called **survival of the fittest**.

- In evolutionary terms, survival means **reproducing** and passing adaptations on to the next generation.

Natural Selection

- Darwin named his mechanism for evolution **natural selection**.

- Natural selection is the process by which **organisms with variations most suited to their local environment survive and leave more offspring.**

- In natural selection, the **environment** influences fitness.

Natural Selection

- In nature, well-adapted individuals **survive** and **reproduce**.

- From generation to generation, populations continue to change as they become better **adapted**, or as their **environment** changes.

- Natural selection acts only on **inherited traits** because those are the only characteristics that parents can pass on to their offspring.

Natural Selection

- Natural selection does not make organisms **“better.”**
  - Adaptations don’t have to be perfect—just good enough to enable an organism to pass its genes to the next generation.

- Natural selection also doesn’t move in a **fixed direction**.

- If local environmental conditions change, some traits that were once adaptive may no longer be useful, and different traits may become adaptive.

- If environmental conditions change faster than a species can adapt to those changes, the species may become **extinct.**

Example

- This hypothetical population of grasshoppers changes over time as a result of natural selection.

- Grasshoppers can lay more than 200 eggs at a time, but only a small fraction of these offspring survive to reproduce.

Example

- Certain variations, called adaptations, increase an individual's chances of surviving and reproducing.

- In this population of grasshoppers, heritable variation includes yellow and green body color.

2 Variation and Adaptation

Example

- Green color is an adaptation: The green grasshoppers blend into their environment and so are less visible to predators.

- Because their color serves as a camouflage adaptation, green grasshoppers have higher fitness and so survive and reproduce more often than yellow grasshoppers do.

3 Survival of the Fittest

Example

- Green grasshoppers become more common than yellow grasshoppers in this population over time because more grasshoppers are born than can survive, individuals vary in color and color is a heritable trait, and green grasshoppers have higher fitness in this particular environment


Natural Selection
with the Amoeba Sisters