



16.3 Darwin presents
his case

In 1858, Alfred Russel Wallace wrote an essay proposing evolution.

After Darwin contacted him, Wallace's essay was presented together with some of Darwin's observations at a scientific meeting in 1858.

The next year, Darwin published his first book on evolution: ***On the Origin of Species.***

Evolution by Natural Selection

Darwin named his mechanism for evolution *natural selection*.

Natural selection occurs in any situation in which

1. more individuals are born than can survive (the struggle for existence),
2. there is natural heritable variation (variation and adaptation), and
3. there is variable fitness among individuals (survival of the fittest).

The Struggle for Existence

After reading Malthus, Darwin realized that 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, and that some of those variants are better suited to life in their environment than others.

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

Survival of the Fittest

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.

Natural Selection

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

Populations change as they become better adapted, or as their environment changes.

Natural selection acts only on inherited traits - the only traits 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 reproduce.

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

There is no one, perfect way of doing something.

Natural selection simply enables organisms to survive and reproduce in a local environment.

Natural Selection

If the environment changes, some beneficial traits 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.

Common Descent

Natural selection depends on the ability of organisms to reproduce and leave descendants.

Every organism alive today is descended from parents who survived and reproduced.

According to the **principle of common descent**, all species—living and extinct—are descended from ancient common ancestors.

Common Descent

Common Descent implies that life has been on Earth for a very long time.

Darwin suggested that the fossil record was evidence of ***descent with modification*** over long periods of time.

Common Descent

Darwin based his explanation for the diversity of life on the idea that species change over time.

A single “tree of life” links all living things.

