

Key Concept 2: Mechanisms of Evolution

Learning Objectives

Students will be able to ...

Essential Knowledge

Students need to know that ...

Development of Natural Selection Theory

EVO 2.1(a) Describe the scientific discoveries that informed the theory of natural selection.

EVO 2.1.1 Key discoveries made by several scientists contributed significantly to Darwin's understanding of biological evolution.

- Several naturalists, such as Lamarck and Wallace, contributed models of evolution that informed Darwin's theories.
- Darwin's ideas about evolution were influenced by the work of geologists Hutton and Lyell, whose work highlighted the slow-acting geological processes that shape Earth's features.

Selective Mechanisms

EVO 2.2(a) Describe how selective pressures in the environment can affect an organism's fitness.

EVO 2.2(b) Explain how selective pressures in the environment could cause shifts in phenotypic and/or allele frequencies.

EVO 2.2(c) Use data to describe how changes in the environment affect phenotypes in a population.

EVO 2.2(d) Predict how allelic frequencies in a population shift in response to a change in the environment.

EVO 2.2.1 Darwin's theory of natural selection is a selective mechanism in biological evolution that may lead to adaptations.

- Abiotic ecosystem components (e.g., nutrients) and biotic ecosystem components (e.g., predators) act as selective pressures.
- Favorable traits in a given environment lead to differential reproductive success, or fitness, and over time can produce changes in phenotypic and/or allele frequencies.
- Heritable traits that increase an organism's fitness are called adaptations.
- Over time, adaptations can increase in frequency in a population's gene pool.
- Patterns of natural selection can include phenomena such as coevolution, artificial selection, and sexual selection.

EVO 2.2.2 Favorable traits are relative to their environment and subject to change.

- Changes in the environment happen both naturally (e.g., floods, fires, climate change) and through human-induced activities (e.g., pollution, habitat destruction, climate change).

Cross Connections: Revisit these topics in Unit 4: Genetics to *connect key concepts* involving genetic processes. Mutation types in DNA sequence, replication errors, and the random nature of independent assortment can lead to phenotypic variations on which natural selection can act. Also, *connect key concepts* to Unit 1: Ecological Systems. Changes in resources (e.g., nutrients from biogeochemical cycles and predator–prey interactions) can act as selective pressures on organisms.