

12: Evolution – Concepts and Mechanism

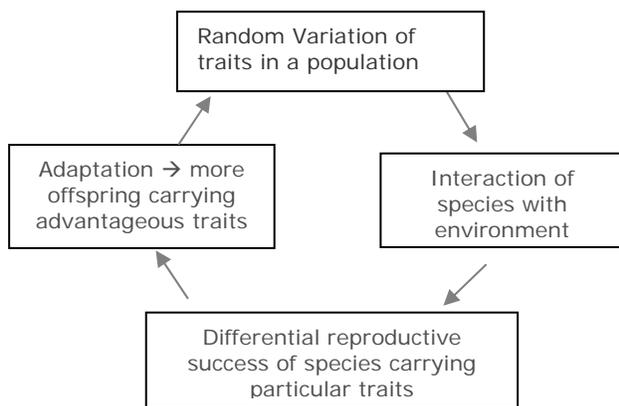
Key Biology Terms

Ancestor: Early type of species from which others have evolved.
Descent: Current day organisms that arose from ancestral forms over time and as a result of mutations
DNA: Deoxyribonucleic Acid. An organic chemical in four types, that when arranged in particular ways can carry and transfer genetic information from parent to offspring.
Embryology: The study of development of an organism from conception to birth.
Evolution: Descent with modification
Extinct: No members of the species exists today.
Fossils: Ancient impressions or remnants left in sedimentary rock by extinct species.
Gradualism: Idea that evolution occurs via a slow consistent change in traits over time.
Heritable Adaptation: Any inherited trait that ultimately leads to a reproductive advantage of a species.
Hypothesis: Attempt to explain why observations occur
Inheritance: Refers to any trait or the assemblage of traits that can be passed down from one generation to the next.
Modification: Refers to changes in a species over time
Natural Selection: The major mechanism of modification during evolution.
Phylogenetic tree: Depiction of the pattern of evolution
Punctuated Equilibrium: Evolutionary changes occur relatively quickly followed by long periods of stabilization.
Speciation Event: When members of a new reproductive community no longer interbreed with their ancestral population as a result of isolation and subsequent accumulation of adaptations to their new environment.
Taxonomy: A hierarchical grouping of organisms with ascending categories having more general characteristics.

The Process of Natural Selection

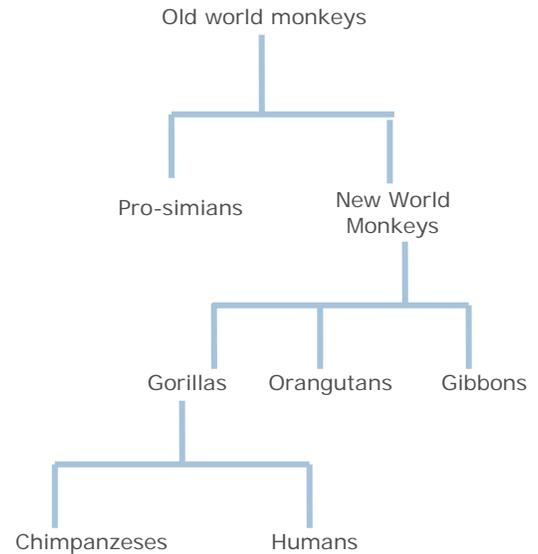
-“Selection” is not intended to imply that there is some higher power or force judging and selecting the best species according to some ideal.
 -Natural Selection is a result of a species interaction with the environment, with “selection” being determined by whichever species lives long enough to propagate and thereby be successful.
 -Survival of the “Fittest”. Fit refers to best fit to environment.
 -Survival depends on an organisms fit to the environment.
 - Natural Selection cannot predict the future. For example, which variations will appear spontaneously in nature and then prove to benefit a species from a reproductive standpoint

The Process



Branches of Phylogenetic Tree

A branch contains the oldest ancestor in that line plus all of its descendants. Relationship between ancestor and descendant determined by number of shared characteristics in common. Each node =speciation event.



Other Key Concepts

Evolution → New traits that help an organism adapt to their environment. Also, over time → speciation event → origin of new species.

Traits acquired through an individual’s experience or behavior can not be coded for in DNA and can not be passed down to offspring.

Environmental changes → more rounds of natural selection → new trait set → adaptation → over time, new species.

Minor mechanisms of modification:

Gene Flow - individual species breed outside their native group.

Non-random Mating - In-breeding

Scientific Processes

Retracing Darwin’s Steps via the “scientific method,”

Observations:

#1 - Reproducing organisms produce more offspring then environment can support.

If all offspring survive to reproduce → struggle of existence.

#2 - Within any given population, there is a range of individuals, heritable characteristics.

#3 - Survival depends on an organism’s inherited traits.

Hypothesis:

--Attributes that lead to better fit to an environment → greater chance for leaving behind offspring.

--Disproportionate reproductive success among population members → gradual change in traits of that population.

Hypothesis Testing: Using Theory to explain the retrospective evidence.

Evolution Theory today

Gradualism less accepted today. Replaced by the idea of Punctuated Equilibrium.