

Chapter 24 The Origin of Species

Macroevolution - The origin of new taxonomic groups, such as new species, new genera, even new kingdoms

Speciation (Fig 24.1)

Anagenesis - phyletic evolution, the accumulation of changes associated with the transformation of one species into another

Cladogenesis - branching evolution, the building of one or more new species from a parent species that continues to exist

Biological Species Concept - Species is a population or group of populations whose members have the potential to interbreed with one another in nature to produce viable, fertile offspring, but who cannot produce viable, fertile offspring with members of other species.

What Prevents Interbreeding?

Prezygotic Barriers

Habitat isolation

Behavioral isolation

Temporal isolation

Mechanical isolation

Gametic isolation

Postzygotic Barriers

Reduced Hybrid Viability

Reduced Hybrid Fertility

Hybrid Breakdown

Other Species Concepts

Ecological

Pluralistic

Morphological

Geneological

Modes of Speciation (Fig 24.6)

Allopatric speciation - a geographic barrier physically isolates populations and initially blocks gene flow (Fig 24.7 & 24.8)

Conditions Favoring Allopatric Speciation

The gene pool of the peripheral isolate probably differs from that of the parent population from the outset

Until the peripheral isolate becomes a large population, genetic drift will continue to change its gene pool at random

Evolution caused by natural selection may take a different direction in the peripheral isolate than in the parent population

Adaptive radiation - the evolution of many diversely adapted species from a common ancestor (Fig 24.11)

Sympatric speciation - intrinsic factors, such as chromosomal changes and nonrandom mating, alter gene flow

Chromosomal Changes

Autopolyploid - an individual that has more than two chromosome sets, all derived from a single species (Fig 24.13)

Allopolyploid - an individual that has more than two chromosome sets, derived from two different species (Fig 24.15)

Punctuated Equilibrium - Species diverge in spurts of relatively rapid change, instead of slowly and gradually (Fig 24.17)

Origin of Evolutionary Novelty

Modified versions of older structures

Exaptation - a structure that evolved in one context and became co-opted for another function

Allometric growth - a difference in the relative rates of growth of various parts of the body (Fig 24.19)

Paedomorphosis - sexually mature adult retains features that were juvenile structures in its evolutionary ancestors (Fig 24.21)

Heterochrony - a general term for evolutionary changes in the timing or rate of development (Fig 24.20)

Homeosis - alteration in an organism's basic body design or spatial arrangement of body parts (Fig 24.23)

Species Selection - A theory maintaining that species living the longest and generating the greatest number of species determine the direction of major evolutionary trends (Fig 24.24)