

Chapter 19-2 p546-552 "Patterns and Processes of Evolution"



- Be able to identify processes that influence whether species and clades survive or become extinct.
- Describe what gradualism and punctuated equilibrium mean.
- Give examples of **adaptive radiation**, **convergent evolution**, and coevolution

Speciation and Extinction

macroevolutionary patterns:

transformations in anatomy, phylogeny, ecology and behavior that take place in clades larger than a single species

includes speciation, and extinction

Macroevolution and Cladistics

- Fossil evidence is used to classify organisms into clades
- A cladogram does NOT imply that one species was a direct ancestor to another
- It instead shows how species branch off from common ancestors



Adaptation and Extinction

- Clades produce new species under pressure from their environments
- Other species in the clade go extinct as a result of this pressure
- If the rate of speciation is greater than the rate of extinction, then the clade survives.
- Conversely, if the rate of extinction is greater than the rate of speciation, the clade will eventually go extinct.

Patterns of Extinction

- Species are going extinct all the time as they struggle to survive
- This level of extinction is called "<u>background</u> <u>extinction</u>"
- Alternately, once in awhile drastic environmental changes cause MOST species to go extinct
 - called a <u>mass extinction</u> event
 - mass extinctions are usually caused when multiple environmental changes hit at once
 - occasionally, a single event can cause a mass extinction (ex: asteroids and dinosaurs)
 - While tragic, organisms that survive the mass extinction now have a golden opportunity to branch out quickly!

Rates of Evolution

Two main patterns

- gradualism: slow, steady rate of change
 - how Darwin thought organisms evolved, which is correct for some species!

punctuated

equilibrium: organisms don't change hardly at all for a long time, and then quickly change over a brief period

also is evidenced in the fossil record!



Rapid Evolution After Equilibrium

- Three situations where a species may evolve rapidly
 - I) if a population becomes isolated from the main population
 - 2) if a population migrates to a new environment
 - 3) survivors of a mass extinction

Adaptive Radiation

<u>adaptive radiation</u>: where a species or group of species evolves into several different forms that live in different ways
ex: mammalian evolution after the extinction of the dinosaurs.
ex 2: Galapagoes finches



Convergent Evolution

convergent evolution:

evolution of similar structures and characteristics in organisms that aren't closely related

- occurs as natural selection favors similar solutions to the same problem!
- ex: marsupial vs placental mammals
- ex 2: shark, dolphin



Coevolution

 coevolution: the evolution of a species in response to another species
ex: bats/moths

ex 2: flowers/pollinators

