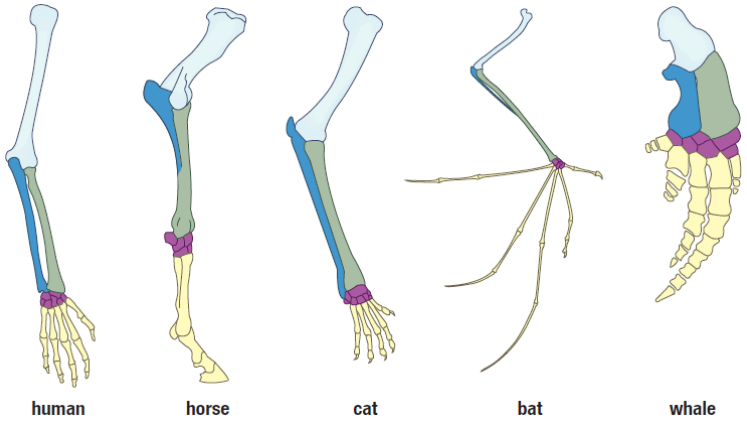
8.3 Patterns of Evolution

Divergent Evolution

Divergent Evolution is the evolution of many species from a single common ancestor.

- Occurs when a single species is placed under two different sets of selective pressure
- Results in less competition between the new species

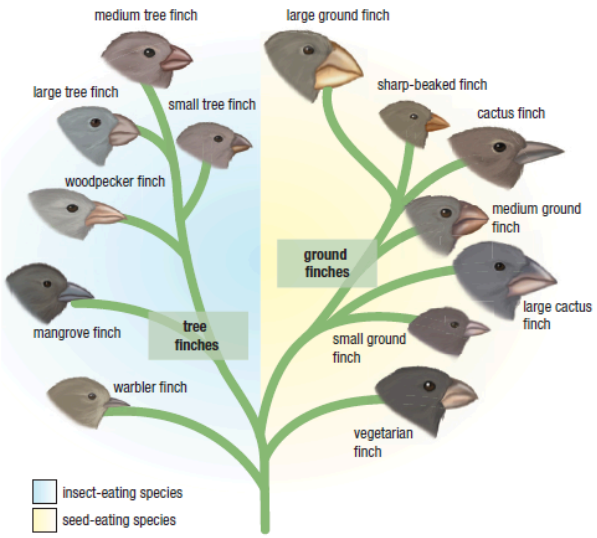


E.g. Humans, horses, cats, bats, and whales evolved from the same common ancestor

Adaptive Radiation

Adaptive radiation is a type of divergent evolution in which a single species is relatively rapidly evolved into many new distinct, but closely related species.

- Occurs when species are in an **isolated region** where few species are competing for resources
- e.g.: Islands, Areas of mass extinction
    - in the Galapagos Islands, finch species with various beak shapes and sizes evolved from a single species



Original mainland species had a medium-sized beak, ideally suited to feed on medium-sized seeds

- Finches with different beaks on mainland faced competition from other bird species
- In the Galapagos islands, finches born with different beak sizes faced little competition

- Different beaks are naturally selected in different habitats
- Galapagos Islands have a diverse range of habitats (moist forests to dry deserts)

Convergent Evolution

Convergent Evolution: the evolution of similar traits in distantly related species

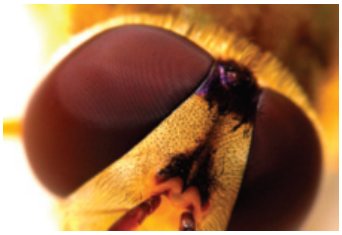
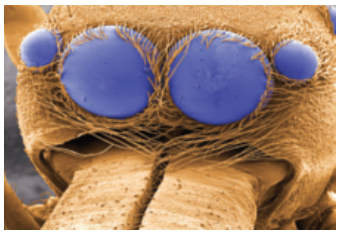
- Occurs when species are placed under similar selective pressure (e.g. must adapt to the same kind of environment)
- Note: while some traits will converge, each species retains their own distinct features


- Example: **Cacti** (from South America) and **Euphorbia** (from South Africa) evolved similar features in response to extremely dry conditions
  - Thick green stems (photosynthesis, water storage)
  - Sharp protective spines (ward off predators)
  - Cacti spines evolved from leaves
  - Euphorbia spines evolved from the outward growth of stem tissues.


- Example: Sharks and dolphins both evolved similar streamlined bodies
  - **Sharks** evolved from primitive fish
    - Tail moves side-to –side, with flukes pointing upward
  - **Dolphins** evolved from land mammals (descendants of dorudon!)
    - Tail moves up-and-down, with flukes pointing sideways


Convergent Evolution - Examples Continued

- Various species evolved **light-detecting organs** due to the selective advantage of detecting and responding to light
  - Protists have simple eyes spots
  - Other species have evolved complex and varied eyes


Coevolution

Coevolution: one species evolves in response to the evolution of another species

- Some plants have evolved hard protective shells to protect their seeds
- Some seed-eating mammals have evolved powerful jaws and teeth for chewing through hard shells.
- Coevolving species may become increasingly dependent on the other.

Homework: p. 345 #1,3, 4, 5