

Chapter 5 - Lesson 4 - Speciation

- **Speciation** - the formation of a new species

- A species can be thought of as a population of individuals who are reproductively isolated

- not capable of breeding with individuals of other species

- Most new species are believed to arise by a three-step process called **allopatric** speciation

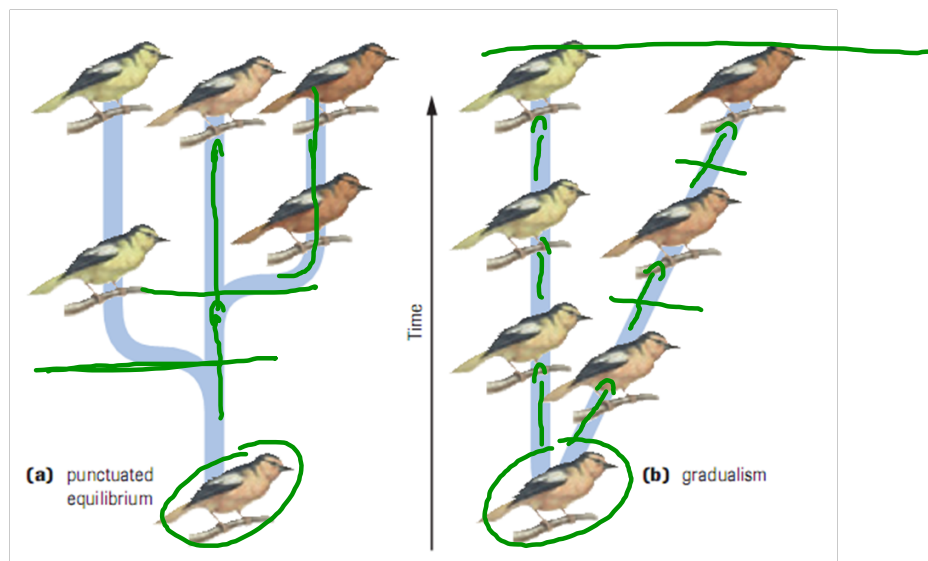
- Step 1: A physical barrier separates a single interbreeding population into two or more groups that are isolated from each other.
 - Any mutations that occur in one of these isolated groups are not shared with the other population
- Step 2: Natural selection works on the separated groups independently, resulting in inherited differences in the two populations.
 - In other words, the populations evolve independently.
 - Differences in selective pressures will be greater if the populations experience pronounced differences in their environments.
- Step 3: In time, accumulated physical and/or behavioral differences between the populations become so pronounced that the groups, should they be reunited, would no longer be sexually compatible.
 - At this point, they have formed two or more distinct species



- Physical barriers range in size from entire mountain ranges, glaciers and oceans to river channels and canyons

- **theory of punctuated equilibrium** - the idea that species evolve rapidly, followed by a period of little or no change

- This theory has three main assertions:
 - many species evolve very rapidly in evolutionary time
 - speciation usually occurs in small isolated populations, so intermediate fossils are very rare
 - after an initial burst of evolution, species are well adapted to their environment and so do not change significantly over long periods of time



Convergent evolution - the development of similar traits or adaptations in unrelated species

- can be the result of occupying similar niches
- these are called **analogous** traits
- ex. wings, antifreeze proteins, eyes to see in the dark, large ears

Divergent evolution - occurs when members of the same species form different traits in response to different environments

- neanderthals and modern humans (same ancestor, different environments)
- red fox and the kit fox

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