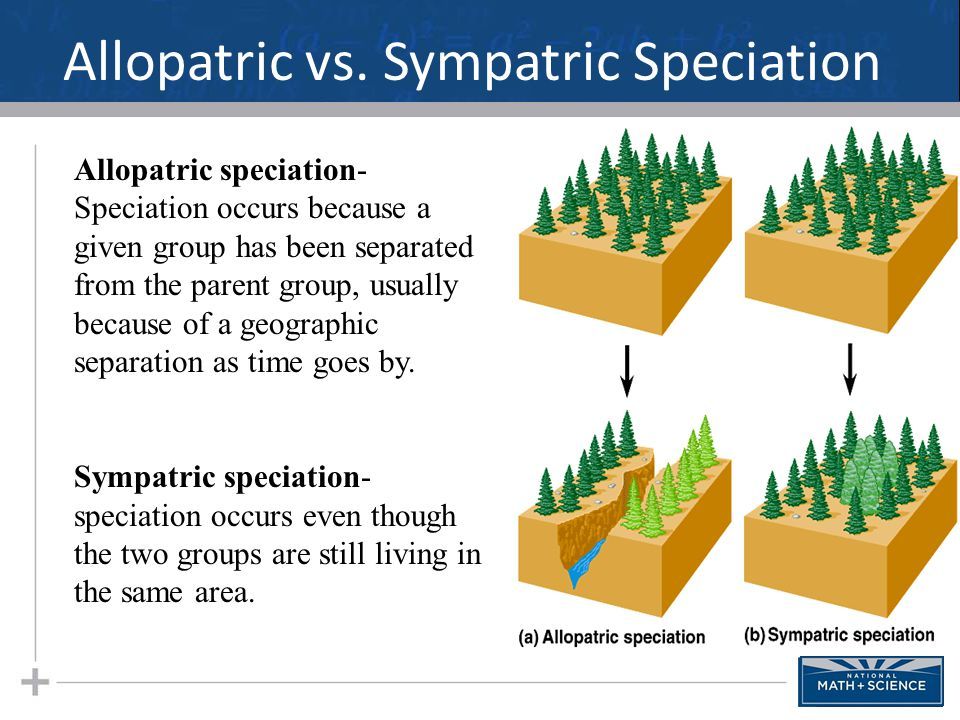
**Unit 2: Evolution – How Evolution - Macro** Date: \_\_\_\_\_\_\_\_\_\_\_\_\_

****Objectives - By the end of the lesson you should be able to:

* Describe how macro-evolution is different from micro-evolution
* Describe the 3 patterns of speciation
* Explain a problem with speciation and the proposed solution

**Macro-evolution: AKA Speciation**

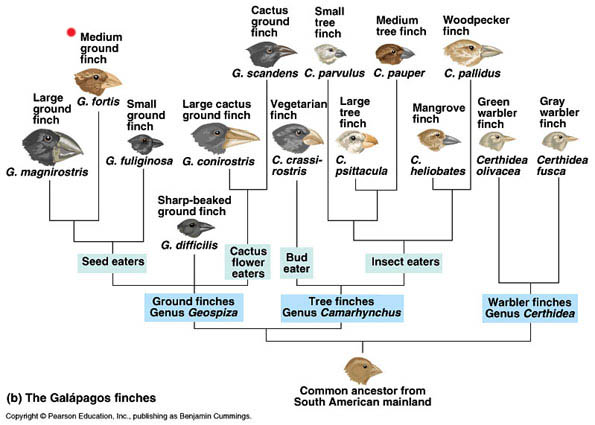
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Recall:

* **Species**: population of organisms that are able to **breed** and produce **viable**, **fertile** offspring
* When a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (by a geographic barrier for example), speciation can occur over a long period of time as all of the small changes in the gene pool due to micro-evolution add up over time.
* Eventually the differences in the two populations are so great that the two populations can \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to make viable, fertile offspring. We now have two different species. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is said to have occurred.

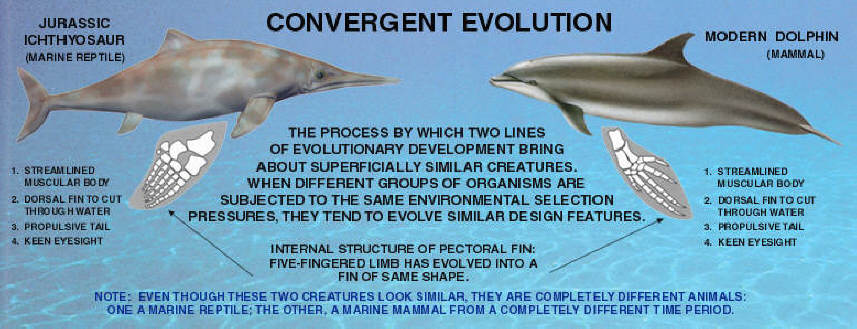
**Patterns of Speciation**

**1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ AKA Adaptive Radiation**

* + Occurs when small fragments of a populations \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ …..they adapt (evolve) to their new habitats
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + EX. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

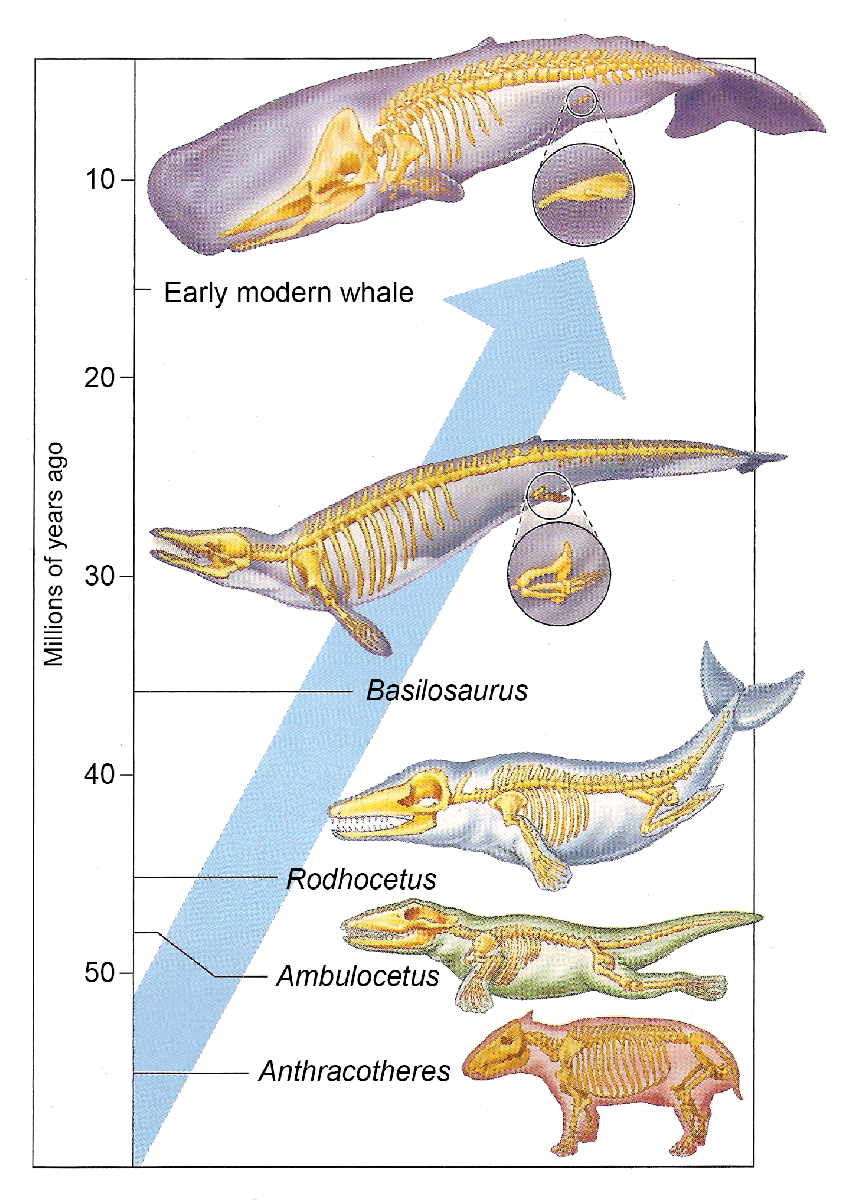
* Occurs when \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and adapt (evolve) so will display similar characteristics

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ so DNA is not closely related
* EX. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

* Occurs when organisms are closer connected to one another by biological interactions \_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ . A change in one organism may be followed by a corresponding change in the other organism.
* EX. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

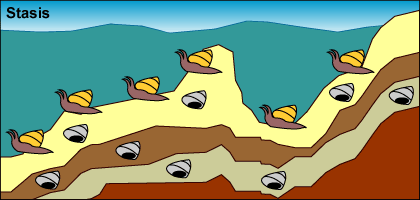
**Potential Probelm**

* There is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_!
* How is it possible that can we jump from one species to another with no fossil record of it ever occurring?
* Why is fossil evidence so important??

**Fossils are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ …**

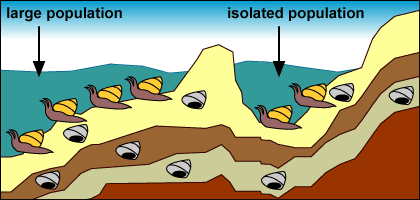
**Proposed Solution - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

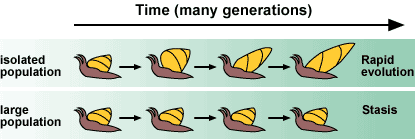
* **Eldredge and Gould in 1972**
* Proposed that “less fit but survivable” members of a population would be pushed to the periphery or to less desirable extremes of the species habitat.
* The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (evolve) to the new harsh environment
* Re-introduction could happen and the peripheral population would \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

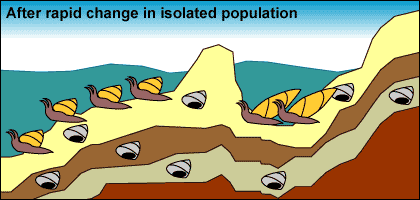
 BUT WHY NO FOSSIL RECORD!??!?

EX: Mollusk Evolution by Punctuated Equilibrium

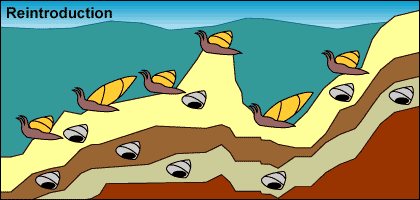
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** A population of mollusks is experiencing stasis, living, dying, and getting fossilized every few hundred thousand years. Little observable evolution seems to be occurring judging from these fossils



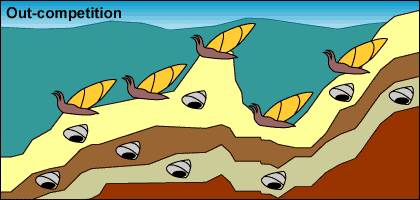
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_:** A drop in sea level \_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_number of mollusks from the rest of the population.
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: The small, isolated population experiences strong selection and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ because of the novel environment and small population size: The environment in the newly formed lake exerts new selection pressures on the isolated mollusks. Also, their small population size means that \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ influences their evolution. The isolated population undergoes rapid evolutionary change.



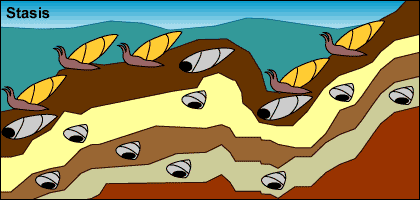
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: Few fossils representing transitional forms are preserved because of their relatively \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ population size, the \_\_\_\_\_\_\_\_\_\_\_\_\_\_ of change, and their \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

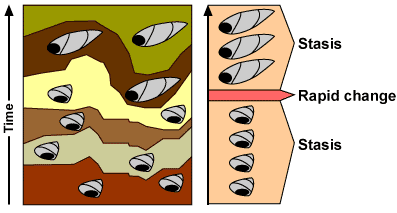
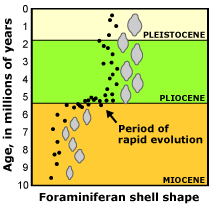
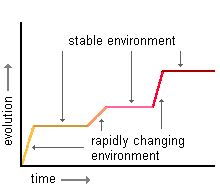
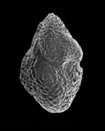


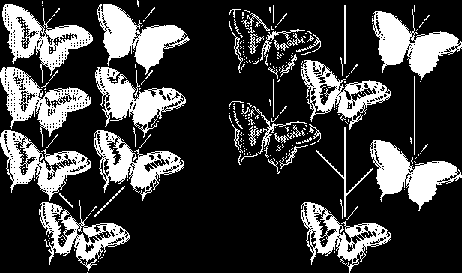
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: Sea levels rise, reuniting the isolated mollusks with their sister lineage.



* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ :** The isolated population \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Larger population size and a stable environment make evolutionary change less likely. The formerly isolated branch of the mollusk lineage may \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ their ancestral population, causing it to go extinct.



* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** : Larger population size and a larger range move us back to step 1: stasis with occasional fossil preservation.
* This process would produce the following pattern in the fossil record: 
* We observe similar patterns in the fossil records of many organisms. For example, the fossil records of certain foraminiferans (single-celled protists with shells) are consistent with a punctuated pattern.
*  

**Comparison**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



Which graph is showing Gradualism? Punctuated Equilibrium?

Which model of evolution could be easily used to explain a lack of intermediate fossils?

