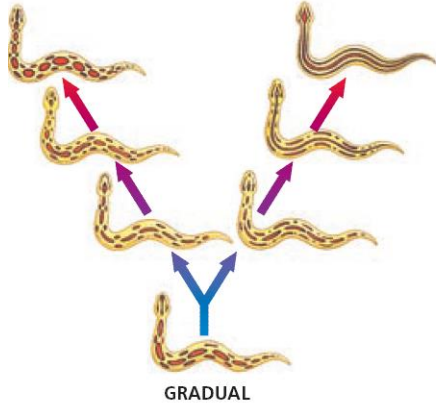


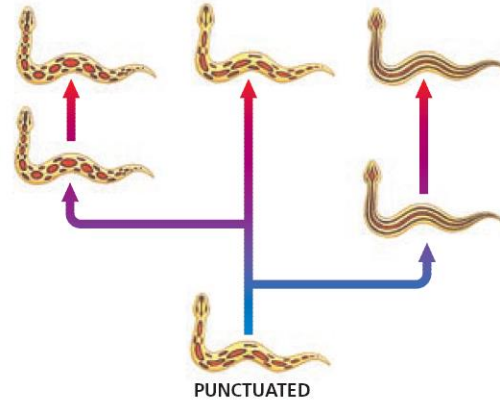
# Types of Evolution: Punctuated Equilibrium vs Gradualism

Use the information below AND YOUR NOTES to answer the questions that follow. READ the information before attempting to do the work. You may need to refer to this information often.

## GRADUALISM

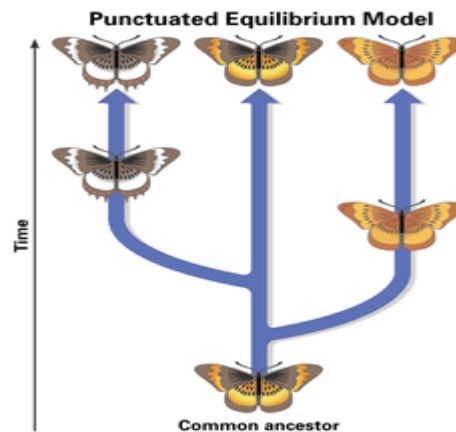
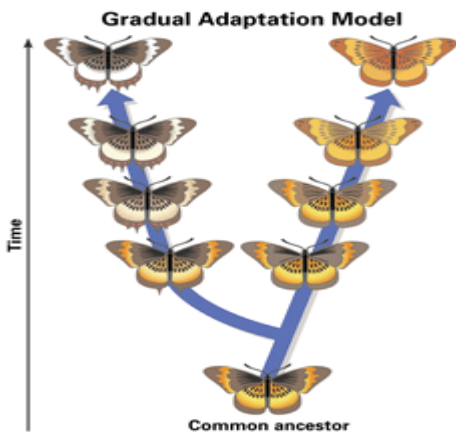
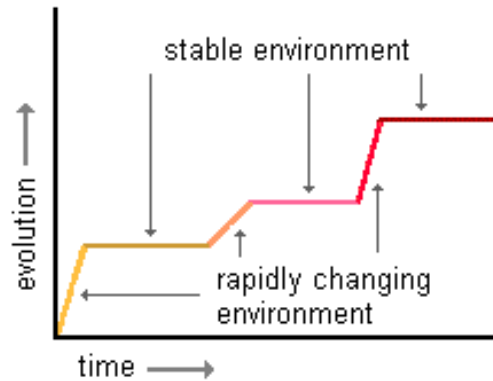
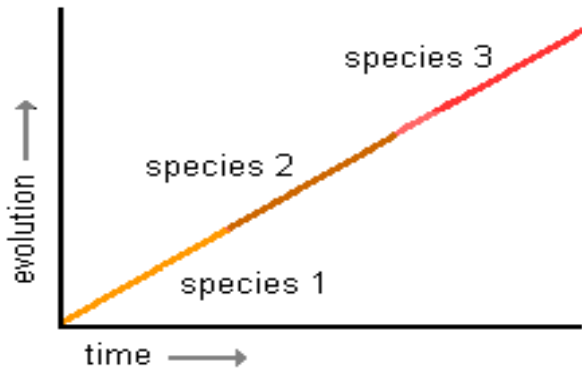


## PUNCTUATED EQUILIBRIUM

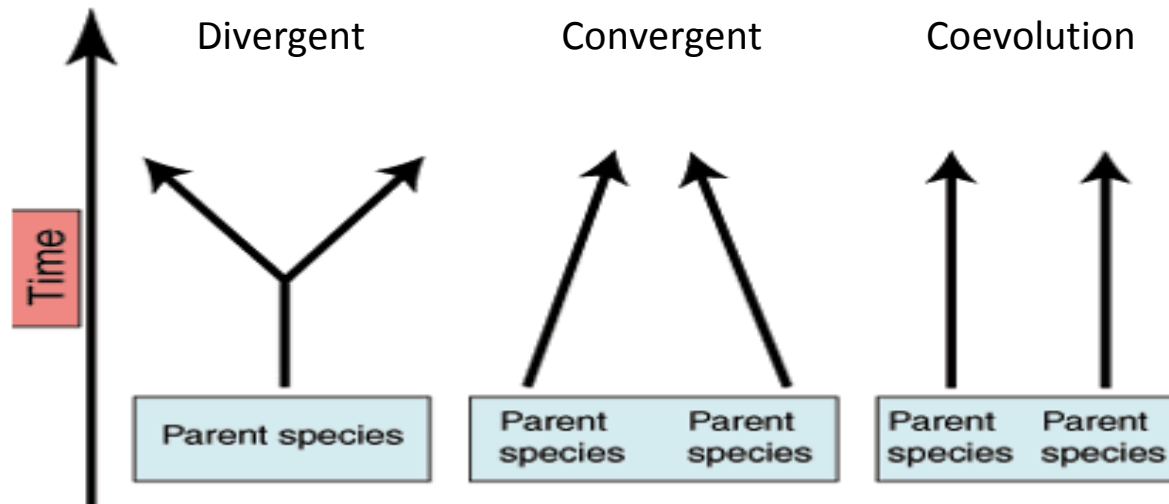


Gradualism - Natural selection gradually changes the average features of a species. This process continues for long enough for a species to change into a new species and the original species becomes extinct.

Punctuated Equilibrium - periods of rapid speciation followed by long periods of stasis –no change.



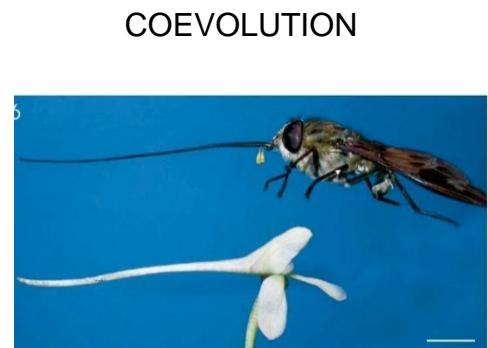
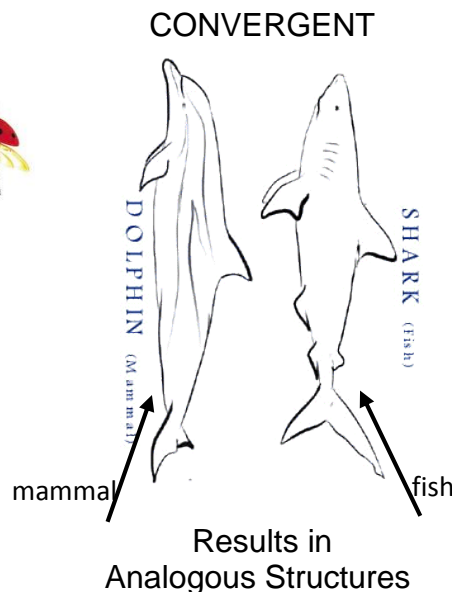
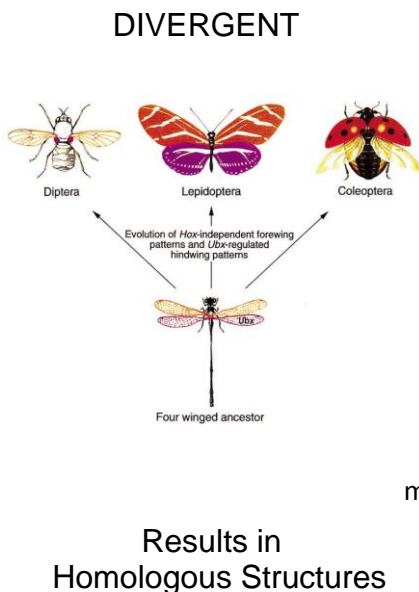
# Types of Evolution: Divergent, Convergent & Coevolution



**Divergent** – ONE species evolves into two different species.

**Convergent** – TWO separate species in different areas evolve to look or behave in a similar manner

**Coevolution** – TWO species that have a partnership or symbiotic relationship evolve together to continue the relationship



As the flower evolved over time, the pollinating partner the fly, evolved along with it to maintain the relationship.

**Keep this page for notes and to study for your test!**

# TYPES OF EVOLUTION

Directions: Read each description below and choose which of the four types of evolution it is by placing an X under the correct answer for each description.

For convergent evolution and divergent evolution ONLY, use the key to record if the scenario is describing a homologous, vestigial, or analogous structure. Record in the box under the "X".

H = Homologous structure









V = Vestigial structure

A = analogous structure

	Description	Convergent evolution	Divergent evolution	Coevolution	Punctuated equilibrium
1	In the ocean surrounding Antarctica, there are fish that survive the cold water by using a molecule made of glycoproteins that circulates the blood and keeps it from freezing. Certain kinds of worms that live in the Arctic ocean also make antifreeze proteins that help them live in icy water.				
2	Horse evolution shows long stable periods of little evolution interrupted by brief periods of rapid change.				
3	Hummingbirds have a beak just the right length to reach the nectar in a cardinal flower and as they feed their foreheads bump into the pollen structure. Cardinal flowers are red which hummingbirds can see but bees can't. Cardinal flower's pollen structure is just the right length for the hummingbird to pick up pollen as it feeds.				
4	Ostriches are native to the savannahs of Africa, while penguins live in the polar regions. Although ostriches and penguins are closely-related, they look very different				
5	The <i>Galloti atlantica</i> and <i>Galloti galloti</i> lizards evolved through natural selection from a common ancestor into a wide variety of different looking lizards.				
6	Whales, sharks, and penguins all have streamlined bodies and fins/flippers for				

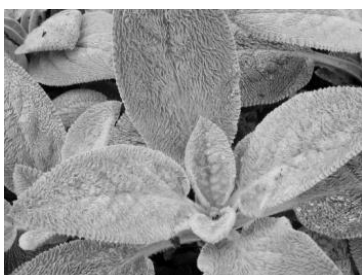
moving in water even though they belong in different classes of animals (mammals, fish, and birds).				
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Are the following pairs of animals examples of convergent or divergent evolution?

		Convergent	Divergent
	and		<input type="checkbox"/> <input type="checkbox"/>
	and		<input type="checkbox"/> <input type="checkbox"/>
	and		<input type="checkbox"/> <input type="checkbox"/>
	and		<input type="checkbox"/> <input type="checkbox"/>

An adaptation is any characteristic that increases fitness, which is defined as the ability to survive and reproduce. Match the following adaptations to the correct organism.

- \_\_\_\_\_ This plant lives in a dry, temperate forest and is in danger of losing too much water through its stems. It also wants to ensure that it could survive a natural disaster like a fire or parasite infestation.
- \_\_\_\_\_ This plant likes to grow in an upward direction and will often grow on other plants. Due to its length it must have a way to hold on as it grows so it does not fall.
- \_\_\_\_\_ This plant lives on the sand dunes of many beaches. It must be able to survive in direct sunlight by developing some type of sunscreen. It also has developed a way to collect water on its leaves so it can use the morning dew for hydration.
- \_\_\_\_\_ This plant grows along the muddy shores and in shallow water. It needs a way to stay upright and balanced in the waves as well as keep its trunk from becoming too saturated.



Fine hair on leaves



Thick bark



Stilt roots



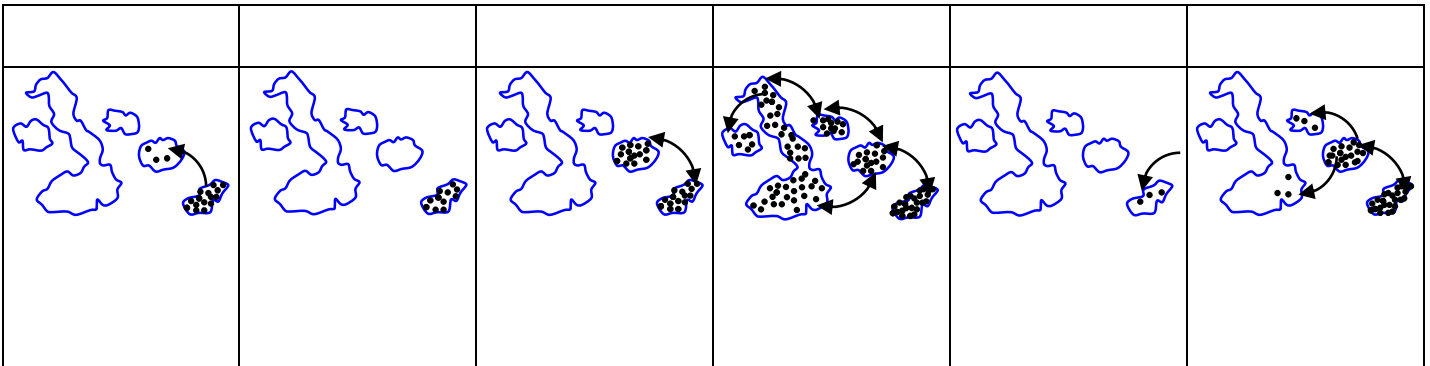
Tendrils

## SPECIATION IN GALAPAGOS ISLAND FINCHES

While visiting the Galapagos Islands located about 600 miles off the northwest coast of South America, Charles Darwin counted 13 species of finch. In addition to size and other characteristics, he noticed that each had a slightly different shaped beak. Darwin observed that the birds on the Galapagos Islands had some similarities to the finches on the South American mainland. Darwin theorized that perhaps there was a common ancestor that came over to the Galapagos Islands from the mainland for all of the different species of finches on the islands. Darwin's observations of the various finches and of the environment of the islands, helped him formulate his theory of natural selection. The adaptive radiation and speciation of the Galapagos Island finches also shows the effects the geographic isolation mechanisms operating in the islands.

1. Define species. \_\_\_\_\_
2. Define speciation. \_\_\_\_\_
3. Define reproductive isolation. \_\_\_\_\_
4. Table #1 contains diagrams representing the events of finch migration through the Galapagos Islands. Sequence the diagrams to show in the correct order of finch migration. Table #1 also contains statements that describe the events of finch migration through the Galapagos Islands. Sequence the statements to describe the correct order of finch migration.

**TABLE #1: Number the Diagrams in the Correct Sequence**



**Number the Statements below in the Correct Sequence**

The finches increased in numbers and, under influence of natural selection, gradually became adapted to the local environment.	Some managed to fly back to the first island but reproductive isolation had occurred between them and the existing population.	Originally, there were no finches on the islands. Some finches from the mainland managed to fly across to them.	Some of the finches managed to fly to a second island where the environment was different. Gradually they adapted to the conditions on the second island.	This process was repeated over and over again as the finches colonized more of the islands.	Some finches managed to fly to other islands where the environment was different. Adaptation to the new conditions gradually took place

5. Describe speciation of the Galapagos Island finches in terms of geographic isolation. \_\_\_\_\_

**Get checked off before moving on \_\_\_\_\_**