

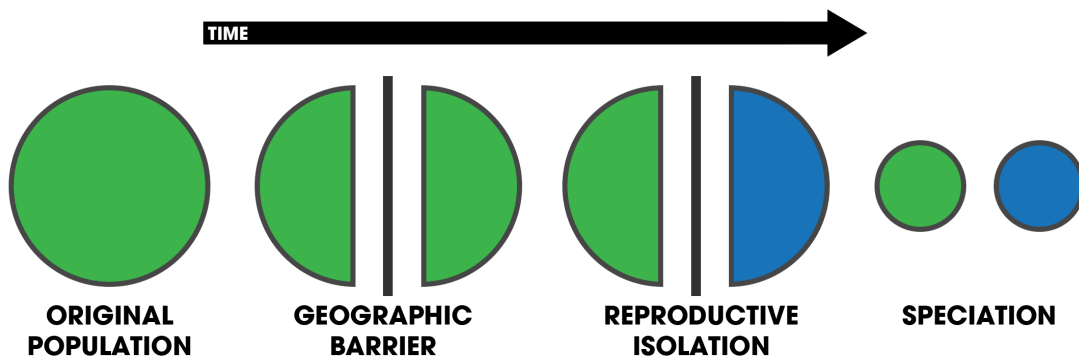
Name:

## How can changes in a population lead to new species?

### Model 1 - Allopatric Speciation

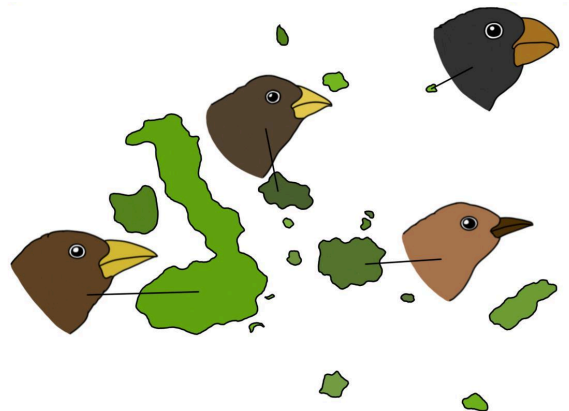
Geographic isolation is an isolating mechanism in nature. Over long periods of time, it can lead to [speciation](#). As the name suggests, geographic isolation is when populations of a species become separated geographically. This could also happen from the **founder effect**, where a small group breaks away from a larger population and establishes a group in an isolated area. Isolation could also occur when a geographic event, like an earthquake or a landslide separates a population.

Once the populations are separated evolution can occur through multiple mechanisms. **Natural selection** could act on each population, where some individuals have favorable traits for survival. **Genetic drift** can occur, where genotypes become more common due to random chance. These mechanisms can lead to each subpopulation becoming so different, that they can no longer interbreed and are considered separate species.



1. We have documented many examples of this type of speciation occurring. Darwin's finches are the most famous example.

View the model shown. Discuss what kind of geographic barriers would have led to the finch speciation in the Galapagos.



## Reproductive Isolating Mechanisms

2. Explore “Reproductive Barriers” at <https://learn.genetics.utah.edu/content/evolution/barriers/> to complete the following table:

Organism	How were they isolated	Subpopulation changes
Stickleback fish		
Ground Squirrels		
Crickets		
Warbler		
Fireflies		
Coral		
Monkeyflowers		
Beetles		
Cotton		
Sea Urchins		

3. Reproductive isolation reduces **GENE FLOW** between populations. This means that each subpopulation evolves separately and can result in a new species. Isolating mechanisms fall into the following categories. For each category, identify which example(s) from the chart above matches it.

<b>Reproductive isolation:</b> physiology prevents mating or producing fertile offspring. Ex. shape or reproductive organs not compatible	
<b>Temporal isolation</b> - timing isolation, individuals mate at different times of year. Example. frogs that mate in May versus those that mate in July.	
<b>Behavioral isolation</b> - behaviors prevent mating. Ex. birds recognize mates by songs or dance	

Still confused? Here is more information on reproductive isolation:

[https://bio.libretexts.org/Bookshelves/Introductory\\_and\\_General\\_Biology/Book%3AGeneral\\_Biology\\_\(Boundless\)/18%3AEvolution\\_and\\_the\\_Origin\\_of\\_Species/18.2%3AFormation\\_of\\_New\\_Species/18.2B%3AReproductive\\_Isolation](https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3AGeneral_Biology_(Boundless)/18%3AEvolution_and_the_Origin_of_Species/18.2%3AFormation_of_New_Species/18.2B%3AReproductive_Isolation)

## Another Model of Speciation: Sympatric Speciation

**Sympatric speciation** does not require geographic isolation. In this model, populations can live in the same area, but may occupy different niches. A niche refers to an organism's way of life, which might include aspects of how it hunts, where it lives, and food preferences.



For example, 200 years ago, apple maggot flies laid their eggs only on hawthorns — but today, these flies lay eggs on hawthorns and domestic apples (which were introduced to America). Females generally choose to lay their eggs on the type of fruit they grew up in, and males tend to look for mates on the type of fruit they grew up in. So hawthorn flies generally end up mating with other hawthorn flies and apple flies generally end up mating with other apple flies.

In general, sympatric evolution occurs within populations that are not completely separate, but have separate behaviors or choices that ISOLATE them.



4. What data would you need to gather from the flies to determine if evolution (or speciation) was occurring in the groups?

5. Synthesis: **How does reproductive isolation differ in sympatric modes and allopatric modes of speciation?**