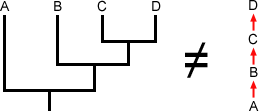
The process of evolution produces a pattern of relationships between species. As lineages evolve and split and modifications are inherited, their evolutionary paths diverge. This produces a branching pattern of evolutionary relationships. By studying inherited species' characteristics and other historical evidence, we can reconstruct evolutionary relationships and represent them on a "family tree," called a **phylogeny.**

To build a **phylogenetic tree**, biologists collect data about the heritable characters of each organism they are interested in, such as physical characteristics (morphology), genetic sequences, and behavioral traits. These characters are then compared across the organisms.



The more than 700 islands of the Caribbean are home to about 150 species of anoles, a closely related group of lizards (genus *Anolis*) that occupy diverse habitats and niches. Research on these lizards is enriching our understanding of evolutionary processes, such as adaptation by natural selection, evolution, and the formation of new species— and it is helping to illuminate how and why there are so many different kinds of living organisms on Earth.

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***Figure 2: Caribbean islands are home to the anoles.***

*The anole species featured in the film live on the islands of Cuba, Jamaica, Hispaniola (which comprises Haiti and the Dominican Republic), and Puerto Rico.*

**Part 1: Identifying Ecomorphs and Building a Phylogenetic Tree**

1. Examine the photographs of 16 species of anole lizards. Work together to develop a phylogenetic tree based on how they appear in the photographs.

1. As you build your phylogeny, discuss which lizards are most closely related to one another and explain your rationale for the various groupings.
2. Watch the first part of the film *Lizards in an Evolutionary Tree*  (until 06:48).
3. Revaluate your phylogeny based on the information provided in the short film.
4. What characteristics did you use to categorize your anoles in the phylogeny you constructed? Explain your reasoning.

An **ecological niche** is the role and position a species has in its environment; how it meets its needs for food and shelter, how it survives, and how it reproduces. A species' **niche** includes all of its interactions with the living and non-living factors of its environment.

Species of Caribbean anoles can be categorized into six groups according to their body characteristics (morphology) and the ecological niches they occupy. These categories are known as **ecomorphs**.

1. Did your groupings match the ecomorphs described? Why or why not?
2. Using the diagram below and the information from the film, choose one ecomorph and explain how the characteristics of that body type are adaptations to that ecomorph’s particular habitat.



1. Morphology can be useful in helping determine phylogeny, however DNA evidence often gives us a much different picture of the true relationships between species.
2. You will now examine two phylogenetic trees from a website (Phylogeny.fr) that generates phylogenetic trees based on DNA sequences.
3. Using the list of lizard species on the following page, color code one phylogenetic tree according to the ecomorph similarity.
   1. Color all branches that lead to grass-bush anoles **green**
   2. Color all branches that lead to twig anoles **red**
   3. Color all branches that lead to truck-ground anoles **blue**
   4. Color all branches that lead to trunk-crown anoles **yellow**
4. Using the list of lizard species, color code the other phylogenetic tree according to the island they are found on.
   1. Color all branches of lizards that are found on Puerto Rico **green**
   2. Color all branches of lizards that are found on Cuba **red**
   3. Color all branches of lizards that are found on Jamaica **blue**
   4. Color all branches of lizards that are found on Hispanola **yellow**



**Part 2: Evaluating Phylogenies and Exploring Anole Adaptive Radiation**

1. Watch the next segment of the film *Lizards in an Evolutionary Tree*  (06:48-12:48).
2. Explain how geographical isolation and sexual selection for dewlap color has driven the speciation of anole lizards on these islands.
3. Watch the final segment of the film *Lizards in an Evolutionary Tree*  (starting at 12:48).

In evolutionary biology, **adaptive radiation** is a process in which organisms diversify rapidly into a multitude of new forms, particularly when a change in the environment makes new resources available, creates new challenges, or opens new environmental niches.

1. Explain how the different ecomorphs are an example of adaptive radiation.
2. Based on the trees you color-coded and the information form the film, develop a claim about whether the species that belong to the same ecomorph or the species that live on the same islands are more closely related to each other. Justify your claim with several pieces of evidence.