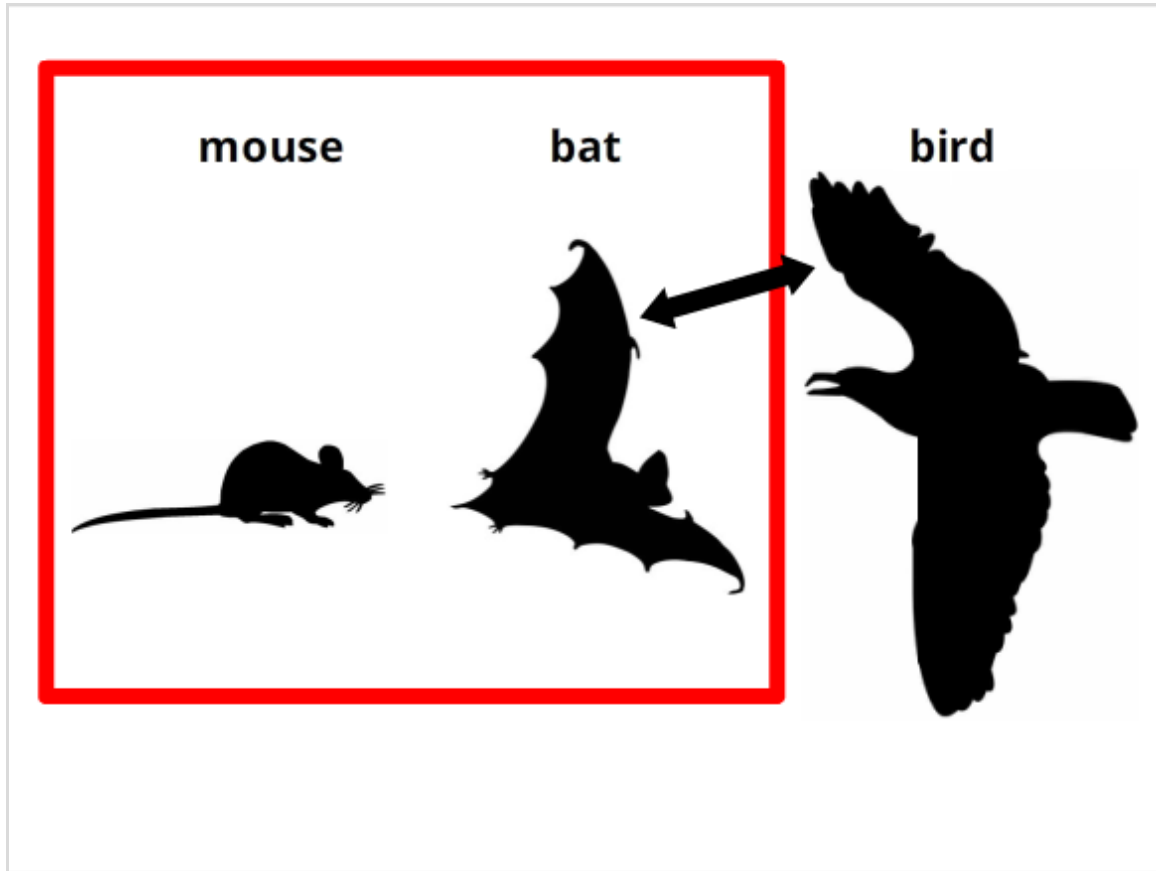


## Module 9: Classification – The Basics

### Topic 2 Content: Cladograms

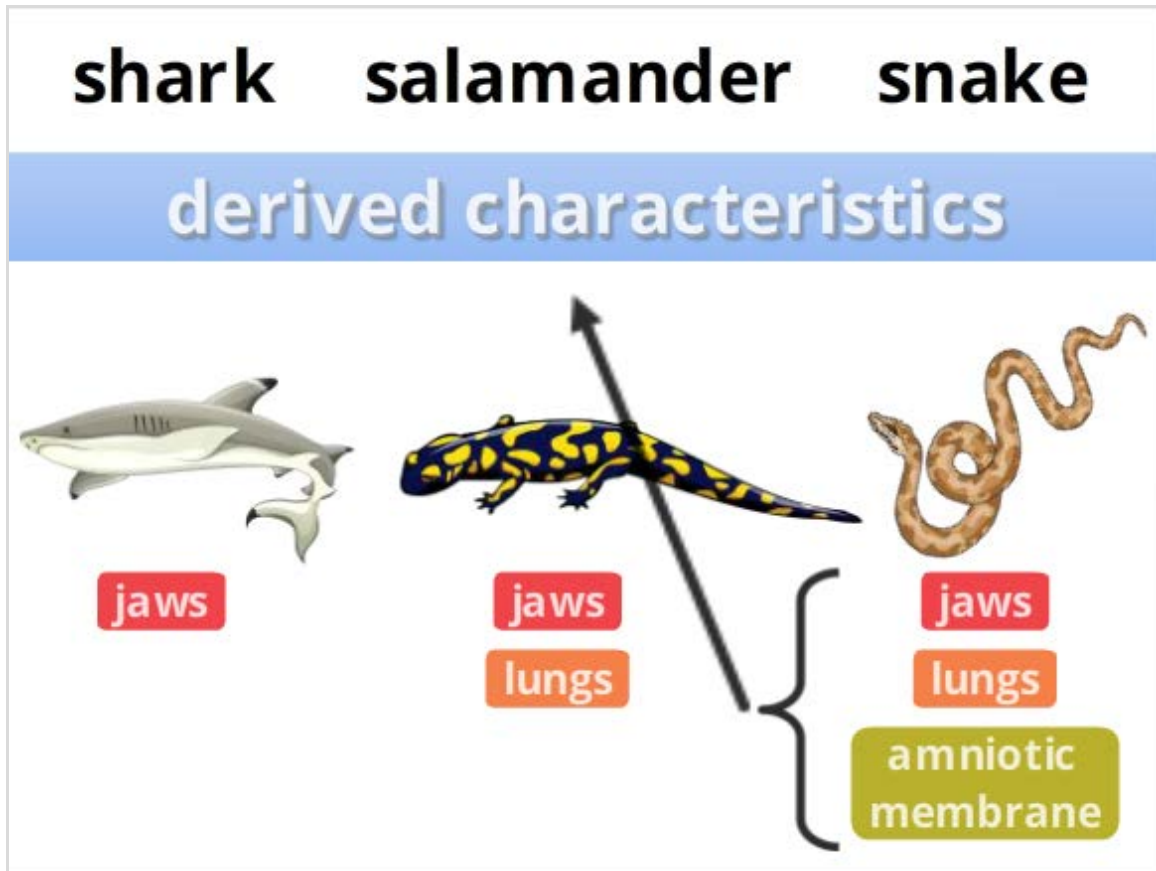
#### Introduction



Early taxonomists classified organisms according to their physical features. Relying solely on physical characteristics, you might conclude that bats and birds are closely related because both organisms have wings. However, bats are actually more closely related to rodents than they are to birds. Why is it, then, that rodents such as mice do not have wings? Although bats and rodents have a common ancestor, bats evolved to fly with wings whereas mice did not. On the other hand, birds evolved to fly with wings, but the wings of birds and bats evolved independently. As you can see, in order to accurately classify organisms according to how they are related, you must consider evolutionary relationships and not just physical similarities.



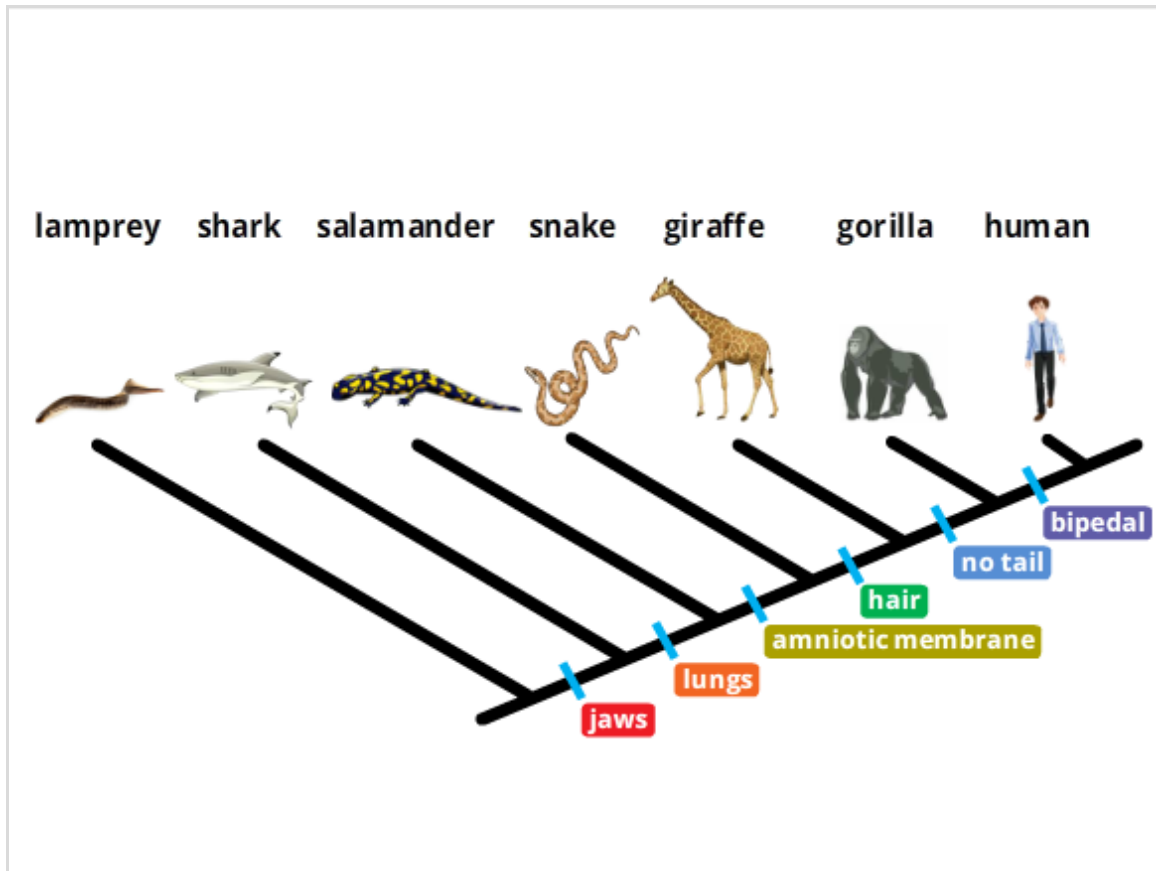
Module 9: Classification – The Basics  
Topic 2 Content: Cladograms



As a species of a clade evolve over time, some traits remain the same while others change. The traits that have remained in some species of a clade but not in other species of the same clade can be used to determine evolutionary relationships among the species. These traits are called derived characteristics. Cladograms indicate how species are related to each other based on derived characteristics.

# Module 9: Classification – The Basics

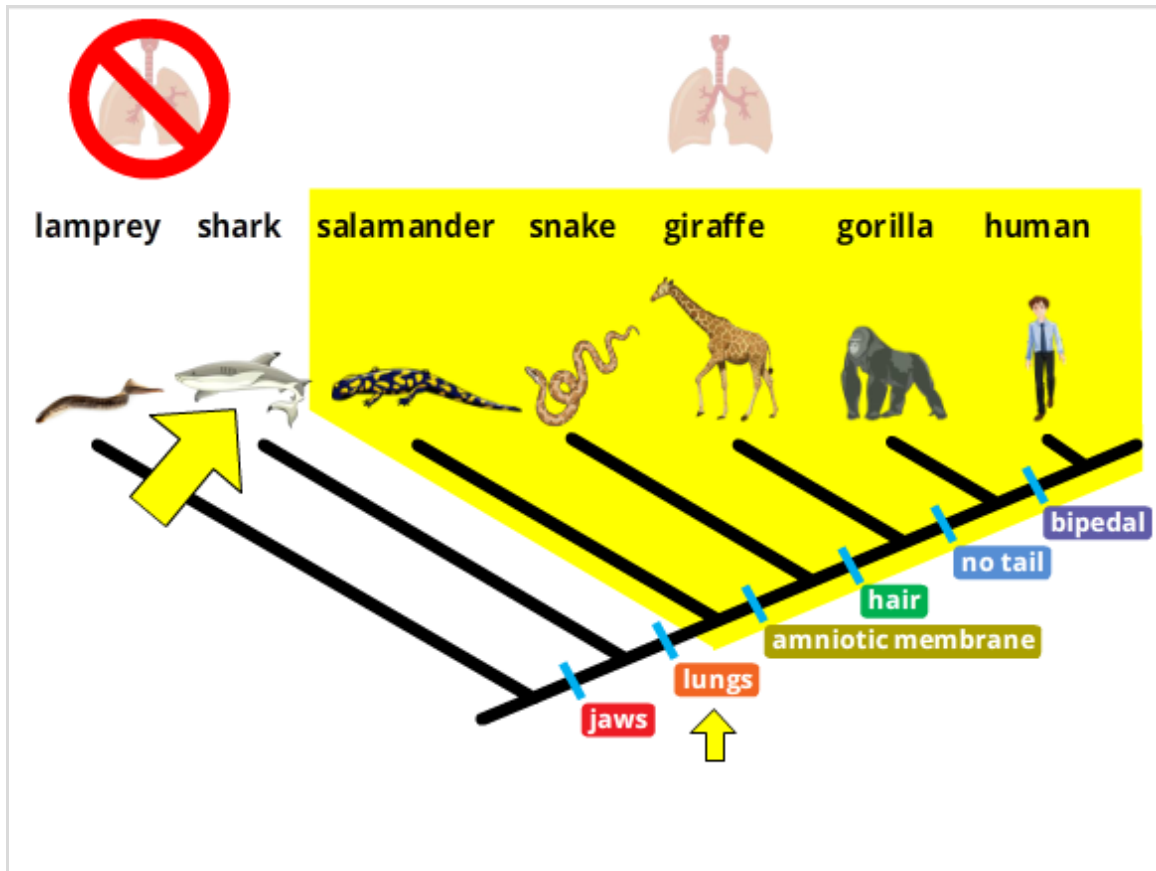
## Topic 2 Content: Cladograms



Notice how a cladogram takes on the shape of the letter "V." At the top you will see different species that are connected by branches. All the organisms to the right of the branch belong to the same clade. A node is the intersection of each branch and represents the most recent common ancestor of the entire clade. Between the nodes, there are hash marks that represent the derived characteristics.

# Module 9: Classification – The Basics

## Topic 2 Content: Cladograms



Organisms that branch off to the right of a derived characteristic share that trait, whereas animals that are to the left of the derived characteristic do not have that trait. In this example cladogram, lungs are a derived characteristic. Because the shark branches off to the left of the lungs trait, you know that lungs did not evolve in sharks. If you snip the cladogram between the shark and salamander branches, you are left with a clade that includes salamanders, snakes, giraffes, gorillas, and humans. Notice that snakes no longer have four limbs as salamanders, giraffes, gorillas, and humans do. Nevertheless, snakes still belong to the same clade because they share a common ancestor.