

Cladograms

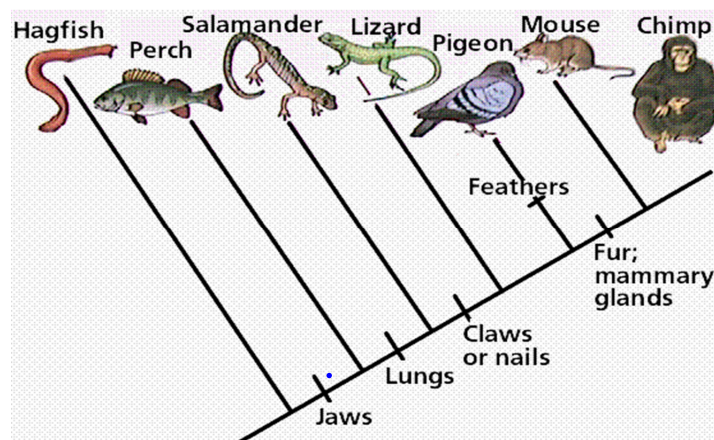
Standard: Students will evaluate the role of natural selection in the development of the theory of evolution.

Element: Explain the history of life in term of biodiversity, ancestry, and the rates of evolution.

EQ: What is a cladogram and how are they constructed?

Scientists show how organisms are related in a picture called a **cladogram**.

A **cladogram** is a diagram constructed using **shared, derived traits** that shows evolutionary **relationships** between organisms.



Cladograms

A **derived trait** is a characteristic of an organism that was **NOT** present in its **ancestors**.

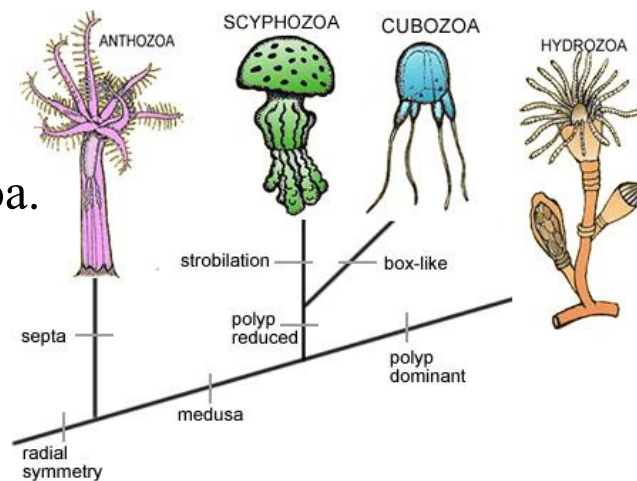
For example: the ancestors of **mammals** did not have **fur**. Since all mammals have some type of hair or fur, we say that having hair/fur is a **derived** trait that **all mammals share**.



Cladograms show which derived traits are **shared** between **different** types of organisms.

For instance, on this cladogram the trait for "**medusa**" (a type of body shape) is shared between scyphozoa, cubozoa, and hydrozoa.

Anthozoa does **NOT** have the **medusa** trait.

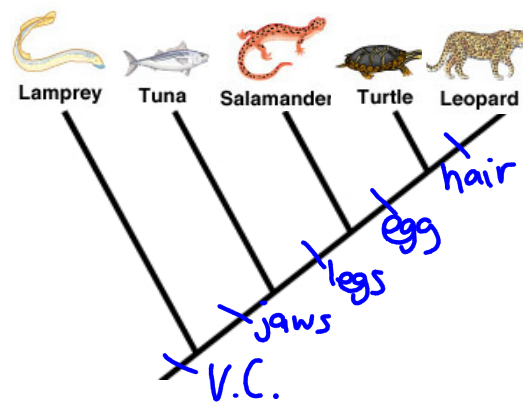


Cladograms

How to create a cladogram:

1. Make a chart that has a separate column for each **trait**.
2. Now make a separate row for each different **type of organism** that will be on your cladogram.
3. Check off which traits are **present** in each organism.
4. The organism with the **fewest** number of checks will go **first** in your cladogram, followed by the one with the **next lowest** number, etc.
5. Mark the **derived traits** on the finished cladogram in the correct order.

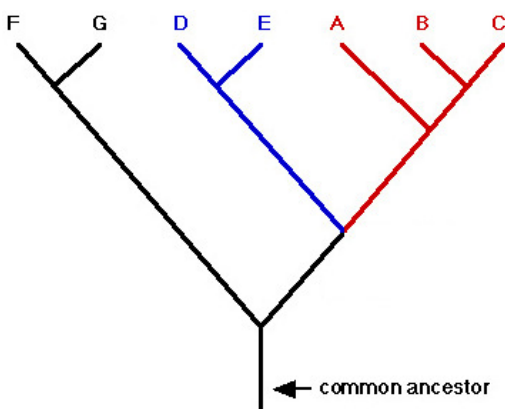
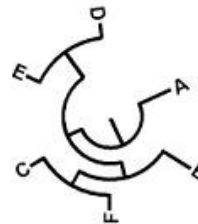
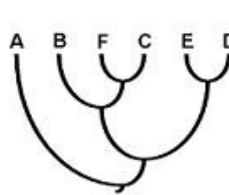
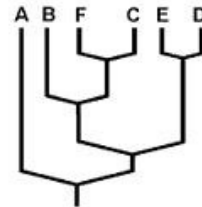
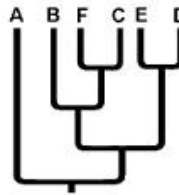
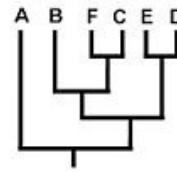
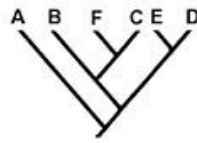
	tuna	leopard	lamprey	turtle	salamander
four walking legs		✓		✓	✓
amniotic egg		✓		✓	
hair		✓			
vertebral column	✓	✓	✓	✓	✓
jaws	✓	✓		✓	✓



Cladograms

Cladograms can have several different types of **shapes**.

Even though they **look different**, all of the cladograms to the right show the same **relationships** between A, B, C, D, E, and F.



*Species **D** and **E** are more **closely related** to each other than either is to species **A**.*

A cladogram shows us how **closely related** two species are to each other.

In this cladogram, the color-coding shows us the most closely related species. The **shorter** the distance to a common point, the **more closely related** the species are.

Cladograms

Let's practice with the organisms from *Walking with Monsters*.

	eyes	jaws	egg shells	lungs	exoskeleton	limbs	backbone	"sail" for temp. reg.	scaly skin
arthropods	✓				✓				
fish	✓	✓					✓		
mammal-like reptiles	✓	✓	✓	✓		✓	✓	✓	✓
reptiles	✓	✓	✓	✓		✓	✓		✓
amphibians	✓	✓		✓		✓	✓		

