Sorting Seashells

hhmi | BioInteractive

Click & Learn
Student Worksheet

INTRODUCTION

The biodiversity of **mollusks** — invertebrate animals with soft, unsegmented bodies — is stunning. Some mollusks, such as slugs, squid, and octopuses, typically do not have outer shells. But many others, including snails and clams, have shells that vary widely in size, shape, and color among different species. How can we use these diverse characteristics to organize species of mollusks and other organisms according to evolutionary relatedness?

In this activity, you will explore this question using a small selection of marine mollusks. In Part 1, you'll sort photos of the mollusks' shells based on characteristics you observe. In Part 2, you'll work through the *Sorting Seashells* Click & Learn to learn more about these mollusks and their evolutionary relationships. By doing this activity, you'll examine the usefulness of sorting organisms based on shared characteristics and explain how this information can be used to study evolutionary relationships in general.

MATERIALS

- "Shell Cards" available from the *Sorting Seashells* webpage

PART 1: SORTING SHELL CARDS

The "Shell Cards" show the shells of different marine mollusks, including cone snails, cowries, and other marine snails. Closely examine each shell on the cards, looking at both the front and back.

1. Sort the shells into **3–10 groups** in a way that makes sense to you. Describe how you sorted the shells below. You can list the numbers of the shells in each group or draw a quick diagram.

2. Describe the characteristics and reasoning you used to sort the shells.

3. What other information about the mollusks that had each shell would have been helpful to know when sorting the shells?

4. Select the definition that most closely describes what you did.

   a. **Taxonomy:** Organizing organisms into groups according to a set of rules, based on similarities or differences in their characteristics.

   b. **Phylogeny:** Making hypotheses about the evolutionary relationships among organisms, which can be based on similarities or differences in organisms' characteristics.

PART 2: BUILDING A PHYLOGENETIC TREE

Phylogeny is essential to modern taxonomy, which emphasizes evolutionary relatedness. One tool in phylogeny is the **phylogenetic tree**: a diagram showing proposed evolutionary relationships among different groups or species.

To build a phylogenetic tree of the mollusks you saw in Part 1, work through the Click & Learn *Sorting Seashells*. In this Click & Learn, you can explore the shells of the mollusks in more detail. Click on each shell photo to open a short description and 3D view where the shell can be rotated and magnified.

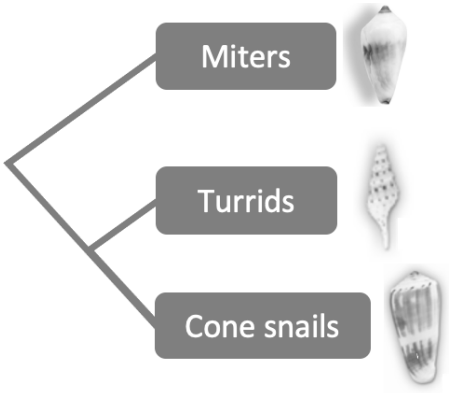
Use the Click & Learn to answer the following questions.

5. Which type of mollusk was chosen as the first outgroup for the phylogenetic tree? Explain at least **two** ways in which that type of mollusk significantly differs from the others. (*Hint*: Watch the video clip called "Dr. Olivera discusses major molluscan groups.")

6. Explain what the branches on a phylogenetic tree represent.

7. Describe one example from the Click & Learn in which shell texture, color, or shape was not a reliable indicator of evolutionary relationships. What was a more reliable indicator in that case?

8. Some of these snails produce venom that could be used to make new medicines. As mentioned in the Click & Learn, turrids and cone snails produce venom, but miters do not.
   a. Using the tree below, label or describe where the venom system most likely evolved.



   b. Suggest at least one other scenario for where the venom system evolved. Why is this scenario less likely than the one you chose above?

9. How does the final phylogenetic tree in the Click & Learn compare to the groups you made in Question 1?

10. The phylogenetic tree in the Click & Learn was built based on morphological characteristics. Which other characteristics of organisms could be used to build a phylogenetic tree?