

## Seashell Phylogeny and Evolution Teacher Guide

The seashell phylogeny and evolution activity is an interactive online activity that can be done in class or assigned as homework. This document describes supporting resources that can be used to teach students about seashells and a pre-activity exercise that uses picture cards to familiarize students with the concept of sorting organisms.

### Key Concepts

1. Phylogeny is based on evolutionary relationships.
2. A phylogenetic tree can be built by identifying the most dissimilar members in a group of organisms.
3. A phylogenetic tree can be built by identifying the most similar members in a group of organisms.
4. Hard remains such as fossils, bones, and shells may not give sufficient clues to group organisms correctly.
5. Superficial similarity does not always indicate a close evolutionary relationship.
6. Even experts do not always agree on the subtleties of some evolutionary relationships.

### Pre-Activity Video Clip Suggestions

The shells used in the activity are from marine molluscs of the Philippines. The Indo-West Pacific region, including the Philippines, is rich in marine biodiversity.

If time allows, you can build excitement for the shell activity by showing students a mini-documentary of Philippines biodiversity (12 minutes), available at

[http://www.biointeractive.org/biodiversity/2009\\_maritime\\_culture.html](http://www.biointeractive.org/biodiversity/2009_maritime_culture.html)

Alternatively, you can show a brief video segment on the subject (2 minutes), which is found at

[http://www.biointeractive.org/biodiversity/2009\\_philippines\\_biodiversity.html](http://www.biointeractive.org/biodiversity/2009_philippines_biodiversity.html)

You can highlight the feeding behavior of a group of snails, called cone snails, which are included in the activity. Cone snails are venomous and carnivorous; some hunt fish, others hunt snails or worms. A fish-hunting species is shown in this video clip (2 minutes):

[http://www.biointeractive.org/biodiversity/2009\\_conus\\_catus\\_strikes\\_fish.html](http://www.biointeractive.org/biodiversity/2009_conus_catus_strikes_fish.html)

You may also show an extended video feature on cone snails (13 minutes), available at

[http://www.biointeractive.org/biodiversity/2009\\_versatile\\_hunters.html](http://www.biointeractive.org/biodiversity/2009_versatile_hunters.html)

Other video clips related to cone snails can be found here:

<http://www.biointeractive.org/biodiversity/video.html>

You can download these videos by following the download instructions on their respective pages. You can also find these videos on the DVD “Exploring Biodiversity: The Search for New Medicines,” available at no charge from HHMI.

### Pre-Activity Sorting Exercise

Picture cards of the shells are available in color and black and white under “Biodiversity and Evolutionary Trees—An Activity on Biological Classification” at <http://biointeractive.org/activities/index.html>. The pictures

are arranged so that two images (front and back) of each shell can be printed together and cut into a card twice the width of a regular playing card. This larger card is then folded and taped into a two-sided shell card.

Using these shell cards, briefly describe the shells to the students and allow them to sort the shells in a way that makes sense to them. They must create between 3 and 10 groups.

To help them group the shells, students can access an online virtual reality shell gallery that allows users to rotate the shells for closer examination at <http://www.biointeractive.org/activities/shells/gallery.html>

Ask students to explain why they sorted the shells the way they did. Discuss problems of sorting according to size, color, or texture, and why those characteristics are not necessarily indicative of evolutionary relationships.

### Making the Online Activity More Hands-On

As students progress through the online exercise, you can enhance the hands-on nature of the activity by drawing the resulting phylogenetic tree on a piece of paper and placing the shell cards on the appropriate branches. Teacher can also use the blackboard to build the consensus phylogenetic tree. Instead of drawing the branches, you could also use masking tape or pieces of string to represent them.

### Additional Enrichment Information

Links to related videos and animations are scattered throughout the online activity.

### Shell Phylogeny Reference and Shell Name Index



- |                               |                         |                                 |                       |
|-------------------------------|-------------------------|---------------------------------|-----------------------|
| 1. <i>Conus magus</i>         | The Magician's Cone     | 11. <i>Pecten pallium</i>       | The Ducal Mantle      |
| 2. <i>Neritina communis</i> * | Zigzag Nerite           | 12. <i>Cypraea tigris</i>       | The Tiger Cowrie      |
| 3. <i>Bursa nobilis</i>       | The Noble Frog Shell    | 13. <i>Conus ebraeus</i>        | The Hebrew Cone       |
| 4. <i>Conus capitaneus</i>    | The Captain's Cone      | 14. <i>Cypraea annulus</i> *    | The Ringed Cowrie     |
| 5. <i>Cypraea annulus</i> *   | The Ringed Cowrie       | 15. <i>Conus chaldeus</i>       | The Astrologer's cone |
| 6. <i>Conus marmoreus</i>     | The Marble Cone         | 16. <i>Neritina communis</i> *  | Zigzag Nerite         |
| 7. <i>Neritina communis</i> * | Zigzag Nerite           | 17. <i>Imbricaria conularis</i> | The Cone-shaped Miter |
| 8. <i>Distorsio anus</i>      | The Distorted Anus      | 18. <i>Conus circumcisis</i>    | Circumcision Cone     |
| 9. <i>Conus omaria</i>        | Omaria Cone             | 19. <i>Cypraea moneta</i>       | The Money Cowrie      |
| 10. <i>Cypraea isabella</i>   | Queen Isabella's Cowrie | 20. <i>Turris babylonia</i>     | Tower of Babel        |

\*Note that 2, 7, and 16 are all *Neritina communis*, and 5 and 14 are both *Cypraea annulus*. Only 2 and 5 are shown in the diagram above.