Evolutionary History

1.5: Finding Similarities with the Mystery Fossil
Students learn that the Mystery Fossil skeleton contained a fetal skeleton and consider how whales, wolves, and crocodiles give birth. (5 min)

To: Student Paleontologists  
From: Andre Mosley, Natural History Museum Director  
Subject: New Findings About the Mystery Fossil

Exciting news! We have finished putting the bones of the Mystery Fossil back together, and we found something amazing: The Mystery Fossil was pregnant! We found a tiny baby fossil—a baby Mystery Fossil—inside her body!

I know you are working to decide where to place the Mystery Fossil in the museum and that you are using similar structures to help you decide where to place it. Maybe the baby we found inside can help you decide what the Mystery Fossil is similar to: whales, wolves, or crocodiles?

The discovery of the baby fossil’s skeleton inside the Mystery Fossil tells us that the Mystery Fossil came from a species that carried its young inside them until they were born. What do you know about how whales, wolves, or crocodiles carry their babies?
Students take live birth into account as they weigh claims that the Mystery Fossil shares a common ancestor respectively with whales, wolves, or crocodiles. (10 min)

The fact that the Mystery Fossil had a baby inside of it is information that can be used as evidence to support or refute (go against) one of the claims.

Look at the Claims chart on the wall and review each claim. If students are using digital devices, point out that the claims are also on their screens.
Students take live birth into account as they weigh claims that the Mystery Fossil shares a common ancestor respectively with whales, wolves, or crocodiles. (10 min)

Whether a species gives live birth or lays eggs is something that is passed down from ancestor populations, just like body structures are passed down. In fact, special body structures are passed down to allow egg layers to lay eggs and to allow organisms that give live birth to do so.

These kinds of body structures are not always bone structures: As we’ve seen, there are many other kinds of body structures, too. For example, some body structures allow some organisms to produce milk, as we saw in the article “How You Are Like a Blue Whale.”
Students take live birth into account as they weigh claims that the Mystery Fossil shares a common ancestor respectively with whales, wolves, or crocodiles. (10 min)

The Mystery Fossil looks a lot like a crocodile, and it shares many similar body structures with crocodiles. It also shares many similar body structures with both whales and wolves.

However, it actually shares an important feature with whales and wolves that it does not share with crocodiles: The Mystery Fossil, the whale, and the wolf all have live births, while the crocodile does not.

This suggests that the whale, the wolf, and the Mystery Fossil must have inherited live birth from the same ancestor population, which means that the Mystery Fossil shares an ancestor population with the whale and the wolf that is not shared by the crocodile.
Students take live birth into account as they weigh claims that the Mystery Fossil shares a common ancestor respectively with whales, wolves, or crocodiles. (10 min)

An evolutionary tree, the kind of diagram we’ve been looking at in the article and in the Sim, is a visual way for paleontologists to organize the information they have about life on Earth across millions of years. One kind of information they use to create and organize the tree is about the many shared structures that different organisms have.

The Natural History Museum wants to organize the fossils in its exhibits, using methods that paleontologists use. By applying these methods, we can consider similarities in structures as we think about the claims for placing the Mystery Fossil in the museum. Later in this unit, you will learn about other information that paleontologists use to organize the tree.
Where in the museum does this new fossil belong?

- Claim 1: The Mystery Fossil belongs with the whales, in the Whale (Cetacea) exhibit.
- Claim 2: The Mystery Fossil belongs with the wolves, in the Carnivore (Carnivora) exhibit.
- Claim 3: The Mystery Fossil belongs with the crocodiles, in the Reptile (Reptilia) exhibit.

Your are left to consider the other two claims.
Students find structural similarities among the Mystery Fossil, the whale, and the wolf. Students then consider what a common ancestor might have looked like. (15 min)

**Make careful and precise comparisons.** These comparisons are important because the list of shared structures that you find may be used as evidence when you are ready to make or support claims about the organism(s) you are examining.

**Why do different species share similar structures?** You now know that two species share similar structures if both species inherited those structures from a common ancestor.

**Finding Similar Structures**

Paleontologists look for shared body structures in different species. There are many different body structures and some of them can be difficult to find. Which of the body structures in the list can you find in each of the species below?
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EH 1.5.3 COMPARING THE MYSTERY FOSSIL TO WHALES AND WOLVES

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Finding Similar Structures

Paleontologists look for shared body structures in different species. There are many different body structures and some of them can be difficult to find. Which of the body structures in the list can you find in each of the species below?

Select all the structures that the Mystery Fossil has:

- skull
- teeth
- neck bones
- "one, two, many" front limb structure
- rib bones
- backbone
- hip bone (pelvis)
- back limbs (legs)
- tail
Students find structural similarities among the Mystery Fossil, the whale, and the wolf. Students then consider what a common ancestor might have looked like. (1.5 min)

Discussion Questions

1. Which bone structures are similar between the Mystery Fossil, whale, and wolf?

2. Based on your answer to Question 1, what structures would a common ancestor of whales, wolves, and the Mystery Fossil share?
EH 1.5.3 COMPARING THE MYSTERY FOSSIL TO WHALES AND WOLVES

Students find structural similarities among the Mystery Fossil, the whale, and the wolf. Students then consider what a common ancestor might have looked like. (15 min)

- Summarize the results of your search for specific structures.
- What do you think the results indicate about these three different species?
- Why are the bone structures of a living species similar to those of an extinct species?
- How can two species that seem so different can have so many shared structures?

- They share a common ancestor; they inherited all of these structures from the same common ancestor.
Students make a model that shows a likely common ancestor based on structures shared between two new, imaginary species. (15 min)
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The Modeling Tool is a tool that allows you to create a diagram to show your ideas about shared structures and evolutionary trees. It will not give you feedback about whether your ideas are accurate or not, but you should still do your best to show well-developed, clear thinking. Scientists create models such as this one to share their ideas about how the world works.
Determine the relationships between the three species and predict the structures of Species A.
Instructions

Goal
Determine the relationships between the three species and predict the structures of Species A.

Do
- Press each structure of Species A.
  - Use a blue structure to indicate that Species A has that structure.
  - Use an X to indicate that Species A does not have that structure.
  - Use a gray structure with a question mark to indicate that you do not know whether Species A has that structure.
- Press INDICATE ORGANISM TYPE and select an option for each species.
Determine the relationships between the three species and predict the structures of Species A.

Species A

Species B

descendant species

Species C

descendant species

common ancestor population
Determine the relationships between the three species and predict the structures of Species A.
EH 1.5.4 PREDICTING BODY STRUCTURES OF A COMMON ANCESTOR

Students make a model that shows a likely common ancestor based on structures shared between two new, imaginary species. (15 min)

Modeling Body Structures
Launch the *Evolutionary History* Modeling Tool activity: *Shared Structures*.

**Goal:** Determine the relationships between the three species and predict the structures of Species A.

**Do:**

- Press each structure of Species A and choose the most likely appearance of the structure.
  - Use a blue structure to indicate that Species A has that structure.
  - Use an X to indicate that Species A does not have that structure.
  - Use a gray structure with a question mark to indicate that you do not know whether Species A has that structure.
- Press INDICATE ORGANISM TYPE and select an option for each species.
Modeling Body Structures
Launch the Evolutionary History Modeling Tool activity: Shared Structures.

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  - Use an X to indicate that Species A does not have that structure.
  - Use a gray structure with a question mark to indicate that you do not know whether Species A has that structure.
- Press INDICATE ORGANISM TYPE and select an option for each species.
How did you label the three species?
Species B and C are descendants; Species A is the common ancestor.

What are the shared structures between Species B and C? Are they exactly the same?
Tail, backbone, hind limbs, and nostrils are shared structures. The nostrils and backbone are the same, but there are differences in the hind limbs and tails.

What structures do you think Species A had? Why?
Species A had a tail, backbone, hind limbs, and nostrils because these are all shared structures in Species B and C. I do not know whether Species A had front limbs.
Check Your Understanding

Note: If you do not have access to Amplify Science at home, your teacher will provide you with an alternate way to complete this homework.

This is a chance for you to reflect on your learning so far. This is not a test. Be open and truthful when you respond to the questions below.

Scientists investigate in order to figure things out. Are you getting closer to figuring out where to put the Mystery Fossil in the museum?

1. I understand how the Mystery Fossil can provide information about its environment.
   - yes
   - not yet

2. I understand why the shared body structures between the Mystery Fossil, whales, and wolves also have differences.
   - yes
   - not yet

3. I understand the process that happened to make the Mystery Fossil, whales, and wolves change from a common ancestor population.
   - yes
   - not yet

4. What are you still wondering about as you consider similarities and differences between species?