DRAG & DROP HERE TO ADD TO YOUR FIELD BOOK

NAVIGATION

Move forward using the → key or click **NEXT**.

Move back using the ← key or click **BACK**.

Do not close your internet browser or you will lose your work.

TOOLS

- Click help if you are confused.
- Hover pointer over images to get more information.
- Click and drag items to the timeline or to your Field Book.
- Use the comment box to make notes, justify answers, and ask questions.

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Trait Tracker

How well do you know your body? How long did it take evolution to put together the pieces that would eventually be you?

Some of our traits evolved a long time ago, but some are relatively recent. Which are which? Time to find out using the TRAIT TRACKER!

BEGIN

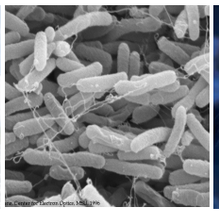
DRAG & DROP HERE TO ADD TO YOUR FIELD BOOK

Traits that we share with other organisms.

In this activity we will discover traits that we share with other organisms and use fossil evidence to learn when these traits evolved. Are any of these organisms unfamiliar to you? If so, hover over images to learn more.

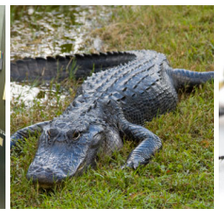

Ring-tailed lemur


Swordfish


Bacteria


Moon jellyfish


Paleontologist


Alligator


Rhino beetle

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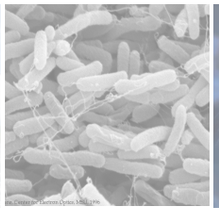
Bacteria


Moon jellyfish


Paleontologist


Alligator


Rhino beetle

Lemur catta
These tree-dwelling primates are native to Madagascar. They live in social groups called troops.

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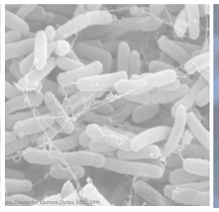
Bacteria


Moon jellyfish


Paleontologist


Alligator


Rhino beetle

Xiphias gladius
Swordfish live in the Atlantic, Pacific, and Indian Oceans and use their "sword" to slash prey.

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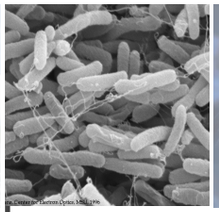

Bacteria

Escherichia coli
Some varieties cause disease, but others live in human digestive tracts and help break down food.

Moon jellyfish

Paleontologist

Alligator

Rhino beetle

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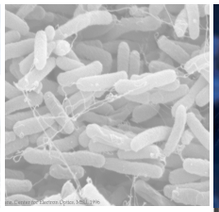

Bacteria

Moon jellyfish

Paleontologist

Alligator

Rhino beetle

Aurelia aurita
Moon jellyfish capture small prey using toxic tentacles and can grow 10 – 16 inches (25 – 40 cm) in diameter.

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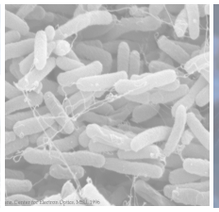
Swordfish



Bacteria

Moon jellyfish

Paleontologist

Alligator

Rhino beetle

Homo sapiens
Matt Carrano is a paleontologist at the National Museum of Natural History. Most summers he can be found in the desert looking for dinosaurs.

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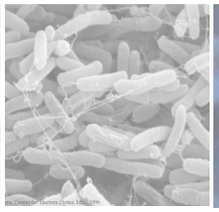
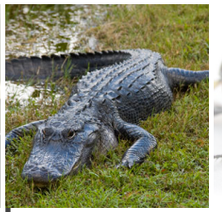


Bacteria

Moon jellyfish

Paleontologist



Alligator

Alligator mississippiensis
Alligators are apex predators, found in wetland environments of the southeastern United States.

Rhino beetle

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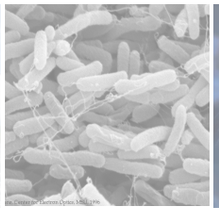
Swordfish



Bacteria

Moon jellyfish

Paleontologist

Alligator

Rhino beetle

Oryctes nasicornis
These insects spend their first 2 – 4 years as grubs, but only live for a few months as adults.

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Which organisms share these traits with you?

Each of the traits we'll investigate here had a big effect on the evolution of humans and other organisms. Start exploring them by determining which organisms share each trait with you.

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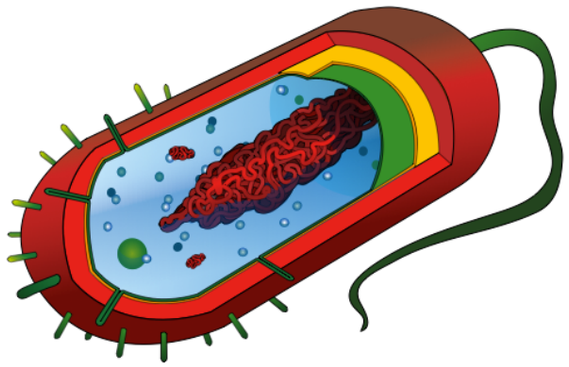
Check the box if the organism shares this trait with humans. Click next when you are ready to move onto the next trait.

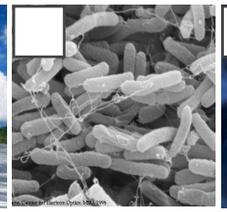


Humans are cellular.
Cells are the basic building blocks of life. A cell is a microscopic unit that contains genetic material, cytoplasm, and the other chemicals, proteins, and structures needed to maintain life.

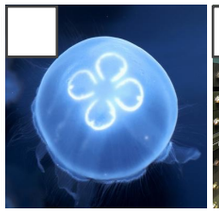
Bacteria

Ring-tailed lemur

Swordfish

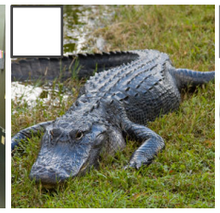


Bacteria



Moon jellyfish

Paleontologist



Alligator

Rhino beetle

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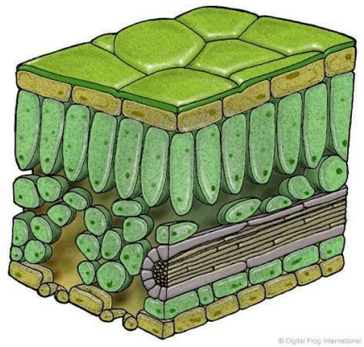
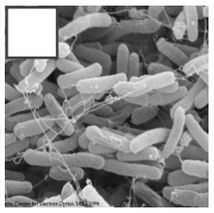


Leaf cross-section

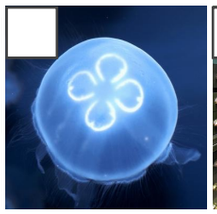
Humans are multicellular.
A multicellular organism contains many different cells working together. These cells have specialized functions, and one cell cannot survive independent of the others.

Ring-tailed lemur

Swordfish



Bacteria



Moon jellyfish

Paleontologist

Alligator

Rhino beetle

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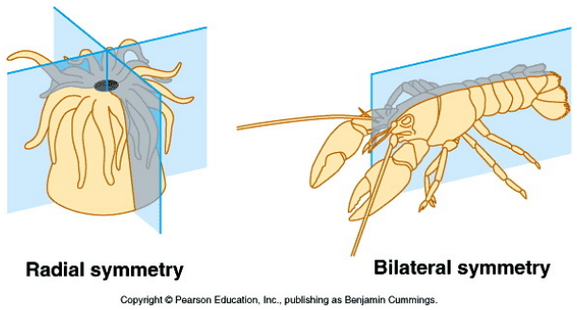


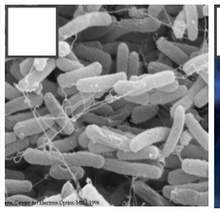
Humans have bilateral symmetry.

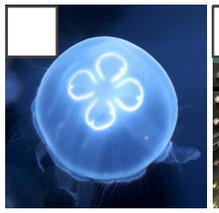
An animal with bilateral symmetry has one and only one plane of symmetry. An imaginary line drawn from head to tail on an animal with bilateral symmetry will result in two identical halves. If there is more than one way you could divide an animal that results in identical halves, this animal has radial symmetry instead.

Sea anemone and lobster


Ring-tailed lemur


Swordfish


Bacteria


Moon jellyfish


Paleontologist


Alligator


Rhino beetle

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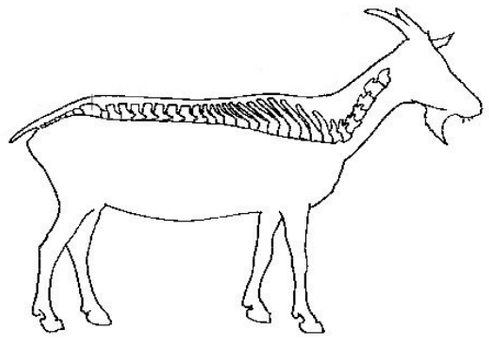


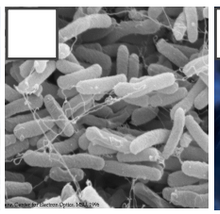
Goat

Humans are vertebrates.

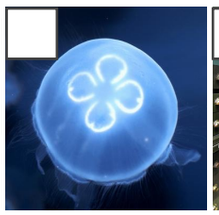
A vertebrate is an animal with a backbone. This backbone is composed of many smaller bones, called vertebrae. The vertebrae protect a bundle of nerves, the spinal cord.

Ring-tailed lemur

Swordfish

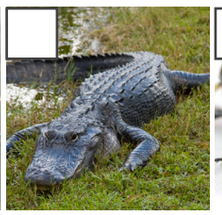


Bacteria



Moon jellyfish

Paleontologist



Alligator

Rhino beetle

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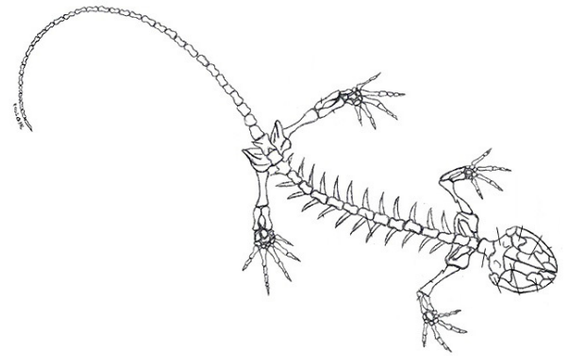


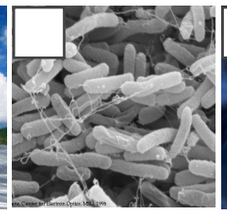
Humans are tetrapods.

A tetrapod is an animal with four feet or limbs, or any animal that evolved from a tetrapod. In some tetrapods, these limbs have evolved into structures that help the animal move through air or water.

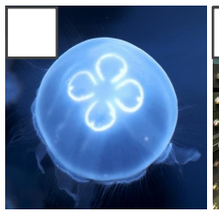
Salamander

Ring-tailed lemur

Swordfish

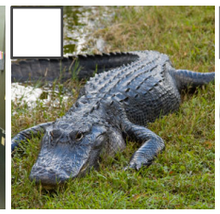


Bacteria



Moon jellyfish

Paleontologist



Alligator

Rhino beetle

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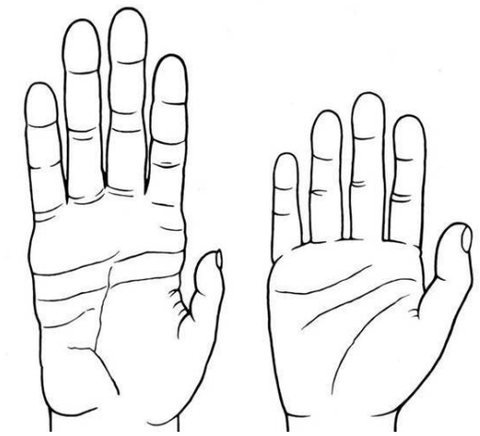
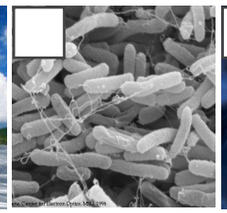


Chimpanzee and Human hands

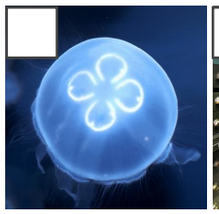
Humans have opposable thumbs.
An opposable thumb is a specialized finger that can be held opposite to the other fingers of the hand. This allows for grasping and fine manipulation of objects.

Ring-tailed lemur

Swordfish

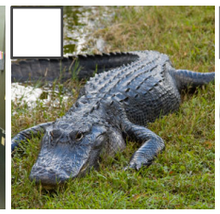


Bacteria



Moon jellyfish

Paleontologist



Alligator

Rhino beetle

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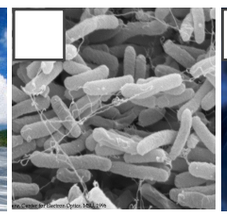
Check the box if the organism shares this trait with humans. Click next when you are ready to move onto the next trait.

Human

Humans are bipedal.
An animal is bipedal if it walks on its two hind legs. This leaves the front legs free to use for purposes other than locomotion.

Ring-tailed lemur

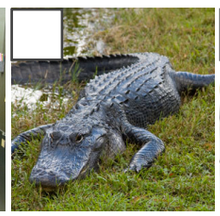
Swordfish



Bacteria

Moon jellyfish

Paleontologist



Alligator

Rhino beetle

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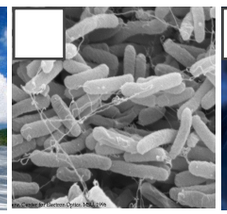
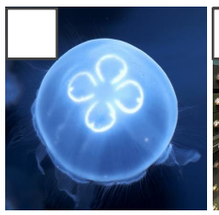
Ring-tailed lemur

Swordfish

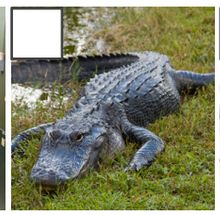


Bacteria



Moon jellyfish

Paleontologist



Alligator

Rhino beetle

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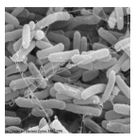
Scientist check-in

✓ = SCIENTIST ○ = YOU

How did you do? Do you want to try again? YES NO

If you are confused, hover over answers for explanations.

		CELLULAR	MULTI-CELLULAR	BILATERAL SYMMETRY	VERTEBRATE	TETRAPOD	OPPOSABLE THUMBS	BIPEDALISM
Bacteria *Escherichia coli*		✓	○					
Ring-tailed lemur *Lemur catta*		✓	✓	✓	✓	✓	✓	
Rhino beetle *Oryctes nasicornis*		✓	✓	✓	○			
Swordfish *Xiphias gladius*		✓	✓	✓	✓	○		
Moon jellyfish *Aurelia aurita*		✓	✓	○				
Alligator *Alligator mississippiensis*		✓	✓	✓	✓	✓		○
Paleontologist *Homo sapiens*		✓	✓	✓	✓	✓	✓	✓

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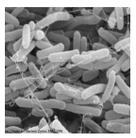
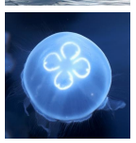
If you are confused, hover over answers for explanations.

	CELLULAR	MULTI-CELLULAR	BILATERAL SYMMETRY	VERTEBRATE	TETRAPOD	OPPOSABLE THUMBS	BIPEDALISM
Bacteria *Escherichia coli* 	✓	○					
Ring-tailed lemur *Lemur catta* 	✓	✓	✓	✓	✓	✓	
Rhino beetle *Oryctes nasicornis* 	✓	✓	✓	○			
Swordfish *Xiphias gladius* 	✓	✓	✓	✓	○		
Moon jellyfish *Aurelia aurita* 	✓	✓	○				
Alligator *Alligator mississippiensis* 	✓	✓	✓	✓	✓		○
Paleontologist *Homo sapiens* 	✓	✓	✓	✓	✓	✓	✓

A moon jellyfish has radial symmetry. It can be divided into identical halves many different ways.

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DRAG & DROP HERE TO ADD TO YOUR FIELD BOOK

Write explanation here...

The tree of life.

Now we've learned that animals share traits with us, but how did this happen?

We share traits with other animals because we have **common ancestry**. All living organisms in the world are related. The more closely related we are, the more traits we share.

Using the **fossil record**, scientists are able to trace the family tree of life back in time and determine when these traits appeared in our ancestors.

Which organisms do we share the most traits with? Which organisms do we share the least with? Write your answer in the Field Book.

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When do you think the different traits emerged?

When do you think these human traits appeared? Why might we share some traits with many organisms, but other traits with only a few? Remember that we share common ancestors. **Drag traits to the timeline. Try to estimate what order they evolved in and when. Click on the timeline to write in the dates.**

4.5 B.Y.A. ---------- TODAY

OPPOSABLE THUMBS

BIPEDALISM

VERTEBRATE

MULTI-CELLULAR

TETRAPOD

CELLULAR

BILATERAL SYMMETRY

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4.5 B.Y.A. ---------- TODAY

CELLULAR | MULTI-CELLULAR | BILATERAL SYMMETRY

OPPOSABLE THUMBS | BIPEDALISM | VERTEBRATE | TETRAPOD

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DRAG & DROP HERE TO ADD TO YOUR FIELD BOOK

Write explanation here...

When do you think the different traits emerged?

Drag traits to the timeline. Try to estimate what order they evolved in and when. Click on the timeline to write in the dates, but don't worry. You'll be able to edit your answers later. Write your reasoning in your Field Book.

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DRAG & DROP HERE TO ADD TO YOUR FIELD BOOK

Write explanation here...

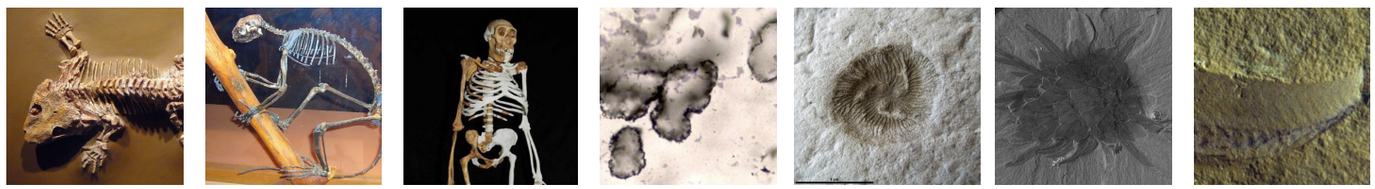
What fossils show evidence for these traits?

The study of fossils is one of the ways scientists can track evolution through time.

Find the fossil that shows the earliest evidence for each of the traits and drag it to that space.

4.5 B.Y.A. ---- 3 bya ---- 2 bya ---- 1 bya ---- 500 mya ---- 20 mya ---- TODAY

CELLULAR	MULTI-CELLULAR	BILATERAL SYMMETRY	TETRAPOD	VERTEBRATE	OPPOSABLE THUMBS	BIPEDALISM



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DRAG & DROP HERE TO ADD TO YOUR FIELD BOOK

What fossils show evidence for these traits?

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Find the fossil that shows the earliest evidence for each of the traits and drag it to that space. Do you want to adjust the order or timing of any of your traits?

4.5 B.Y.A. ---- 3 bya ---- 2 bya ---- 1 bya ---- 500 mya ---- 20 mya ---- TODAY

CELLULAR	MULTI-CELLULAR	BILATERAL SYMMETRY	TETRAPOD	VERTEBRATE	OPPOSABLE THUMBS	BIPEDALISM

Tribrachidium heraldicum
Tribrachidium lived on the sea floor and fed on microbial mats.

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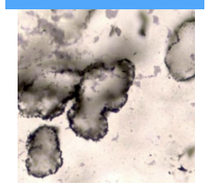
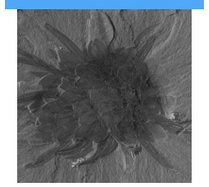
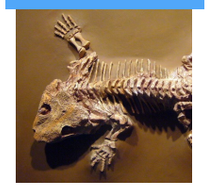
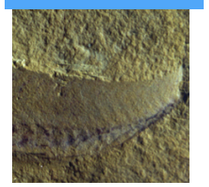
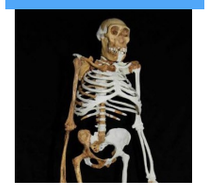
Do you want to adjust the order or timing of any of your traits? YES NO

4.5 B.Y.A. — 3 bya — 2 bya — 1 bya — 500 mya — 20 mya — TODAY

CELLULAR	MULTI-CELLULAR	BILATERAL SYMMETRY	TETRAPOD	VERTEBRATE	OPPOSABLE THUMBS	BIPEDALISM
						

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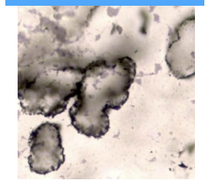
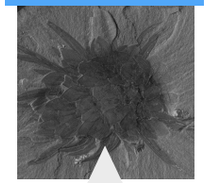
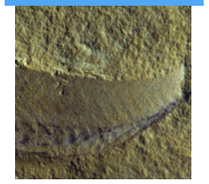
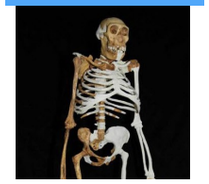
DRAG & DROP HERE TO ADD TO YOUR FIELD BOOK

What fossils show evidence for these traits?

Now you have been given dates for when the traits first appeared. Use these dates to create a new timeline. Compare your results to the order you estimated before. Do any of these findings surprise you?

4.5 B.Y.A. ---- 3 bya ---- 2 bya ---- 1 bya ---- 500 mya ---- 20 mya ---- TODAY

CELLULAR	MULTI-CELLULAR	BILATERAL SYMMETRY	TETRAPOD	VERTEBRATE	OPPOSABLE THUMBS	BIPEDALISM
						

Bilateral symmetry
First appeared: Ediacaran Period, 555 million years ago. Animals with bilateral symmetry have one plane of symmetry in a line that extends from tail to head.

4.5 B.Y.A. ---- TODAY

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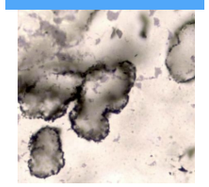
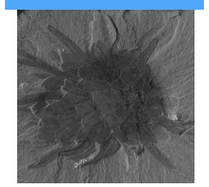
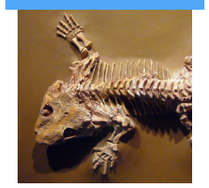
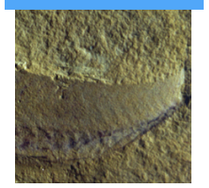
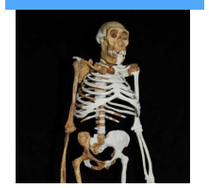
DRAG & DROP HERE TO ADD TO YOUR FIELD BOOK

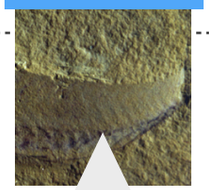
What fossils show evidence for these traits?

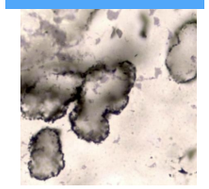
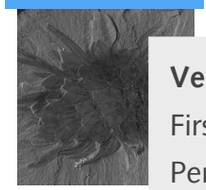
Now you have been given dates for when the traits first appeared. Use these dates to create a new timeline. Compare your results to the order you estimated before. Do any of these findings surprise you?

4.5 B.Y.A. ---- 3 bya ---- 2 bya ---- 1 bya ---- 500 mya ---- 20 mya ---- TODAY

CELLULAR	MULTI-CELLULAR	BILATERAL SYMMETRY	TETRAPOD	VERTEBRATE	OPPOSABLE THUMBS	BIPEDALISM
						

4.5 B.Y.A. ---- VERTEBRATE ---- TODAY



CELLULAR	MULTI-CELLULAR	BILATERAL SYMMETRY
		
3.5 B.Y.A.	580 M.Y.A	555 M.Y.A

Vertebrates
First appeared: Cambrian Period, 500 million years ago. Vertebrates are animals with a backbone.

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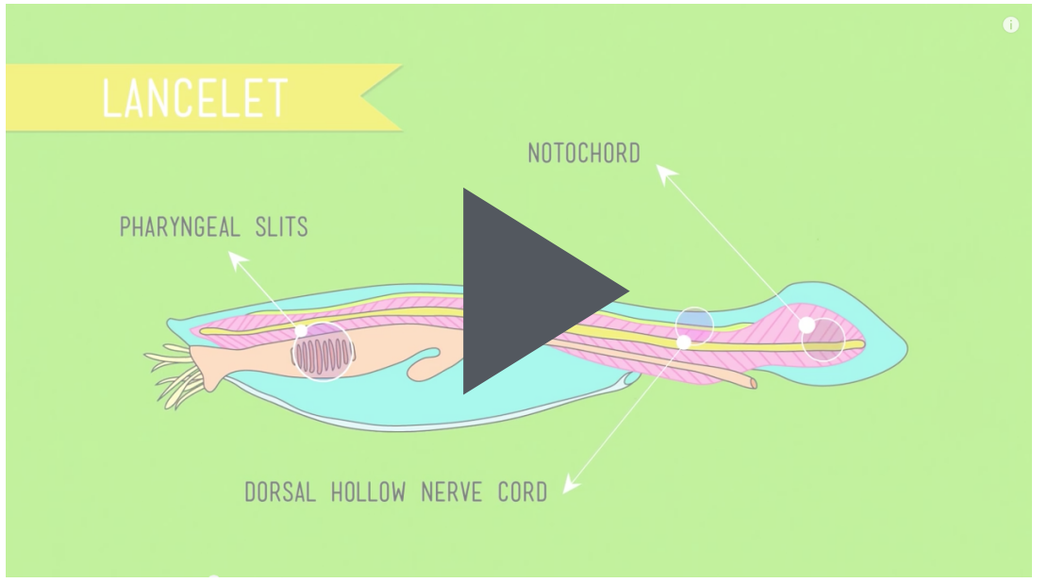
Scientist check-in

Now that you have completed your timeline, listen to the scientist talk about when these traits evolved and see if you came to the same conclusion. Remember: It's all right to adjust your findings. Scientists often change their conclusions when they get new data.



Using fossils to learn about evolution and time.

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Exploring time metaphors.

Scientists love to use models to show concepts that are difficult to see. Many models or metaphors have been used to depict the scale of time.

One popular model of time is comparing the history of the Earth to the length of a day. If the Earth formed at midnight, the first life wouldn't appear until 5:45 AM. Dinosaurs evolve at 10:49 PM, go extinct at 11:40 PM, and humans don't appear until 11:59:56 PM.

Now that you've built this timeline of critical human traits, can you think of other ways to depict it?

Choose one of the metaphors that you've seen or create your own to depict when these different traits may have arisen.

Upload your creation to your Field Book.

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FINISH