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.

NEXT →

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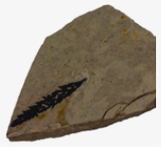
It's a Date!

How old is this fossil? 

Not even paleontologists can tell how old a fossil is just by looking at it. In this activity, you'll discover how paleontologists use STRATIGRAPHY, RELATIVE DATING, and ABSOLUTE DATING to learn about the fossils they find in the field.

BEGIN

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Write explanation here...

Introducing the hillside

Take a look at this hillside. Which rock layer do you think is the oldest, and which do you think is the youngest? Why?

Explain your answer in the comment box in your field book.

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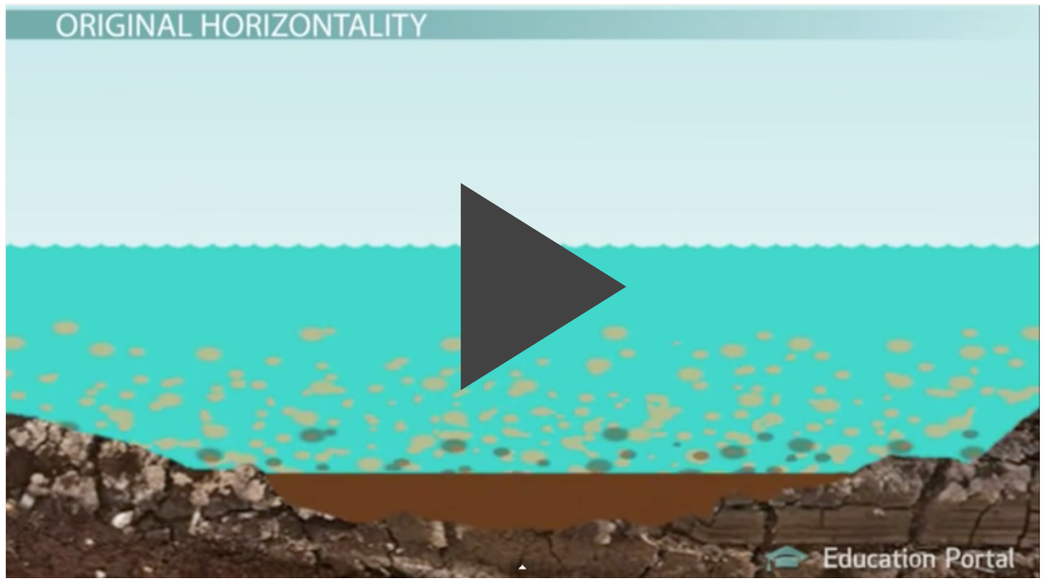
Understanding Stratigraphy



Investigate how rock layers are formed and shaped, and how we can use them to date fossils.

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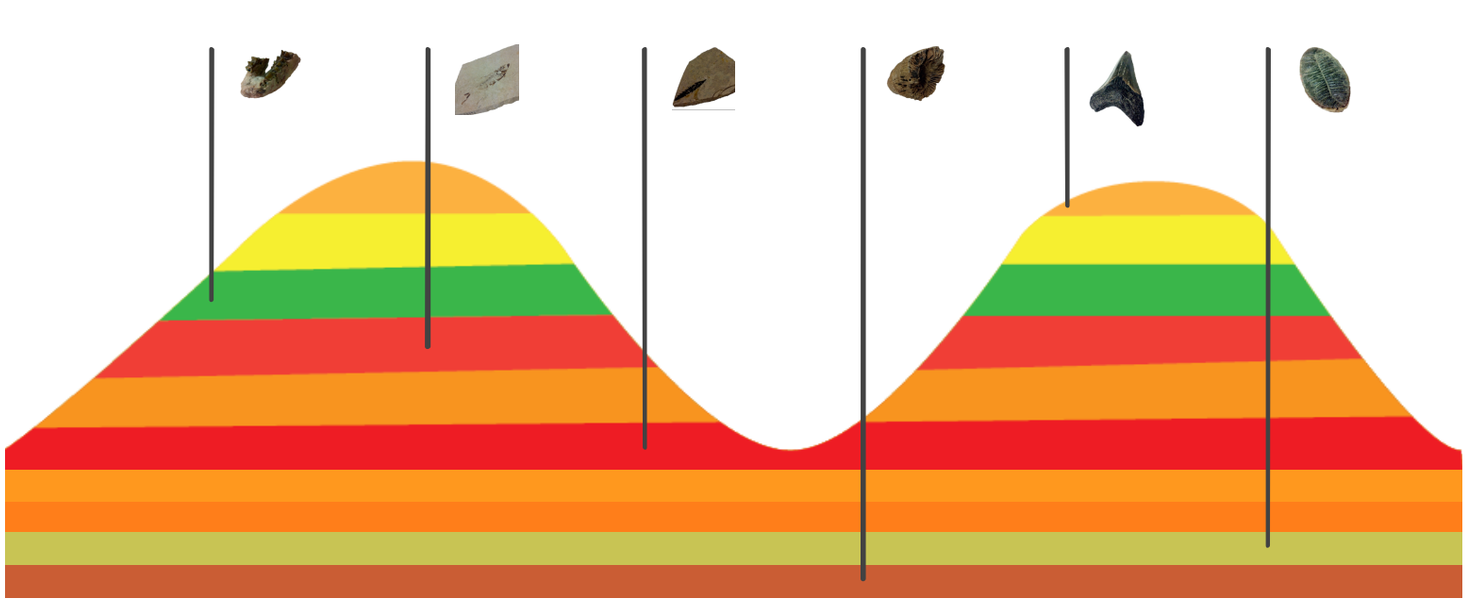
Looking at the fossil site.

This is the hillside where fossils were found. Take a look at this cross-section and notice the rock layers with fossils inside. Do you have enough information to order them from youngest to oldest?



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Looking at the fossil site.

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Oreodont jaw
Mammal. An herbivore related to camels and pigs.

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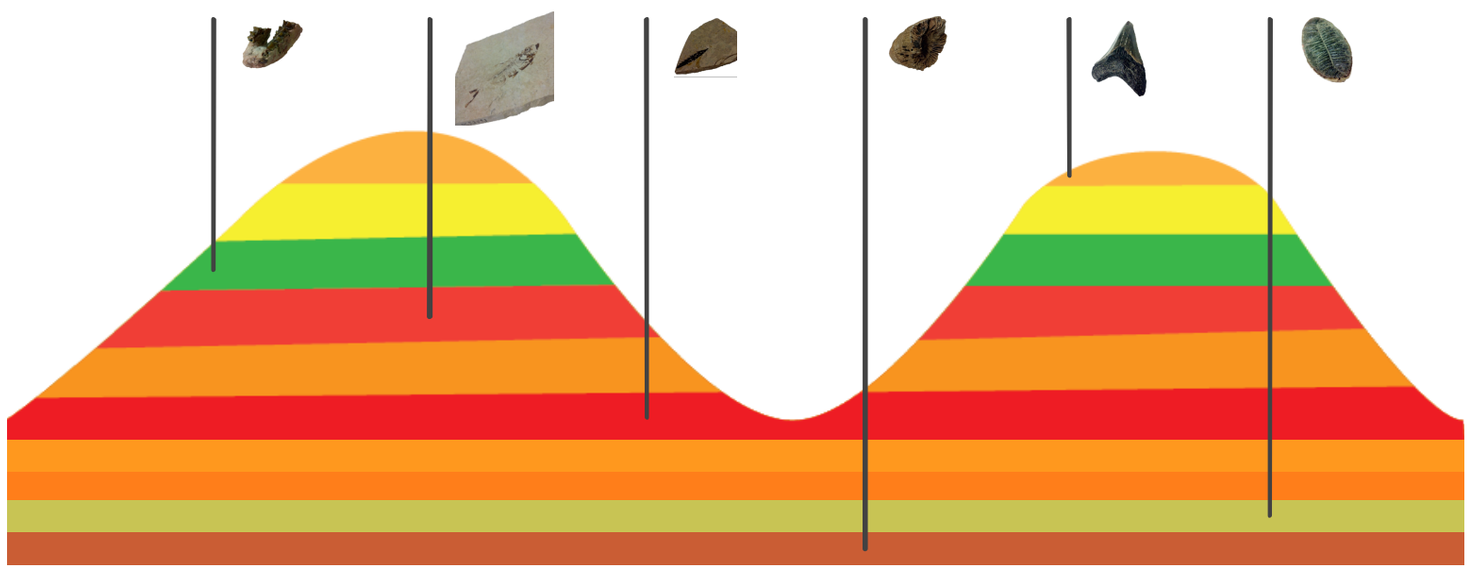
Priscacara serrata
Fish. An extinct species of freshwater perch.



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Metasequoia leaf
Tree. An extinct species of redwood.

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Siphonophrentis fragment
Coral. Stationary filter feeders that lived in the ocean.

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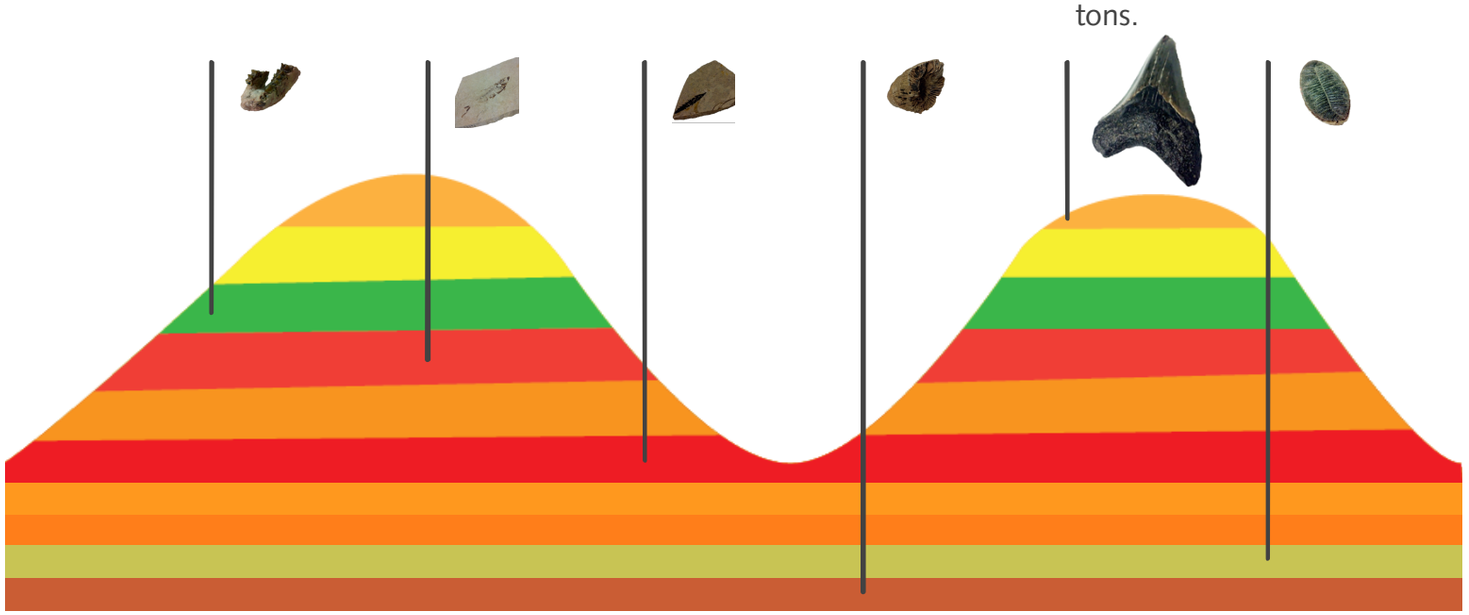
Megalodon tooth
Shark. Could grow 60 feet long and weigh up to 77 tons.



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Asterotheca candolleana frond
Fern. Lived in humid or swampy environments.

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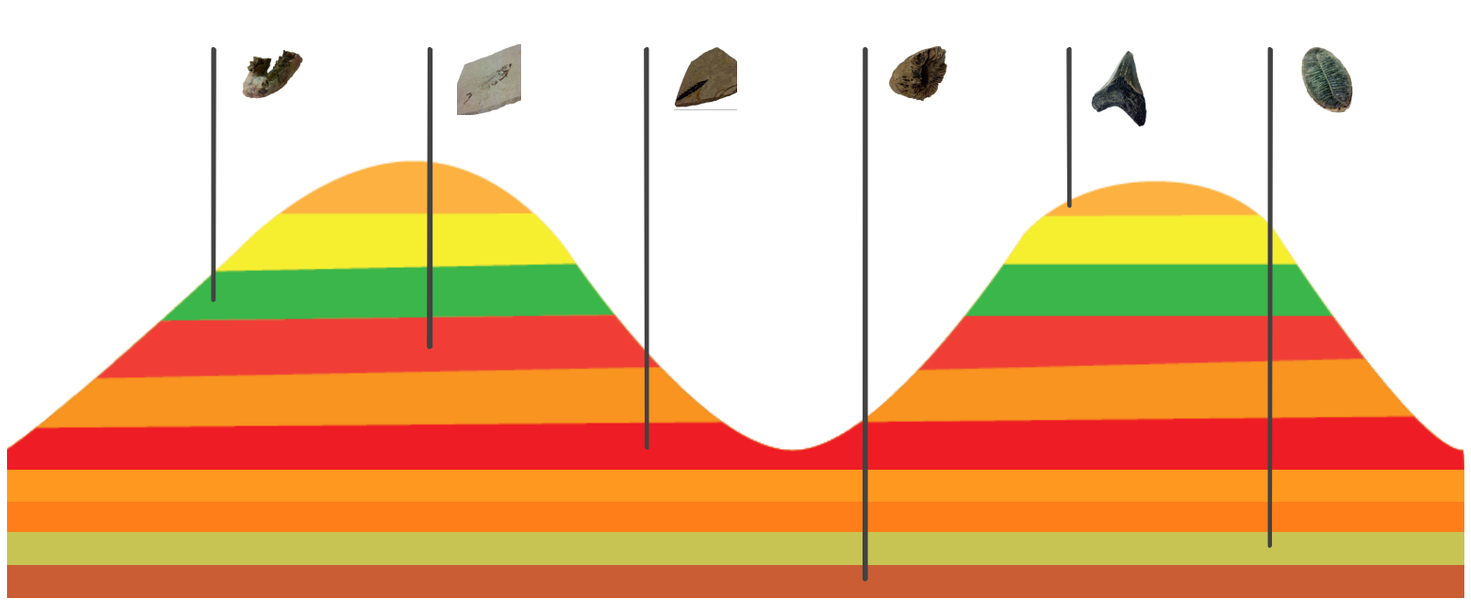
Arrange fossils from oldest to youngest.

Drag the fossils onto the timeline from oldest to youngest.
Use what you have learned to put these fossils in order.

OLDEST ---------- YOUNGEST



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Write explanation here...

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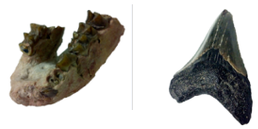

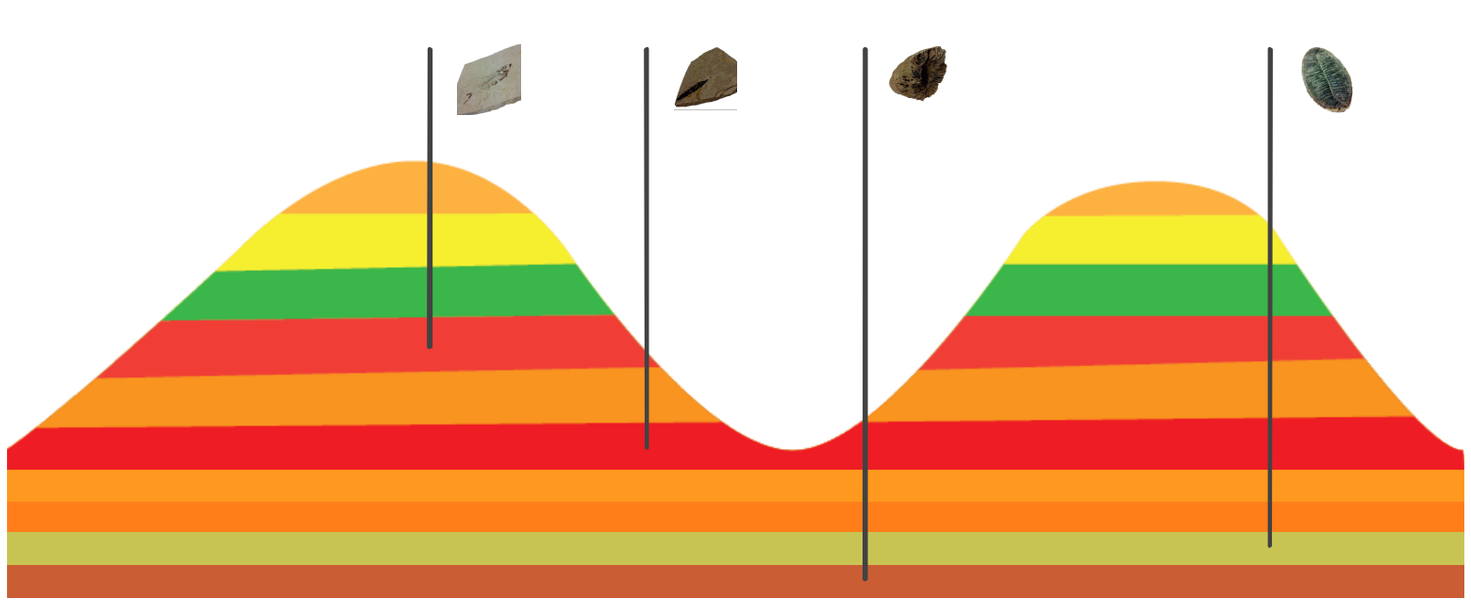

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Scientist check-in

Relative dating is good for more than just understanding how rock layers are stacked. Before radiometric dating was invented, relative dating was the only way for scientists to learn what order geologic events occurred in. By putting events in order, scientists are able to reconstruct the history of an area, such as changes in climate or ecology. It is hard to imagine paleontology without the use of relative dating.

Though relative dating is useful on its own, the modern technique of absolute dating provides information that allows us to determine age ranges for fossils. Move forward to use absolute dating to estimate the age of our mystery leaf.

YOUR TIMELINE

OLDEST ---------- YOUNGEST

SCIENTIST TIMELINE

OLDEST ---------- YOUNGEST

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Absolute dating.

Now that we've looked at how old the fossils are in relation to each other, it's time to add more detail to the story. Let's go back to the hillside and try **absolute dating**.

Let's look again at this fossil leaf. We know where it fits in a timeline relative to the other fossils, but how can we tell its age in years?

Find out how we can use absolute dating to find the age of fossils.

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Radiometric dating.

One tool geologists and paleontologists use for measuring the age of rocks and fossils is known as radiometric dating. You can use this technique if the rock layers you are studying contain igneous rocks.

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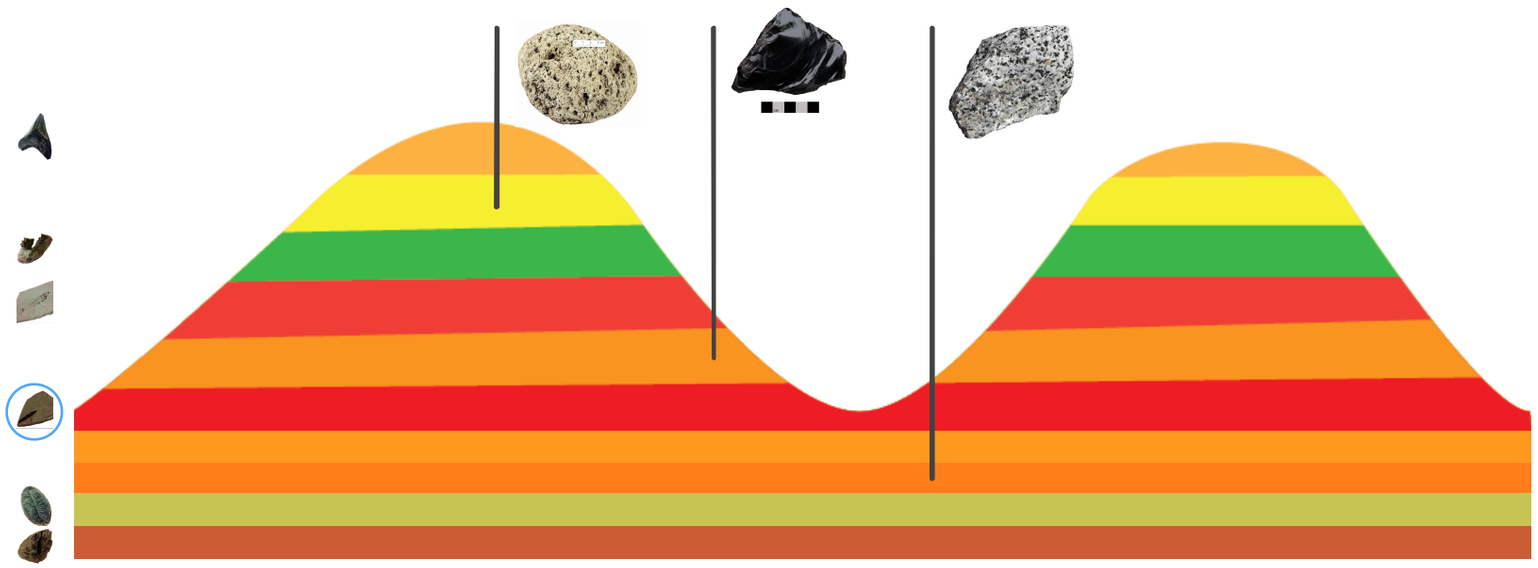
Write explanation here...

Radiometric dating.

Look at our cross-section again, this time examining closely the layers that make it up. Notice that we have added labels for different igneous rock layers. Click on the rocks to perform radiometric dating and find out how old they are.

OLDEST ---------- YOUNGEST



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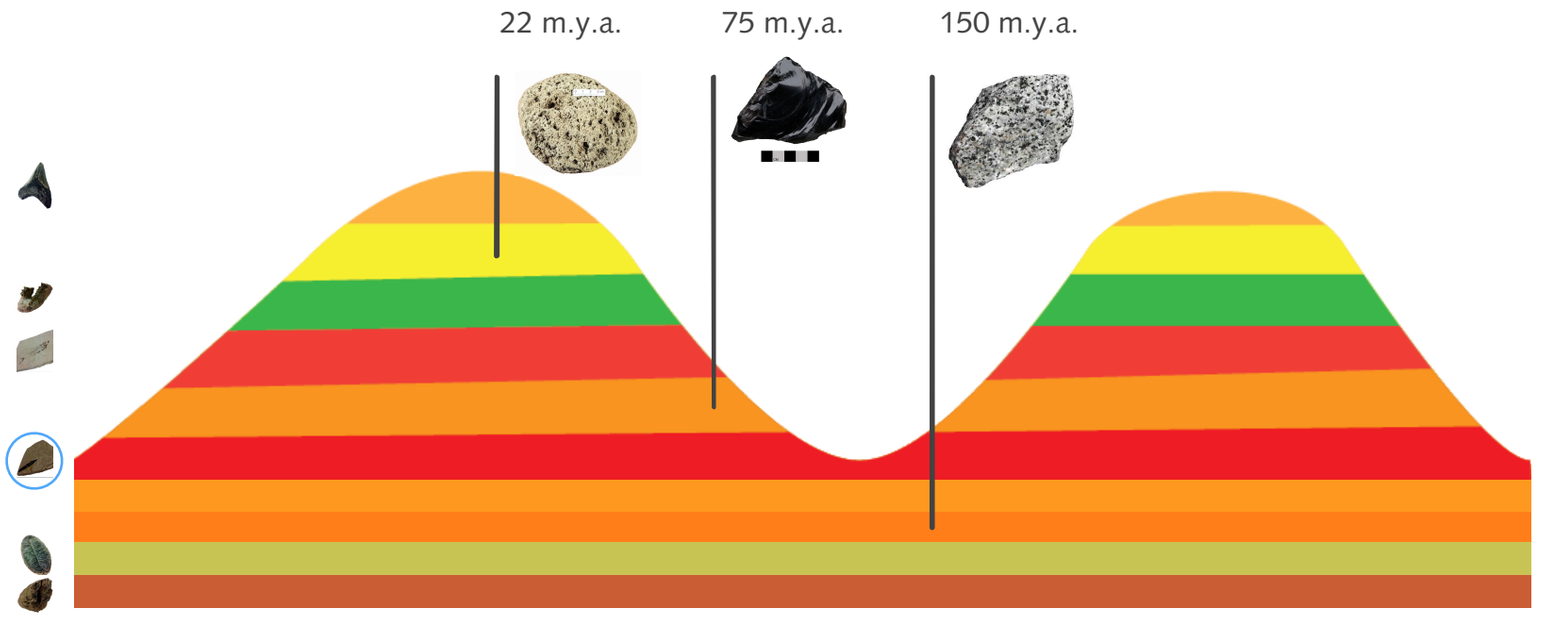
Write explanation here...

Radiometric dating.

Look at our cross-section again, this time examining closely the layers that make it up. Notice that we have added labels for different igneous rock layers. Choose which rocks you want to date to help refine the date of your fossil leaf.

OLDEST ---------- YOUNGEST



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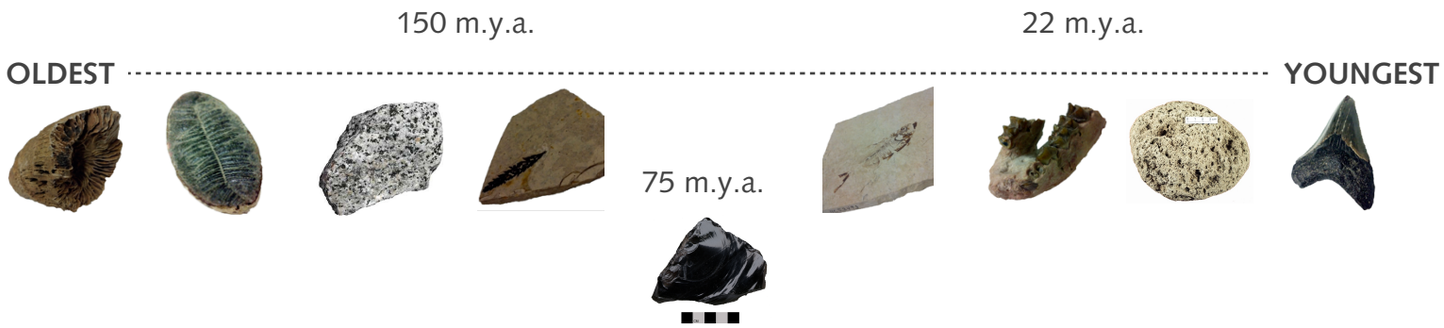
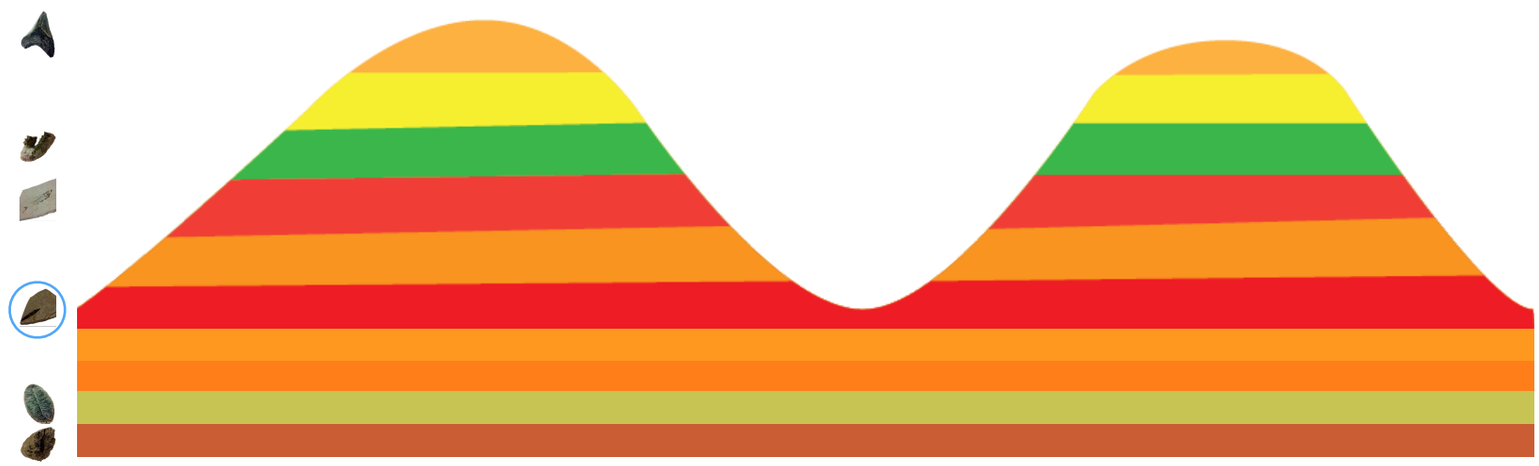
Write explanation here…

Radiometric dating.

Now that you have the dates of the igneous rocks, click and drag them into place on the timeline. How old do you think the mystery fossil is? Why?





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Scientist check-in

Let's see how our experts used radiometric dating to find an age range for our fossil.

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

YOUR TIMELINE

SCIENTIST TIMELINE

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Index fossils.

We can get even more precise dates using **index fossils**.

An index fossil is from a species that was widespread, living in many different places, but short-lived, meaning that the species went extinct soon after it evolved. Because the species was widespread, radiometric age ranges measured at different places can be combined to find out a precise date range for when it lived. Once that range is determined, it can be applied to rock layers in other locations that contain fossils of the same species.

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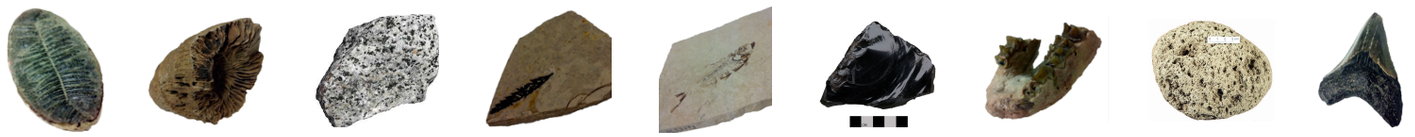
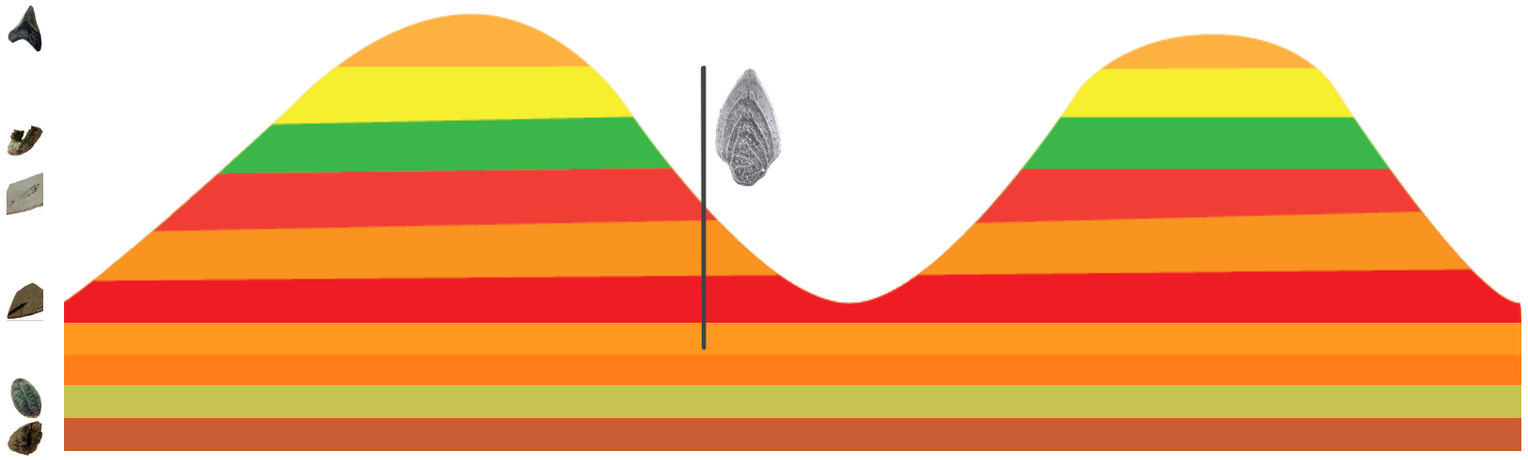
Write explanation here...

Index fossils.

Take a look at where the index fossil was discovered in the hillside. **Drag the index fossil into position on your timeline.** When you're ready, click on the index fossil to see what the lab has to say about the age. How does this change the age estimate for the leaf fossil? What can you say about the ages of the other fossils in the hillside?

OLDEST ---------- YOUNGEST





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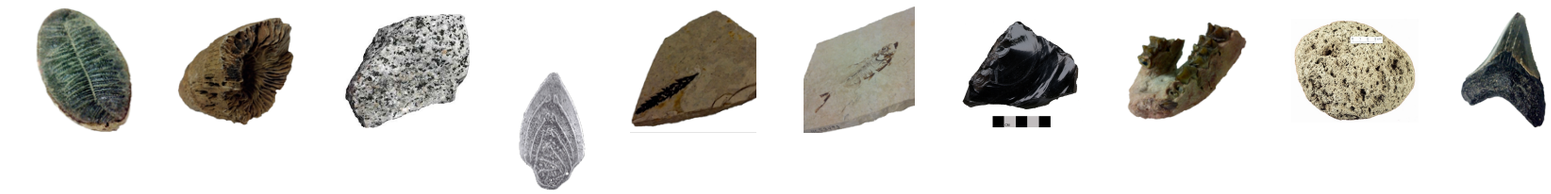
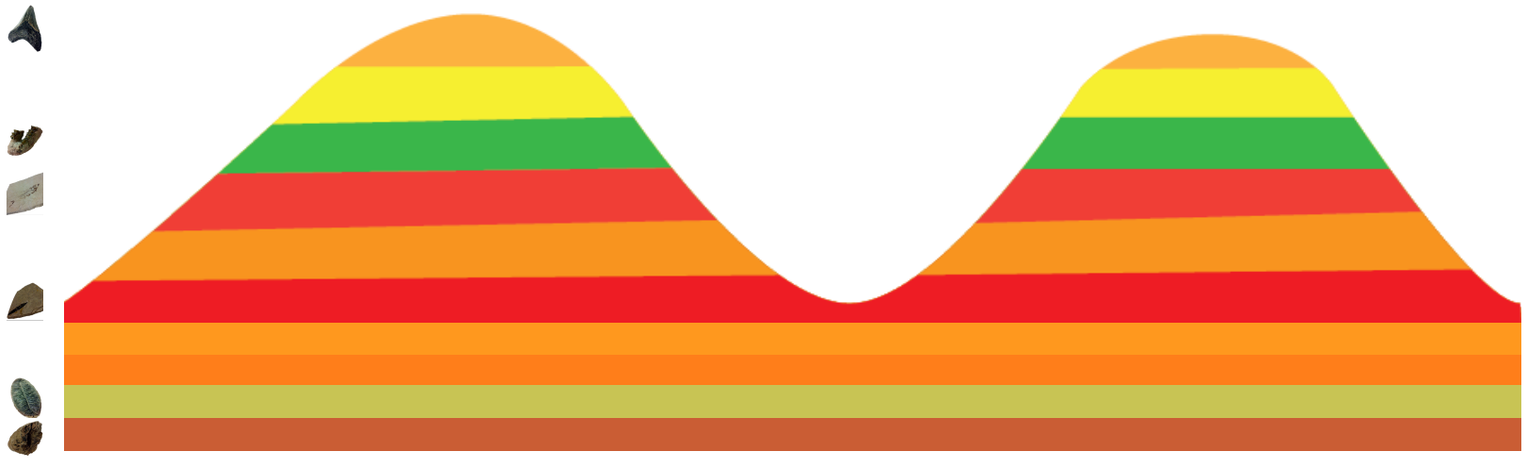
79–84 m.y.a.

OLDEST ---------- YOUNGEST





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Scientist check-in

Most fossils aren't found in formations with as many distinct fossil-bearing layers as the one you've been using for this exercise. There can be a lot more uncertainty in fossils found naturally, which makes the proper application of absolute and relative dating even more important for scientists.

Scientists have been using relative dating to understand geologic processes for over 200 years. They realized that not only could fossils be classified based on the rock layers in which they're found, but that those rock layers could be recognized all over the world. This allowed scientists to develop a relative dating system that could be applied on fossils from widely different areas.

Absolute dating is a more recent technique, but it is a very powerful and accurate tool. Radiometric dating uses the decay rate of radioactive isotopes to predict how old rock samples are. Igneous rocks are the best for radiometric dating, because they are laid down all at once by volcanic activity. Sedimentary rocks are composed of the fragments of many different rocks with different ages, so are less accurate when used for dating.

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FINISH!