



## ONCE UPON A TIME

### Activity Overview

#### BIG IDEA

The geologic time scale can be challenging for students to understand. This activity explores how scientists divide the Earth's long history into smaller segments using plants and animals found in the fossil record.

#### OBJECTIVE

Students will explore the various species that dominated the Cenozoic, Mesozoic, and Paleozoic eras and the Precambrian supereon.

#### BACKGROUND

Paleontology combines geology and biology to study extinct organisms preserved in rocks. Knowledge of geology helps scientists know where to look, what to look for, and how old the fossils are. Geological information helps paleontologists figure out what happened to animals, what may have killed them, and what happened to their remains after they died.

Geologic time is 4.5 billion years of the earth's history that is represented by and recorded in layers of rock. Over the course of geologic time, the continents have moved and shifted, and sea levels have risen and fallen. The geological record spans over 4 billion years. Scientists developed the geological time scale to help keep track of where fossils are found within this rock record. The scale uses units of time called supereons, eons, eras, periods, epochs and stages. Dinosaurs existed for 155 million years during the Mesozoic Era and were the dominant animal longer than any other type that has ever lived.

The Mesozoic Era lasted for 165\* million years, during which time the earth underwent considerable change. The Mesozoic Era is divided into three time periods called the Triassic, Jurassic, and Cretaceous Periods.

During the Triassic Period, all the continents were joined together to form a super continent referred to as Pangea. Some of the evidence for this super continent comes from fossil animals. There are reptiles, for example, that come from Triassic Period rocks of North America that are identical to reptiles found in Triassic Period rocks of Europe and Africa. Geologic studies indicate that Pangea began to break up into today's continents near the end of the Triassic Period.



## ONCE UPON A TIME

### Activity Overview (Cont.)

#### BACKGROUND (CONT.)

During the Jurassic Period, the continents were separating and the Atlantic Ocean was beginning to form, but there were still several large land bridges between many of the continents. As a result, many of the dinosaurs of the Jurassic Period are similar in some parts of the world.

By the Cretaceous Period most of the continents had separated and all of the oceans had formed. Only a few small land bridges remained. By the end of the Cretaceous Period, the continents were in much the same location as they are today.

#### EXTENSIONS

- Use the MOR Outreach Kit: Geologic Time to complete hands-on activities that can help students better understand geologic time.
- Visit Museum of the Rockies on a field trip to see fossils from the time periods in this lesson.

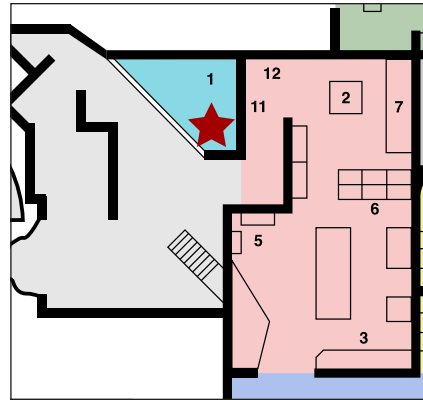


## ONCE UPON A TIME Museum Instructions

### MATERIALS

Student activity sheets, clipboards, pencils (Pens, crayons, and markers are not allowed in exhibit spaces)

### LOCATION



### ACTIVITY TIME

30 Minutes

### INSTRUCTIONS

*This activity can be used to explore geologic time. Throughout the exhibit, students can find maps on exhibit panels showing the Earth's land masses and oceans during different time periods. However, the best place to show the geologic time scale is in the Landforms, Lifeforms exhibit before the Dinosaurs Under the Big Sky exhibit space.*

Find a space in the first room of the Landforms, Lifeforms exhibit before the Dinosaurs Under the Big Sky exhibit at MOR.

Tell your students that paleontology combines geology and biology to study extinct organisms preserved in rocks. Knowledge of geology helps scientists know where to look, what to look for, and how old the fossils are. Geological information helps paleontologists figure out what happened to animals, what may have killed them, and what happened to their remains after they died.

Geologic time is 4.5 billion years of the earth's history that is represented by and recorded in layers of rock. Over the course of geologic time, the continents have moved and shifted, and sea levels have risen and fallen. The geological record spans over 4 billion years. Scientists developed the geological time scale to help keep track of where fossils are found within this rock record. The scale uses units of time called eons, eras,



## ONCE UPON A TIME Museum Instructions (Cont.)

### INSTRUCTIONS (CONT.)

periods, epochs and stages. The scale includes four eras: Pre-Cambrian, Paleozoic, Mesozoic and Cenozoic.

Dinosaurs existed for 155 million years during the Mesozoic Era and were the dominant animal longer than any other type that has ever lived.

After working through the first page of the activity, have your students explore the Landforms, Lifeforms exhibit, the Dinosaurs Under the Big Sky exhibit, and the Cenozoic area upstairs from the Viewing Lab, to find displays and fossils of the plants and animals that lived during each time segment.

Have students use the displays to draw pictures on the second page of the activity before calculating the length of each of the different time segments.



## ONCE UPON A TIME

### Classroom Instructions

#### MATERIALS

MOR Outreach Kit: Geologic Time including ribbon of geologic timeline  
50 meter measuring tape and printouts to mark key eras

#### ACTIVITY TIME

45 Minutes

#### INSTRUCTIONS

*This activity can be used to support lessons involving geologic time.*

Providing a demonstration for geologic time can enhance student understanding of a difficult concept. For this visual demonstration, you will need a 50 meter measuring tape and printouts to mark key eras. Take your students outside to the playground, or to a long hallway. Explain that you are going to create a timeline that will represent the age of the Earth.

1. Attach the end of the tape measure to the floor and tell students that “0” is today.
2. Have students walk the tape measure out with you.
3. At 1 meter stop and explain that 1 meter is going to represent 100 million years.
4. Continue out to the 46 meter mark; the 46 meter mark will represent the beginning of Earth, and the beginning of the Precambrian Era. Set the tape measure down and walk with your students back to “today,”
5. Stopping at 5.41 meters to introduce the beginning of the Paleozoic Era,
6. 2.52 meters to introduce the beginning of the Mesozoic Era,
7. 0.66 meters to introduce the beginning of the Cenozoic Era
8. Stop at any other key events you wish to feature (for example, oxygen appeared in earth’s atmosphere 2.45 billion years ago—24.5 meters).

When we put Earth’s timeline to scale we can better understand that living things as we think of them didn’t appear until relatively recently. After this demonstration, use the activity sheet to introduce how scientists estimate the age of the Earth. Use the materials in the Outreach Kit to introduce the common plants and animals of each time segment.



## ONCE UPON A TIME

### Classroom Instructions (Cont.)

#### INSTRUCTIONS (CONT.)

#### Optional Extensions for the Classroom:

1. Introduce the idea of a timescale by having students create a timeline of important events that have happened in their lives. The first event would be birth (accompanied by their birth date), and the last event would be the current date. Events in between should not be evenly spaced but to scale with the age they were when the event happened.
2. After introducing the geologic timescale with this activity and a visual demonstration, have students/student groups create their own geologic timeline on 46 inches of receipt paper, where each inch represents one-hundred million years, marking the beginning of eras and other key events.
3. Have students work in groups or individually to write a report on a prehistoric animal; have the students present their information to the class in order of existence. For example coral would present first, followed by trilobites, followed by ferns, etc.

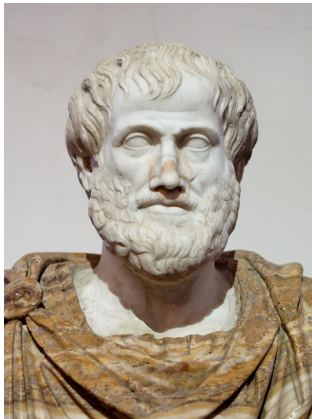


## Once Upon a Time

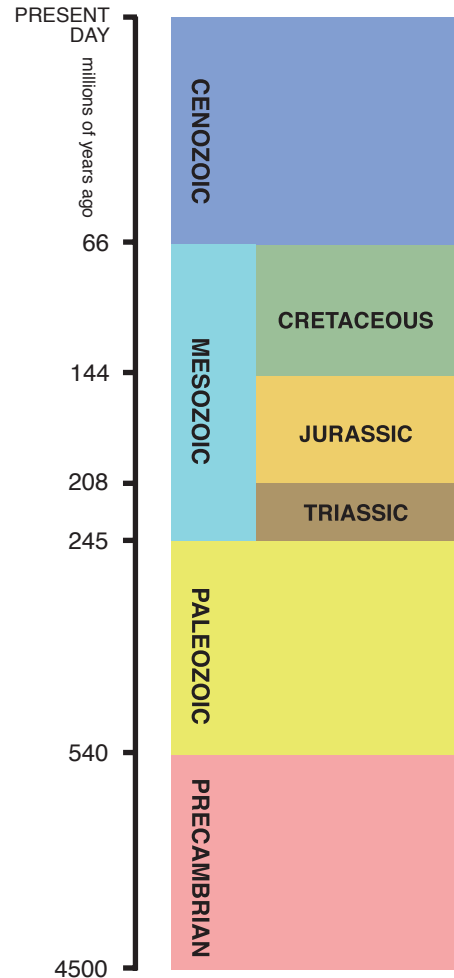
NAME \_\_\_\_\_

One question that people long tried to answer was: “How old is the earth?” The earliest Greek philosophers, like Aristotle, simply assumed that the earth had always been around forever. Some Southwest American Indian tribes believed that the world had been created and destroyed several times. Ancient Egyptians counted different reigns of kings back 24,950 years. The Ancient Romans tried to use written human records to count backward to the beginning of time, and came up with a date of about 2,300 BC. The Irish Bishop James Ussher used a similar technique in 1654 to come to the date of 4,004 BC for the creation of the world.

[https://en.wikipedia.org/wiki/Dating\\_creation](https://en.wikipedia.org/wiki/Dating_creation)



Then, in the 1840s, as people started digging and mining deeper into the earth as geologists started learning more about the earth, they realized that much of the earth had distinct layers. They found these layers as they started mining and digging deeper into the earth. Geologists noted that layers hundreds of miles apart were in very similar patterns, which they called the geologic column.



How many layers do you count in the **geologic column** to the right, including the periods in the Mesozoic Era?

\_\_\_\_\_

# MOR TIME



## Once Upon a Time (Cont.)

One problem was that Geologists didn't know how many years it took for each layer to get laid down.

Of course, they didn't have the full picture, and not every layer is present in every place. Geologists tried several other calculations, such as the amount of salt added to the oceans, but the big breakthrough came in 1896. In 1896 Radiation was discovered, and ten years later radiometric dating was used on several types of rocks to find the oldest ones – It came out to be 4.6 billion (or 4,600 million) years.

“mya” = million years ago

TIME SEGMENT	SHOW YOUR WORK	HOW MANY MILLIONS OF YEARS DID THIS TIME SEGMENT LAST?
Cenozoic Era “ends”: 0 Cenozoic Era begins: 66 mya		
Mesozoic Era ends: 66 mya Mesozoic Era begins: 252 mya		
Paleozoic Era ends: 252 mya Paleozoic Era beings: 541 mya		
Precambrian ends: 541 mya Precambrian begins: 4,600 mya		

Which time segment lasted the longest? \_\_\_\_\_

Which time segment has lasted the shortest amount of time? \_\_\_\_\_



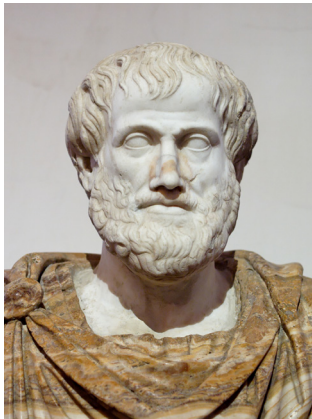


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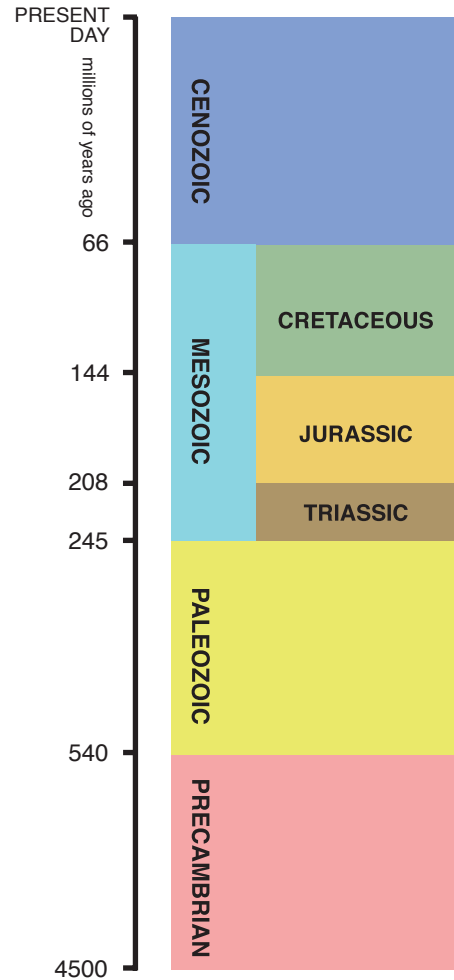
NAME \_\_\_\_\_ ANSWER KEY \_\_\_\_\_

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How many layers do you count in the **geologic column** to the right, including the periods in the Mesozoic Era?

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# MOR TIME



## Once Upon a Time (Cont.)

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TIME SEGMENT	SHOW YOUR WORK	HOW MANY MILLIONS OF YEARS DID THIS TIME SEGMENT LAST?
Cenozoic Era “ends”: 0 Cenozoic Era begins: 66 mya	$66 - 0 = 66$	
Mesozoic Era ends: 66 mya Mesozoic Era begins: 252 mya	$245 - 66 = 179$	
Paleozoic Era ends: 252 mya Paleozoic Era begins: 541 mya	$540 - 245 = 295$	
Precambrian ends: 541 mya Precambrian begins: 4,600 mya	$4500 - 540 = 3,960$	<b>3,960 million years or 3.96 billion years</b>

Which time segment lasted the longest? Precambrian

Which time segment has lasted the shortest amount of time? Cenozoic