



## Activity Description & Estimated Class Time

Over the course of two 50-minute class periods, students will prepare time lines of events in their own lives. They will then produce time lines of geologic events in the history of the Earth.

## Correlations to NC Science Standards

ESS.8.1 Understand the history of Earth and its life forms based on evidence of change recorded in fossil records and landforms.

## Learning Target

Students will demonstrate knowledge and understanding of:

- the estimated age of the Earth
- the breakdown of Earth's history with the Geologic Time Scale

## Brief Science Background

The age of the Earth is a topic that has long been discussed and debated. The currently accepted age of the Earth in the scientific literature is about 4.5 to 4.6 billion years. The whole notion of geologic time is mind-boggling to most adults, let alone middle school students. A million years is a blink of an eye in the life of a rock, but it is a huge span compared to the history of human civilization. This activity lets students begin to explore the notion of time, first on an personal scale and then in geologic terms.

For a little perspective on these long periods of time, consider the following: One million seconds is a little bit more than 11.5 days. One billion seconds is just under 32 years!

## Part 1 — Personal Time Lines

### Materials

#### Materials for groups of 2 students

- meter tapes
- roll of adding machine paper
- scissors (provided by the teacher)
- pencils (provided by the teacher)

### Preparation allow for approx. 15 min.

Create a timeline of your life as an example and reference using a meter length of paper.

### Procedure

1. Ask each student to cut a meter of paper off the roll of adding machine tape. Tell them that they are going to make a time line of their life on this piece of paper. The requirements are:
  - they must use as much of the paper as possible
  - there should be some marked scale on the paper
  - events on the time line must include their date of birth, the date they first started school, the date they first started middle school, and the dates of 5 other events of their choosing.

Display your timeline as an example and reference. Students may have some trouble with scale in this activity. It is important to let them struggle with this for a while and then direct them with questions. For example, if you have a meter of tape

**Procedure  
cont.**

and you are 14 years old, how much of the paper should a year take up? Some students may want to mark their scale in years, others may want to use months. **The important lesson is that increments of time should take up the same distance on the paper.** This will give them practice measuring and thinking in terms of ratios.

Post student time lines and discuss with the students the various time lines and ask for patterns. Give particular attention to the blank spots on the lines and ask the students if this signifies that nothing happened during these times.

## Part 2 — Geologic Time Scale

**Materials****Materials for the whole class**

- ability to project Geologic Time Scale (SD 1)

**Materials for groups of 2 students**

- meter tapes
- roll of adding machine paper
- colored pencils
- photocopy of Geologic Time Reference Points (SD 2)
- scissors (provided by the teacher)
- pencils (provided by the teacher)

**Procedure**

1. Tell the students that they will now work in pairs to make a timeline of the Earth. Specify that the figures that they will use are the currently accepted numbers based on the best scientific evidence to date. If students raise religious issues, simply point out that this is science class, and we are studying the scientific explanations of geologic time and events.
2. Have each pair of students measure out and cut off 5 meters of paper. We will use the age of the Earth as 4.6 billion years. Discuss the relative sizes of million and billion. Write 1,000 million = 1 billion on the board. **Tell the students that each millimeter on the paper will represent 1 million years.**  
Write the following on the board and discuss with students:  
$$1 \text{ mm} = 1 \text{ million years}$$
$$1,000 \text{ mm} = 1 \text{ billion years}$$
$$1 \text{ meter} = 1 \text{ billion years ?}$$
$$= 4.6 \text{ billion years}$$
3. Ask the students how long their timeline must be to measure out 4.6 billion years.  
**4.6 meters = 4.6 billion years**
4. Have the students mark a starting point near one end of the paper and then measure out 4.6 meters and mark this spot as the present day.
5. Ask students what time (distance) marks they think would be good to have on their timeline. This is a good time to discuss different events such as oldest rocks, first life, modern humans appear and where they think they may go on their time times.
6. Decide to place a hatch mark every 100 million years. Calculate out the distance together as a class.  
$$1 \text{ mm} = 1 \text{ million years. } 100 \text{ mm} = 100 \text{ million years. } 100 \text{ mm} = 10 \text{ cm.}$$
**So, 10 cm = 100 million years.**



**Procedure  
cont.**

**Content  
Connection**

7. Give students the Geologic Time Reference Points (SD 2). Remind the students that the dates on the list refer to millions of years before the present. **It is very important to state that this is not a definitive list and that the events recorded on the list actually took place over a span of millions of years rather than one distinct point in time.** There is also much current debate with regard to the events on the timeline. This debate is fueled constantly by new finds in the fossil record and advances in technology.
  8. Have them locate the reference points on the timeline and ask them to label and make a symbolic drawing of the events on the paper.
1. Post the students' time lines and ask them for observations. What do they notice? What do they wonder? There is a wealth of discussion material here, but teachers at the very least should ask students:
    - What could the blank spaces represent?
    - What could explain the observation that organisms appear in a particular order?
    - What do you notice about humans?
  2. Display the Geologic Time Scale (SD 1) and have the students add the names of eons and eras. Point out that the divisions of geologic time are associated with major geologic events and extinctions.

SD 1

Geologic Time Scale

GEOLOGIC TIME SCALE  
(Time indicated as millions of years ago)

EON	ERA	PERIOD	EPOCH	TIME	BIOLOGICAL EVENTS
PHANEROZOIC EON	CENOZOIC	Quaternary	Holocene	0	modern plants whales apes monkeys modern mammals horses
			Pleistocene	0.01	
		Tertiary	Pliocene	1.6	
			Miocene	5.3	
			Oligocene	23.7	
			Eocene	36.6	
			Paleocene	57.8	
			66.4		
	MESOZOIC	Cretaceous	66.4	flowering plants birds dinosaurs flying reptiles mammals	
		Jurassic	144		
		Triassic	208		
	PALEOZOIC	Permian	245	NON-MARINE (mostly) MARINE aquatic reptiles reptiles amphibians sharks amphibians	
		Carboniferous	Pennsylvanian		286
			Mississippian		360
		Devonian	408		
		Silurian	438		
		Ordovician	505		
		Cambrian	570		
PROTEROZOIC EON			(PRECAMBRIAN)	570	sponges worms
ARCHEAN EON				2500	algae
HADEAN EON				3800	
				4600	

## SD 2

## Geologic Time Reference Points

<b>Event</b>	<b>Years Ago</b>
Rise of modern civilization	0.011 million (6,000 years)
Homo sapiens, modern humans	0.30 million (300,000 years)
Oldest stone tools	3.3 million
Beginning of formation of Himalayan Mountains	40 million
Early horses	55 million
Dinosaurs go extinct	65 million
Rocky Mountains form	75 million
Early flowering plants & birds	150 million
Dinosaurs rule	165 million
Early mammals	225 million
End of formation of Appalachian Mountains	260 million
First reptiles	320 million
First trees	390 million
Early sharks	450 million
Early land plants	460 million
Early fish	490 million
Early shelled organisms and large numbers of marine fossils	530 million
Early multi-celled organisms	600 million
Oxygen in the atmosphere	2.4 billion
Oldest fossils of living organisms (bacteria and algae)	3.5 billion
Oldest known earth rocks	4 billion
Earth formed	4.6 billion