

# Geological Timeline Activity

**Significant developments and extinctions of plant and animal life can be shown on a geologic time scale.**

To understand evolution, humans must think in units of time much larger than those we use to define our lives. After all, evolutionary change occurs too slowly to be measured in days, months, or years. Instead, it's documented in layers upon layers of rock deposited over the course of 4.6 billion years.

The earth has been significantly altered during this time by climate swings, volcanism, drifting continents, and other "earth shattering" events. These dynamic conditions, in turn, have influenced every living thing that has inhabited the planet. Because of this, biology alone cannot fully explain the evolution of life on our planet. It's necessary to include the physical sciences -- geology, chemistry, and physics -- in order to understand the conditions in which life arose and evolved.

*The story of life is told primarily by its victims.* Scientists say that only one in a thousand species that have ever lived survives today. The other 99.9 percent are extinct, gone forever. With few exceptions, the lifespan of individual species is short by geological standards, on average between 2 and 10 million years. No matter how well adapted a creature is to its environment, history has shown that even the most dominant can be wiped away. Ironically, extinction is a springboard to other life. Even in the most catastrophic of events, species survive and continue to evolve, often filling niches left by the victims.

Extinction is by and large a natural process in which species, groups, and even whole families of organisms disappear. Background extinctions, which are ongoing throughout the history of life, eliminate one family every million years or so. The more destructive and relatively sudden kind of extinction -- the mass extinction event -- is caused by environmental influences and has a global impact on diversity. All extinctions identified in this timeline are mass extinction events.

The geologic time scale we use to study the history of the earth and of its life forms is commonly referred to as "deep time," and it's a concept perhaps as difficult to conceive as deep space. Can humans measure deep time? Yes. Will we ever truly comprehend such immensity of time? Probably not. But to develop a better understanding of evolutionary change in its proper historical context, we must try. This timeline provides a framework for doing so.

### Procedure to make a Geological Timeline of Major Events

1. Work in a group of four students.
2. Lay the adding machine tape on the floor where it won't interfere with other students. Tape the ends to the floor.
3. Within the first 20 centimeters in the **top left corner**:
  - a. Write a **full heading** -- Geological Timeline, names in the group, date, and period
  - b. Underneath the heading, make a **scale**.
    - 1 meter = 1 billion years
    - 1 centimeter = 10 million years
    - 1 millimeter = 1 million years
4. Measurement for the timeline will begin with "**Today**", starting on the **left side of the paper**, **measure 20 cm** to the right on the line, and make a vertical mark. Label this mark -- **Today**



Today

5. Using the Major Events listed in **Table 1**, **measure and write the major events** on your geologic time line.
6. Each student will answer the Analysis questions; however, you will turn in one timeline per group.

Table 1 Major Events in Geological Time

Time	Scale	Major Event	
Today	0 cm	The Present	<b>CENOZOIC ERA</b> (write in blue)
~100,000 ya	0.1 mm	Homo Sapiens (Modern Form of Human Species)	
~ 22 mya	2.2 cm	Grasses	
~ 33 mya	3.3 cm	First Apes	
~50 mya	5 cm	Eohippus (First Known Horse)	
65 mya	6.5 cm	<b>CENOZOIC ERA</b>	<b>MESOZOIC ERA</b> (write in red)
~ 65 mya	6.5 cm	Dinosaurs Extinction	
~140 mya	14 cm	First Flowering Plants	
~200 mya	20 cm	Earthworms	
~220 mya	22 cm	First Mammals	
~240 mya	24 cm	Start of the age of the dinosaurs	<b>MESOZOIC ERA</b>
248	24.8 cm	<b>MESOZOIC ERA</b>	
~330 mya	33 cm	Winged Insects	
~380 mya	38 cm	First Insects	
~390 mya	39 cm	First Sharks	
~395 mya	39.5 cm	Amphibians	<b>PALEOZOIC ERA</b> (write in green)
~400 mya	40 cm	Ferns	
~440 mya	44 cm	First Land Plants	
~440 mya	44 cm	First Jawed Fish	
540 MYA	54 cm	<b>PALEOZOIC ERA</b>	
~550 mya	55 cm	Jellyfish	<b>PRECAMBRIAN TIME</b> (write in orange)
~1.8 bya	1 m 8 cm	First Eukaryotes	
~2.4 bya	2 m 40 cm	Significant rise in oxygen, to ~2% level	
~3.5 bya	3 m 50 cm	Prokaryotes (bacteria)	
~4.6 bya	4 m 60 cm	Formation of Earth and Moon	
4.6 bya	4 m 60 cm	<b>PRECAMBRIAN TIME</b>	

Geological Timescale Questions – Answer in full sentences on a separate page

1. What is the geological time scale?
2. How does the geological time scale further our understanding of life on our planet?
3. For how long has there been life on earth? What percentage of the age of our planet does this represent?
4. For how long have there been human living on earth? What percentage of geological time does this represent?
5. For how many years did dinosaurs exist? What percentage of geological time does this represent?
6. What is the oldest era? How long did it last? What happened during this era?
7. How did mass extinctions lead to new forms of life?
8. What is the difference between background and mass extinctions?
9. How do scientists determine when an era begins and ends?
10. What is the purpose of constructing a geological time line?