Division Of Geological Survey
HANDS ON EARTH SCIENCE
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UNDERSTANDING GEOLOGIC TIME

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Time. A simple concept we take for granted every day. "I have a karate class in two hours." "One more day until the weekend." "My birthday is in eight months." "I have worked here for 12 years." "The Ohio Geological Survey originated nearly 160 years ago." "The Age of the Dinosaurs began 245 million years ago." "The Earth is 4.6 billion years old." Well, wait a minute. Maybe the concept of time, especially geologic time, is not so simple. It's easy to comprehend the time span of "one more day until the weekend." However, it is not so easy to comprehend the time span of "the Earth formed 4.6 billion years ago."

How much is a billion? One billion seconds from the beginning of 1996 would be the year 2029. How much is a million? If a person lived for 1 million days, they would be 2,740 years old. These analogies may help put into perspective the immensity of geologic time. We hope the following activity of making a human time line will help even more.

This activity is easier to do outside. You will need an area approximately 260 yards in length, 260 yards of twine, and some masking tape. Mark off the twine in yards using the masking tape and a yard stick. The last yard measured should be marked off in feet. The last foot measured should be marked off in inches. Assign each student an event from the list below. The outdoor scale used here is 2 inches = 1 million years.

The student representing the formation of the Earth should pace off 254 yards from the present. The rest of the students should then pace off their respective distances from the present for their assigned events. For example, the student representing the beginning of life on Earth would pace off 194 yards from the present, and the student representing the first reptiles would pace off 18 yards from the present.

When the human time line is complete, start with the formation of the Earth and have the students shout out what event they represent and how long ago they happened. For example, "I am the first reptile. I appeared 330 million years ago." Remember, the student representing the beginning of the Earth will have to shout very loudly, as they will be more than two football fields away from "the present"!

The students representing "recent" events, those events closer to the present, will be crammed together at the end of the time line. If the students cannot fit closely enough together, use longer pieces of tape to mark the event on the twine and have the students stand to the side.

This activity can be done inside using a smaller scale, such as $^1/_{10}$ inch = 1 million years. The time line can be made on adding machine paper and then taped to the wall. The students could also draw pictures of their events and tape them under the time line on the wall. For "recent" events, a larger scale could be used. This larger scale time line could be taped under the longer time line, indicating that much has happened in a relatively short period of time.

SOURCE: *Ranger Rick's nature scope: digging into dinosaurs,* National Wildlife Federation; *Historical geology of North America,* by Morris Peterson, J. Keith Rigby, and Lehi Hintze, Wm. C. Brown Company Publishers; *Understanding and collecting rocks & fossils,* by Martyn Bramwell, Usborne Publishing; *Fossils, rocks, and time,* by Lucy Edwards and John Pojeta, Jr., U.S. Geological Survey.

NOTE: Maps showing the geology and glacial deposits of Ohio are available from the Division of Geological Survey.

—Timeline starts on reverse—

TIME LINE EVENTS

Distance from present, indoor scale (1/10 inch = 1 million years)	Distance from present, outdoor scale (2 inches = 1 million years)	Years ago	Events
38 feet	254 yards	4.57 billion	Formation of Earth • Precambrian
31.5 feet	210 yards	3.78 billion	Oldest known rocks
29 feet	194 yards	3.5 billion	Life on Earth begins • oldest known fossil (anaerobic bacteria)
12.5 feet	83 yards	1.5 billion	Oxygen accumulates in atmosphere • granite-rhyolite emplaced in western Ohio • one-celled algae appear
10 feet	67 yards	1.2 billion	Oldest animal fossil (jellyfishlike organism)
8 feet	56 yards	1 billion	Formation of iron, copper, and nickel ores • rifting in western Ohio, Grenville Mountains form in eastern Ohio
6 feet	37 yards	670 million	Abundant soft-bodied, wormlike animals in the sea • Precambrian rocks deeply eroded in Ohio
5 feet	32 yards	570 million	Cambrian Period • numerous hard-shelled animals (trilobites) appear in the sea
4 feet	28 yards	500 million	Ordovician Period • oldest rocks exposed in Ohio—limestone and shale in southwestern Ohio • North America situated close to Equator • diverse sea life (trilobites, brachiopods, clams, snails, corals, fish without jaws)
3 feet 7 inches	24 yards	435 million	Silurian Period • salt and gypsum deposits in northern and northeastern Ohio • first life on land (ferns and mosses) • first fish with jaws • giant sea scorpions abundant
3 feet 5 inches	23 yards	410 million	Devonian Period • black shale deposits in northern and central Ohio • Age of Fishes • first sharks • first land animals (amphibians and wingless insects) • first forests
3 feet	20 yards	360 million	Mississippian Period • sandstone and shale deposits in eastern, central, and northwestern Ohio • Age of Crinoids • supercontinent Pangea is forming
2 feet 10 inches	18 yards	330 million	Pennsylvanian Period • coal deposits in eastern Ohio • coastal swamps and tropical forests common • formation of Appalachian Mountains • supercontinent Pangea is complete • large winged insects, spiders, and scorpions abundant on land • first reptiles • first evergreen trees • large trees and plants
2 feet 5 inches	16 yards	290 million	Permian Period • youngest rocks exposed in Ohio—sandstones and shales in southeastern Ohio • widespread extinctions occur among land and sea life (trilobites, brachiopods, ancient corals, many amphibians, trees, and ferns) • great fin-backed reptiles (*Dimetrodon*) dominant
2 feet	13 yards	240 million	Triassic Period • no deposits in Ohio • Pangea begins to split apart into Laurasia and Gondwana • Age of Reptiles begins • first dinosaurs • pine forests • abundant clams, snails, modern corals, ammonoids, marine reptiles (ichthyosaurs and plesiosaurs), and land reptiles (phytosaurs) • first small mammals
1 foot 8 inches	11 yards	205 million	Jurassic Period • no deposits in Ohio • North American Plate moves westward at a rate of 6 miles per million years • dinosaurs (*Stegosaurus, Allosaurus, Brachiosaurus, Diplodocus*) rule the Earth • flying reptiles (pterosaurs) appear • marine reptiles common • first known bird
1 foot 2 inches	8 yards	138 million	Cretaceous Period • no deposits in Ohio • formation of Rocky Mountains • North America continues to move west • ammonoids, clams, snails, corals, bryozoans, ichthyosaurs, and plesiosaurs abundant in seas • *Tyrannosaurus* and *Triceratops* abundant on land • large pterosaurs abundant in the air • first snakes • first grasses and flowering plants
6 inches	4 yards	65 million	Tertiary Period • Teays-age stream deposits in southwestern Ohio • North American Plate and Pacific Plate collide • huge extinction (dinosaurs and many other species) • Age of Mammals begins • beginning of modern shell life in seas • North America begins to cool
5 inches	3 yards	45 million	Pangea splits into modern continental masses
4 inches	2 yards	37 million	First elephants, horses, deer, bears, and ancestors of cats and dogs
2 inches	1 yard	24 million	Apes abundant • huge sharks in seas • plant life similar to today
0.04 inch (1 mm)	10 inches	5 million	Early forms of humans • first tool-using primitive humans
0.01 inch (0.3 mm)	3 inches	1.6 million	Quaternary Period • beginning of the Ice Age • abundant horses, mastodons, beavers, porcupines, and large ground sloths
0.008 inch (0.2 mm)	2 inches	1 million	Abundant sabertooth cats, wooly mammoths, bison, and rodents
0.001 inch (0.03 mm)	0.02 inch	10,000 years	End of recent Ice Age • two-thirds of Ohio covered by unconsolidated glacial deposits • many large land mammals become extinct
0	0	the present	Humans dominate the Earth • North America continues to move west