



PALEO TIME LINE

GRADE LEVEL: 6 - 12

TIME REQUIRED: Two class periods

SETTING: Classroom

GOAL: Create a time line

OUTCOMES: At the end of the lesson the student will be able to:

- visualize the passage of time through the use of familiar historical events,
- visualize the layering of artifacts and/or fossil remains with the oldest remains at the bottom and the youngest (newest) remains at the top,
- visualize the length of time which has passed since the appearance of various plant and animal species
- visualize the passage of time between major pre-historic events,
- and understand the number of evolutionary events that have occurred during the most recent geologic time periods.

KERA GOALS: Meets KERA goals 1.1, 1.6, 1.7, 1.8, 1.9, 1.15, 2.2, 2.4, 2.6, 2.20, 4.2, 4.5, 5.3, 6.2, 6.3

BACKGROUND INFORMATION

The natural history of our earth is told on countless "pages" of rocks. Each rock layer is like a page of a novel. Fossils litter various rock layers and provide the ever-changing story of life on our planet. The positioning of fossils in respect to each other provides a clue to the passage of time. Geologists have used these rock and fossil records to divide pre-historic time into four large time frames called eras. Boundaries between these eras are not always clear, but each era has a set of typical animals, plants, and geologic changes that set it apart.

The oldest and longest time period is called the Precambrian Era. It began when the earth was first formed, about 4.6 billion years ago. Little is known about life in this era because few fossils have been found.

The Paleozoic Era followed the Precambrian Era. Scientists believe that at the beginning of this era there was only one large continent on earth called Pangaea. This continent, located near the South Pole, was covered with ice. About 400 million years ago, the huge



continent drifted towards the equator, causing the ice sheet to melt. During this period of time the available fossil record becomes more complete.

It was during the Mesozoic Era, which began about 225 million years ago, that the continent of Pangaea slowly separated into the seven present-day continents. Variations in temperature and climate occurred. Reptiles of many shapes and forms lived during this era. For over a 100 million years during this time period giant dinosaurs roamed the earth. Very small mammals, birds, and some flowering plants developed near the end of this period.

The Cenozoic Era began about 65 million years ago. This is the era in which we currently live. The climate during this era has ranged from hot and humid to prolonged periods of cold. The strange pre-historic creatures of old have developed into the life forms with which we are so familiar today.

The geologic eras are further divided into shorter time spans called periods. Various periods are separated by important geologic events. The list of eras and periods, with their major environmental events and changing forms of life, is called the Geologic Column.

This Geologic Column provides us with a view of the planet's history. It shows the enormous span of geologic time and the multitude of living creatures that have come and gone.

Background information taken from Petrified Forest National Park, "Dividing the Earth's Chapters", found in *Fascinating Fossil Factory*.

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MATERIALS NEEDED

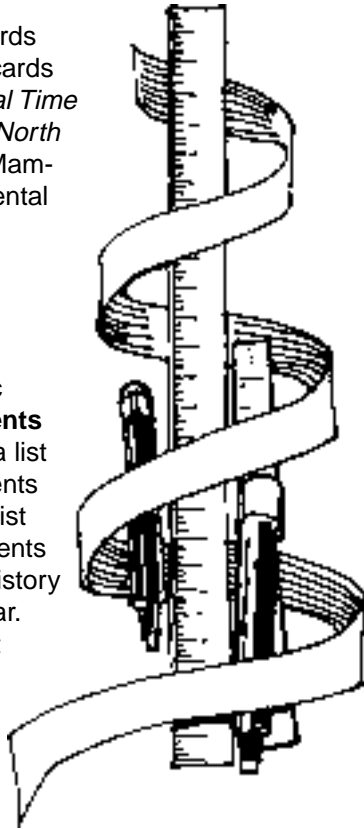
- Two rolls of adding machine tape
- Yardstick
- Ruler
- Marking pens
- Special Events activity cards
- Paleo Time Line Activity cards
- Optional Chart: *Geological Time and the History of Life in North America* (available from Mammoth Cave NP Environmental Education Program)

PROCEDURE

ACTIVITY ONE:

Make a time line of historic events known by the students

1. Have the students make a list of important historical events they have studied. Their list should include several events from ancient to modern history with which they are familiar. The list could include (but should not be limited to):
 - *ancient history* – the first humans; the Tigris-Euphrates River cultures; ancient Egypt; building of the Great Wall of China; the Roman Empire,
 - *early history* – the Middle Ages; Shakespeare; Columbus discovers the New World; westward expansion in America,
 - *modern history* – the California Gold Rush; the invention of the phonograph, automobile, airplane; World War I or II; Space Travel; your school classroom.
2. Have each student or pair of students choose a different event from your list. Have them produce a visual image that illustrates their event. They may find or draw a picture or they may use one of the drawings from the “Special Events” activity sheet. Have the students perform research in order to determine the year or time frame in which their event occurred. How long ago was that? In calculating time, remind them to add 2,000 years to any events that are listed as a time B.C. (For example, an event which occurred in 1,500 B.C. would be 3,500 years old.)
3. Have the students determine an appropriate scale of time for their list of historical events. NOTE: A scale of 1-inch equals 100 years would produce a time-line over 20 feet long to record the oldest Homo sapiens remains found in North America – dating back to 22,000 BC from Los Angeles – or 250 feet long to reach back 300,000 years ago to the first confirmed Homo sapiens remains found in Hungary! Using this scale, cut a piece of adding machine tape the necessary length. You will now paste or tape the Special Events pictures vertically along this section of tape.
4. Explain that when scientists search for clues to our history, they must search through many facts, they must read lots of documents, and sometimes they must literally dig down into the earth to look for discarded items from early civilizations. When excavating a site, the newest events (and artifacts) would be found at the top of the hole. The oldest artifacts and the remains of the oldest civilizations will be found at the bottom of the hole. As an example, the clothes you wore last week would be at the bottom of the clothes hamper. The clothes you are wearing today would be at the top of the hamper. With this in mind, begin with the oldest event chosen by the class. Because it is the oldest, we would find it at the bottom of an excavation site. Therefore, that picture will be found at the very bottom of the tape. Draw a vertical line across the width of the tape at the very bottom. Write the date of your earliest historic event next to the line. Now paste or tape the picture which shows that event on or next to the line.
5. Next you are ready to record the second oldest event. How many years passed between these two events? Using your scale, how much distance must you measure up the tape? Measure the distance and draw a vertical line across the width of the tape in the appropriate place. Write the new date next to this line. Now paste or tape the picture of that event on or next to this new line.
6. Proceed to the third oldest date and repeat steps 4 and 5 for this and all other events until you get to your classroom (today’s date) at the very top of the tape.
7. Have a discussion of the time line of events:
 - How far down would a scientist have to “dig” to find information about the pyramids? About knights in shining armor? About man walking on the moon?
 - What do you notice about the number of events and their distance apart on your tape? Which part of our history seems to be the most crowded? Why are the events at the bottom of the tape so far apart? Do you



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think this is because people didn't do as much a long time ago, or do you think it is because it is harder for scientists to find artifacts and information about older events?

- What do you predict your time line may look like in the next 100 years?

ACTIVITY TWO:

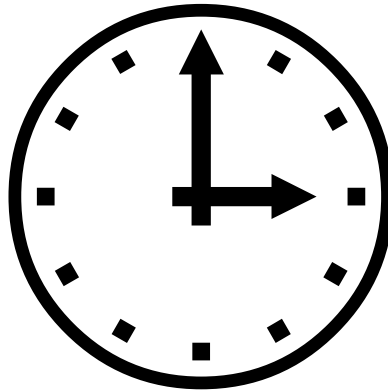
Make a time line of pre-historic history

1. Tape or otherwise fasten the adding machine tape horizontally to the classroom or hallway wall, approximately eye-level for your students. Draw a vertical line across the width of the tape one inch from the beginning edge of the tape. This line should be labeled "TODAY".
 2. OPTIONAL INSTRUCTION FOR YOUNGER STUDENTS: Instruct students to measure the length of the tape, placing a vertical line every 10-inches. Label the distance at the bottom of each vertical line (10, 20, 30, etc). This will provide a scale of one-inch equals one million years. The length of the tape should equal the distance back in time you would like to represent. NOTE: The tape will be 42.5 feet long to trace back to the first marine hard-shell animals; or 250 feet long to trace back to the first signs of life.
 3. Pass out the "Paleo Time Line" cards, one to each student or pair of students.
 4. Using the ratio of 1 inch = 1 million years, each student or pair of students should calculate how far their time period will be from "Today." They may calculate their answer in inches or convert their answer to feet and inches. In turn, allow them to measure, mark and label their "Special Event" along the adding machine tape at the appropriate distance from the vertical "Today" line.
 5. Tape the top of the "Historic Time Line" over the vertical "Today" line so that it is within the first inch (first one million years) of the "Paleo Time Line."
 6. With each student/pair of students standing at their location, point out how much time has passed between primary geological and paleontological events. Point out the great number of events that occurred during historic time. Compare the frequency of historic events to the vast amounts of time between paleo events.
- Have them calculate the distance back to the first marine hard-shell animals found 510 million years ago, going back in time three billion (3,000 million) years to the first signs of life, or going back 4.5 billion years to the beginnings of geologic time! They should use a scale of one-inch equals one million years. If a roll of adding machine tape is 160 feet long, how many rolls of tape will they need to complete this activity?
2. Change the scale for activity one. Go outside to the school football field and let the students measure and label the most recent million years of history. Use the scale 100 yards equals one million years. Ask them how far down the field they think that they would have to walk to reach their birth date. How far would they walk to reach the discovery of America? How much time is represented by one yard? (Answer: 10,000 years Can the students tell you what Kentucky was like 10,000 years ago? (One possible answer: Prehistoric Indians lived in the Mammoth Cave area at that time) Divide 10,000 years by the number of inches in a yard to discover the number of years represented by one inch. (Answer: 278 years. Round this number off and use 280 years for one inch) How many events can the students list that happened in the first inch of history?
 3. Change the scale for your prehistoric time line. This time try using one-foot equals one million years. Have each student recalculate the new distances. Mark off your new time line outdoors in the school playground or along the school football field. Use flags or signs to show each event. NOTE: The older events may extend past the end of the football field. Instruct the students to find a landmark on their way home (from the bus or car window) that would be equivalent to the beginnings of life on earth! How far will they need to travel to find the first life forms or the start of geologic time?
 4. Students could research and report on the evolutionary event depicted on their card prior to labeling the event on the time line tape.
 5. Students could add sketches, photographs, or line drawings to the time-line tape, which show the species living during their time period.
 6. Take a field trip to a rock quarry, to a road-cut, or to an expanse of exposed local rock to search for fossil remains. Ask permission of the landowners before you collect any fossils you see!

EXTENSIONS:

1. Prior to this activity, have students calculate the length of adding machine tape they will need in order to reach back to the beginnings of prehistoric time.

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1 – 1 ½ Million Years Ago	Ice Ages Begin
2 Million Years Ago	First Humans Appear
10 Million Years Ago	Mammoth Cave Begins to Form
50 Million Years Ago	Modern Plants & Animals
65 Million Years Ago	Dinosaurs Are Extinct
130 Million Years Ago	First Flowering Plants Develop
150 Million Years Ago	Early Mammals
160 Million Years Ago	Early Birds
180 Million Years Ago	Bony Fish & Palm Trees
240 Million Years Ago	Start of Age of Dinosaurs
255 Million Years Ago	Early Insects & Seed Ferns
290 Million Years Ago	First Reptiles
300 Million Years Ago	Early Amphibians
350 Million Years Ago	First Land Animals (Scorpions)
410 Million Years Ago	Earliest Land Plants
450 Million Years Ago	First Fish
510 Million Years Ago	First Marine hard-shell Animals
3,000 Million Years Ago (3 Billion Years Ago)	Algae; First Signs of Life

PALEO TIME LINE CARDS

1 – 1½ Million Years Ago
Ice Ages Begin

10 Million Years Ago
**Mammoth Cave
Begins to Form**

65 Million Years Ago
**Dinosaurs
Become Extinct**

150 Million Years Ago
Early Mammals

180 Million Years Ago
**Bony Fish and
Palm Trees**

2 Million Years Ago
First Humans

50 Million Years Ago
**Modern Plants
and Animals**

130 Million Years Ago
**Flowering Plants
Develop**

160 Million Years Ago
Early Birds

240 Million Years Ago
**“Age of Dinosaurs”
Begins**

PALEO TIME LINE CARDS

255 Million Years Ago
**Early Insects
and Seed Ferns**

300 Million Years Ago
Early Amphibians

410 Million Years Ago
Earliest Land Plants

510 Million Years Ago
**First Marine Hard-
Shelled Animals**

290 Million Years Ago
First Reptiles

350 Million Years Ago
First Land Animals

450 Million Years Ago
First Fish

3,000 Million Years Ago
(3 Billion Years Ago)
Algae
First Signs of Life

PALEO TIME LINE SPECIAL EVENT CARDS

