The Alabama Museum of Natural History (AMNH) is part of the University of Alabama Museums and is located on the UA campus in Smith Hall. Opened in 1910, it is the oldest natural history museum in Alabama, and one of the oldest natural history museums in the nation. AMNH’s mission is to broaden the knowledge of natural sciences and human culture through collections and quality programs of research, instruction, and service.

**Science and Social Studies Standards Covered:**

SC (9-12) Biology 11. Classify animals according to type of skeletal structure, method of fertilization and reproduction, body symmetry, body coverings, and locomotion.

SC (9-12) Geology 6. Explain the concept of geological time within the framework of the geologic time scale.

SC (9-12) Geology 15. Identify geological regions in Alabama and the southeastern United States.

Fossil Program: Take a step back 350 million years ago (mya) in Alabama’s history to when dragonfly wings were three feet wide and grasses grew to 80 feet tall! Learn about a time when Alabama was mostly covered in oceans, giving way to fearsome aquatic beasts and giant turtles. Discover Alabama’s dinosaurs and Ice Age animals, some of which may surprise you! This program is an educational ride through Alabama’s prehistoric past which includes a presentation and hands-on experience with actual fossils. And it all happens in your classroom! The program discusses what a fossil is, the fossilization process, and how paleontologists recover them including a look at the law of superposition. The presentation also discusses geologic time from the Cambrian period, 350 mya, to the Quaternary period (what period we are in now) and uncovers what creatures lived in Alabama during those times.

**For more information or to schedule this program call (205) 348-7550 or email programs@ua.edu**
**Did you know?**
The Alabama Museum of Natural History is right on the University of Alabama campus? It is housed in Smith Hall near the Gorgas Library.

**Did you know?**
AMNH is a great destination for school field trips. Guided tours cost $2 per student. If you would like a hands-on component added, a tour and Discovery Lab is only $5 per student.

**For information** regarding field trips, you can call (205) 348-7550 or email programs@ua.edu.

**For more info or to schedule** this in-school program for your room, email programs@ua.edu

www.amnh.ua.edu

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**Suggested Pre-Visit Activities:**
- *A Day in the Life of Paleontologist Thomas Carr*
- *Evolution website*
- Clock of Eras activity
- Science Journal entries

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**Suggested Post-Visit Activities:**
- Science Journal entries
- Fossil Beds
- Make Your Own Geologic Time Scale
- Other Fossil Activities

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**Books About Fossils and Dinosaurs:**
- *Fossils: The Evolution and Extinction of Species* by Niles Eldridge
- *Dinosaurs: A Very Short Introduction* by David Norman

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**Videos About Fossils and Dinosaurs:**
- *Discovering Alabama: Tracks Across Time*
- *Discovering Alabama: Geologic History of Alabama*
Our planet is approximately 4.5 billion years old. During that time, it has gone through many changes. It's easy to say that trilobites lived 500 million years ago, and dinosaurs roamed 65 million years ago, but that much time is difficult to grasp. This activity will help you see relative lengths of time of about 375 million years of Earth's history. Read about each of these eras of Earth's geologic history and fill in the clock accordingly. You are only pretending to move the hour hand in this activity. The first one is done for you.

<table>
<thead>
<tr>
<th>Color</th>
<th>Era</th>
<th>Years</th>
<th>Clock time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>Hadean</td>
<td>700 million</td>
<td>1 hour 52 minutes</td>
</tr>
<tr>
<td>Grey</td>
<td>Achaean</td>
<td>1.3 billion</td>
<td>3 hours 28 minutes</td>
</tr>
<tr>
<td>Yellow</td>
<td>Proterozoic</td>
<td>1.975 billion</td>
<td>5 hours 12 minutes</td>
</tr>
<tr>
<td>Blue</td>
<td>Paleozoic</td>
<td>295 million</td>
<td>47 minutes</td>
</tr>
<tr>
<td>Brown</td>
<td>Mesozoic</td>
<td>183 million</td>
<td>29 minutes</td>
</tr>
<tr>
<td>Green</td>
<td>Cenezoic</td>
<td>65 million</td>
<td>10 minutes</td>
</tr>
</tbody>
</table>
The Hadean Era occurred between 4.5 and 3.8 billion years ago. It gets its name from Hades, the Greek netherworld, and is characterized by colliding planetesimals which produce a lot of heat. It is most likely that Earth would have been molten at this time, with no solid rock forming until after this era. The oldest rocks on Earth, aside from meteorites, date back to about 3.8 billion years ago. The black color symbolizes the void of life at this time.

The Archean Era occurred about 3.8 to 2.5 billion years ago. This era is marked by continent formation and the beginnings of life. The Earth had cooled enough to allow undersea rock and continental plates to begin forming. The atmosphere was still very different from the one existing today. It was most likely a mixture of methane, ammonia, and other gases. This mixture would not have supported life as we have it now, however, it was early into the Archean Era that life first began appearing. All life during this time was bacterial, some of which can still be found today (stromatolites). This was also the first time the Earth saw autotrophs, life that relied on light to live and gave off oxygen. The grey color represents the beginnings of life on Earth.

The Proterozoic Era occurred between 2.5 billion and 543 million years ago. Though life started in the Archean Era, fossils from that time are rare. The most extensive and abundant early life fossils come from the Proterozoic Era. It was during this time that the Earth started to see a new type of cell being developed, the eukaryote. This is a result of the oxygen-rich atmosphere created by the autotrophs from the Archean era. These new cells contained a previously non-existent part, a nucleus. With the development of the eukaryotes, cells soon began joining together to create the first multicellular algae and animals (toward the end of the era). Life was not the only thing changing at this time; a single super continent, Rodinia, also formed. The yellow color represents the emergence of more varied forms of life.
The Paleozoic Era occurred between 543 and 251 million years ago. The era includes two of the most important events to happen to animal life in Earth’s history. This era began with an “explosion” of multicellular animals. The variety was so great, that almost all living animal phyla appeared within a few million years. This is where we see trilobites, brachiopods, mollusks, and other life. Life also starts to move out of the oceans and onto land in this era. Land plants evolve rapidly; giant insects can also be found during this time. However, the end of this era was marked with a mass extinction which erased approximately 90% of all marine animal species. It was the largest extinction in Earth’s history. The blue color symbolizes the explosion of aquatic life during the era.

The Mesozoic Era occurred between 251 and 65.5 million years ago. Following the mass extinction of the Paleozoic era, new life formed. Species diversity slowly recovered. Dinosaurs began and (most) ended during this time. Birds, other reptiles, and a variety of plant life also became abundant. Oceans receded, exposing more land for animals to live on. Pangea, the supercontinent, is present during this era. The brown color symbolizes the extinction characterizing the end of this era.

The Cenezoic Era occurred between 65.5 mya and the present. This is the era we live in today. Many call it the “Age of Mammals” because the largest animals on land are mammals, though mammals are not the only animal to gain diversity and number. Many early Cenezoic animals were surprisingly larger than their modern counterpart, while others perceived to be much larger, were in fact near the same size we have today. Beavers, sloths, and some birds towered over their modern-day relatives, while mammoths and mastodons were around the same size, if not a little smaller, than elephants today. Flower plants also become abundant. Continents are continuing to separate, volcanic activity is making mountain formations, creating the world we see today. Humans arrive much later, only about 200,000 years ago. This represents about seven seconds on the clock.
Fossil Beds

By David R. Stronck

Materials and Equipment:

Each group of two students will need: A large cardboard box with a bottom surface of at least 30 cm x 30 cm, sand (or loose soil) to cover the bottom with a thickness of 2.5 cm-7.5 cm., bones of a chicken or other small animal, a sturdy plastic fork, a magnifying lens (optional), a picture of the animal whose skeleton is being reconstructed.

Safety note: provide plastic forks for the students to dig up the bones as there is a slight risk of them injuring themselves on sharp bones if they sure their hands to do the sifting.

Focus:

Fossils are impressions, traces, or remains of dead plants or animals that are preserved in rocks. After scientists find fossils, they work on the problems of interpreting their origin. They try to answer such as questions as: What did the living animal or plant look like? What did it eat? How did it move? Why did it die?

Challenge:

Can you reconstruct the skeleton of an animal for its “fossil” bones and describe what it was?

Time: 45 minutes

Procedure:

1. This activity should follow one on human bones. For example, the students could learn how to name major bones shown on a cardboard Halloween skeleton to “feel” these bones in their own bodies.

2. Obtain the bones of enough small animals to provide one skeleton for each box. Perhaps the easiest bones to collect are those from whole fryer or roaster chickens. Other possibilities are turkey, if your boxes are large enough, and fish. The key is to have all or most of the skeleton. Simply collect the bones after eating and remove any fat or skin by boiling the bones in soapy water.

3. Scatter the bones of one animal over the surface of the sand or soil in the bottom of a box, and then carefully bury them. Middle school students may be able to manage the activity by having the bones of two different animals in the same box.

4. Discuss how scientists know so much about dinosaurs, explaining that all of our knowledge about dinosaurs has come from scientists digging bones out of rocks. Scientists then organize the bones by following the model of animals that are now living.

5. Carefully dig up the bones from the box with a plastic fork. (If they use their hands they might cut or puncture themselves on any sharp bones.)

Question— How many legs did your animal have? Could it fly? How did it eat? Could it run quickly? How tall was it? How much did it weigh? Why did it die?

1. Working from a picture of the animal species whose bones are buried, arrange the bones in the form of that animal. Tell the students there is one “fossilized” animal in each box. As an option, they may examine the animal’s bones, especially the small ones, with a magnifying lens. Under magnification, the students may discover such things as the long bones are hollow and the ends of the bones have cartilage. After finding all the bones, ask the students to describe their animal. If the students want to “preserve” their skeletons, they may glue the arranged bones to a cardboard sheet or wooden board.
Further Challenges:

Encourage the students to bring to class models of dinosaurs and books about dinosaurs. Some children have stuffed animals that are dinosaurs. Help the children to discuss theories about how dinosaurs became extinct. Perhaps they died of cold and starvation after the Earth’s atmosphere was filled with dust or volcanic ash either from a giant meteorite or from volcanic activity.

To explore real fossils, find out if there is an exposed fossil bed near your school and either take the children to dig some fossils or bring some of the fossils to the school into examine and discuss. To find out whether there is a fossil bed near your area, contact the geology department of your local community college or university.

References:


This lesson plan was found in Water, Stones, and Fossil Bones edited by Karen K. Lind.
Your class can make fossil entries in your science journals! Here are some ideas...

⇒ (Before visit) Why have some animals become extinct, while others evolved?
⇒ (After visit) After learning more about fossils and geologic time, have your thoughts changed about why some animals have gone extinct and others have evolved? If no, why? If so, how?
⇒ Why are animals that have been frozen so useful to scientists?
⇒ Where are Cretaceous deposits found in Alabama? What types of fossils do you find there? Why?
⇒ What conditions need to be present for fossilization to occur?
⇒ What methods are available for dating fossils?
⇒ What geologic time period interests you the most? What is the dominant species, position of the continents, state of the oceans, and make-up of the atmosphere during that time?
⇒ According to geologic time, what eon, era, period, and epoch are we in today?
⇒ What conclusions can you draw from fossil tracks? What if the footprints also have a center track?
⇒ What is cryptozoic time?
⇒ Why is it that about 87% of Earth’s history left no fossils?
Make your own Geologic Time Scale

Materials: construction paper, scissors, tape, metric ruler, markers

Procedure:
1. Cut the construction paper along its length into strips 5 cm wide.
2. Tape the strips together end to end so that you have ribbon about 5 m long.
3. Roll up the ribbon so that it is easy to handle. Unroll it as needed.
4. Using a scale of 1 mm equals 1 million years, measure, mark, and label each of the following: Formation of the Earth (4.6 billion years ago), to the Evolution of Complex Organisms (1.8 billion years ago), to the End of Cryptozoic Time (600 million years ago), to the Present.

Questions:
The first three parts of your time line are all part of Cryptozoic time. Cryptozoic time means “secret life.” Why is this a time of “secret life”?
How many times longer is Cryptozoic life than the time after it?
Other fossil activities:

- Take a small piece of clay, and form it into a disk about 3 cm to 4 cm across. Carefully press your thumb into the clay. Then allow your “fossil” to harden overnight. Compare your print to those of your classmates. See if you can match the print to the right person.

- Use a drawing or photograph to observe animal tracks. See where the animal(s) moved, or what the animal(s) may have been doing. Paleontologists use these skills to predict how ancient animals behaved and interacted. When you have deciphered your drawing or photo, create a drawing of your own and try to have a classmate deduce your story.

- Put some fresh hay and water into a beaker or glass pan. Gently boil the mixture until the water achieves an amber color. Add some more hay to the mixture and let it sit for a day or two. Take a drop of the liquid and observe it under a microscope. What do you see? Sketch the organisms that you see and compare it to your classmates. Did you see the same things?