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Find the panel **Taphonomy Clues to Ancient Life and Death**. What is one piece of evidence that helped paleontologists find out what happened at this site?

Deinonychus adults and teeth found among tenontosaurus remains suggest that Deinonychus were hunting tenontosaurus. The body of a young tenontosaurus found

with adults indicates that they lived in family groups.

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Ceratopsians or “horned dinosaurs” were a group of Late Cretaceous dinosaurs that included Triceratops and Pentaceratops. Scientists think that horns and frills were adaptations that served a number of functions. List three of these functions below and describe the advantages that they would have for ceratopsians.

Horns used in combat for males.

Horns and frills help individuals determine the age and species of others.

Frills show size and strength.

Some solid frills to protect the neck.

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The **Cretaceous extinction**, which marks the end of the **Mesozoic Era** and the dinosaurs, is the most well-known extinction event in Earth's history. What was the cause of this extinction event, and what evidence do scientists have of it?

The cause of this extinction event was an asteroid impact. Scientists have found

evidence including a thin clay layer containing iridium, a substance found in meteorites, between rock layers that mark the end of the Cretaceous. They have also found quartz minerals with high pressure cracks in these layers, which is more proof of asteroid impact at this time. Additionally, there is a crater off the coast of the Yucatan Peninsula in Central America.

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In the early Tertiary, prey animals gained large body sizes, improved ability to run across open spaces and burrowing abilities. What changes in the environment lead to these adaptations?

Tropical forests gave way to woodlands and prey species could not always escape by climbing trees, so they had to adapt to an environment with fewer trees and more open ground.



Sam Noble Museum 2401 Chautauqua Ave., Norman, OK 73072-7029
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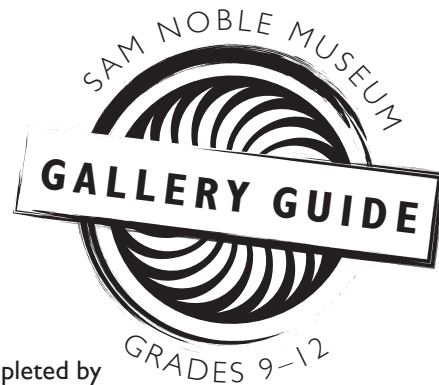
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HALL OF ANCIENT LIFE

Welcome to the Sam Noble Museum!

These gallery activities are designed to be completed by a student or group of students.

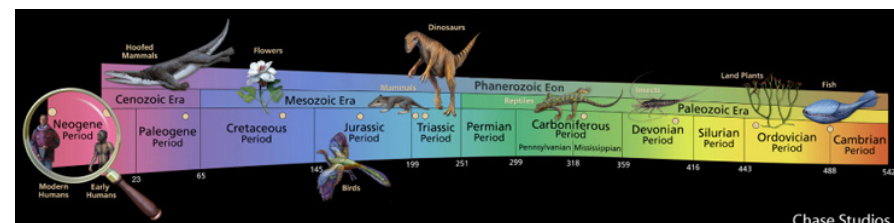
Gallery Guides are available for each of the museum's three permanent galleries.



The Hall of Ancient Life takes you on a trip through time, from the formation of the earth, 4.6 billion years ago to the end of the Pleistocene Period, 11,700 years ago. Each section of the gallery represents a different time period in Oklahoma's prehistory so you can see how the environments and animals have changed through time.

Everything you see in the gallery today is based on fossil evidence from plants and animals. Paleontologists, scientists that study ancient life, use this evidence to reconstruct life in the past. In fact, many of the fossil animals and plants you will see were found by museum paleontologists right here in Oklahoma including the giant Apatosaurus and Sauropaganax of the Jurassic Period, and the newly discovered Aquilops!

Look at the geologic timeline below to see the different periods represented in the gallery. The timeline can be found on each section of the gallery marking which time period you are exploring.





1. Begin at the Hall of Ancient Life, located on the first floor. The entrance displays cases of plants and animals with a display of the earth in the middle.
2. Explore the gallery to find the answers to the questions below.
3. Start your journey at the entrance and end in the room with the mammoth.



Define **superposition**. How does it help paleontologists?

Superposition states that rock layers are arranged with the oldest layers on the bottom and youngest layers on top. Stratigraphy, the science of studying rock layers, allows paleontologists to determine

the order of fossils in time. They can then take this timeline of rock layers and use it when they dig at other sites.

2 Arthropods first appeared in the **Cambrian Period**. All arthropods have exoskeletons. What is an exoskeleton and what are the evolutionary advantages to having a skeleton?

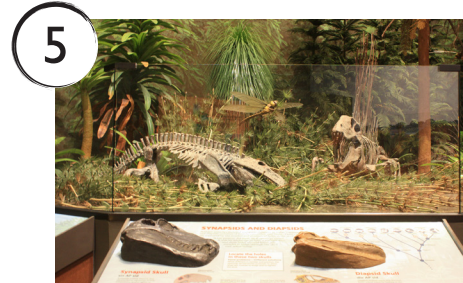
An exoskeleton is a skeleton on the outside of the body. Skeletons of all types protect and support internal tissues and organs, improve movement and support body weight.

3 **Tetrapod** is the name given to the first animals that walked on land. It means four feet. What evolutionary innovations did tetrapods have?

Tetrapods evolved bones and muscles along the back, head and belly to provide body support. They also developed knees and elbows which allowed more flexibility when moving on land.

4 **Pennsylvanian Coal Swamps** had more oxygen in the atmosphere than today because large amounts of decaying plants called peat held onto carbon dioxide and did not remove much oxygen from the air. What effect did high amounts of oxygen in the atmosphere have on insects at this time?

High oxygen levels allowed insects to evolve larger sizes than most insects today because the tracheal tubes that carry oxygen to the cells are limited by the amount of oxygen in the air. More oxygen in the air allowed the tracheal tubes grow larger carrying more oxygen to the cells and increasing the size of insects.



What is the difference between a **diapsid** and a **synapsid**? What evolutionary features does each possess?

Diapsids have two holes on each side of the skull behind the eyes and synapsids have only one. Diapsids adapted the ability to run quickly on two legs and some had feathers for warmth. Some

diapsids basked in the sun to regulate their body temperature. Synapsids developed better regulation of their body temperature and different kinds of teeth for processing food quickly.



The **Permian extinction** is known as the largest mass extinction in Earth's history. What three causes are paleontologists investigating for the Permian extinction? How could these events cause mass extinction?

Volcano eruptions that released carbon dioxide into the atmosphere and caused climatic warming and sea level change.

Toxic ocean water caused by slow moving and stagnant oceans could have poisoned marine animals and lead to mass extinction.

7 Which group of diapsid reptiles became dominant in the **Triassic Period**? What features did they gain in the Triassic Period that they did not have in the Permian Period?

Archosaurs became dominant in the Triassic Period. They had an additional opening in front of the eye socket, and more developed limbs for speed and stability while running.

8 What is a **theropod**? What adaptations allowed them to become the dominant carnivores of the Jurassic?

Theropods are solitary, carnivorous predators that ran on two legs. Theropods evolved long, hollow bones, increased speed, narrow feet, serrated teeth and curved claws. All of these adaptations made them very effective predators.