# Module 9: Earth's History
## Topic 3 Content: A Tour of Geologic Time Notes

The geologic time scale holds secrets to the life that has existed on Earth since the beginning of time. It is time for you to take a journey through the history of Earth.

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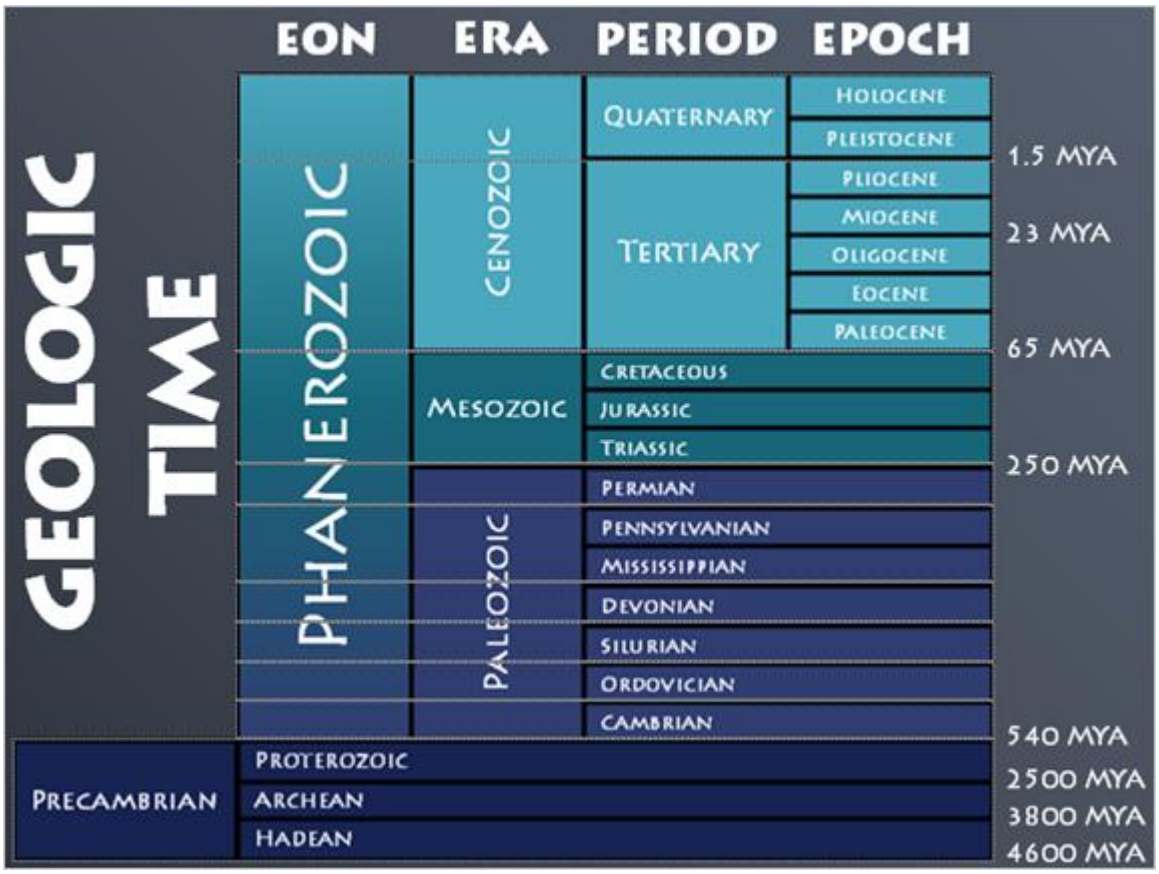


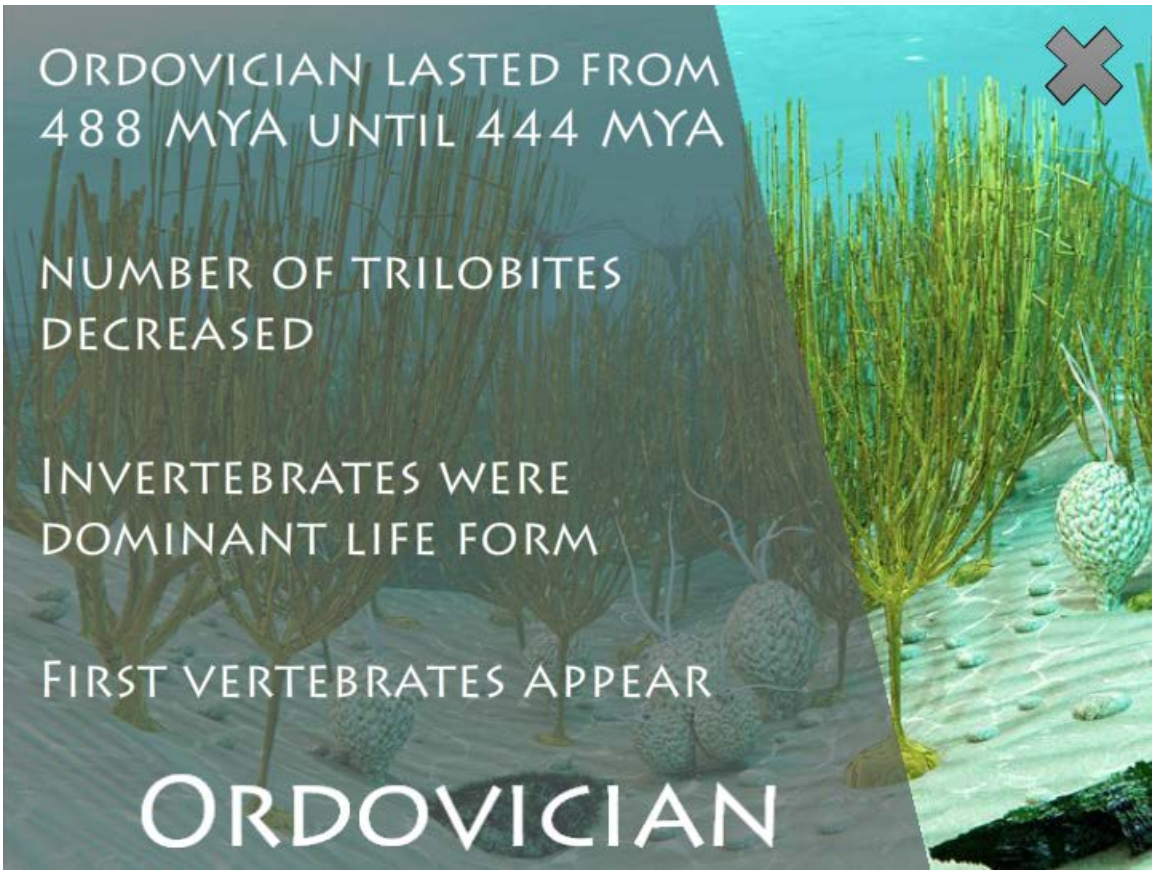

Click on each of the segments of time shown on the diagram to learn more about their individual characteristics. Make sure to visit all of the segments until the entire time scale is grayed out.


The Precambrian eons lasted from around 4.6 billion years ago to 542 million years ago. During the Precambrian, the environment was very harsh. Meteorites bombarded the planet, volcanoes erupted, and the atmosphere was filled with toxic gas. Slowly, the ocean formed, yielding evidence of early life in the form of algae, corals, and bacteria. This indicates that life began in the oceans. The oldest fossils found have a date of 3.5 billion years of age. Precambrian time is divided into three eons:

- Hadean
- Archean
- Proterozoic

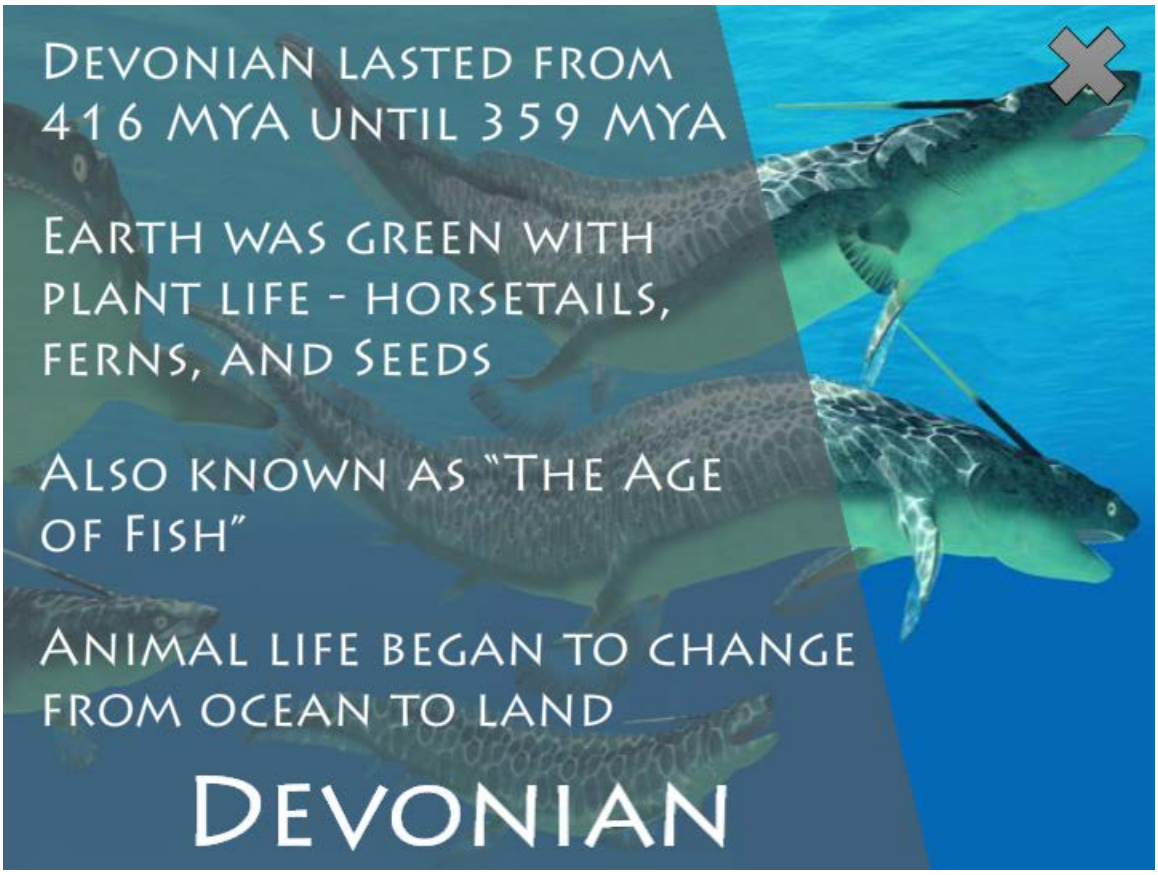
*Image: Early Earth NASA/JPL-Caltech*


The Cambrian Period was the first period of the Paleozoic Era. The word *Paleozoic* means "ancient life." The Cambrian Period began 540 million years ago and ended 488 million years ago. During this period, ocean life that was once unicellular flourished into multicellular life. Shallow oceans covered much of the ancient continents, and it was in these oceans where life "exploded." This image represents one of the most dominant fossils of the period: the trilobite. Trilobites were bottom feeders that lived much like modern-day horseshoe crabs. The trilobite's exoskeleton is commonly found in sedimentary rock layers between the ages of 540 to 250 million years of age. During the Cambrian Period, the amount of oxygen in the atmosphere greatly increased, making it more like the modern atmosphere.



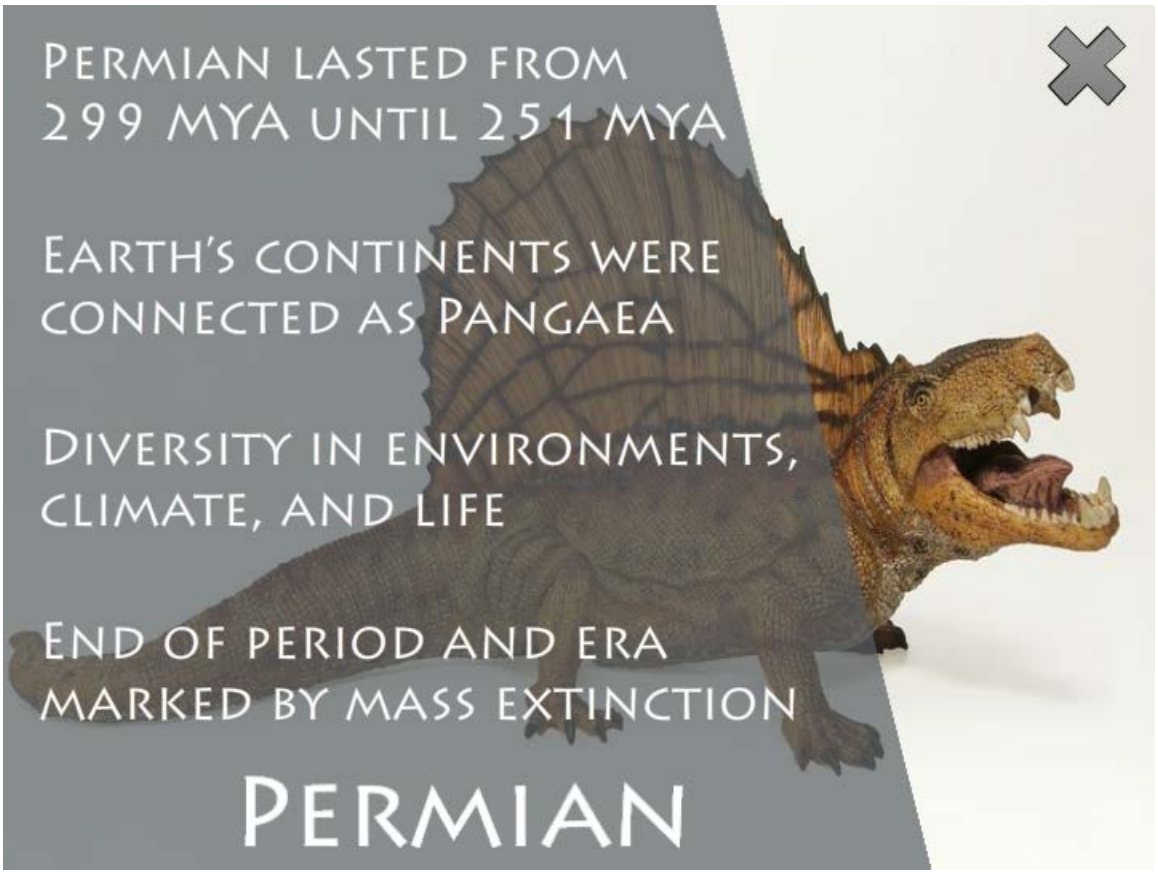

The Ordovician Period began 488 million years ago and ended 444 million years ago. During this period, the number of trilobites decreased. Invertebrates continued to dominate and ranged in size from tiny graptolites to extremely large mollusks. Some of the first vertebrates, or animals with backbones, were jawless, toothless fish, which swam among expansive groups of corals. At the end of the Ordovician, an extinction event occurred that killed off 60% to 70% of all species.


The Silurian Period began 444 million years ago and lasted until around 416 million years ago. During the Silurian Period, small mossy plants began to grow in coastal areas. The dominant aquatic life forms were the Eurypterids, which were large scorpion-like arthropods. In addition, small arthropods began to appear on land.

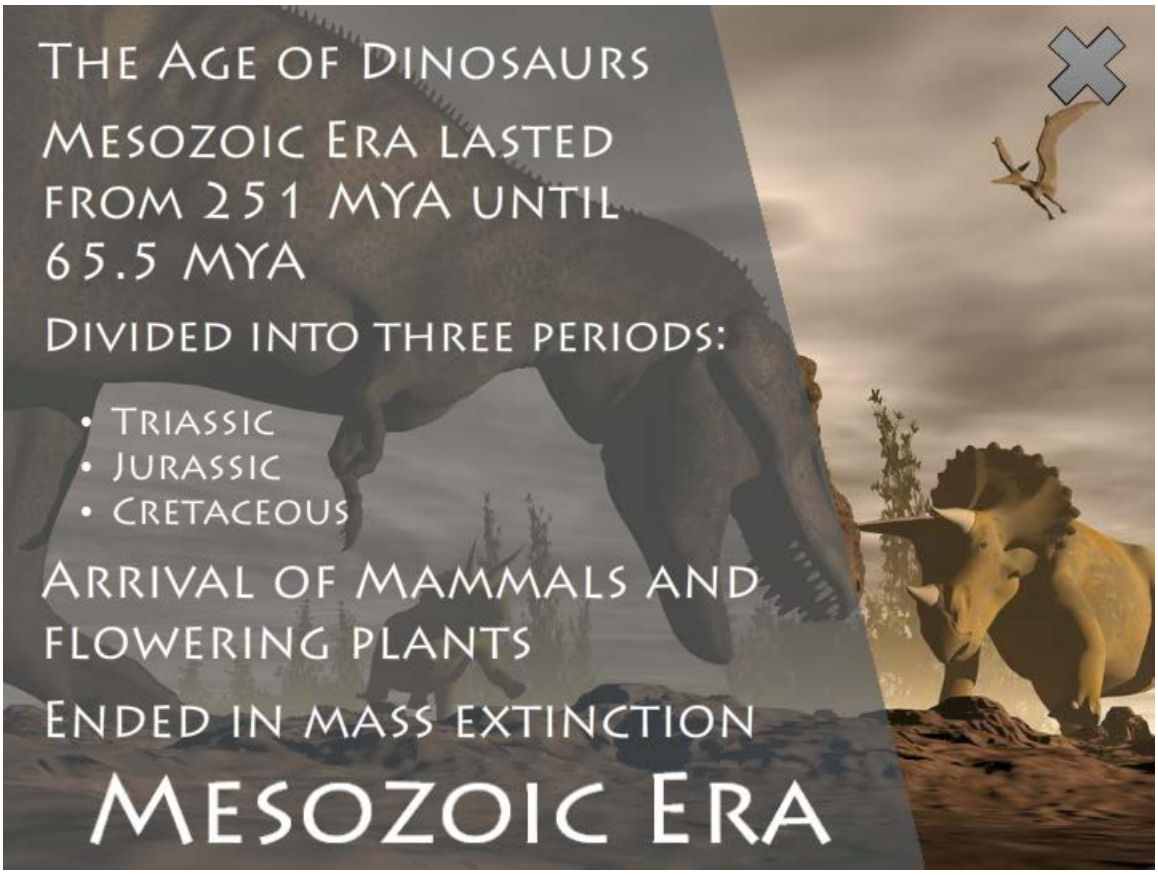



The Devonian Period began 416 million years ago and lasted until around 359 million years ago. This period saw Earth's landscape become green with plant life, particularly giant horsetails and ferns but also seed-bearing plants. The numbers and types of fish became more diverse, and the Devonian is also called "The Age of Fish." Some ocean organisms developed stubby legs, a sign that vertebrate life would soon emerge from the oceans. At the end of the Devonian, an extinction event occurred that killed off 70% of all species.


The Carboniferous was composed of both the Mississippian Period and the Pennsylvanian Period. Around 359 million years ago, the Mississippian Period began and lasted until the Pennsylvanian Period began 318 million years ago. During this time, the continents were all very close to one another around the equator. Because of the location of the continents, the climate was tropical. During these periods in geologic time, amphibians, insects, and four-limbed vertebrates dominated swampy landscapes. The insects present included giant cockroaches and dragonflies. At the end of the Carboniferous, reptiles appeared. These two periods are collectively called the Carboniferous because many carbon-containing coal beds formed during this time in Earth's history.

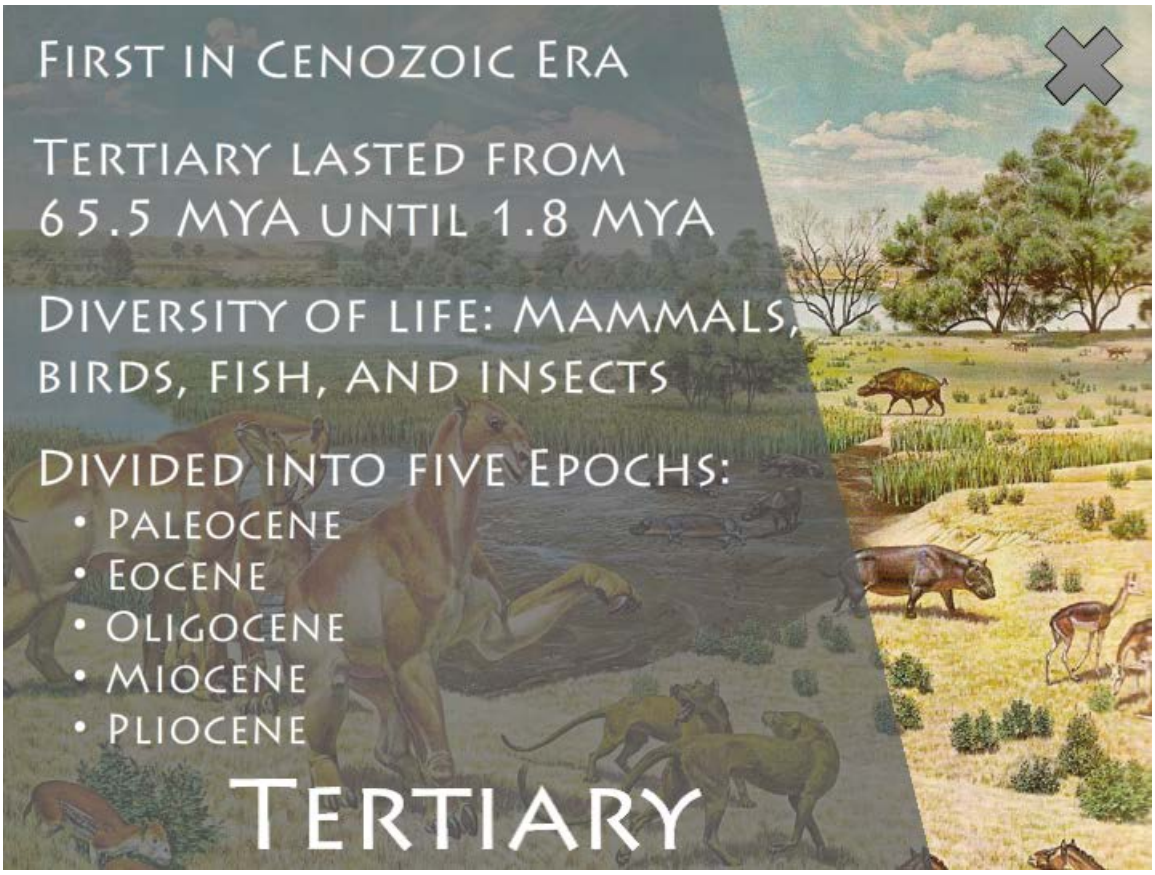



The Permian Period began 299 million years ago and lasted until around 251 million years ago until the end of the Paleozoic Era. During the Permian Period, the continents were connected as Pangaea. The landscape was composed of a variety of different environments with a variation in climate and a wide diversity of life. This period is known for early reptiles, like the Dimetrodon shown in the image. The Dimetrodon was known for having large, spiny sails. The function of this sail was most likely to block the Sun's heat and keep the organism cool. The end of the Permian Period and the Paleozoic Era was a mass extinction of around 90% to 96% of all species. This was caused by the rapidly changing climates associated with continental collisions and shrinking ocean environments.




Popularly known as "The Age of Dinosaurs," the Mesozoic Era is when dinosaurs populated the Earth. It lasted from 251 million years ago to 65.5 million years ago, and it was subdivided into three periods: the Cretaceous, the Jurassic, and the Triassic. During these periods of geologic time, the dinosaurs evolved into a dominant life form and then became extinct. Mammals and flowering plants also show up in the fossil record during this time.

Currently, the most accepted theory that explains the end of the Mesozoic Era is the Impact Theory. According to this theory, a meteorite smashed into Earth around 65.6 million years ago and devastated life by blocking out the Sun and cooling the planet. This event led to the extinction of the dinosaurs and the end of the Mesozoic Era; however, both mammals and flowering plants survived the extinction event.




The Tertiary Period was the first period of the Cenozoic Era. It began around 65.5 million years ago and lasted until around 1.8 million years ago. At the beginning of the Tertiary Period, the climate was still tropical and allowed for a great diversity of mammals, birds, fish, and insects. Toward the latter part of the Tertiary Period, the global climate cooled and provided environments for grasslands and grazing animals. The Tertiary period is divided into five epochs:

- The Paleocene Epoch;
- The Eocene Epoch;
- The Oligocene Epoch;
- The Miocene Epoch; and
- The Pliocene Epoch.


The Quaternary Period is the current period in geologic history, and it is divided into two epochs: the Pleistocene and the Holocene. The Quaternary Period began 1.8 million years ago, and it is a period of cooling. By the beginning of the Quaternary Period, the continents had moved into their current positions. This created large glaciers that are found at each pole. The beginning of this period saw the appearance of humans, as well as the evolution of large mammals, like the Woolly Mammoth shown in this image. During the latter part of the period, human populations evolved to form complex societies and civilizations.