

GEOLOGIC TIME

Scientists have determined that the **absolute age** of the Earth is 4.6 billion years. The ability to determine the age of rocks in specific years has only been possible in recent years. However, from the earliest days of the science of geology, geologists have understood Earth's history in terms of **relative time**. They established a system of divisions and subdivisions to categorize rocks and Earth's history into understandable segments.

The Geologic Time Scale

The **geologic time scale** is a map that divides Earth history into logical segments of time. The oldest segment of time appears at the bottom of the scale and the most recent time period is at the top of the scale. The divisions on the scale mark significant transitions in Earth's history.

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It is important for Earth science students to learn the Geologic Time Scale since all professional geologists refer to this to describe when geologic events occurred, when life forms existed, and so on. Modern geologists also know the absolute dates associated with the relative times listed in the time scale.

Lesson Checkpoint:

Why did early geologists create the divisions of geologic time?

Divisions and Subdivisions

The geologic time scale is broken into divisions and subdivisions. The broadest divisions are called **eons**. Eons are divided into **eras**, eras are divided into **periods**, and periods are divided into **epochs**. For example, the Pleistocene is an epoch in the Quaternary period in the Cenozoic era in the Phanerozoic eon.

EON	ERA	PERIOD	Ma
Phanerozoic	Cenozoic	Quaternary	0.01
		Tertiary	65.0
	Mesozoic	Cretaceous	
	Jurassic		



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Precambrian	Proterozoic	Middle	3400
		Early	
	Late		
	Middle		
	Archean	Early	

There are two Eons. **Precambrian** simply refers to the time before the Cambrian Period. **Phanerozoic** is derived from two Greek words that literally mean "visible life." The names of the eras simply make reference to the life forms found in those eras. **Paleozoic** literally means "ancient life." **Mesozoic** means "middle life." **Cenozoic** means "recent life." The Period names are, for the most part, derived from the regions which were first studied and described by geologists.

The Cambrian period, for example, was named after Cambria, England. The ending of the Epoch names, -cene, is derived from the Greek word "kainos" which means "new." Each Epoch represents new life forms with which that Epoch is identified.

This is a very simplified version of the Geologic Time Scale. Through the years, geologists have broken the Geologic Time Scale into smaller and smaller subdivisions. This is the result of increased and more detailed studies of the various strata and rock formations throughout the Earth. For the beginning student, however, this basic time scale presents the essentials.

Lesson Checkpoint:

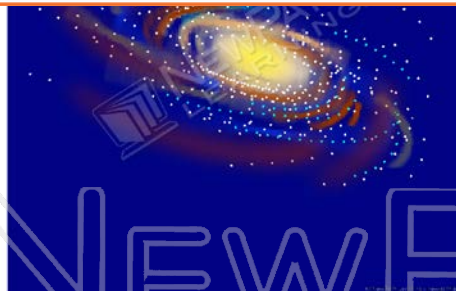
What does each Epoch represent in the Geologic Time Scale?

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When the Earth was large enough, its own gravitational force caused the separation of the Earth's rocky materials into layers. The **core** is the center of the Earth and is the densest material, nickel and iron. The **mantle** is the next layer, and the thickest. The surface of the Earth is covered by a relatively thin **crust**, which is the least dense of the layers.

The Earth's earliest atmosphere most likely consisted of gases such as water, ammonia and methane. A second atmosphere eventually formed which was composed of sulfur, water and carbon dioxide. The sources of these gases were probably volcanoes and impacts from comets. Approximately 3.9 billion years ago, oxygen first began to accumulate in Earth's atmosphere. The oxygen was produced by photosynthesis from simple organisms like algae.

Lesson Checkpoint:

As the Earth grew into a planet, what caused the separation of the Earth's rocky materials into layers?

The Paleozoic Era

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The Mesozoic Era

The Mesozoic Era literally means "middle life." It lasted from 248 million years ago to 65 million years ago. This era is most popularly known as "The age of the Reptiles." Some even call it "The age of the Dinosaur." It is during this era that life crawled out of the water and learned to live exclusively on land. Even though the reptiles were the most dominant of animals, early birds and small mammals also began to appear on the landscape.

