

Geologic Time Chart

A fossil is any evidence of life in the prehistoric past. Fossils have been found in rocks approximately 3.5 billion years old. These oldest known fossils are from the Swaziland Group of rocks in South Africa. As new forms of life evolved, they became abundant at different times. Some of these species did not last for very long, but were "confined" to fairly short periods of geologic time and, because of this, finding such a "short term" fossil is a clue to the age of the rocks. These fossils are called index fossils.

Age	Era	Periods	Epoch	Age	Dominant Life Forms
65 M.Y.	CENOZOIC	QUATERNARY	HOLOCENE	5 M.Y.	The Quaternary period includes the ice ages, two million years ago, when glaciers covered vast amounts of Europe, North America, and Asia. Modern man first appeared about 50,000 years ago, during the Holocene epoch.
			PLEISTOCENE	2 M.Y.	
		TERTIARY	PLIOCENE	10 M.Y.	Present-day life began to develop in the Tertiary period. Mammals were the dominant large animals, while insects and modern-type plants were also evolving. Marine life was dominated by one-celled organisms and mollusks.
			MIOCENE	25 M.Y.	
			OLIGOCENE	40 M.Y.	
			EOCENE	60 M.Y.	
PALEOCENE	65 M.Y.				
130 M.Y.	MESOZOIC	CRETACEOUS	Many one-celled animal groups such as coccolithophores, diatoms and dinoflagellates became abundant for the first time. These animals floated in oceans teeming with life. The land also supported abundant life. A "mass extinction" at the close of the Cretaceous period ended many plant and animal species.		
180 M.Y.		JURASSIC	Dinosaurs persisted throughout the Jurassic period, some reaching ninety feet in length and weighing forty tons. Birds made their first appearance, evolving from reptiles and retaining many reptilian characteristics.		
230 M.Y.		TRIASSIC	Reptiles dominated the land while mollusks, particularly the cephalopods, dominated the oceans. Dinosaurs and marine reptiles made their first appearance during the late Triassic period. Shallow water marine invertebrates and mammals were rare. The Atlantic and Indian oceans formed during the mid-Triassic period allowing sea life to flourish.		
270 M.Y.	PALEOZOIC	PERMIAN	Reptiles dominated the land in the Permian period. Seas contracted in the mid-Permian period leading to a decline in marine life. The close of the Permian period is marked by a mass extinction in which many important groups of forams, corals, bryozoa, brachiopods, arthropods, and crinoids perished.		
310 M.Y.		PENNSYLVANIAN	The eastern United States was covered by coal swamps during much of the Pennsylvanian period. In these swamps scale trees (lycopods), seed ferns, and other plants thrived. Reptiles arose and diversified during the Pennsylvanian period.		
350 M.Y.		MISSISSIPPIAN	The Mississippian period was a time when warm seas harboring many groups of plants and animals covered much of the United States. Life continued to expand and diversify both on land and in the oceans.		
400 M.Y.		DEVONIAN	The Devonian period was a time of widespread invasion of the earth's land masses by organisms; mollusks, arthropods, and amphibians were particularly successful. In the oceans, fish flourished. The Devonian period is often called the "Age of the Fishes" because every fish class was present and common.		
430 M.Y.		SILURIAN	Invertebrates dominated the life of the Silurian period. Aquatic vertebrates were not common until the close of the Silurian period. It was not until the late Silurian period that plants and possibly animals invaded the land. The oldest known land-plant fossils, of late Silurian age, were recently found in Australia.		
500 M.Y.		ORDOVICIAN	Life was apparently limited to the oceans during the Ordovician period. Some of the oldest vertebrate fossils (jawless fish) are Ordovician in age, although life was dominated by the invertebrates. Bryozoans and crinoids appear for the first time during the Ordovician period.		
600 M.Y.		CAMBRIAN	The early Cambrian period provides the first record of many plant and animal groups. Sponges, archaeocyathids, brachiopods, trilobites, primitive mollusks, and echinoderms all first appeared in the Cambrian period.		
Precambrian 4.5 Billion - Origin of Earth		Most of geologic time is included in the Precambrian. The fossil record is poor, exhibiting only blue-green algae, bacteria, and in the latter half, stromatolites			

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Geological Time Scale Chart

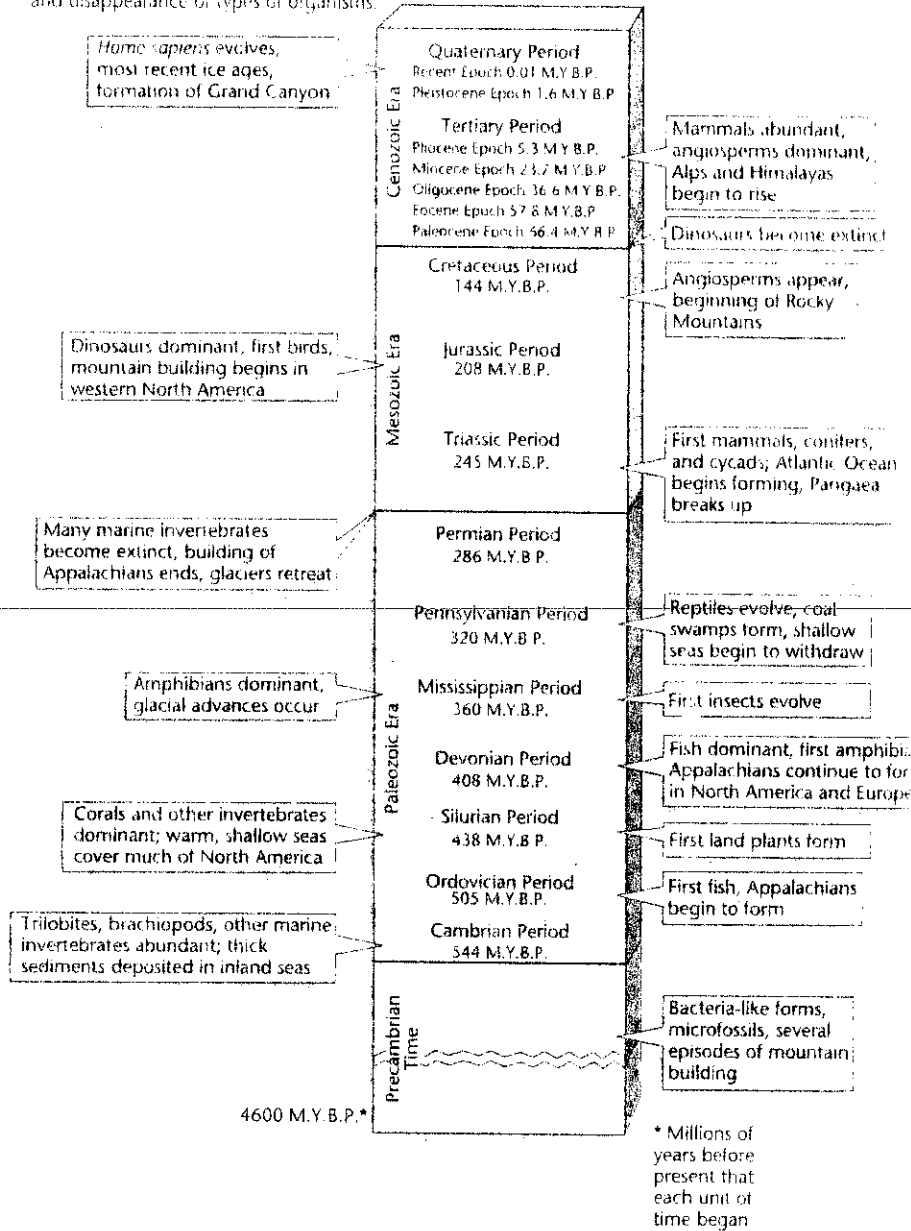
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Geological Time Scale Chart

Era	Period	Epoch	Million Years Ago (MYA)	Characteristic Life
Cenozoic	Quaternary	Holocene (Recent)	.001	Culmination of mountain building followed by erosion and moderate, short-lived invasions of continental margins by the seas. Rise of modern plants, animals, and man. Evolution of humans during the last 5-8 million years. Transition from archaic mammals to modern orders and eventually families. Early warming trends were reversed by the middle of the period to cooler and finally to glacial conditions.
		Pleistocene	1.8	
	Tertiary	Pliocene	5.3	
		Miocene	23.7	
		Oligocene	36.6	
		Eocene	57.8	
		Paleocene	66.4	
Mesozoic	Cretaceous		144	Extensive mountain building at the end, climate cooled worldwide. Extinction of archaic birds and many reptiles by the end of this period.
	Jurassic		208	First reptilian birds. Reptilian diversity was high in all habitats. Climate was warm and stable with little seasonal variation.
	Triassic		245	Earliest dinosaurs, flying reptiles, marine reptiles. Primitive mammals appeared. Continents were high with few shallow seas. Climate warm.
Paleozoic	Permian		286	Rise of primitive reptiles. Extinction of the trilobites. Climate was cold at the beginning but warmed progressively. Widespread extinctions at the end of this period.
	Pennsylvanian		330	Earliest know insects, large arthropods. Climate generally warm and humid. Extensive coal producing swamps. Many specialized amphibians and the first appearance of reptiles.
	Mississippian		360	Extinction of some fish lineages expansion of others. Beginning of large coal production swamps. Extensive radiation of amphibians.
	Devonian		408	Explosion of fish and disappearance of many jawless varieties. First winged insects and tetrapods. Land was higher climate cooler.
	Silurian		438	Earliest know land animals. Primitive plants. Rise of fishes. Abundant trilobites.
	Ordovician		505	Earliest know vertebrates. Primitive plants. Trilobites and cephalopods abundant.
	Cambrian		550-590	Extensive shallow seas. Brachiopods and trilobites common.
Precambrian	Proterozoic		2,500	Primitive water dwelling plants and animals. Changes in the lithosphere produced major land masses and shallow seas.
	Archean		4,600	Oldest know life (mostly indirect evidence). Formation of the earth and slow development of the lithosphere, hydrosphere and atmosphere. Development of life in the hydrosphere.

Adapted from Pough, F. H. 1996. Vertebrate life, 4thed. Prentice Hall. Upper Saddle River, NJ.
 Chart created by Arnold C. Mendez Sr.

The geologic time scale is divided into subunits based on geologic events and the appearance and disappearance of types of organisms.



Across the Curriculum

Have students construct a circle graph representing geologic time. Students should convert the time in each era into a percentage of the total time since Earth's formation, 4.6 billion years ago. Precambrian time represents about 87.6 percent of Earth's history. This equals about 316° of the circle graph. The Paleozoic Era comprises about 7 percent of Earth's history, or

25° on the circle graph. The Mesozoic comprises about 4 percent, or 14° of graph. The remaining 5° represents Cenozoic Era, or 1.4 percent of Earth's history. Suggest that students use different colors to emphasize the different eras on their circle graphs. Students' circle graphs should resemble the one shown on page 385 of the Chapter Review. [L]

