

# Geologic Time Scale

The scale of geologic time is vast, currently estimated at nearly 4.6 billion years. During that time, life evolved into the familiar forms we see today. These materials are provided to assist in understanding time relationships and how life on Earth changed through time.

The dates shown were compiled from several available sources. Table 1 shows some important events in Earth history, presented in the order in which they occurred. The data are also shown on the scale of a calendar year. When geologic time is compressed to the scale of a calendar year, 1 second equals about 146 years. At this scale, World War II began about 0.4 seconds before

midnight on December 31; because of rounding, this is shown as midnight of the new year.

On the back of this sheet is a chart showing the geologic eras, systems, and series; the oldest is at the bottom. On the chart, each dot, number, or letter represents 1 million years. The dots get “older” as you read down the chart, or to the right along a row. Thus, they represent millions of years before present (“mybp”) and show the ages of the oldest known fossils of selected animals or the time of an event. Not all of the items shown in Table 1 are shown on the chart because of space limitations.

Table 1: The development of life through time.

Million Years Before Present	Era, System, or Event	Relative to Calendar Year
	<b>Precambrian</b>	
4600	Earth formed from planetary nebula	1/1, 0:00
3900	Inferred origin of life (first cells)	2/25, 13:02
3800	Oldest age-dated rocks on Earth	3/5, 11:28
3600	Fossil algae and stromatolites (prokaryots)	3/21, 8:20
3250	Fossil evidence of bacteria	4/18, 2:52
2100	Fossil evidence of cells with a nucleus (eukaryots)	7/18, 8:52
1500	First multi-celled organisms (seaweed and algae)	9/3, 23:28
670	Oldest marine worms and jellyfish	11/8, 20:05
600	Vendian period begins: Ediacarian fossils	11/14, 9:23
	<b>Paleozoic</b>	
544	Cambrian system begins	11/18, 20:02
515	Burgess Shale animals, animals with a notochord	11/21, 3:15
505	Ordovician system begins; first fish	11/21, 22:18
470	First fossil evidence of land plants	11/24, 16:57
438	Silurian system begins	11/27, 5:53
430	First vascular land plants	11/27, 21:07
414	Oldest lung fish fossils	11/29, 3:36
408	Devonian system begins; oldest fossil evidence of mosses	11/29, 15:01
385	First insects, scorpions, and centipedes	12/1, 10:49
380	First lobe-finned fish	12/1, 20:20
375	First land animals (amphibians)	12/2, 5:52
370	First sharks	12/2, 15:23
365	First seed plants (ferns)	12/3, 0:54
360	Mississippian system begins	12/3, 10:26
330	First possible reptiles	12/5, 19:33
320	Pennsylvanian system (Kentucky coal)	12/6, 14:36
286	Permian system begins	12/9, 7:21
260	Sail-backed reptiles (Dimetrodon)	12/11, 8:52
245	End of Paleozoic, 96% of all life on Earth perishes	12/12, 13:26
	<b>Mesozoic, the “Age of Reptiles”</b>	
245	Triassic system begins	12/12, 13:26
240	First crocodiles	12/12, 22:57

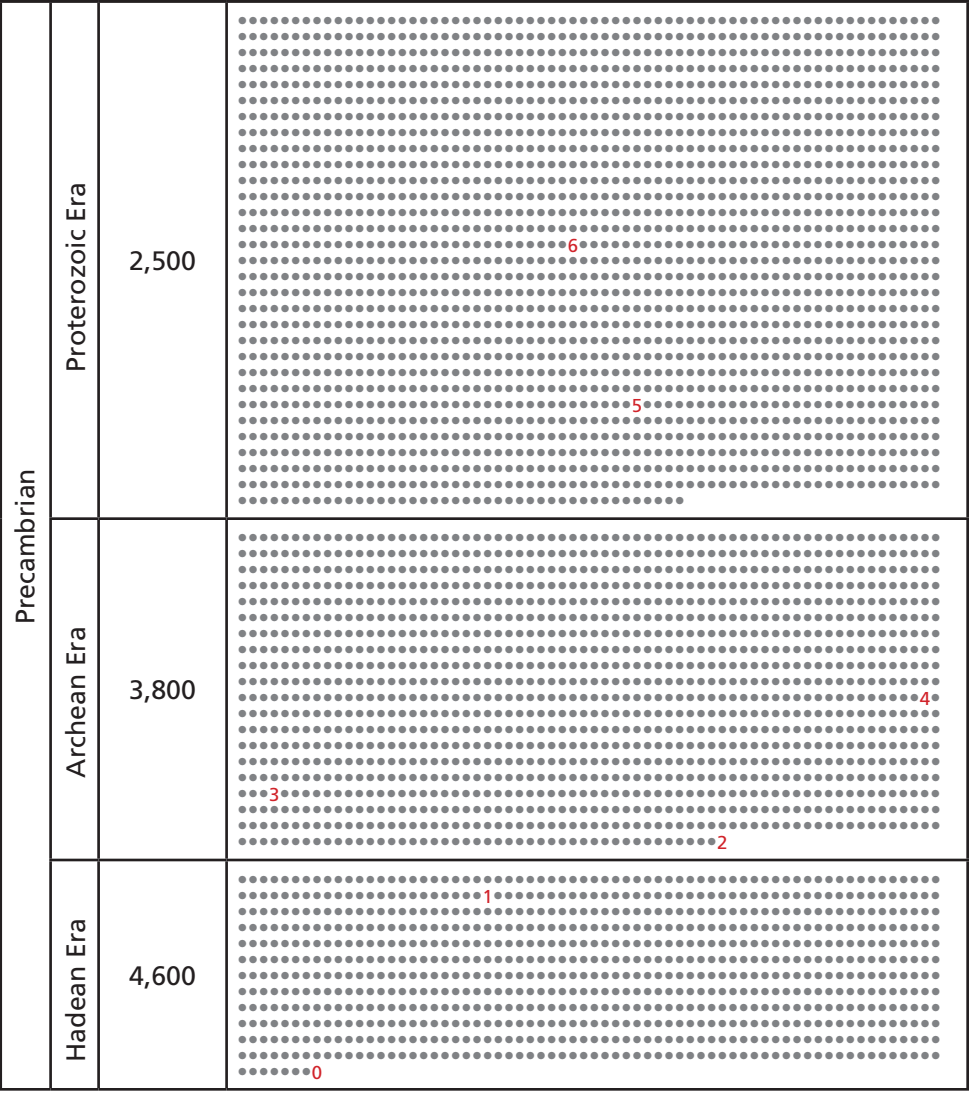
Table 1 (cont.)

Million Years Before Present	Era, System, or Event	Relative to Calendar Year
228	First dinosaurs (Eoraptor and Saltoposuchus)	12/13, 21:48
221	First mammals (shrew-like)	12/14, 11:08
210	First turtles	12/15, 8:05
208	Jurassic system begins	12/15, 11:53
195	Dilophosaurus, an early Jurassic dinosaur	12/16, 12:39
155	First bird, Archeopteryx	12/19, 16:49
152	Apatosaurus and Brachiosaurus, long-necked	12/19, 22:32
150	Allosaurus, meat-eating dinosaur	12/20, 2:20
148	Stegosaurus, plate-backed dinosaur	12/20, 6:09
144	Cretaceous system begins	12/20, 13:46
115	First flowering plants	12/22, 21:00
82	Duck-billed dinosaurs (Maiasaurus)	12/25, 11:50
80	Protoceratops (first dinosaur eggs discovered)	12/25, 15:39
75	Triceratops	12/26, 1:10
70	Tyrannosaurus rex and Velociraptor	12/26, 10:41
65	End of Mesozoic, likely meteor or comet impact	12/26, 20:13
	<b>Cenozoic, the “Age of Mammals”</b>	
65	Tertiary system begins	12/26, 20:13
64	First ancestors of dogs and cats	12/26, 22:07
60	Grasses become widespread	12/27, 5:44
57	First ancestors of pigs and deer	12/27, 11:27
55	First horses (Eohippus)	12/27, 15:15
45	First ancestors of rabbits	12/28, 10:18
39	First monkeys	12/28, 21:43
4	Oldest human-like ancestors (hominids)	12/31, 17:20
2	Quaternary system begins	12/31, 20:57
1	First of four ice ages	12/31, 22:05
1	Oldest direct human ancestor fossil, Homo habilis	12/31, 23:02
0.1	First modern man, Homo sapiens	12/31, 23:48
0.05	Mammoth and mastodon bones, Big Bone Lick, KY	12/31, 23:54
235 years	Revolutionary War	12/31, 23:59
70 years	World War II	1/1, 0:00

Era	System and Series		Began mybp	Relative Time (1 dot or character = 1 million years)
Cenozoic	Quaternary	Holocene	0.01	
		Pleistocene	1.8	X•
	Tertiary	Pliocene	5	•W•
		Miocene	23	•••••
		Oligocene	34	•••••
		Eocene	57	•••V••••••••••U•T
		Paleocene	65	•S•••RQ
Mesozoic	Cretaceous		144	•••P•••O•••••N•••••••••••M••••••••••••
	Jurassic		208	••L•K•J•••I••••••••••••••••••••••••••••••
	Triassic		245	•H•••••••G••••F••••••••••••••••••••••••••
Paleozoic	Permian		286	E•••
	Carboniferous Systems	Pennsylvanian	320	••
		Mississippian	360	•••••D••••••••••••••••••••••••~
	Devonian		408	•••C•••B•••A•••••9•••••••••••••••~
	Silurian		438	••••••~
	Ordovician		505	••••••••~8•••~••••••••~7
	Cambrian		544	•••~

### Events

- 0 Earth formed
- 1 Life originates
- 2 Oldest age-dated rocks
- 3 Blue-green algae
- 4 Bacteria
- 5 Cells with a nucleus
- 6 Multicellular life
- 7 Fish
- 8 Land plants
- 9 Insects
- A Amphibians
- B Sharks
- C Plants with seeds (ferns)
- D Reptiles
- E End-Permian extinction
- F Early dinosaurs (such as Eoraptor)
- G Mammals (shrew-like)
- H Turtles
- I Archeopteryx
- J Apatosaurus
- K Allosaurus
- L Stegosaurus
- M Flowering plants
- N Duck-billed dinosaurs
- O Tricerotops
- P Tyrannosaurus rex
- Q End-Cretaceous extinction
- R Dogs and cats
- S Grasses widespread
- T Pigs and deer
- U Horses (Eohippus)
- V Monkeys
- W Hominids
- X First of four ice ages



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