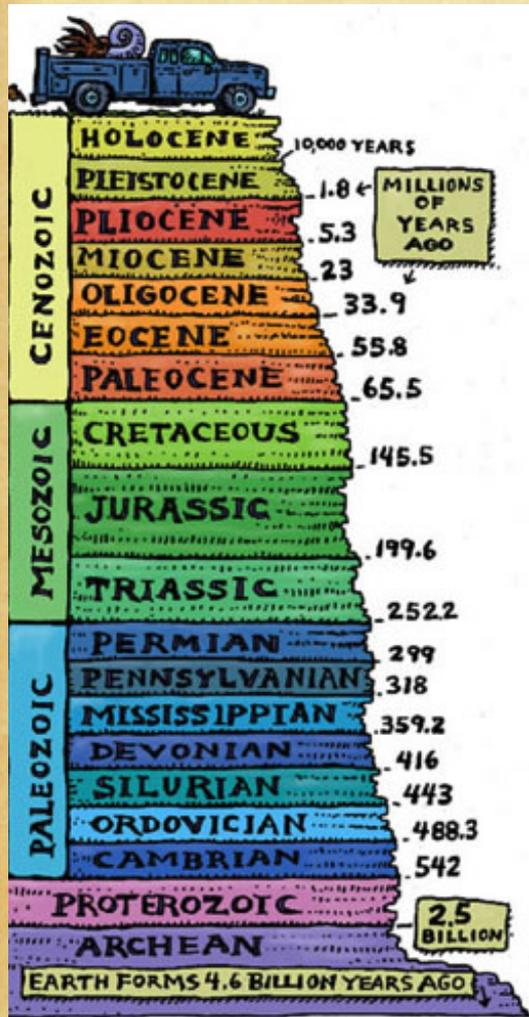


# What Is the Geologic Column?

Chapter 10 Lesson 1  
Part 2

ByDesign Science, Level 6  
By Allyssa Sharpe

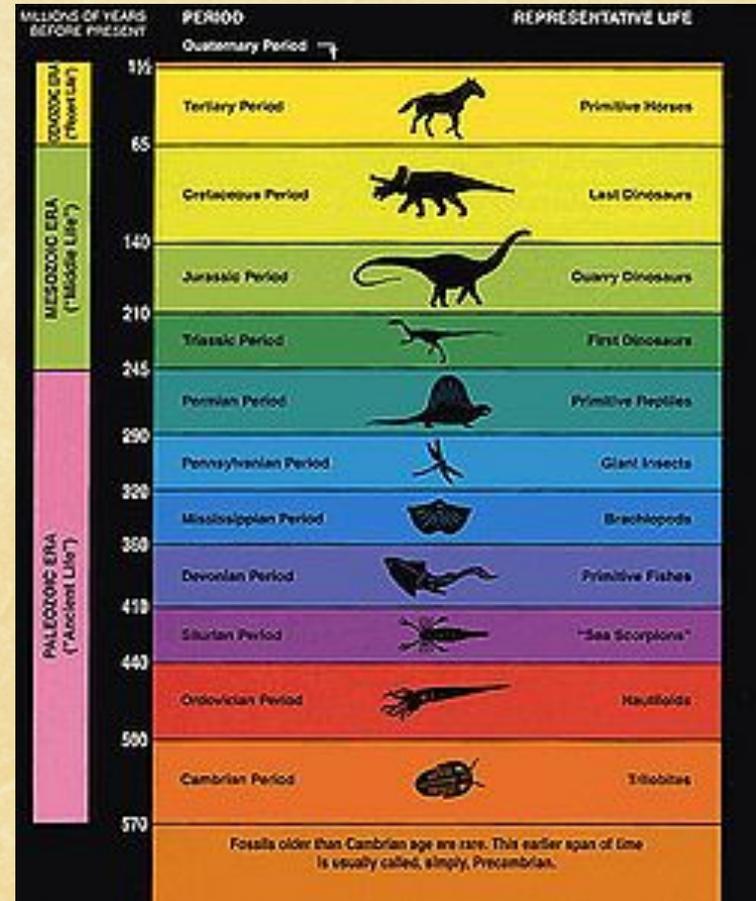
# Time Inferences



- ♦ The geologic column has come to be closely associated with millions of years of evolutionary history, but it was not that way at first.
- ♦ Most of the scientists who first described and published the relationships between the layers and the fossils believed in the biblical account of Earth's history.

# Time Inferences

- ◆ Sometimes the names they assigned to the parts of geologic column reflected characteristics of the rock layers themselves
  - ◆ Like the Cretaceous (which means “chalky”)
  - ◆ Or Carboniferous (because of the carbon in the coal found there)



# Time Inferences

EON	ERA	PERIOD	EPOCH	Ma		
Phanerozoic	Cenozoic	Quaternary	Holocene	0.01		
			Pleistocene	Late	0.8	
		Early		1.8		
		Tertiary	Neogene	Pliocene	Late	3.6
					Early	5.3
				Miocene	Late	11.2
					Middle	16.4
					Early	23.7
					Late	28.5
			Paleogene	Oligocene	Late	33.7
					Early	41.3
				Eocene	Middle	49.0
					Early	54.8
		Paleocene	Late	61.0		
	Early		65.0			
	Mesozoic	Cretaceous	Late	99.0		
			Early	144		
		Jurassic	Late	159		
			Middle	180		
			Early	206		
		Triassic	Late	227		
			Middle	242		
			Early	248		
	Paleozoic	Permian	Late	256		
			Early	290		
		Pennsylvanian		323		
		Mississippian		354		
		Devonian	Late	370		
			Middle	391		
			Early	417		
Silurian		Late	423			
		Early	443			
Ordovician		Late	458			
		Middle	470			
Cambrian		Early	490			
		D	500			
		C	512			
		B	520			
		A	543			
Precambrian	Proterozoic	Late	900			
		Middle	1600			
		Early	2500			
	Archean	Late	3000			
		Middle	3400			
		Early	3800?			

- ♦ Often layers were named after the places where the fossils were first described.
- ♦ The *Jurassic* was named for the Jura Mountains of Switzerland
- ♦ And the *Permian* was named for the town of Perm in Russia where scientists first described the fossils found in these layers
- ♦ It was only later that the long ages suggested by some scientists influenced the interpretation of the geologic column.

# Time Inferences

**Geological Time Scale**

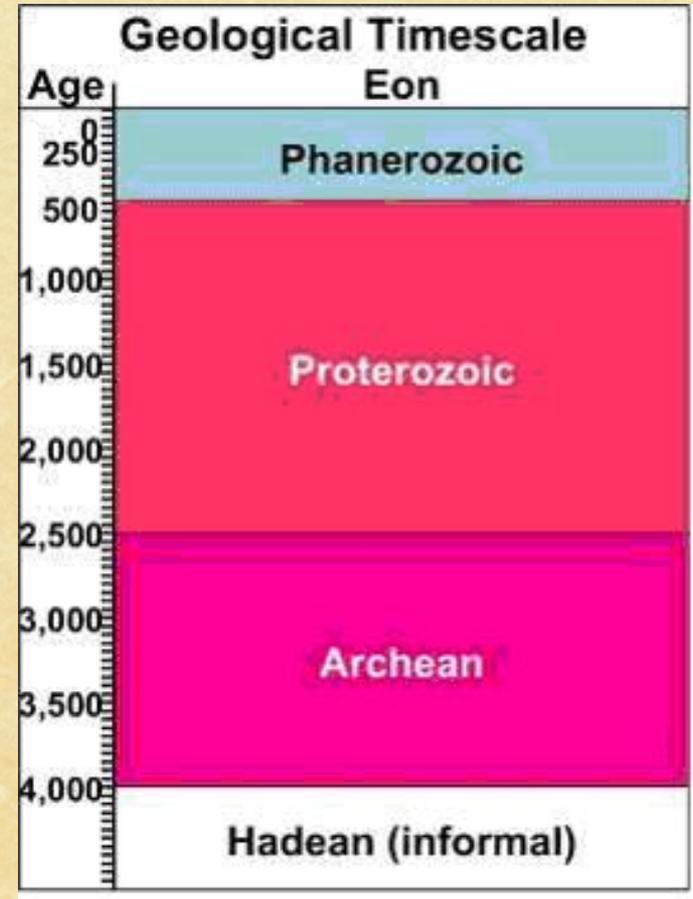
ERA	PERIOD	EPOCH / AGE	Million Years Ago	EVENTS
<b>CENOZOIC</b> <i>Age of Mammals</i>	<b>Quaternary</b>	<i>Holocene</i>	<i>Today</i>	Ice Age ends Humans are dominant
		<i>Pleistocene</i>	0.01	Earliest Humans appear Ice Age begins
	<b>Tertiary</b>	<i>Pliocene</i>	1.6	Hominids (human ancestors) appear
		<i>Miocene</i>	5.3	Grass becomes widespread
		<i>Oligocene</i>	23.7	Mammals are dominant
		<i>Eocene</i>	36.6	Eocene – Oligocene extinction event
		<i>Paleocene</i>	57.8	First large mammals appear
<b>MESOZOIC</b> <i>Age of Reptiles</i>	<b>Cretaceous</b>	<i>Extinction of Dinosaurs</i>	65.5	K-T extinction event Earth looks closer to present-day Flowering plants appear
	<b>Jurassic</b>		144	First Birds appear Pangaea splits into Laurasia, Gondwana Dinosaurs are dominant
	<b>Triassic</b>	<i>First Dinosaurs</i>	208	Pangaea cracks First mammals appear Reptiles are dominant
<b>PALEOZOIC</b>  570 mya – 245 mya	<b>Permian</b>	<i>Age of Amphibians</i>	245	Permian – Triassic extinction event Pangaea forms
	<b>Carboniferous</b>		286	First reptiles appear First large cartilaginous fishes appear
	<b>Devonian</b>	<i>Age of Fishes</i>	360	Late Devonian extinction event First land animals appear First amphibians appear
	<b>Silurian</b>		408	First land plants appear First jawed fishes appear First insects appear
	<b>Ordovician</b>		438	Ordovician – Silurian extinction event First vertebrates appear
	<b>Cambrian</b>	<i>Age of Invertebrates</i>	505	End Botomian extinction event First fungi appear Trilobites are dominant
<b>PRECAMBRIAN</b>  4600 mya – 570 mya	<b>Proterozoic Eon</b>		570	First soft-bodied animals appear First multicellular life appear
	<b>Achean Eon</b>		2500	Photosynthesizing cyanobacteria appear First unicellular life appear
	<b>Hadean Eon</b>	<i>Priscoan Period</i>	3800	Atmosphere and oceans form Oldest rocks form as Earth cools
			4600	

*Formation of Earth*

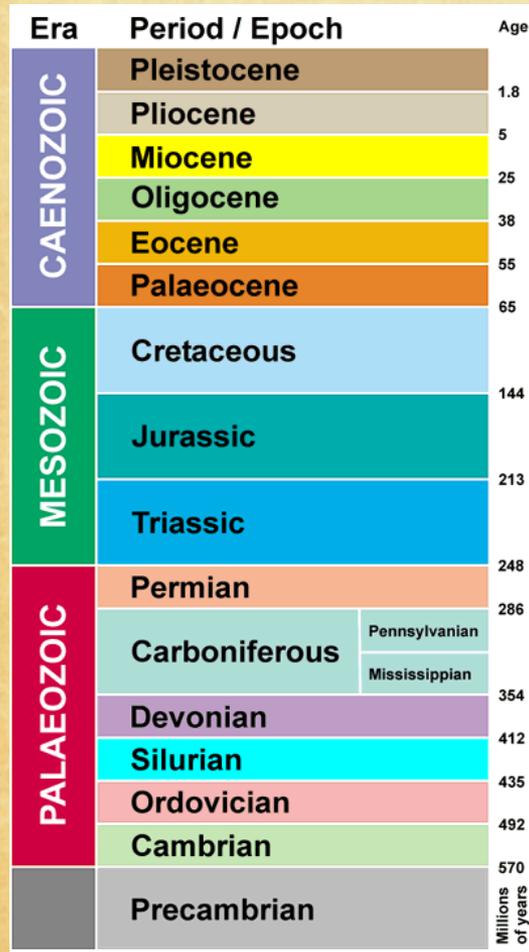
- ♦ The reason for the fossil sequence and the time span associated with it came to be associated with the newest scientific theory – evolution.
- ♦ As individual layers were grouped into larger categories, they were given names with time connotations.
- ♦ Now the geologic column is referred to as the geological time scale and uses divisions called eons, eras, and periods.

# Time Inferences

- ◆ An **eon** is the largest division of geologic time.
- ◆ There are four eons:
  - ◆ Phanerozoic
  - ◆ Proterozoic
  - ◆ Archean
  - ◆ Hadean



# Time Inferences



- ◆ Eons are divided into eras, which are still long periods of time, but shorter than eons.
- ◆ For example, the Phanerozoic eon is divided into three eras – Cenozoic, Mesozoic, Paleozoic.
- ◆ Each of these three eras contain at least three periods.
- ◆ A period is the basic unit on the geologic time scale.

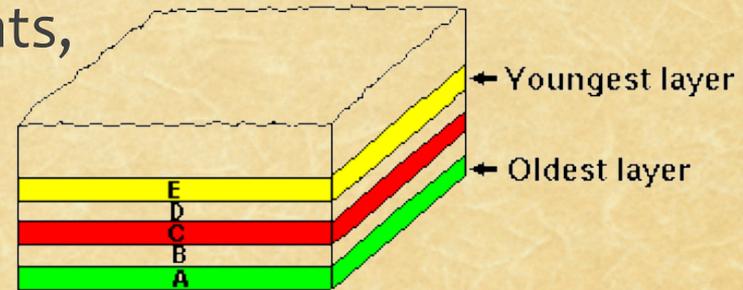
# Time Inferences

	Prefix	Suffix	Meaning
Cenozoic	Ceno = recent	Zoic = animal life	Recent Animal Life
Mesozoic	Meso = middle	Zoic = animal life	Middle Animal Life
Paleozoic	Paleo = old	Zoic = animal life	Old Animal Life

- ◆ Notice how the meaning of the words Cenozoic, Mesozoic, and Paleozoic include the idea of time.
- ◆ Lower layers are considered *older* than higher layers because they were laid down earlier.

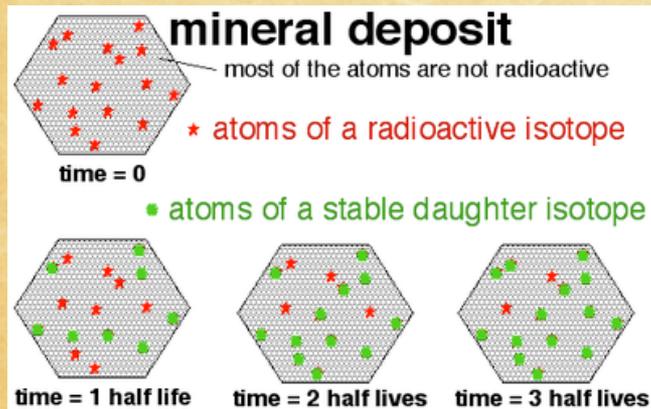
# Time Inferences

- ♦ Scientists often refer to the age of one layer in relation to another.
- ♦ **Relative age** is the age of a rock or formation in relation relative to other rocks or formations, usually defined as a zone fossil name.
- ♦ **Relative dating** is the science of determining the relative order of past events, without necessarily determining their absolute age.



# Time Inferences

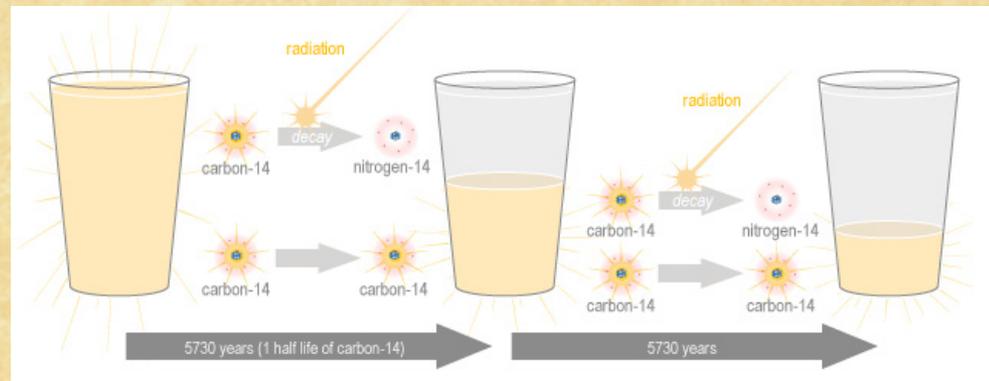
- ◆ Scientists have attempted to assign actual dates to the rock layers using a process called radiometric dating.
- ◆ Also, called absolute dating, it is a method of dating that compares the relative proportions of radioactive isotopes present in a sample.



- ◆ Certain elements that occur in nature decay predictably over time, changing from what we call a parent isotope to what we call a daughter isotope.

# Time Inferences

- ◆ The more time that passes, the less parent isotope is left and the more daughter isotope there is.
- ◆ Scientists know that half-lives of various elements.
- ◆ They can compare the ratio of parent isotopes to daughter isotopes to figure out the age of the rock layers.



# Time Inferences

- ◆ While the ratios of parent isotopes to daughter isotopes are actual data, the interpretation of those ratios as millions of years conflicts with both the biblical history of earth and scientific evidence that is difficult to explain if the layers were really laid down over millions of years.



- ◆ Short age geology predicts that there are more discoveries to be made about radiometric dating and that these discoveries will shed light on why these ratios indicate time spans that conflict with the chronological information found in the Bible.

# Time Inferences

- ◆ The geologic column, which includes both the rock strata and the fossil record, is observable data.
- ◆ The time inferences associated with the geologic column are interpretations of that data, which are influenced by the worldview of the scientists who make them.

