

# Understanding Geologic History

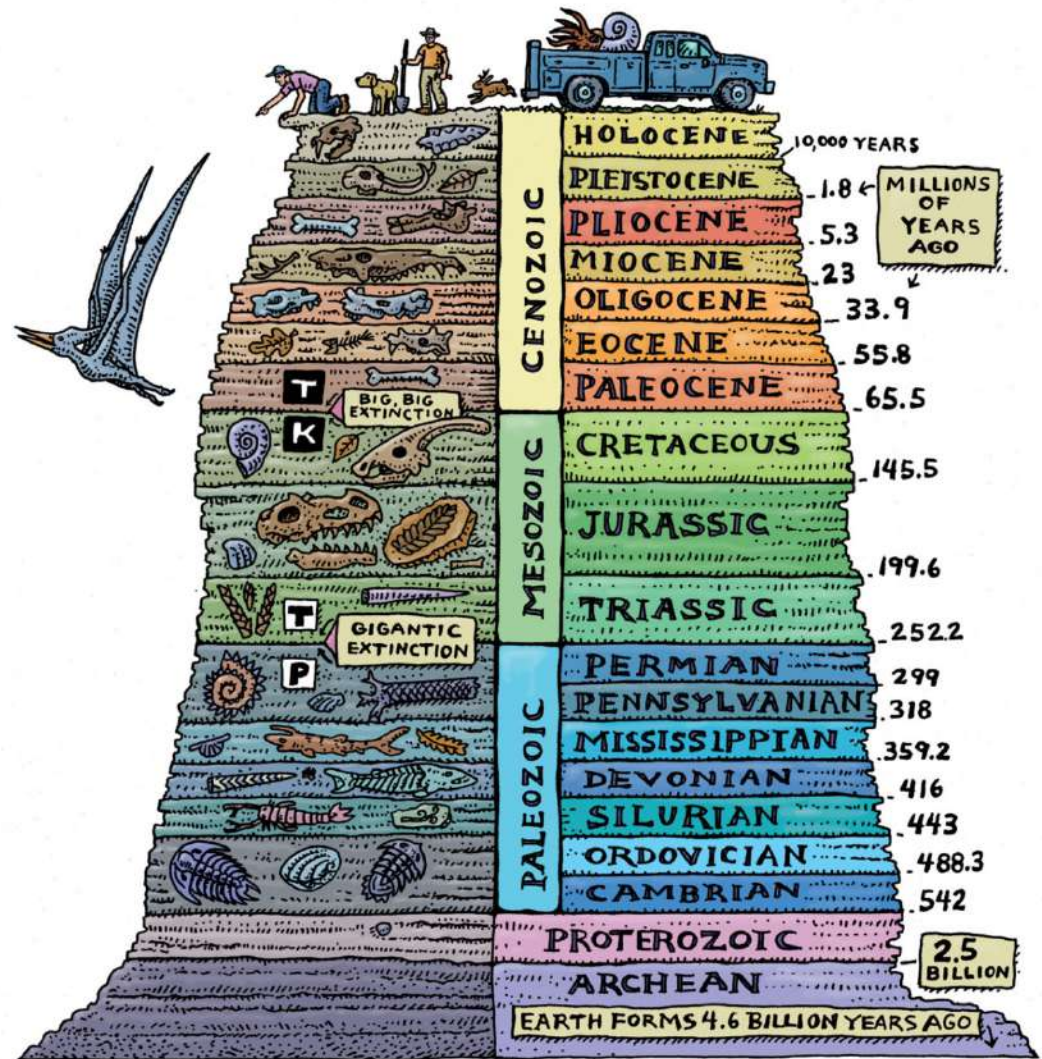
## What is it and Why do we care?



# What is the geologic time scale?

## Geologic Time Scale:

A record of the Earth's history broken up into various units of time that are based on types of fossils contained within Earth's rocks.



# Units of time for Geologic History

- **Eons**- Measured in **billions of years**
- **Eras**- Measured in **hundreds of millions of years** (defined by types of fossils found in rock)
- **Periods**- Smaller period of time defined by abundant creatures alive or became extinct during specific time certain rock was deposited (Jurassic Park- Jurassic Period)
- **Epochs**- Smallest measurement of geologic time, usually in a few million years

# Example: Jurassic Park

- Title of the movie Jurassic Park influenced by the *Jurassic Period*-208 million years ago- 62 million year time period.
- Dinosaurs present in the movie Jurassic Park, were abundant on Earth during the above time frame.

# Major Eras of Geologic History

- The Eras are the next largest interval units into which the Geologic Time is divided and represented on the chart. Eras encompass major intervals of Time and are defined based on the fossil life-forms found in the rock layers, and the Law of Superposition.
- **Cenozoic – 65 million years ago- present**
- **Mesozoic Era- 248 Million to 65 Million Years Ago**
- **Paleozoic-540 Million to 248 Million Years Ago**
- **Precambrian- 540 Million years ago to 4.6 Billion years ago**
- Significance of 4.6 billion years ago?

## Precambrian- 540 Million years ago to 4.6 Billion years ago



- The name means: "before the Cambrian period." This old, but still common term was originally used to refer to the whole period of earth's history before the formation of the oldest rocks with recognizable fossils in them.
- oceans of liquid rock, boiling sulfur, and impact craters everywhere!  
Volcanoes blast off all over the place, and the rain of rocks and asteroids from space never ends.

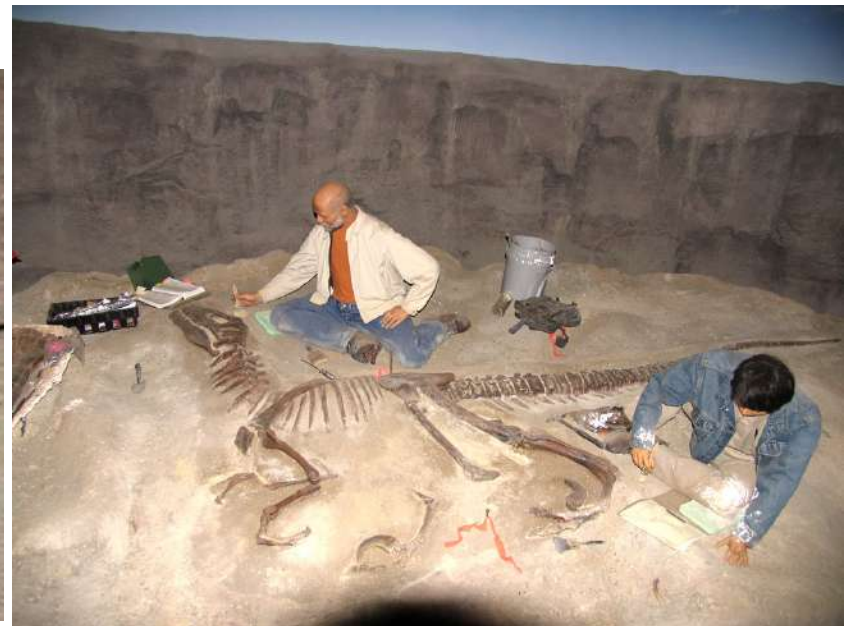
# Paleozoic-540 Million to 248 Million Years Ago

- The Paleozoic is bracketed by two of the most important events in the history of animal life. At its beginning, multicelled animals underwent a dramatic "explosion" in diversity, and almost all living animal phyla appeared within a few millions of years. At the other end of the Paleozoic, the largest mass extinction in history wiped out approximately 90% of all marine animal species.
- During the Paleozoic there were six major continental land masses; each of these consisted of different parts of the modern continents. For instance, at the beginning of the Paleozoic, today's western coast of North America ran east-west along the equator, while Africa was at the South Pole. These Paleozoic continents experienced tremendous mountain building along their margins, and numerous incursions and retreats of shallow seas across their interiors.
- Common Fossil : Trilobite
- are a well-known fossil group of extinct marine arthropods



# Mesozoic Era- 248 Million to 65 Million Years Ago

- The Mesozoic Era is divided into three time periods: the Triassic (251-199.6 million years ago), the Jurassic (199.6-145.5 million years ago), and the Cretaceous (145.5-65.5 million years ago)
- **Mesozoic means "middle animals," and is the time during which the world fauna changed drastically from that which had been seen in the Paleozoic. [Dinosaurs](#), which are perhaps the most popular organisms of the Mesozoic, evolved in the Triassic, but were not very diverse until the Jurassic.** Except for birds, dinosaurs became extinct at the end of the Cretaceous. Some of the last dinosaurs to have lived are found in the late Cretaceous deposits of Montana in the United States.





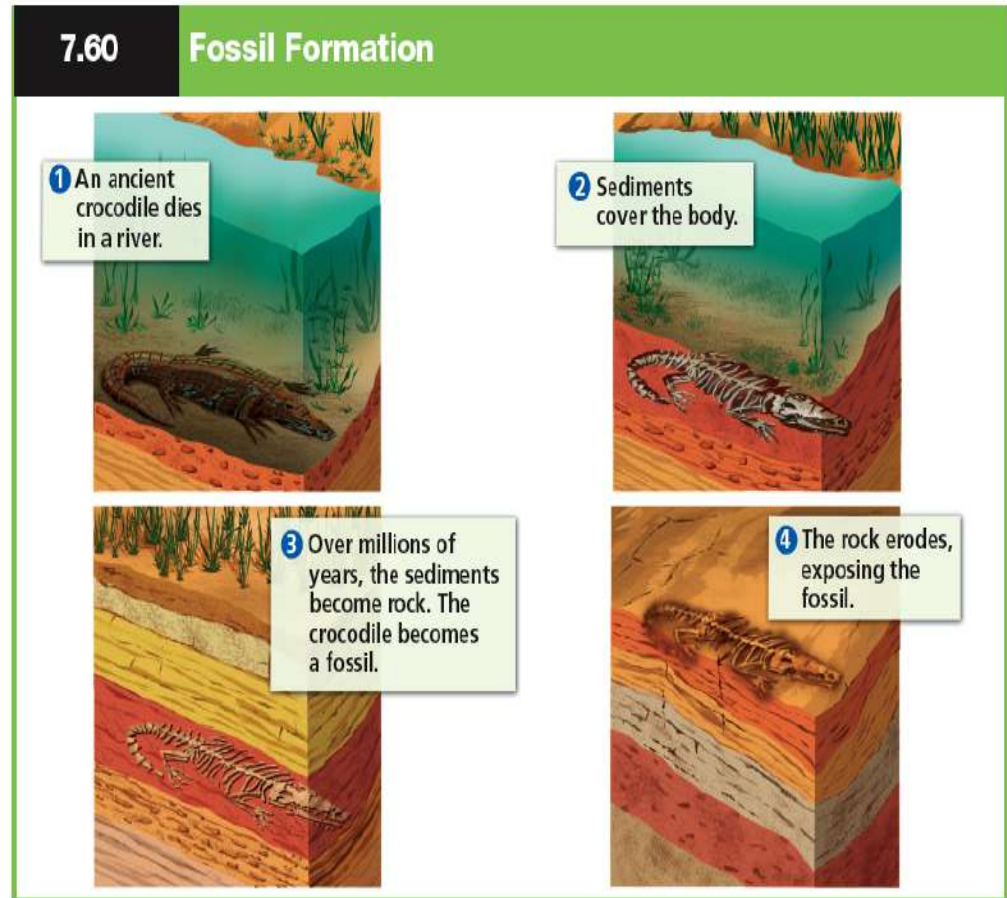
# ***Cenozoic – 65 million years ago- present***

- The Cenozoic Era is the most recent of the three major subdivisions of animal history. The other two are the [Mesozoic](#) and [Paleozoic](#) Eras. The Cenozoic spans only about 65 million years, from the end of the Cretaceous Period and the extinction of typical [dinosaurs](#) to the present. The Cenozoic is sometimes called the Age of Mammals, because the largest land animals have been mammals during that time.
























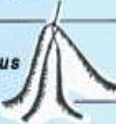


# How A fossil forms

1. Some animals were quickly buried after their death (by sinking in mud, being buried in a sand storm, etc.).
2. Over time, more and more sediment covered the remains.
3. The parts of the animals that didn't rot (usually the harder parts like bones and teeth) were encased in the newly-formed sediment.
4. In the right circumstances (no scavengers, quick burial, not much weathering), parts of the animal turned into fossils over time.
5. After a long time, the chemicals in the buried animals' bodies underwent a series of changes. As the bone slowly decayed, water infused with minerals seeped into the bone and replaced the chemicals in the bone with rock-like minerals. The process of fossilization involves the dissolving and replacement of the original minerals in the object with other minerals



# Index Fossils

- Defined:
- The fossil remains of an organism that lived in a particular geologic age, used to identify or date the rock or rock layer in which it is found

CENOZOIC ERA (Age of Recent Life)	Quaternary Period	<i>Pecten gibbus</i>		<i>Neptunea tabulata</i>	
	Tertiary Period	<i>Calyptrophorus velatus</i>		<i>Venericardia planicosta</i>	
MESOZOIC ERA (Age of Medieval Life)	Cretaceous Period	<i>Scaphites hippocrepis</i>		<i>Inoceramus labiatus</i>	
	Jurassic Period	<i>Perisphinctes tiziani</i>		<i>Nerinea trinodosa</i>	
	Triassic Period	<i>Trochites subbullatus</i>		<i>Monotis subcircularis</i>	
PALEOZOIC ERA (Age of Ancient Life)	Permian Period	<i>Leptodus americanus</i>		<i>Parafusulina bosei</i>	
	Pennsylvanian Period	<i>Dictyoclostus americanus</i>		<i>Lophophyllidium proliferum</i>	
	Mississippian Period	<i>Cactocrinus multibrachiatus</i>		<i>Prolecanites gurleyi</i>	
	Devonian Period	<i>Mucrospirifer mucronatus</i>		<i>Palmatolepus unicornis</i>	
	Silurian Period	<i>Cystiphyllum niagarensis</i>		<i>Hexamoceras hertzeri</i>	
	Ordovician Period	<i>Bathyrurus extans</i>		<i>Tetragraptus fructicosus</i>	
	Cambrian Period	<i>Paradoxides pinus</i>		<i>Billingsella corrugata</i>	
PRECAMBRIAN					

# Fossil Record

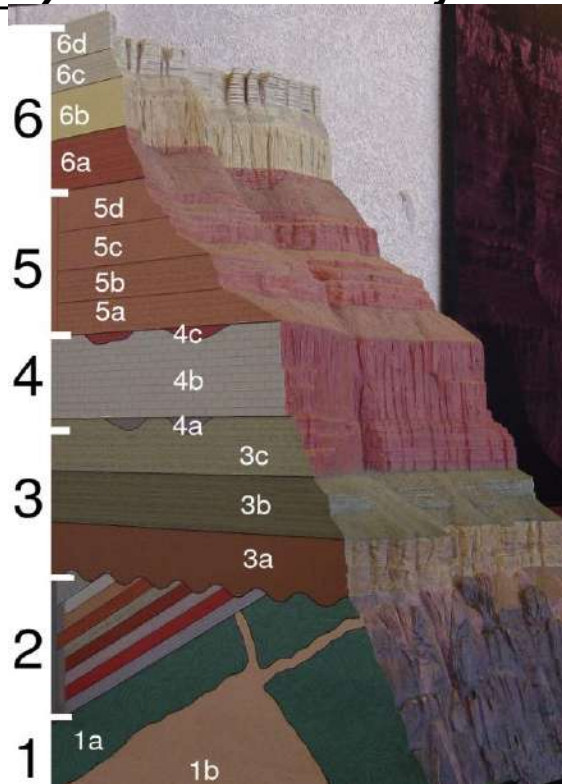


- ***The fossil record consists of two important aspects.***
- **The actual fossil**
- **The deposition of sedimentary rock of time**
- The fossil record can be thought of like the layers a sandwich
- The first layer laid is a piece of bread, then maybe the chicken, lettuce, and another piece of bread
- The first piece of bread is the oldest layer of the sandwich, it was laid first, then the chicken, then the lettuce, then the other layer of bread which is the youngest layer.
- The same occurs with layers of sedimentary rock being laid down over millions of years, with index fossils present



# Original Horizontality & Superposition

- **Law of Horizontality**
- This principle **states that layers of sediment are originally deposited horizontally under the action of gravity.**

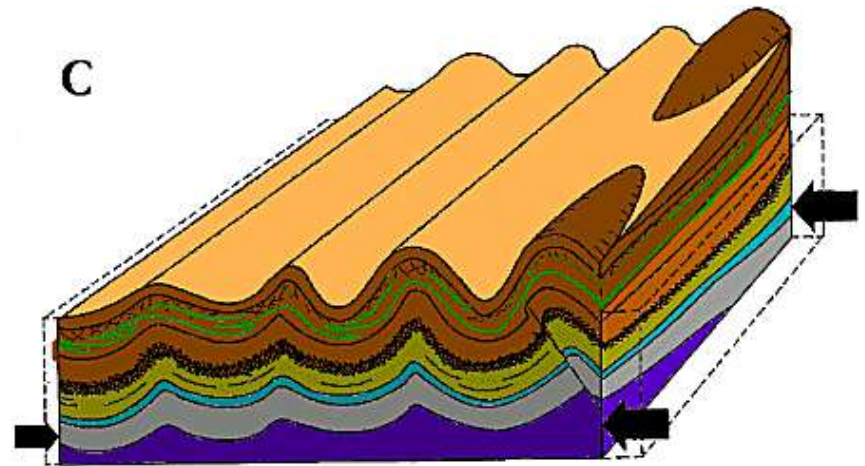


# Superposition

- A general law stating that in any sequence of sediments or rocks that has not been overturned, **the youngest sediments or rocks are at the top of the sequence and the oldest are at the bottom.**



# Example of Superposition Sideling Hill Maryland



-  Conglomerate
-  Sandstone
-  Siltstone
-  Shale
-  Coal and shale

