
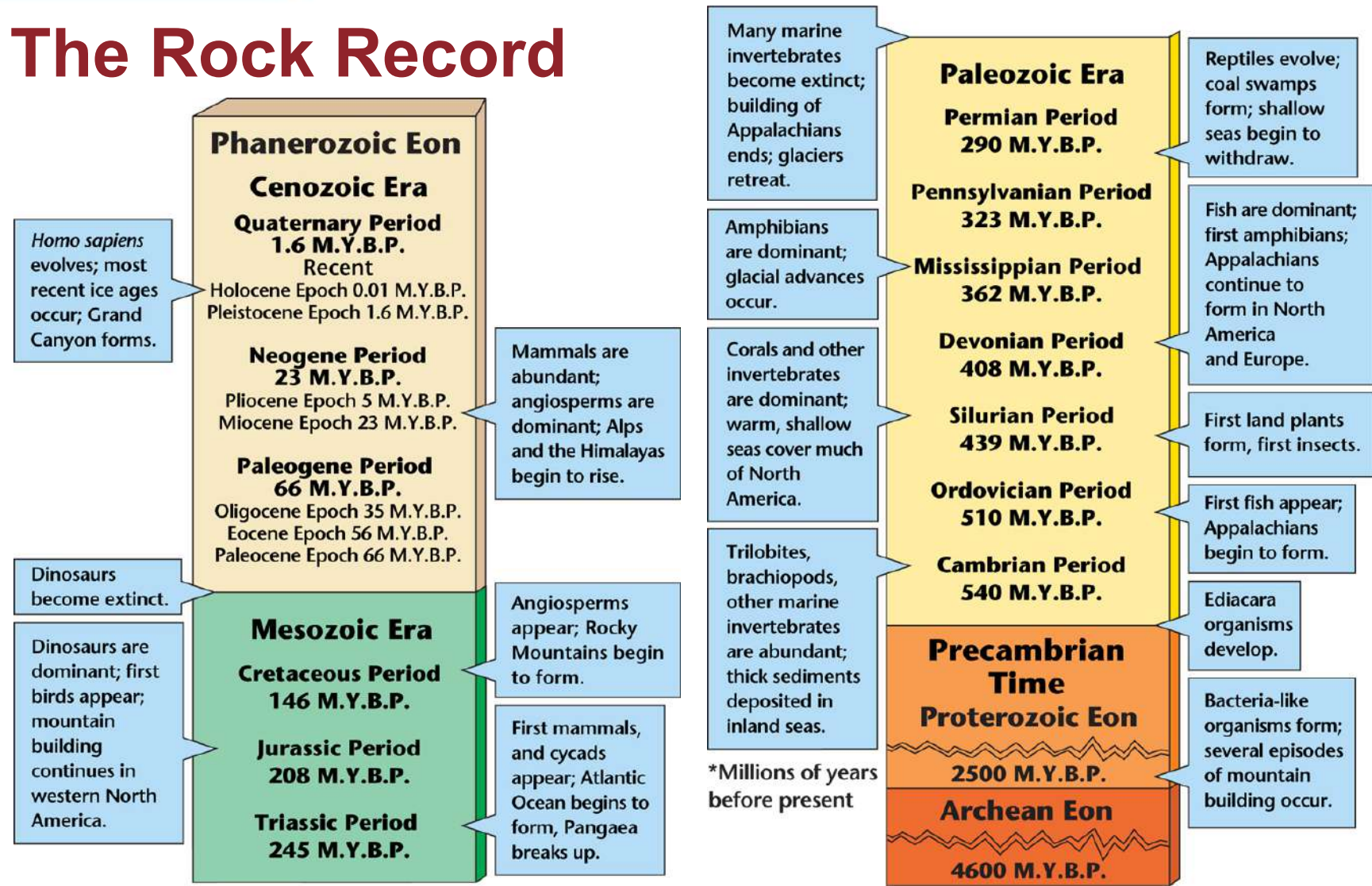


The Rock Record

- Geologists have divided the history of Earth into time units based upon the fossils contained within the rocks.
-  The **geologic time scale** is a record of Earth's history from its origin 4.6 billion years ago to the present.

The Rock Record



Geologic Time

The time scale is divided into units:

- An **eon**, measured in billions of years, is the longest time unit of the geologic time scale.
- An **era**, defined by the differences in life-forms found in rock and measured in hundreds of millions to billions of years
- **Periods**, measured in tens of millions of years to hundreds of millions of years, are defined by the life-forms that were abundant or became extinct during the time.
- **Epochs** the smallest unit & are usually measured in millions of years to tens of millions of years.


Section Assessment

1. Match the following terms with their definitions.

___ **C**on
___ **A**period
___ **D**era
___ **B**epoch

- A.** time periods defined by the life forms that were present; usually measured in terms of tens of millions to hundreds of millions of years
- B.** smaller divisions of time; usually measured in millions to tens of millions of years
- C.** the longest period of time; measured in billions of years
- D.** second longest period of time; measured in hundreds of millions to billions of years

Relative-Age Dating of Rocks

 The principle of **uniformitarianism** states that the forces that continually change the surface features of Earth today have been occurring since Earth formed.

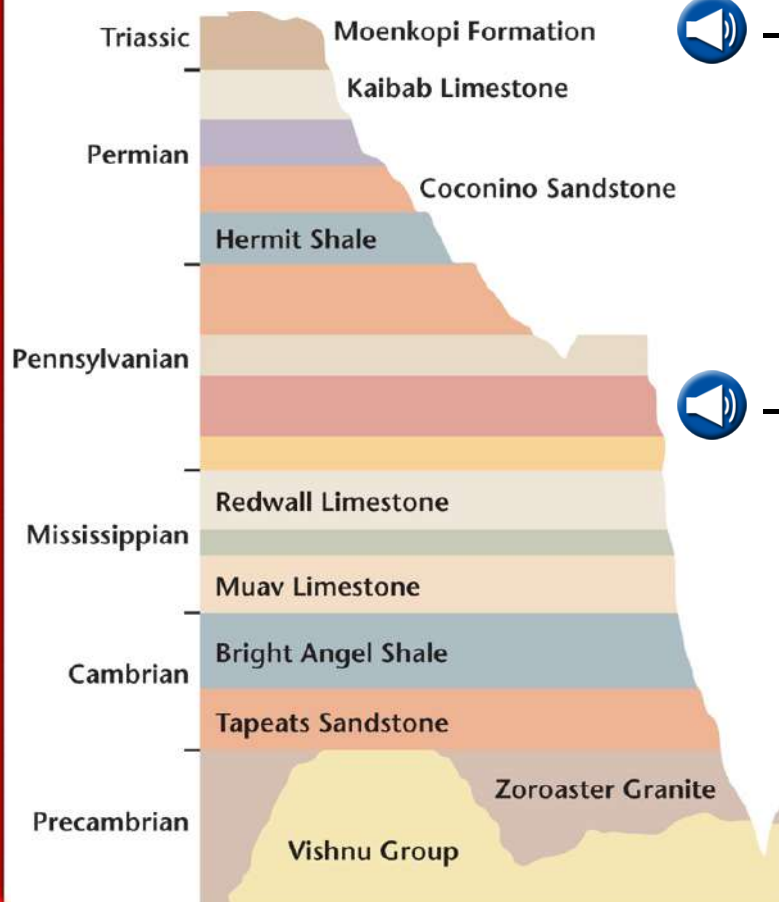
Principles for Determining Relative Age

- The concept of relative-age dating places the ages of rocks and the events that formed them in order, but without exact dates.

This is done by comparing one event or rock layer to another.

Principles for Determining Relative Age

Geologic Principles



– The principle of **original horizontality** states that sedimentary rocks are deposited in horizontal or nearly horizontal layers.

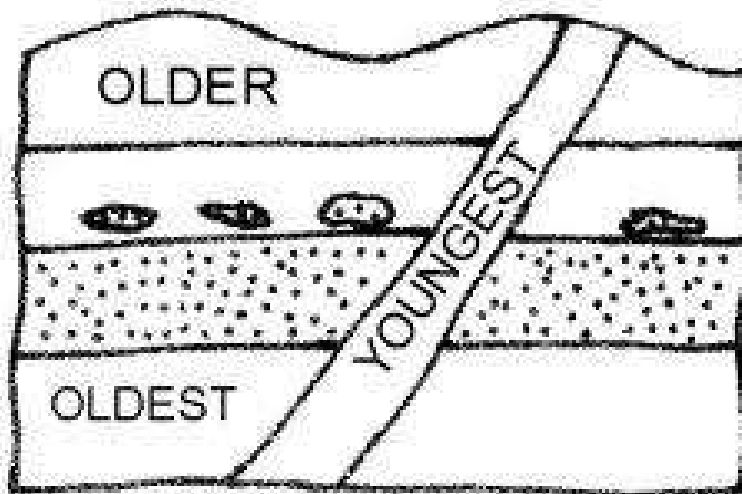


– The principle of **superposition** states that in an undisturbed rock sequence, the oldest rocks are at the bottom and each successive layer is younger than the layer beneath.

Principles for Determining Relative Age

Geologic Principles

- The principle of **cross-cutting relationships** states that an intrusion or a fault is younger than the rock it cuts across.



Other Means of Determining Relative Age

Correlation of Rock Strata

- **Correlation** is the matching of outcrops of one geographic region to another.
- Geologists examine rocks for distinctive fossils and unique rock or mineral features to help correlate the rock layers.
- Correlation allows geologists to accurately locate that same rock layer in another location.

Section Assessment

1. Match the following terms with their definitions.

___ **A** original horizontality

___ **C** superposition

___ **B** unconformity

___ **D** correlation

A. principle which states that sedimentary rocks are deposited in horizontal layers

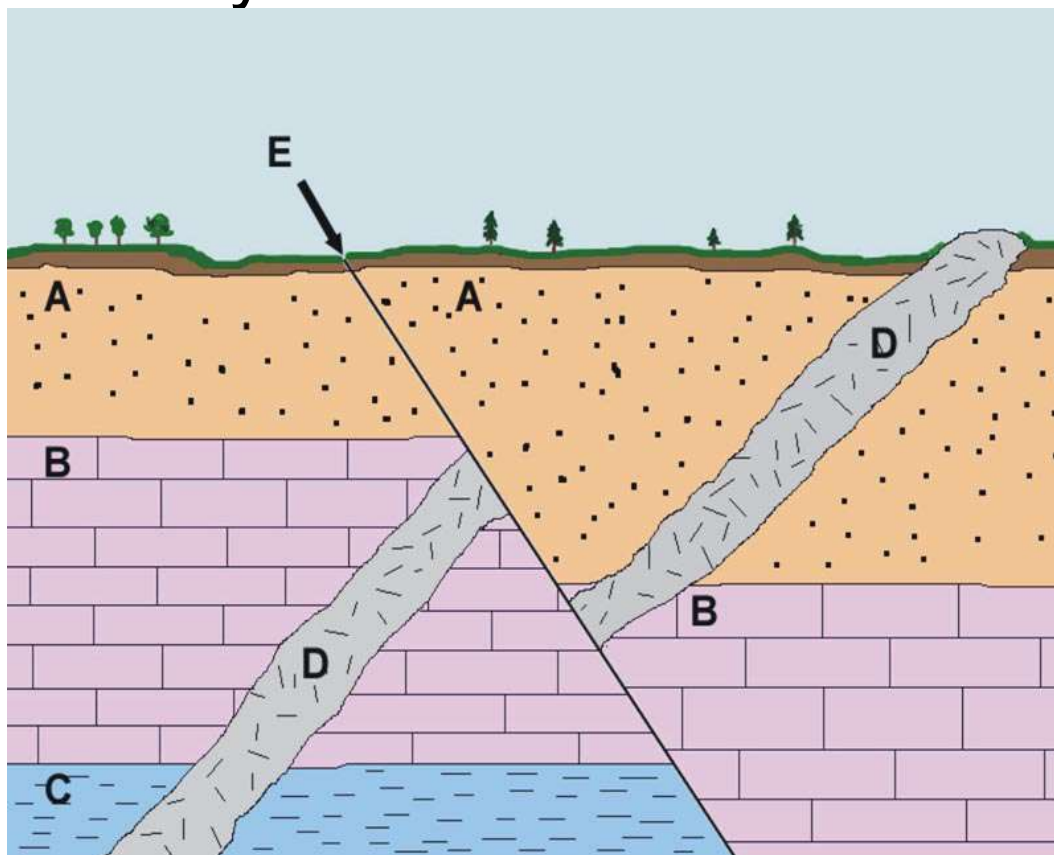
B. a gap in the rock record

C. principle which states that oldest rocks are at the bottom and that each successive layer is younger

D. matching of outcrops from one geographic region to another

Section Assessment

2. What rock layers are the oldest? The Youngest?



We will Take A Break From Notes

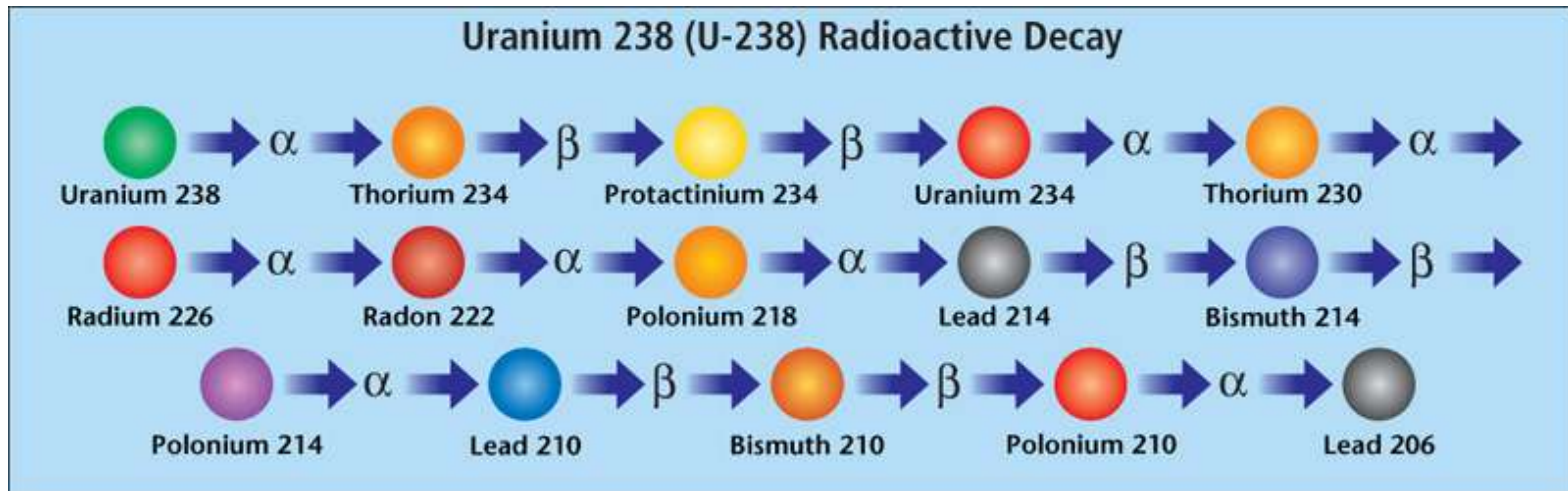
- We will work on the Relative Dating Activity from the Worksheet Ms G is handing out.
- 30 minues

Absolute-Age Dating of Rocks


- Absolute-age dating enables scientists to determine the actual age of a rock, fossil, or other object using the decay rate of radioactive isotopes.

Absolute-Age Dating of Rocks

Radioactive decay is the emission of radioactive particles and the resulting change into other elements over time.



Use of Radioactive Isotopes

 In a process called **radiometric dating**, scientists attempt to determine the ratio of parent nuclei to daughter nuclei within a given sample of a rock or fossil to determine its absolute age.

Because it often takes a long time for the entire amount of an isotope to decay, geologists use the half-life of an isotope.

Use of Radioactive Isotopes


 **Half-life** is the length of time it takes for one-half of the original amount of an isotope to decay.

Table 21-1 Half-Lives of Selected Radioactive Isotopes

Radioactive Isotope	Approximate Half-Life	Decay Product
Rubidium-87	48.6 billion years	Strontium-87
Thorium-232	14.0 billion years	Lead-208
Potassium-40	1.3 billion years	Argon-40
Uranium-238	4.5 billion years	Lead-206
Uranium-235	0.7 billion years	Lead-207
Carbon-14	5730 years	Nitrogen-14

Use of Radioactive Isotopes


Carbon-14

- Carbon-14 (C-14) is a radioactive isotope that is commonly used to determine the absolute age of an object, especially one that is of organic origin.
- C-14 is accurate for dating objects up to 75 000 years old.
- For the dating of a particularly old rock sample, a radioactive isotope with a longer half-life must be used.


Table 21-2 Radioactive Decay of Carbon-14 to Nitrogen-14

	Percent Parent Element	Percent Daughter Element	Elapsed Years	Number of Half-Lives
Time 1	100	0	0	0
Time 2	50	50	5730	1
Time 3	25	75	11 460	2
Time 4	12.5	87.5	17 190	3

Remains of Organisms in the Rock Record


 **Fossils** are the evidence or remains of once-living plants or animals.

The fossil record provides evidence of evolution.

 **Evolution** is an adaptive change in the DNA of populations as a result of mutation and/or environmental change.

Fossils preserved in the rock record also provide information about past environmental conditions and can be used to correlate rock layers from one area to another.

Types of Fossils

 Fossils with **original preservation** are the soft and hard parts of plant and animal remains that have not undergone any kind of change since the organisms' deaths.

Such fossils are uncommon because their preservation requires extraordinary circumstances such as freezing, drying out, or oxygen-free environments.

Types of Fossils

Altered Hard Parts



Types of Fossils

Molds and Casts



Types of Fossils

Indirect Evidence of Past Life

- Trace fossils are indirect evidence of plant and animal life.
- Trace fossils can provide information about how an organism lived, how it moved, or how it obtained food.

