

The Rock Record

Ms. Larsh

What is Relative Age Dating?

Relative age dating is the science of determining the relative order of past events without necessarily determining their absolute age.

Who Was James Hutton?

A scottish geologist who lived in the late 1700's and was one of the first scientists to think of Earth as very old.

His work helped to set the stage for the development of the geological time scale.

What is Uniformitarianism?

the theory that changes in the earth's crust during geological history have resulted from the action of continuous and uniform processes.

Principles for Determining Relative Age

Scientists use several methods, or principles, to determine relative age.

Including- original horizontality, superposition, cross-cutting relationships, & inclusion.

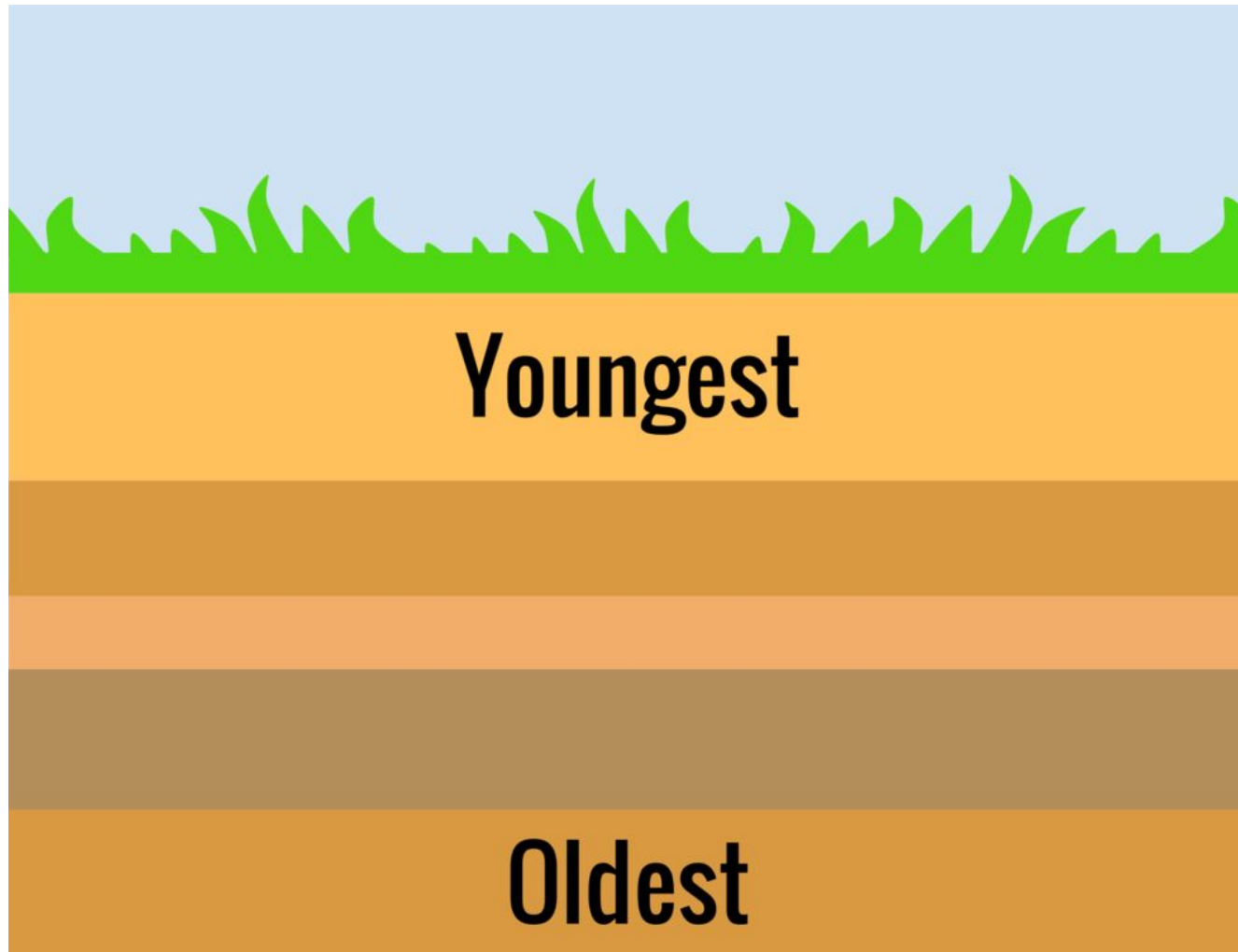
What is Original Horizontality?

The principle that sedimentary rocks are deposited in horizontal or nearly horizontal layers.



What is Superposition?

The principle that an undisturbed rock sequence, has the oldest rocks at the bottom & each consecutive layer is younger than the layer before or beneath it.



What is Cross-Cutting?

The principle that states an intrusion is younger than the rock it cuts across.



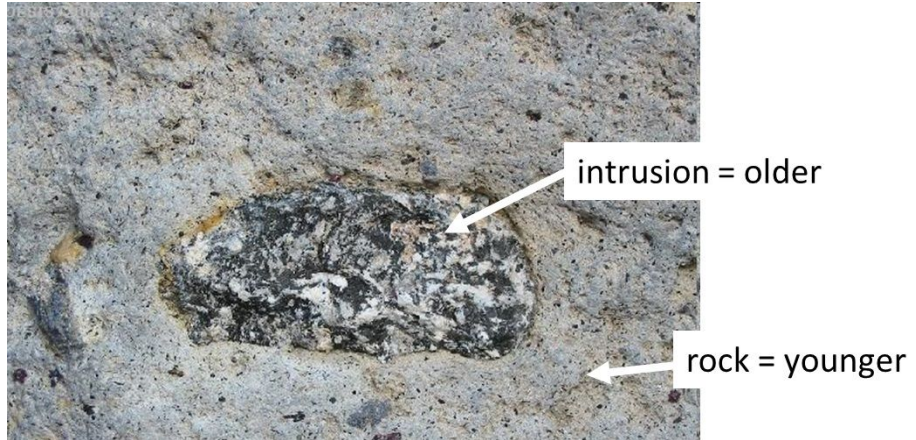
Cross-Cuttingting Cont.

Similarly, faults are younger than the strata & surrounding geological features because the fault cuts across them.



What are Inclusions?

The principle that states fragments, called inclusions, in a rock layer must be older than the rock layer that contains them.



What are Unconformities?

Unconformities are typically buried erosional surfaces that can represent a break in the geologic record of hundreds of millions of years or more.

Three types- Disconformity,
Nonconformity, & Angular Unconformity

What is Disconformity?

Disconformities occur when a horizontal layer of sedimentary rock overlies another horizontal layer of sedimentary rock that has been eroded.

Sedimentary rock includes limestone, sandstone, shale, & conglomerate

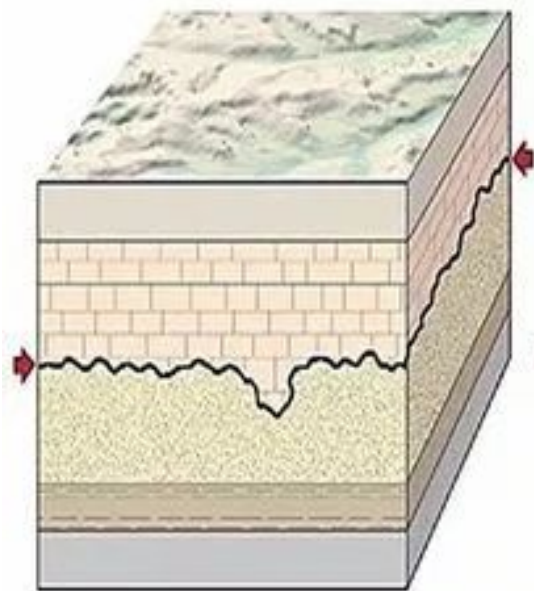
What is Nonconformity?

Nonconformity is the contact that separates a younger sedimentary rock, (such as limestone, sandstone, conglomerate, or shale), from an igneous intrusive rock or metamorphic rock, (such as granite or marble).

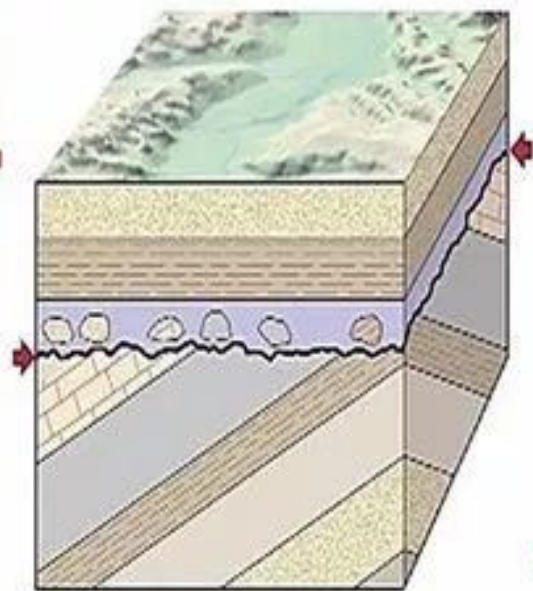
Volcanic activity often causes nonconformity

What is Angular Unconformity?

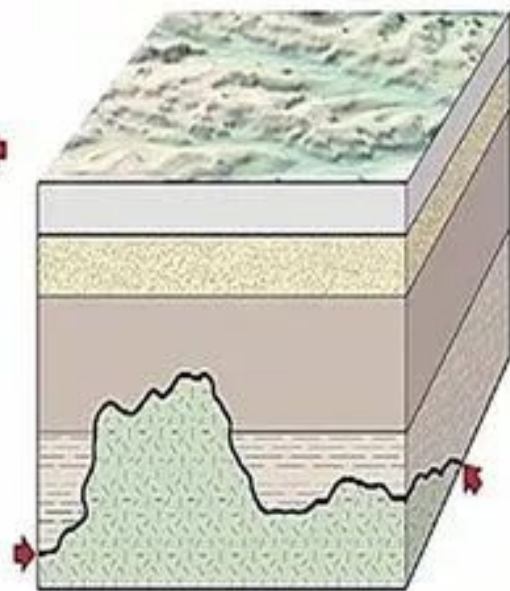
Angular unconformities generally represent a longer time hiatus than do disconformities because the underlying rock had usually been metamorphosed, uplifted, and eroded before the upper rock unit was deposited.



Disconformity



Angular unconformity



Nonconformity

What is Correlation?

The matching of rock outcrops or fossils exposed in other geographic regions.



What is a Key Bed?

A rock or sediment layer used as a marker

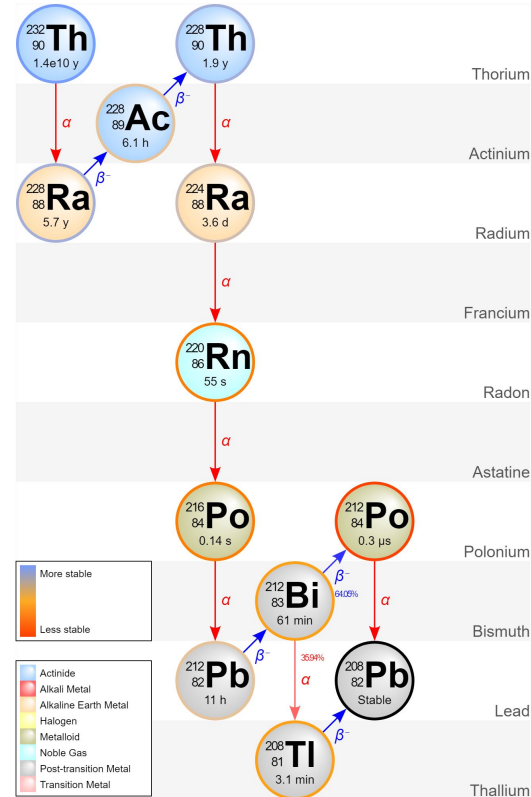
Distinctive rock layers are sometimes deposited over wide geographical areas as a result of meteorite strikes or volcanic eruption.

What is Absolute-Age Dating?

Enables scientists to determine the numerical age of rocks and other objects through measurements or radioactive decay

What is Radioactive Decay?

The emission of radioactive particles and its resulting change into other isotopes over time.



Determining Absolute-Age

Elements are determined by the number of protons they contain. As the number of protons changes with each emission, the original radioactive isotope, or parent, gradually converts to a different element, or daughter.

Determining Absolute-Age Cont.

Because the rate of radioactive decay is constant regardless of pressure, temperature, or any other physical conditions, it is a proven method for absolute-age dating.

Radiometric Dating

The process used to determine the absolute age of a rock, or fossil, by determining the ratio of parent nuclei to daughter nuclei within a given sample

What is a Half-Life?

The length of time it takes for one-half of the original parent isotope to decay

1 half-life = 1:1 or 50% Parent/ 50% Daughter

2 Half-lives=1:3 or 25% Parent/ 75% Daughter

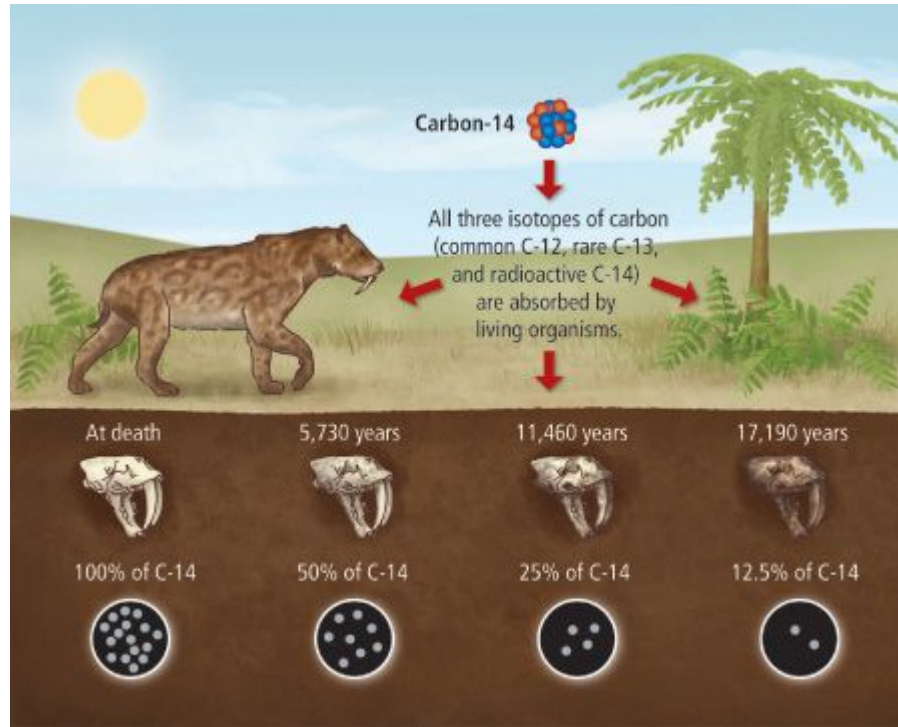
Dating Rocks

Radiometric dating is used to date igneous or metamorphic rocks.

It is NOT useful for dating sedimentary rocks because the minerals in most sedimentary rocks were formed from pre-existing rocks.

Radiocarbon Dating

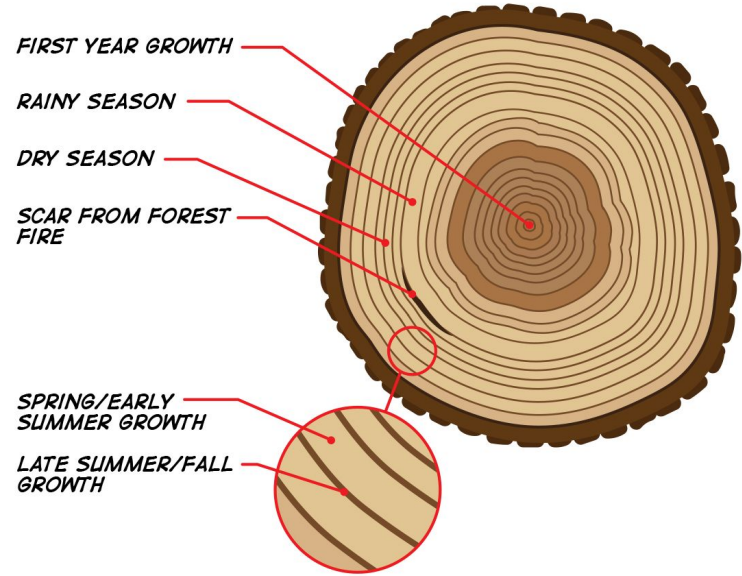
Used to determine the age of relatively young organic materials; objects that were once alive.



Other Ways to Determine Absolute Age

Trees contain a record of time in the growth rings of their trunks, often called annual tree rings.

Dendrochronology - the science of using tree rings to determine absolute age



Other Ways to Determine Absolute Age

Like tree rings, ice cores contain a record of past environmental conditions such as temperature & atmospheric composition in annual layers of snow deposit.



Other Ways to Determine Absolute Age

Similarly, varves or bands of alternating light and dark colored sediments of sand, clay, and silt are studied to understand the seasonal deposition of sediments in lakes.

