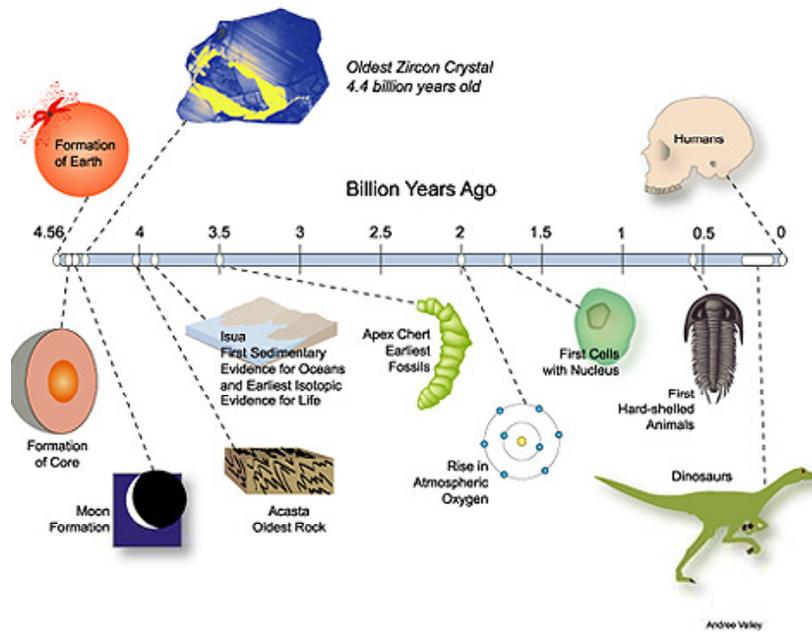


Earth's History



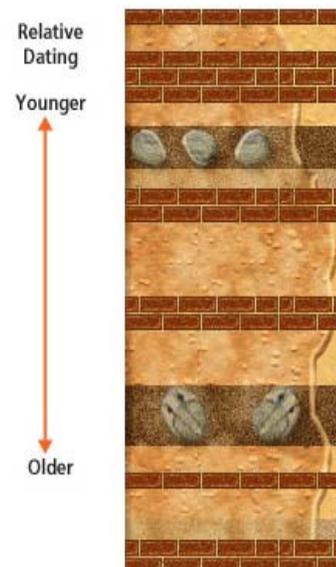
Time

- **Geologic time scale** -Earth's history is divided into blocks of time (eons, eras, periods, and epochs)
 - the time scale was created using **relative dating** principles.
- **Eon** – the largest time unit on the geologic time scale
- **Era**
 - Eras are divided into Eras
 - a large division on the geologic time scale
- **Period**
 - Eras are divided into Periods
 - a smaller division of time
- **Epoch**
 - Periods are divided into Epochs

| EON | ERA | PERIOD | EPOCH | |
|-------------|-----------------|---------------|-----------------------------------|-----------|
| PHANEROZOIC | CENOZOIC | QUATERNARY | HOLOCENE | |
| | | | PLEISTOCENE | |
| | | TERTIARY | PALEOGENE/NEOGENE | PLIOCENE |
| | | | | MIOCENE |
| | | | | OLIGOCENE |
| | | | | EOCENE |
| | | | | PALEOCENE |
| | MESOZOIC | CRETACEOUS | | |
| | | | JURASSIC | |
| | | | TRIASSIC | |
| | PALEOZOIC | PERMIAN | Emplacement of igneous intrusions | |
| | | PENNSYLVANIAN | | |
| | | MISSISSIPPIAN | | |
| | | DEVONIAN | | |
| | | SILURIAN | | |
| | | ORDOVICIAN | | |
| | CAMBRIAN | | | |
| | PROTEROZOIC EON | | | |
| | | ARCHEAN EON | | |
| PRECAMBRIAN | | | | |

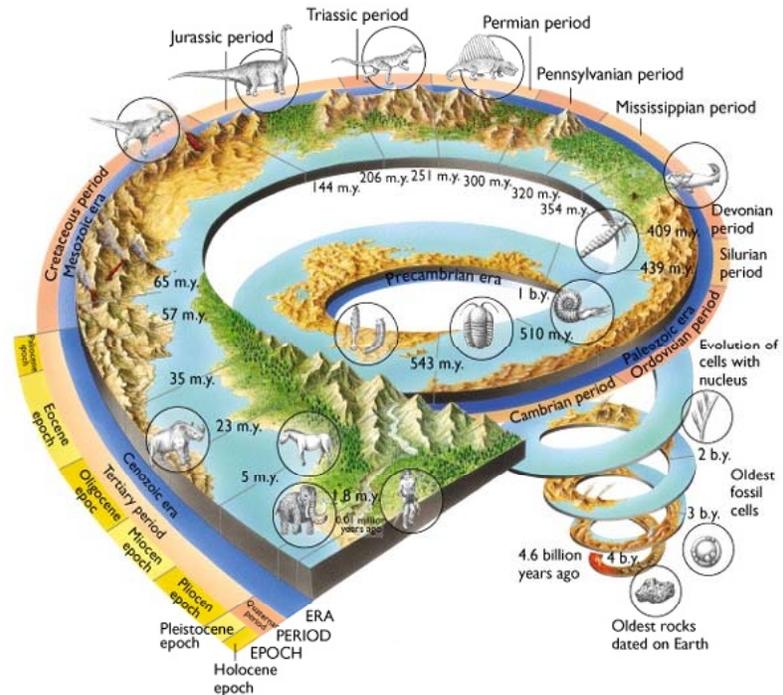
Relative Dating

- Sometimes it's hard to know the **absolute age** of rocks
- **Relative dating** is when rocks are put in chronological order of events (1, 2, 3...)



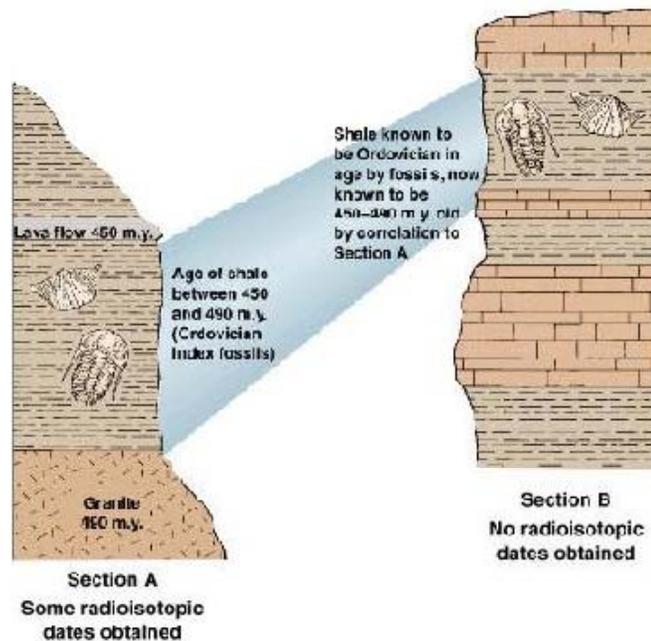
*Absolute age

- The real age of a rock unit, fossil, or an event



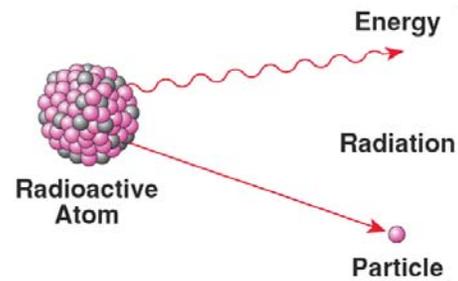
*Correlation

- The process of **showing** that **rocks** or geologic events **from different places** are the **same or similar in age**.



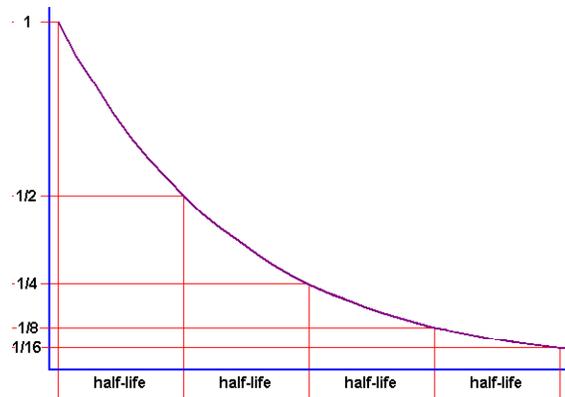
- ***Radioactive decay**

- When a nucleus of unstable atoms *breaks down* into more stable atoms of the same or other elements.



- **Half Life**

- *the time* required for one half of the atoms of a radioactive substance to decay (break down)

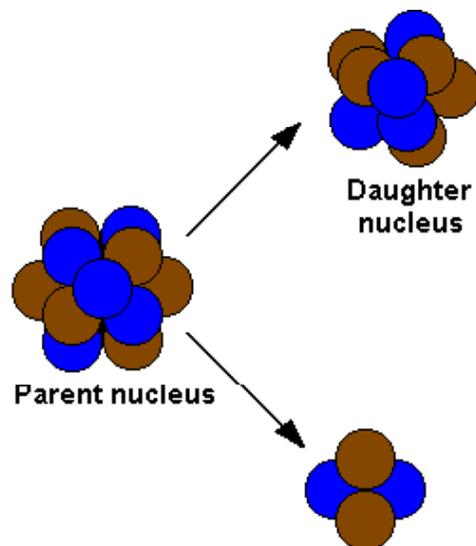


- ***Parent product**

- An unstable or radioactive isotope of an element.

- ***Daughter material**

- The isotopes of an element; they come from the parent element decaying

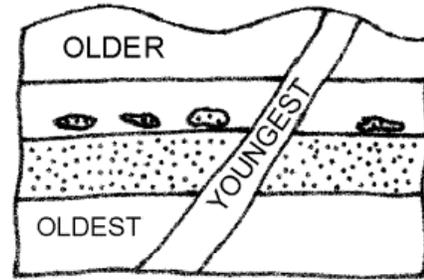


Ideas & Laws

- ***Evolution** – The idea that current life forms have *developed* from earlier, different life forms.
- ***Mass Extinction** – *Periods of time* when whole groups of species have become extinct (all died) in a short time period.
- ***Uniformity of process** – *The idea* that the processes that have shaped the earth in the past are (essentially) the same as those today.

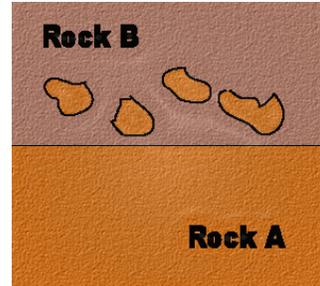
- ***Law (or Principle) of Crosscutting Relationships***

- a principle of relative dating; A rock or fault is younger than any rock or fault it cuts through



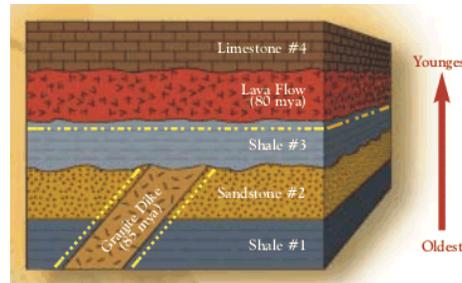
- ***Law of Inclusions**

- **Inclusions** (orange pieces) are older than the rock they are found in (B)



- ***Law of Superposition***

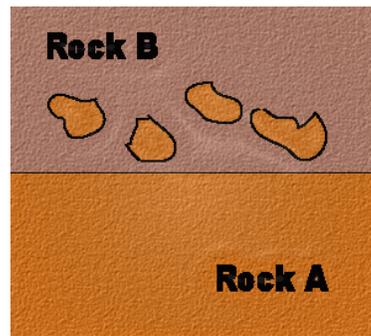
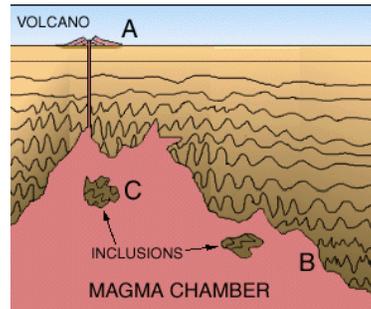
- In any undeformed sequence of sedimentary rocks, each layer is older than the layers above and younger than the layers below.



Rocks & Fossils

*Inclusions

- Sometimes pieces of rock fall into lava or magma, but *don't melt* before the lava solidifies
- The lava solidifies into an igneous rock
- The igneous rock has pieces of (older) rock inside it. These are called **inclusions**.



*Outcrop

- An **outcrop** is bedrock that is exposed (seen) at Earth's surface
- It isn't covered with soil or other materials.



- **Fossil**

- The *remains* or traces of an *organism*
- Preserved (well kept) from the geologic past.



- **Index fossil**

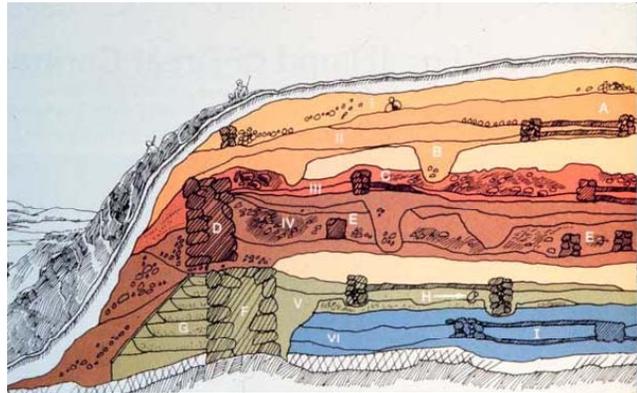
- a fossil that is comes from (associated with) a certain span of geologic time.

Index Fossils

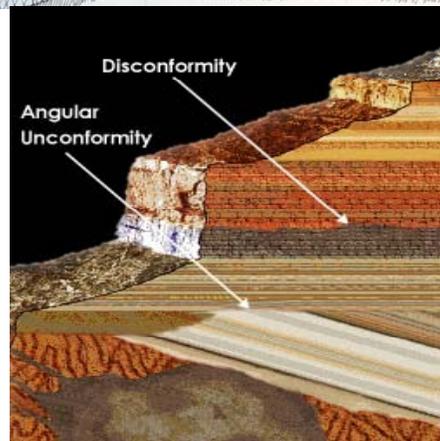
| | | | |
|----------------------------------------|----------------------|------------------------------------|-----------------------------------|
| CENOZOIC ERA (Age of Recent Life) | Quaternary Period | <i>Pecten gibbus</i> | <i>Neptunea tabulata</i> |
| | Tertiary Period | <i>Calyptrophorus velatus</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> |
| PRECAMBRIAN | Ordovician Period | <i>Bathyrurus extans</i> | <i>Tetragraptus fructicosus</i> |
| | Cambrian Period | <i>Paradoxides pinus</i> | <i>Billingsella corrugata</i> |

Other

- ***Stratigraphy**
 - *The study of sedimentary rock layers*
 - *The study of the sequence (order) of formation and the conditions they were formed in.*

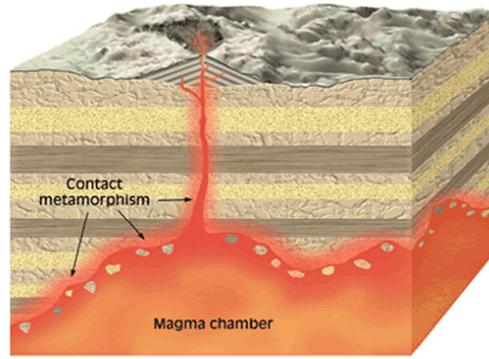


- **Unconformity**
 - An area that represents a *break* (change) in the rock record
 - Caused by erosion or lack of deposition.



- **Contact metamorphism**

- changes in rock caused by the heat from a nearby magma body.



- ***Outgassing**

- When gasses from inside the Earth get out through cracks and volcanic eruptions to Earth's surface.

