Determining Geologic Time

- Many geologic events that Earth Scientists study occurred millions of years ago. The ages of these events can be determined in ***two*** different ways.

1) Relative Dating **2) Absolute Dating**

- Both of these dating methods are needed to accurately record geologic time chronologically and to organize the geologic rock record.

Relative Dating

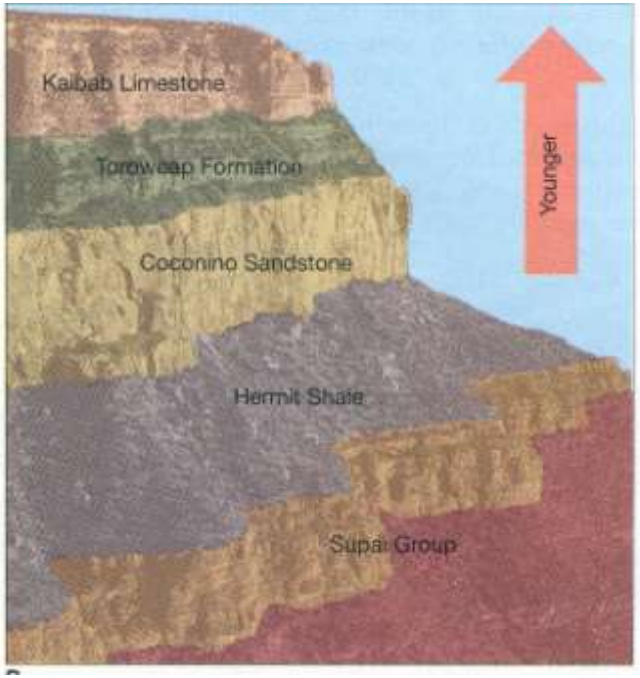
- Places events in a sequence of formation, but does not identify their actual date of occurrence. Often done by comparing events.
- This method of dating can't tell us how long ago something happened, only that it followed one event and preceded another.
- Relative dating techniques include;

1) **Principle (Law) of Superposition**
2) **Principle of Original Horizontality**
3) **Principle of Cross-Cutting Relationships**
4) **Principle of Inclusions**

Relative Dating Techniques

Law of Superposition

- states that in any undisturbed sequence of sedimentary rocks, a sedimentary layer is older than the layers above it and younger than the layers below it. The youngest is always at the top.



Relative Dating Techniques

Principal of Original Horizontality

- states that most layers of sediment are deposited in a horizontal position. If rock layers are folded or inclined, then the layers must have been moved into that position by crustal disturbances.

Relative Dating Techniques

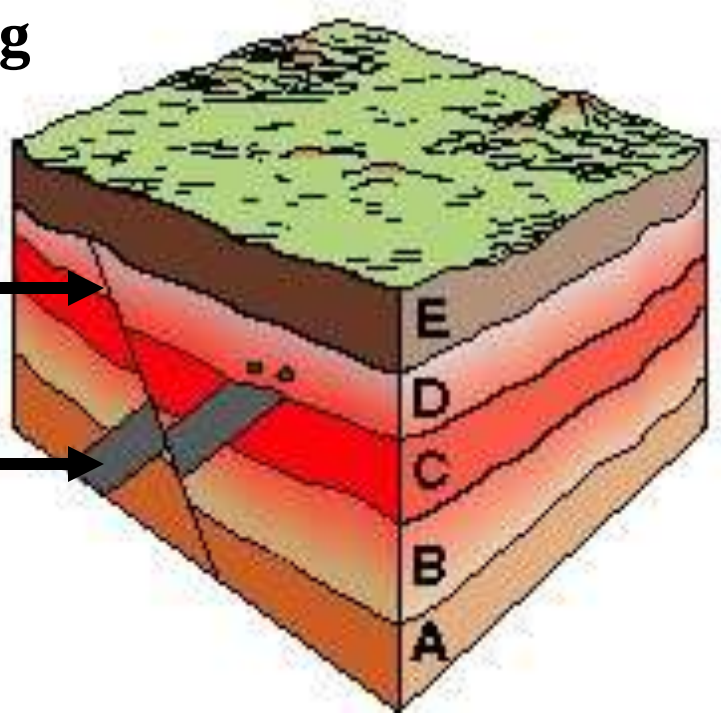
Law of Crosscutting Relationships

- states that an igneous rock or geologic feature is younger than the rocks it has intruded, or cuts across.

Two examples of cross-cutting in this diagram:

Fault cuts rock units A, B, C, D, & dike.

Igneous Dike cuts rock units A, B, & C.

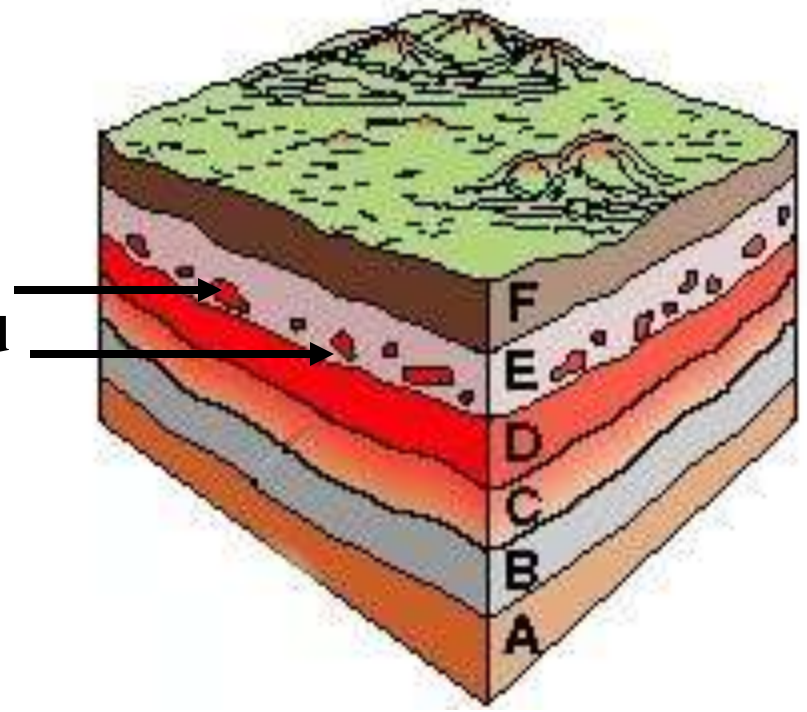


Relative Dating Techniques

Law of Included Fragments

- states that pieces of one rock found in another rock must be older than the rock in which they are found.

Rock fragments from rock unit "D" is included in layer "E" above it.



Absolute Dating

- **Identifies the actual date of an event, & pinpoints the exact time in history when something took place. For example, the extinction of the dinosaurs about 66 million years ago and the age of Earth is approximately 4.6 Billion years.**

- **Absolute dating methods include;**

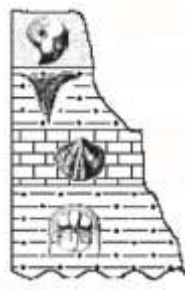
1) <u>Tree Rings</u> - The age of a tree is found by counting the total number of rings.

2) <u>Varves</u> - any sediment layer that shows a yearly cycle. Varves are often seen in glacial lakes dating back to the ice age.

3) <u>Radiometric Dating</u> - calculating absolute ages of rocks and minerals that contain radioactive isotopes.

Sample Question

Refer to the diagram to describe the relationship between superposition and relative time.



Answer:

Relative time is found by comparing one event with another and chronologically arranging them according to age. Relative ages of the layers in the diagram can be seen when referring to the Law of Superposition which states that the lowest layer is the oldest and the age progressively gets younger as you move toward the top of the rock sequence, assuming that the sequence of rock layers were not disturbed.

Relative Dating Techniques