

Relative and Absolute Dating Notes

PS: This has nothing to do with dating your relatives. That would be weird!

How do we find out how old something is?

Relative Dating

- Finding the relative age of events in the geologic record
- Can only determine older or younger, no numerical values

Absolute Dating

- Estimating a numerical age of an object or substance based on scientific analysis.
- The estimate gives you a range of dates, NOT the exact age of the rock.
- Absolute doesn't mean absolute in this case.

Nicolaus Steno (1638 – 1686)

Danish scientist, doctor, and Catholic priest

Reasoned out the Laws of Stratigraphy: study of earth's rock layers.

This was the beginning of relative dating

There are several laws that have been added since his time.



The Law of Superposition: *At the time they are formed, younger layers of rock sit atop older layers. (Younger on top of older)*

The Principle of Original Horizontality: *Rock layers are originally horizontal (flat) when they are laid down.*

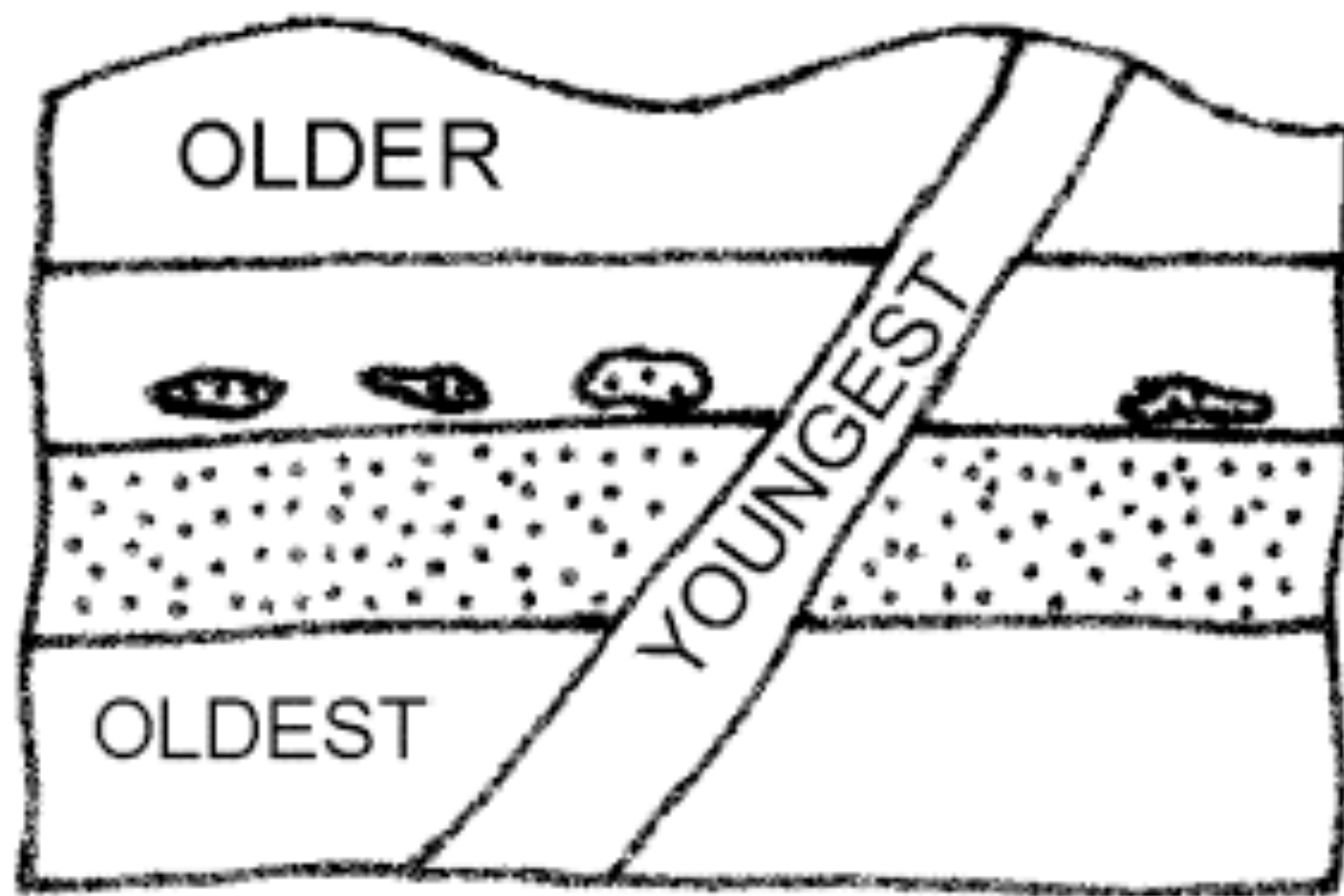
The Principle of Cross-cutting Discontinuities: *If a fault, another rock layer, or an unconformity cut across a rock layer, the rock layer is older than the things cutting it.*

Unconformity- *a large contact surface between two layers that indicates erosion of the older surface(s) and deposition of a new layer*

Usually caused by glaciers or sea-level rises

Law of Inclusions- *Pieces of rock are older than the rock they are inside.*

The Principle of Lateral Continuity: *Rock layers should continue in all directions unless other solid bodies stand in the way, or until erosion and weathering act upon them. (We won't use this one much in this class)*



Absolute Dating

- With new technology, and scientific knowledge, came a new ability to determine the ages of rocks (and fossils)

Absolute Dating: Dendrochronology

- Dendro- Tree Chronology: study of time
- Study the rings of a tree to figure out how old it is, and the conditions in each year of growth
- Trees make “rings” each year of growth.
- Can be done for about the last 11,000 years

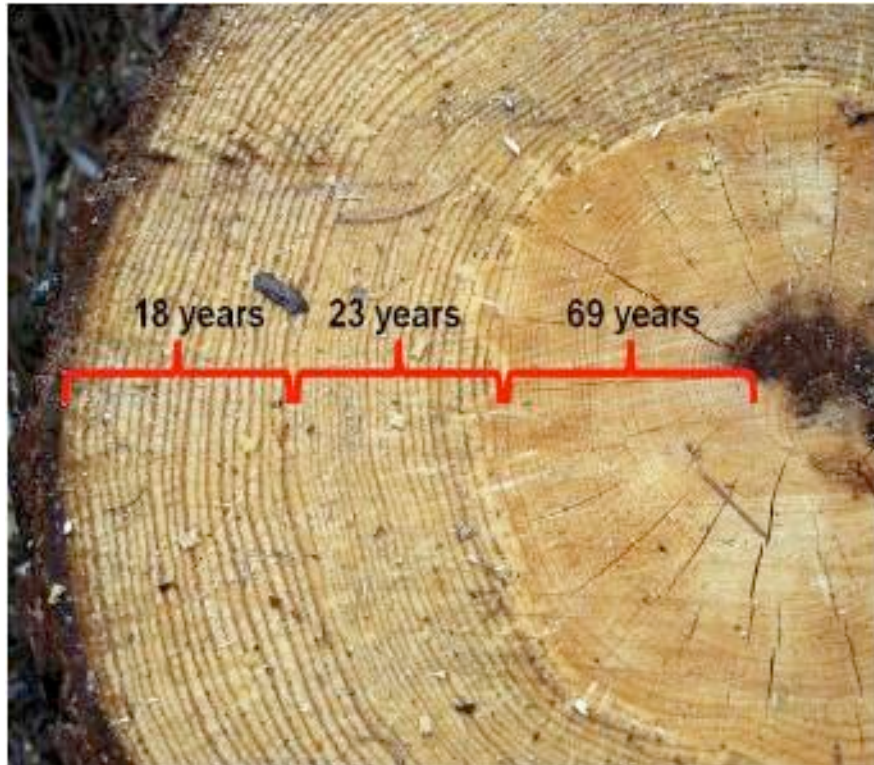
first year growth
rainy season
dry season
scar from forest fire



18 years

23 years

69 years

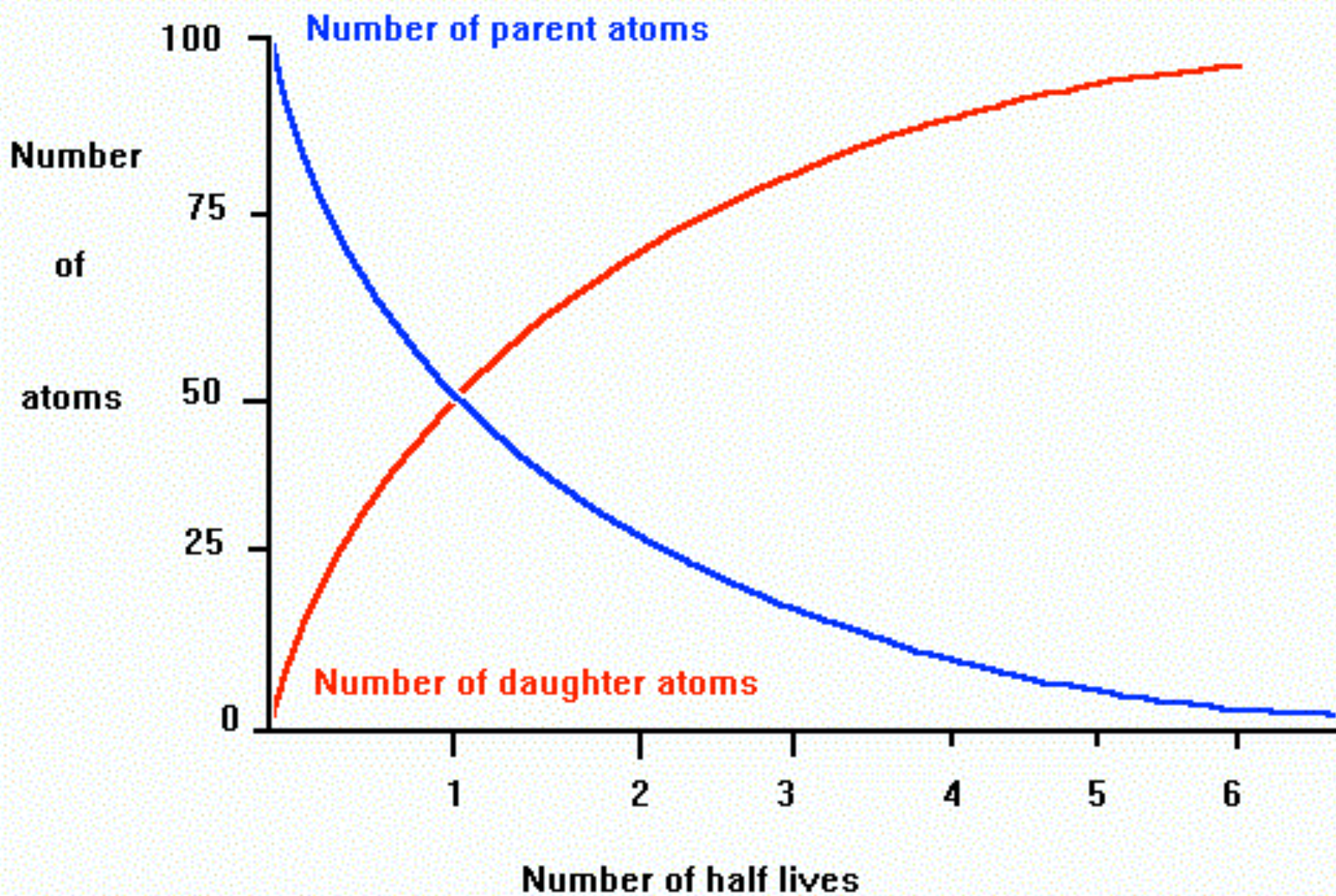


Absolute Dating: Radiometric Dating

- Different elements “decay” (break down into something else) at different rates.
- They eject energy and transform into another form of an element, or a new element.
- We know how long it takes for about half of an amount of the material to change
- We just look at the ratio of old material to New, and it tells us the age!

Radiometric Dating: Half-life

- **Half-life** ($t_{1/2}$) is the amount of time required for a quantity to fall to half its value as measured at the beginning of the time period.
- Ex) C14 half-life= 5730 years.
- If you have 50% C14 and 50% N14, then the object is 5730 years old.



Radiometric Dating

- Radiometric Dating gives a range of ages, not a definite number!
- Different atoms decay at different rates. Some decay at billions of years, some thousands.

Answer the following questions in your notes

- Which method is more accurate?
- Which method probably came first?
- Which method is more useful in the field?
- Which method is more useful overall?