Topic 5 - Time & Origins

A History of Earth
We are all star dust!
The age of the Earth
4.550 Billion years

Methods:
Radiometric dating
  Isotopic decay to measure time
  Ratio of parent to daughter isotopes
  “Younger” dates (radiocarbon dating):
    Carbon-14: half-life = 5,730 years
  “Older” dates
    Uranium-238: half-life = 4.5 billion years

Meteorites
  Created at same time as Earth (4.5 billion yrs old)
Earth’s Magma Ocean
4.525 Billion years

Heavy asteroid/meteor bombardment
Internal heat from radioactive decay
Molten rocks → Magma ocean
Heavy metals sank to core
“Iron catastrophe”
Liquid iron core
Iron Core

4.500 Billion years

Spinning Iron core gives Earth protection via electro-magnetic shield

Solar wind (radiation)

Space travel (no protection)

Mars
  No liquid iron core
  No magnetic shield
  No atmosphere
The Moon
4.500 Billion years

Collision between Earth and a Mars-sized planet
Moon formed from debris
Earth-Moon moving apart

Effects of the collision
Tilting of the Earth’s axis
Climate
Seasons
Stabilizes Earth’s rotation
Tides
Light Elements

Stars = Hydrogen and Helium

Fusion combines elements = energy

3 Helium nuclei fuse $\rightarrow$ Carbon
Another Helium $\rightarrow$ Oxygen

Light elements on the periodic table up to Iron (Iron barrier)

First 26 (20%) elements (no copper, gold, mercury)
Heavy Elements

Death of a star
  Iron barrier
  Fuel exhaustion
  Collapsing star
  Supernova explosion
  All ‘heavier’ elements created

Cassiopeia A: blew up ~ 1680
END:

Universe