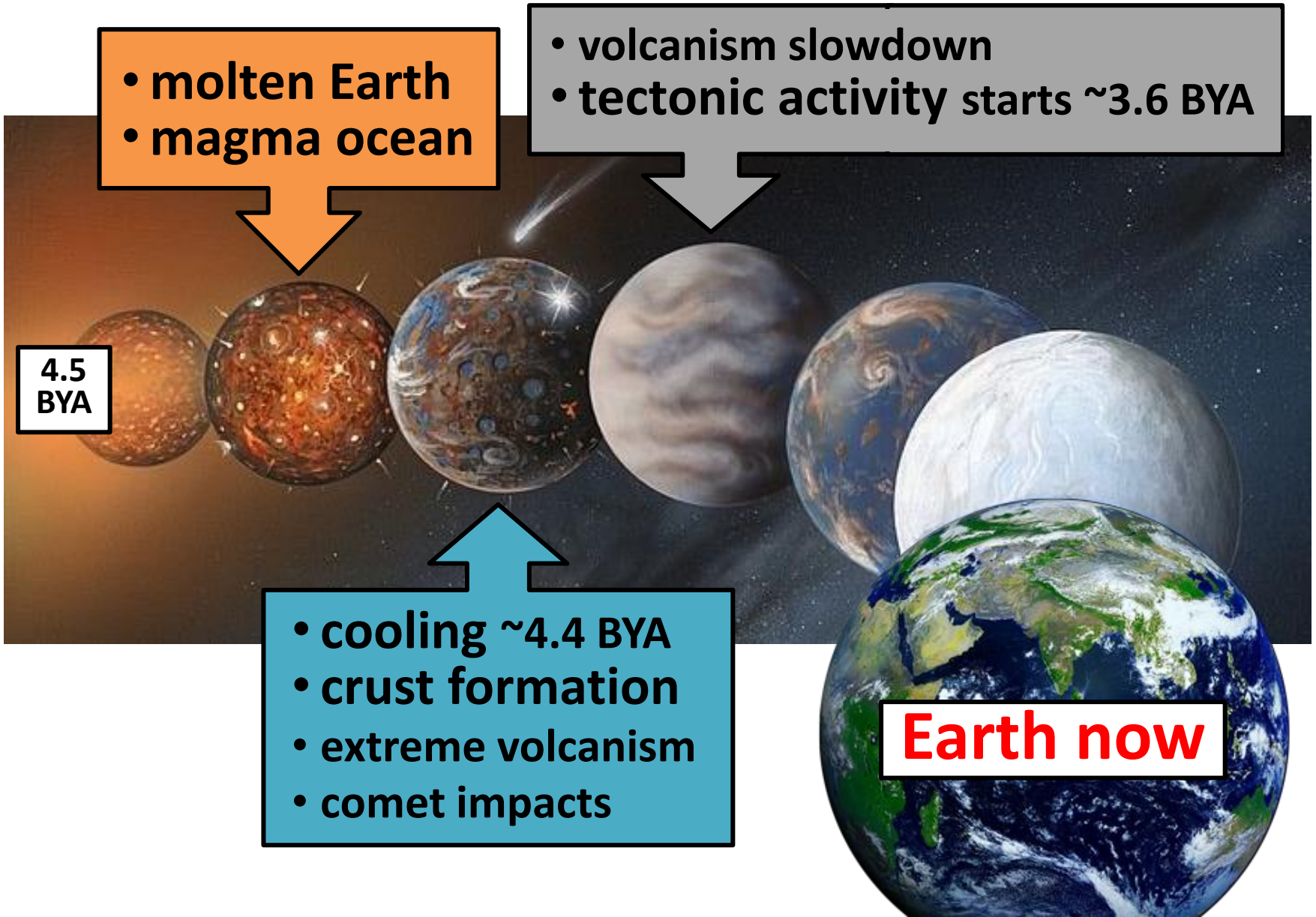
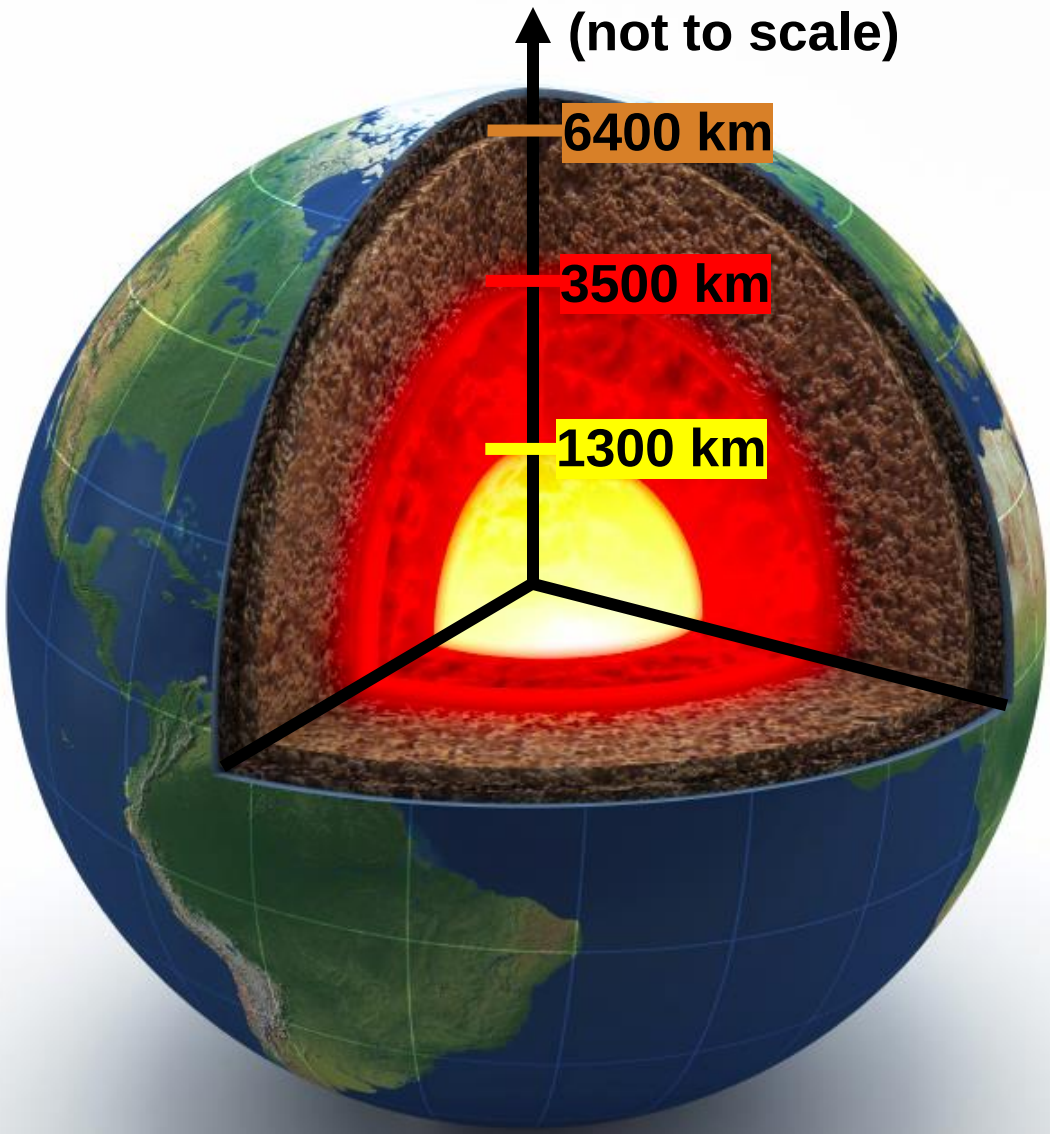
INSIDE EARTH

Solid Earth Evolution



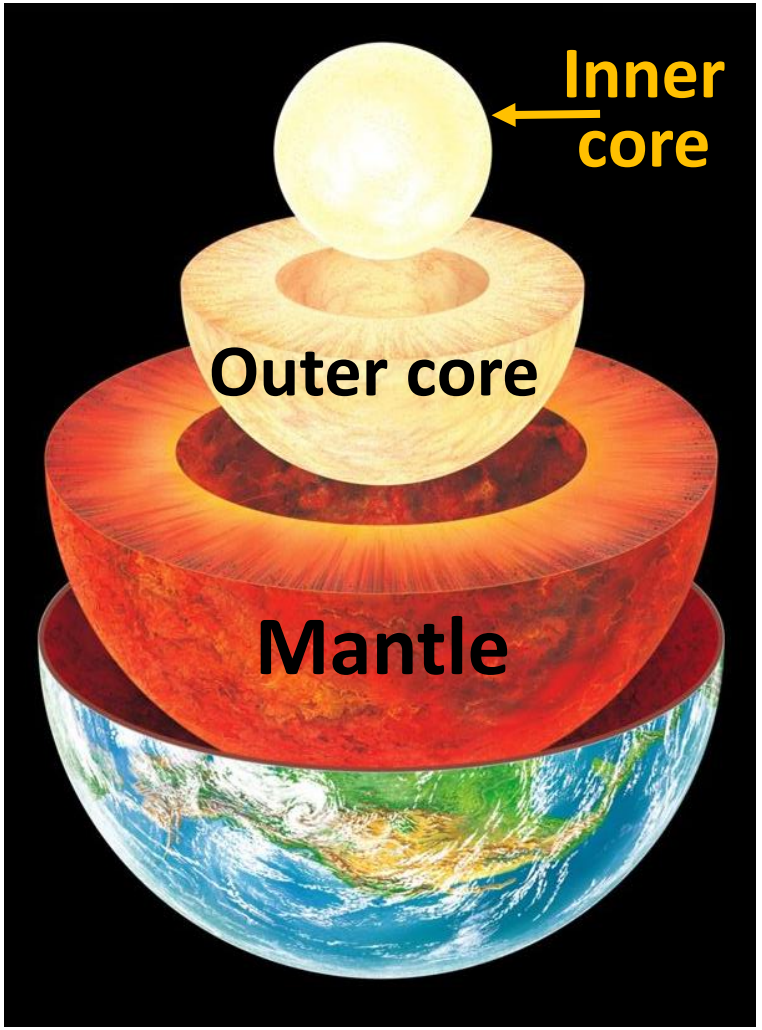
Inside Earth: Layers

- **Inner core**
  - R = 1300 km (0-800 mi)
- **Outer core**
  - 1300-3500 km (800-2200 mi)
- **Mantle**
  - 3500-6400 km (2200-4000 mi)
- **Crust**
  - tops mantle
  - 5-50 km thick (3-25 mi)



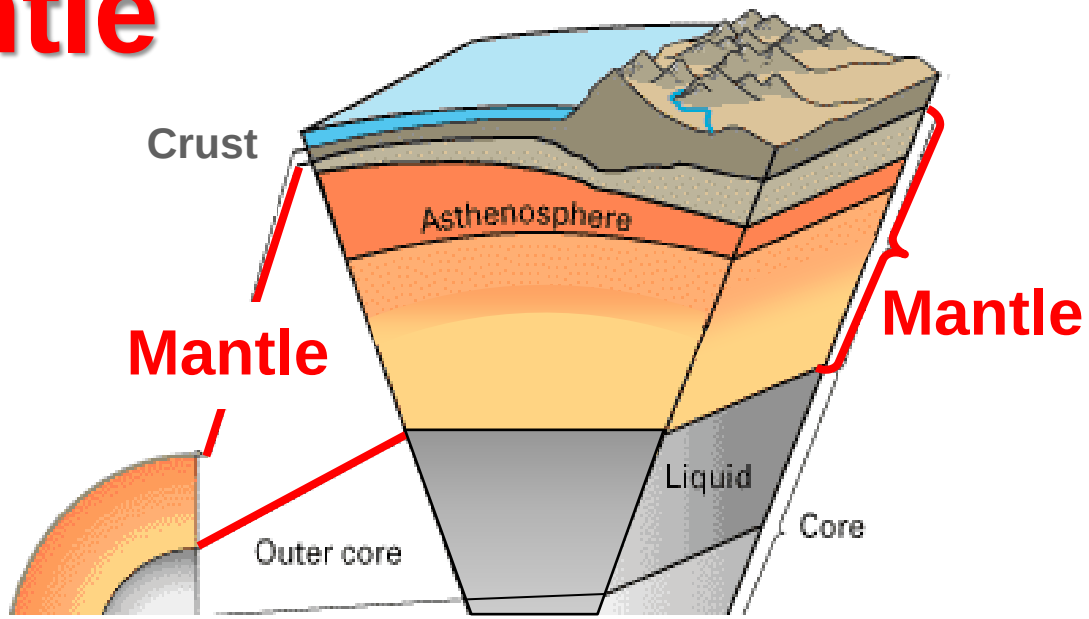
The Core

- **16% of Earth's volume**
- **Two sections:**
  - **inner core**
    - **total diameter ~2600 km**
    - **T ~ 6,000-7,000 K (>10,000°F)**
    - **solid, very dense**
    - **nickel-iron alloy**
    - **grows ~1 mm per year**
  - **outer core**
    - **~2200 km thick**
    - **liquid**
    - **T ~ 4,000-6,000 K (~6,700-10,300°F)**
    - **primarily iron with some nickel and sulfur**
    - **convection of liquid metals creates the Earth's magnetic field**



The Mantle

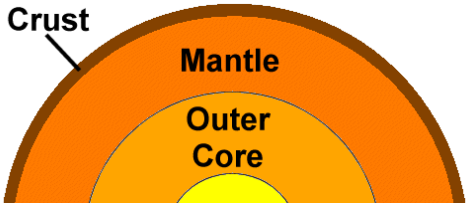
- **2900 km thick**
- **~84% of Earth's volume**

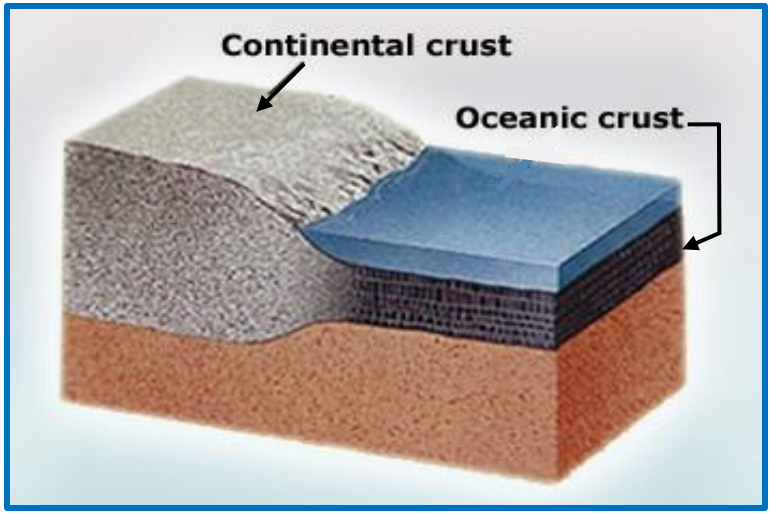


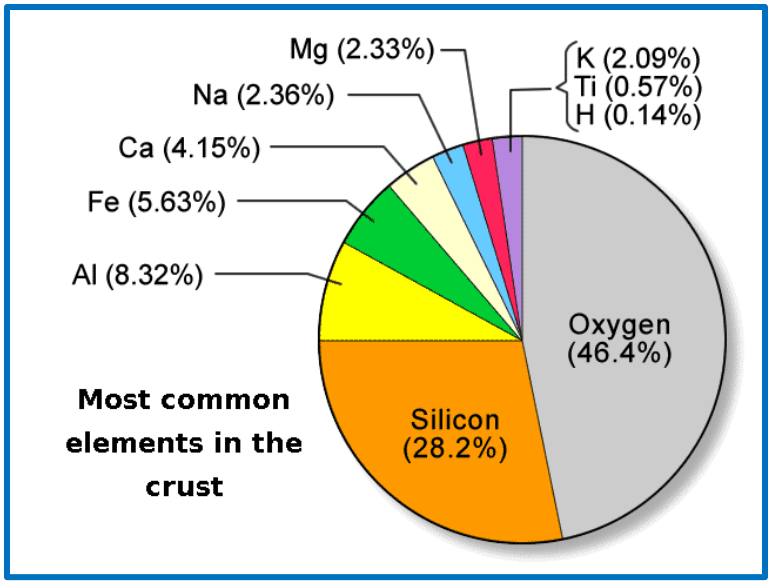
- **Three regions:**
  - **<u>lower region</u>**
    - — **dense, <u>solid</u> (due to *enormous pressure*!)**
    - — **temperatures between ~2000-3,500 K (~3,100-5,800°F)**
  - **<u>upper region</u> (*asthenosphere*, *"weak" sphere*)**
    - — **has reduced pressures and rock strength**
    - — ***plastic* rock (at pressures and temperatures found in this region, mantle rock can deform and flow slowly).**
  - **<u>uppermost region</u>**
    - — **<u>solid</u>; temperatures between 750-1200 K (~900-1,700°F)**

The Crust

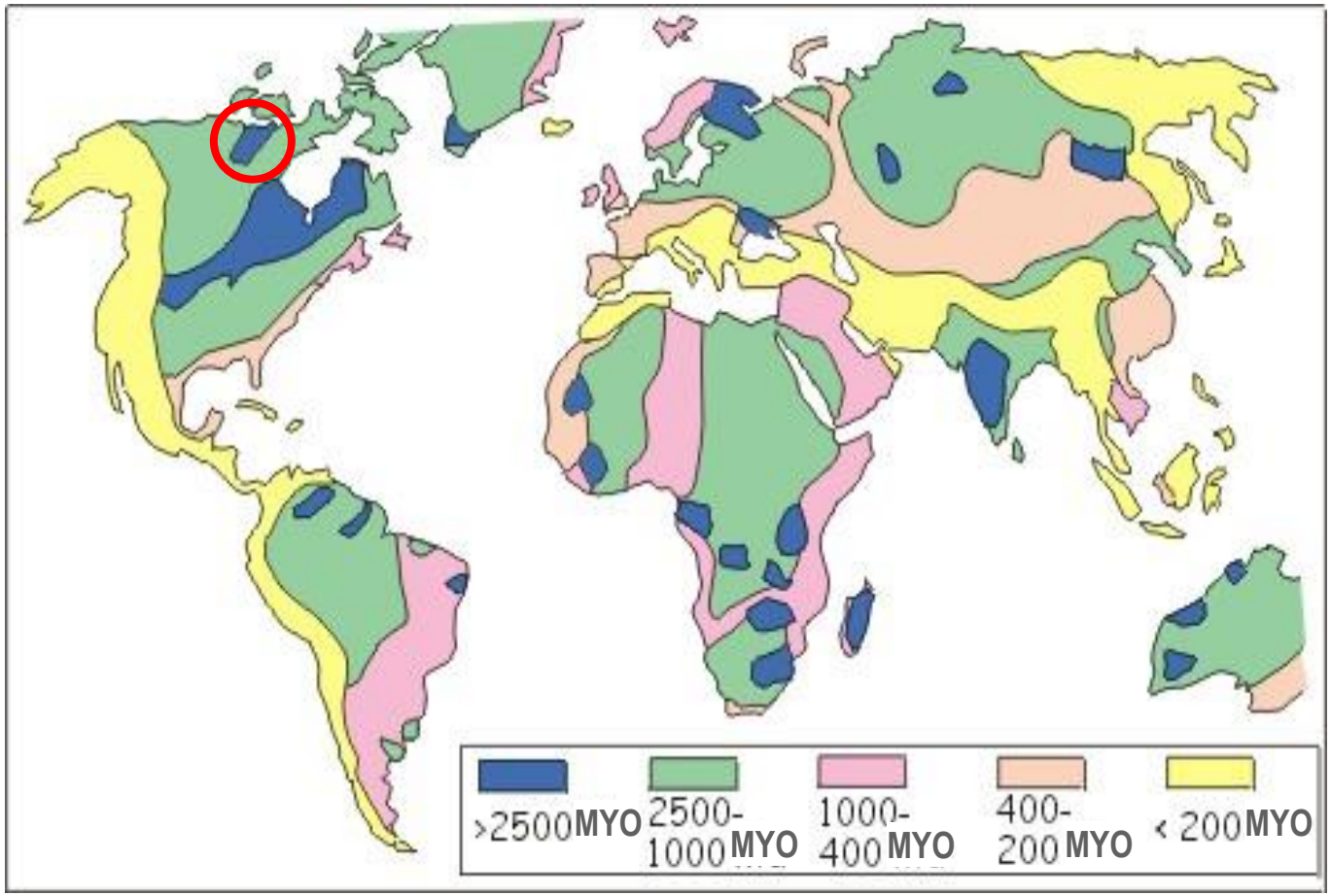
- **<1% of Earth's mass**
- **Solid**
- **Two types:**
  - **oceanic crust**
    - **55% of the surface**
    - **6 to 10 km thick**
    - **composed of basalts**
    - **relatively young (*<200 MYO*)**
  - **continental crust**
    - **45% of the surface**
    - **70% by volume**
    - **25 to 70 km thick**
    - **granites *(less dense)***
    - **mostly old (*up to 3.5-4 BYO*)**







Age of Continental Crust



How old is that rock?

By analyzing radioactive minerals in igneous rocks (*those formed through the cooling and solidification of magma or lava*), scientists can tell how much time has passed since rocks solidified.

The oldest rocks on Earth are found within the stable cores of the continents. The oldest known intact crustal fragment, Acasta Gneiss (located in Northwest Territories, Canada), is estimated to be ~4 billion years old.

Continental Drift Simulation

The Past

https://www.youtube.com/watch?v=UwWWuttntio

The Future

https://www.youtube.com/watch?v=bQywDr-btz4