



# Tuesday, Sept 5, 2017

Pick up: Cornell Notes pg 20

Today you will:

- Describe the layers of the Earth and the interactions among them.
- Take Cornell notes

HOMEWORK:

Study! Quiz Monday

1<sup>st</sup> DIA is Sept 22

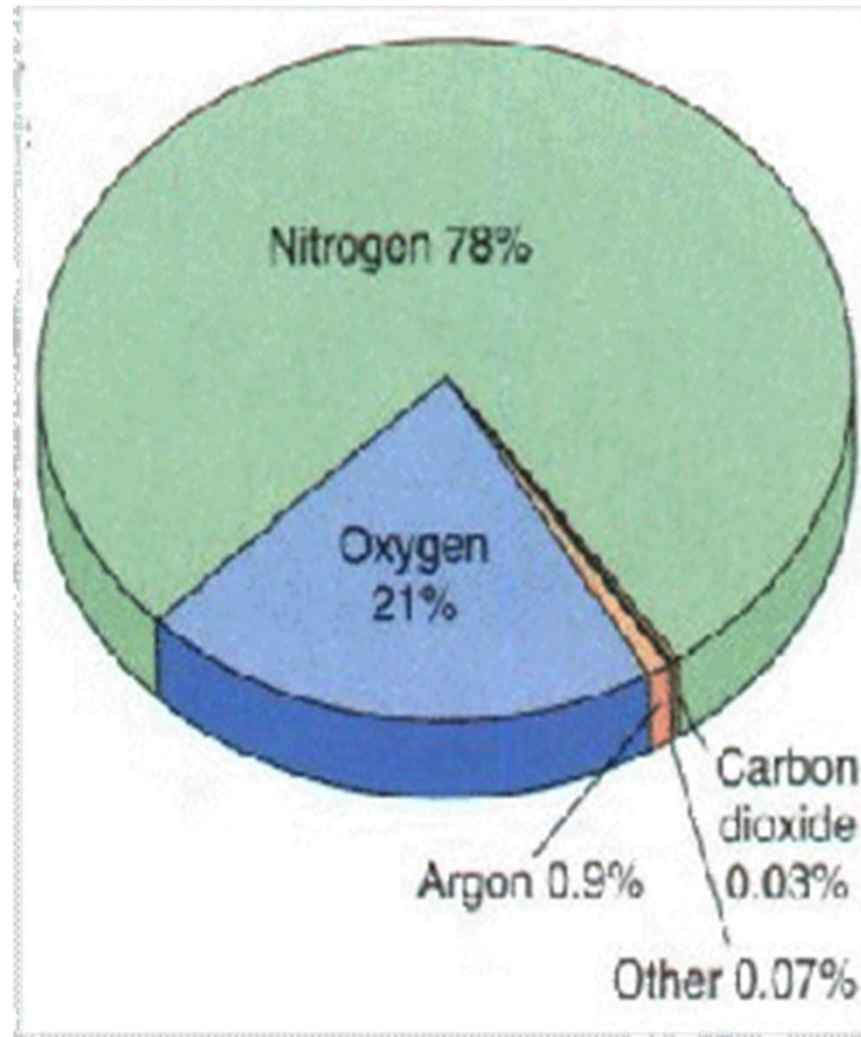


# The Basics

Liquid water covers 71% of  
the surface



Earth has an atmosphere with mostly Nitrogen and oxygen



# Earth Supports Life

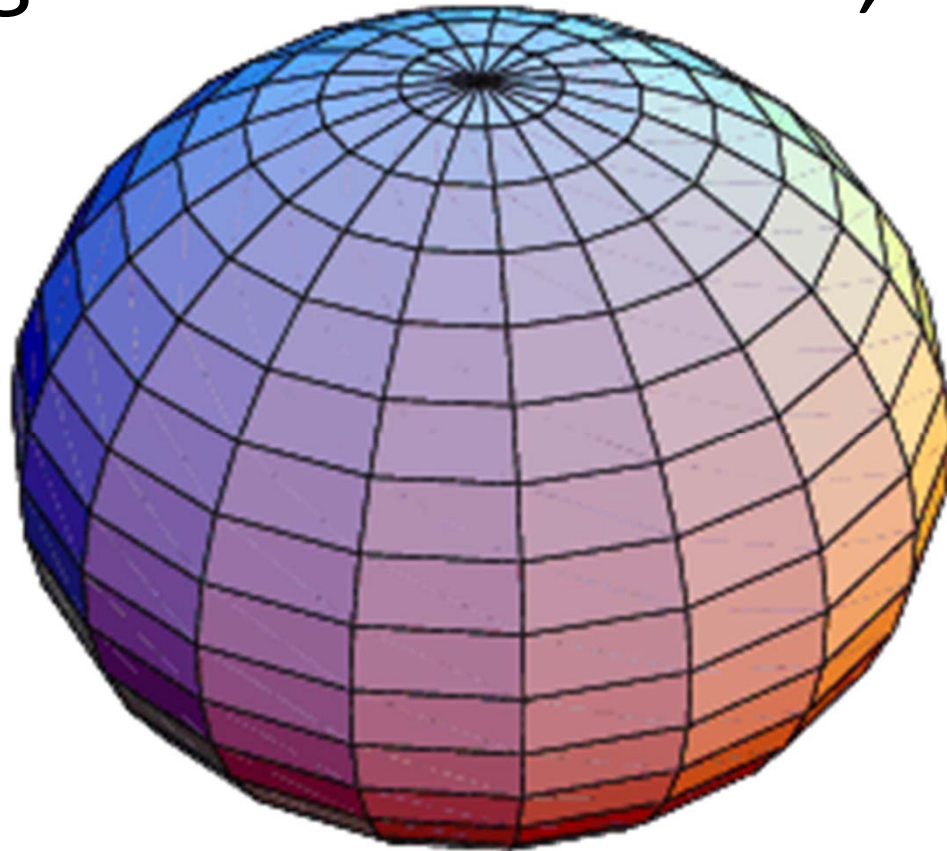




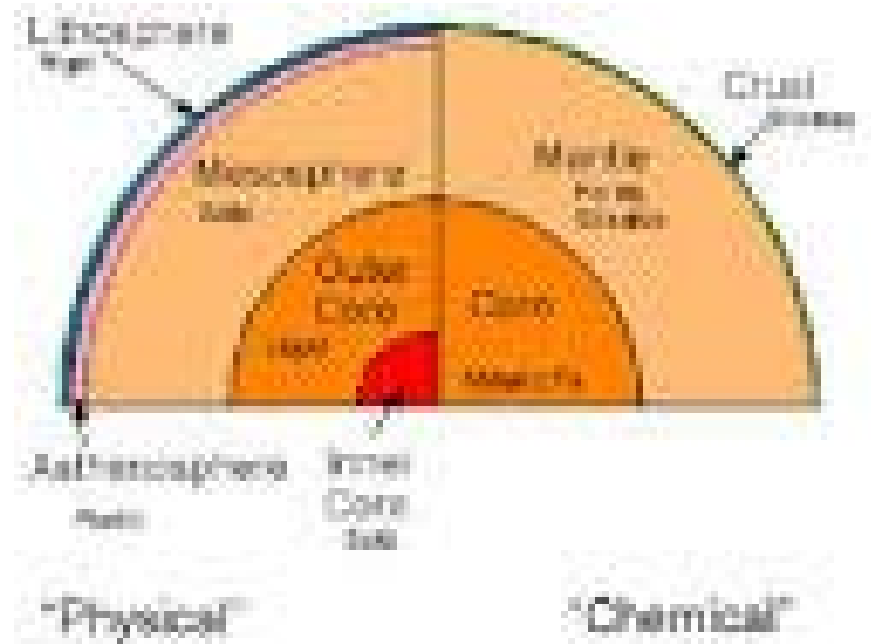
Earth is 4.6 billion  
years old

Not a sphere; an **oblate spheroid**  
(circumference is greater at the equator  
than at the poles)

Average circumference 40,000 km



Earth has 3 compositional zones and 5 structural zones.



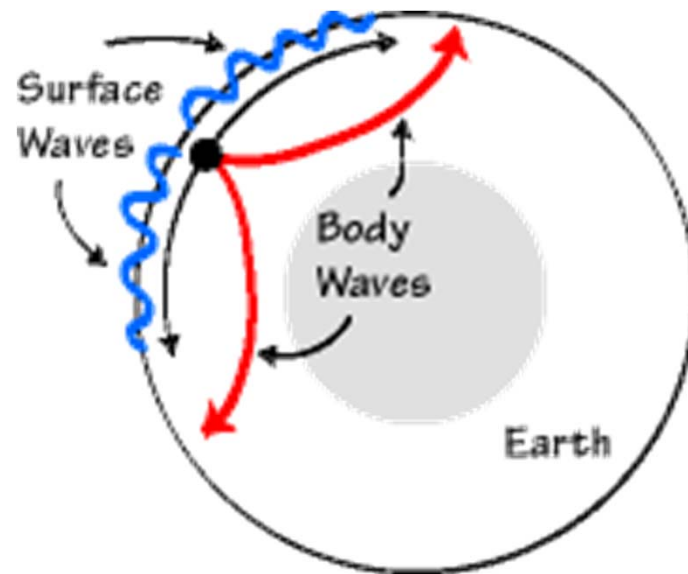


Scientists have only drilled in the upper 3km, have not been to the middle or core



# How do scientists know the layers of the Earth?

- They have come to this conclusion based on the movement of seismic waves (Earthquakes).
- Seismic waves move differently through different materials.
- More on this later!



## Compositional zones (As determined by seismic waves)

- Crust – solid, outermost layer of the Earth; rock
  - Oceanic crust – crust under ocean (thinner)
  - Continental crust – crust under continents (thicker)
- Mantle – 2/3 of Earth's mass, magma is formed
- Core – center of the Earth, made of iron and nickel

# Structural Zones

- Lithosphere – crust and upper mantle (tectonic plates)
- Asthenosphere – plastic part of mantle plates move on
- Mesosphere – majority of the mantle
- Outer core – liquid iron core probably the source of Earth's magnetosphere (North and South Poles)
- Inner core – solid center of Earth

# GRAVITY

Law of gravitation (Isaac Newton) – The force of attraction between two objects depends on the masses and the distance between the objects

- The greater the mass of an object, the greater the gravitational pull.
- The greater the distance is between the objects, the less the gravitational pull .

# What's the difference between weight and mass?

- Weight – the measure of the strength of the pull of gravity on an object. SI unit is the newton (n)



- Mass – how much matter is in an object



- An object's mass will not change from place to place, the weight will.

# The Four Fundamental Forces

The following information is from  
<http://physicsforidiots.com/physics/particles-and-forces/#Gravity>

# Four Fundamental Forces (#5)

Force	Strength	Range
Strong Force – Holds protons together	1	Nuclear distance
Electromagnetic Force – holds atoms to each other	$10^{-2}$	Great distance
Weak force – causes radioactive decay	$10^{-13}$	Nuclear distance
Gravitational force - Attraction of bodies to one another	$10^{-38}$	Greatest distance



# Strong Force

- **Holds protons and neutrons together in the atom.**

Inside a nucleus you have protons and neutrons. Due to the electromagnetic force however all of the protons in the nucleus are pushing each other apart trying to break free (same charges repel), the thing that holds them together is the Strong Nuclear force.

- **Strength: Strongest force**
- **Range: Smallest range**
- **Without strong force, atoms would fall apart**

# Electromagnetism

Electromagnetism can be both attractive and repulsive. If the charges are the same, the objects repel. **Opposite charges attract. This hold atoms to each other for chemical bond.**

- **Range: Second longest.** It's a long ranged force, however the mix of positive and negative charge cancel each other so it's hardly ever felt on large scale, unlike gravity.
- **Strength: Second strongest**
- **Without this force:** Without electromagnetism, we would not have chemical bonds and even worse, all matter would be one singularity without a repulsive force.

# Weak Force

- The weak nuclear force is responsible for all three types of **radioactive decay**.
- Radioactive decay is when an unstable atom changes its nucleus to become stable. Energy is released during this process.
- **Range: 2<sup>nd</sup> shortest range**
- **Strength: 3<sup>rd</sup> strongest**
- **Without weak force**, we would have no sun.

# Gravity

- Gravity is the attraction of bodies toward one another.
- Strength: Weakest

Gravity is the weakest of all the forces, which seems odd at first. It holds planets together and holds them in their orbits. You can easily overcome gravity just by jumping, that's how weak it is.

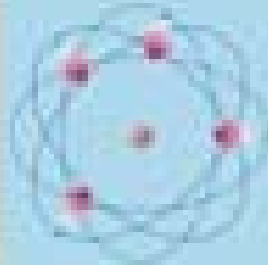
- Range: Longest

It is also the longest ranged force mainly because it is always attractive. Gravity is felt by anything with mass. If it has mass, gravity can act on it.

- Without Gravity: We would not have a solar system!  
No sun, no planets....

# The Four Fundamental Forces of Nature

Electro-  
magnetism



Weak  
Interaction



Strong  
Interaction



Gravitation

