Earth Science- Week 1

Introduction to Earth Science

- earth science, is the study of Earth and the processes that shape its surface.
- the studies of Earth are broken into 4 principal components:
  - Geosphere
  - Hydrosphere
  - Atmosphere
  - Biosphere

Earth's Resources
- Water
- Soil
- fossil fuels (petroleum, coal)
- Metallic ores
- Food

- Geosphere ~ the solid Earth
  - land
  - mountians
  - Rocks
- Hydrosphere ~ water
  - Streams
  - Ground water
  - Oceans
  - Ice
- Atmosphere ~ Air, water
  - Gases
  - Aerosols
  - Moisture
  - Circulations
- Biosphere ~ Life
  - Plants
  - Animals (including humans)
  - Microorganisms

- Earths 4 spheres are not separated by well defined boundaries, each sphere is intertwined with all of the others.
- Earth Science can be defined as the investigation of interactions among the 4 components of the Earth System.
- We study Earth because its important to us, the resources from the Earth, and human impact on the Earth.
- The roles of Earth Scientists:
  - Guarding Earth's resources
  - Protecting against natural hazards
  - Protecting the health of the enviroment
  - Ensuring human life
- Renewable v.s. Nonrenewable - can or can't be replenished within human life time scales.
- Renewable resources: water, soil, food (require joint efforts)
- Nonrenewable resources: fossil fuels, metalic minerals, food (if not regulated)
- Natural hazards:
  - Hurricans
  - Floods
  - Mudslides
  - Tornados
  - Lightning
  - Earthquakes
  - Volcanic Eruptions
- Prevention - avoid or eliminate any damages
- Adjustment - minimize the impacts
- Human Impacts - domestic and industrial inputs to the environment

Any alteration of a natural system has the potential to cause unanticipated changes

- Human impacts
  - Waste production and management
  - Water contamination
  - Soil contamination
  - Air pollution
  - Popular variations
- Earth's future - Global climate change
- Anticipated outcome
  - knowlageable about the earth
  - Passionate about the earth
  - Deal with environmental issues in scientific manners
  - Move forward with academic career

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The Solid Earth

=The Composition And Structure Of Earth=

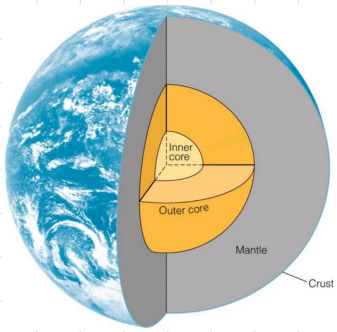
- Science is the process of asking questions about the observable world and then testing the answers to those questions.
- A scientific study starts with curiosity, followed by conducting observations and measurements, developing hypothesis, carrying out experiments, establishing the theory, and forming the law.

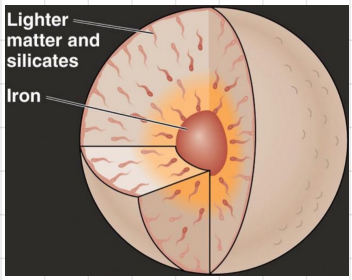
Layered Earth

Crust
- Continential crust
- Oceanic crust

Mantle
- Upper mantle
  - -lithosphere
  - -Asthenosphere
- Lower mantle

Core
- Outer core
- Inner core





- The Earth is layered because the difference in density.
- Density = Mass / volume
- Density of each layer -

Crust
- Continential crust ~ 2.7g/cm³
- Oceanic crust ~ 2.9g/cm³

Mantle
- Upper mantle ~ 3.3g/cm³
  - -lithosphere
  - -Asthenosphere
- Lower mantle ~ 4.5g/cm³

Core
- Outer core ~ 13g/cm³
- Inner core ~ 16g/cm³

- Density is different because of elemental composition

Contenential crust (granite) v.s. Oceanic crust (basalt)

- A light-colored rock composed mainly of oxygen, silicone, and aluminum.

- A heavy, dark-colored rock composed largely of oxygen, silicon, magnesium, and iron.

Life On Earth

- Earth is about 4.6 billion years old, while the ocean is about 4 billion years old.
- The first life forms on Earth arose more than 3.5 billion years ago in the ocean.
- Animals occured in the ocean about 700-900 million years ago.

- Metric Unit
  - °C (Not °F)
  - °C = (°F-32)/1.8
  - °F = (°C x 1.8)+32

- Meters or kilometers (Not feet or miles)
  - -1 foot = 0.305 meter
  - -1 mile = 1.609 kilometer