

# Essentials of Geology

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Chapter 1



An Introduction To Geology

## What is Geology?

Specialties of Geology related to the subsystems of Earth include:

Geochronology  
Geochemistry  
Mineralogy  
Planetary Geology  
Environmental Geology  
Hydrogeology  
Geophysics  
Structural geology  
Stratigraphy  
Seismology  
Oceanography  
Paleontology

### Jobs / Career Preparation



- Earth Sciences Jobs
- Earth Sciences Organizations
- Reading Science for Comprehension
- Geology Schools

## How Does Geology Affect our Everyday Lives?

- Natural Events
- Economics and Politics
- Our role as Decision-makers
- Consumers and Citizens
- Sustainable Development



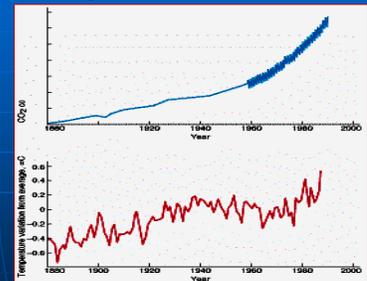
## Global Geologic and Environmental Issues Facing Humankind



From a population of one billion at the beginning of the 19th century, our species now numbers more than six billion people.

Overpopulation ?

## Global Geologic and Environmental Issues Facing Humankind

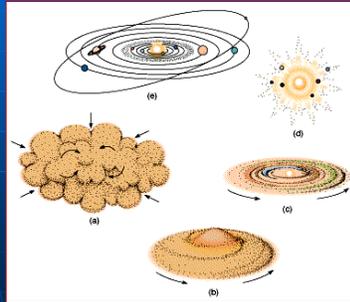


Global warming ?

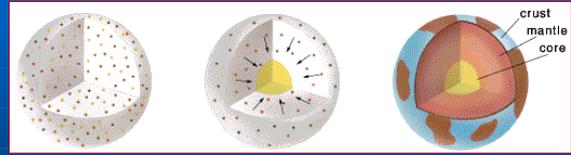
## The Origin of the Solar System

### Solar Nebula Hypothesis

- Condensation and collapse of interstellar material
- Flattening and rotation of cloud
- Accretion of planetesimals
- Birth of Sun



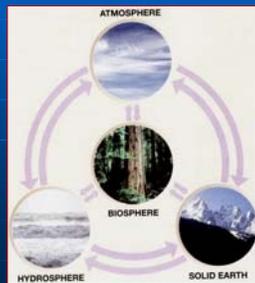
## The Differentiation of Early Earth



Perhaps the most significant event in Earth history, the 'settling' of material according to density resulted in a layered Earth. This concentric arrangement of material led to the formation of continents, oceans, and the atmosphere.

## A View of Earth

- Earth is a planet that is small and self-contained
- Earth's four spheres
  - Hydrosphere
  - Atmosphere
  - Biosphere
  - Solid Earth



### The Core

- solid inner
- liquid outer
- density of 10-13 gm/cm<sup>3</sup>

### The Mantle

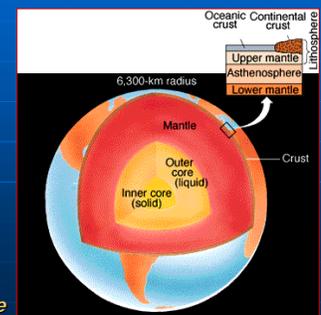
- surrounds the core
- density of 3.3-5.7 gm/cm<sup>3</sup>
- three distinct zones

### The Crust

- oceanic - 3 gm/cm<sup>3</sup>
- continental - 2.7 gm/cm<sup>3</sup>

*Plate Tectonic Theory explains the interactions of these zones*

## Why is Earth a Dynamic Planet?



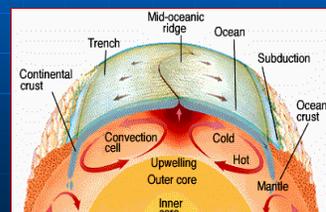
## Geology and the Formulation of Theories

- Plate Tectonic Theory
- The Rock Cycle
- Organic Evolution
- Geologic Time and Uniformitarianism

These theories, supported by extensive research, are the cornerstones of the study of geology, and help explain many seemingly unrelated observations.

## Plate Tectonic Theory

- The Formulation of Plate Tectonic Theory



- Divergent boundaries
- Convergent boundaries
- Transform boundaries
- convection cells
- subduction zones



## The nature of scientific inquiry

- How or why things happen are explained using a
  - Hypothesis – a tentative (or untested) explanation
  - Theory – a well-tested and widely accepted view that the scientific community agrees best explains certain observable facts

## The nature of scientific inquiry

- Scientific methods
  - Scientific method involves gathering facts through observations and formulation of hypotheses and theories

• There is no fixed path that scientists follow that leads to scientific knowledge

