

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



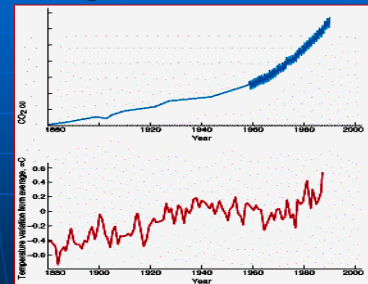
Global Geologic and Environmental Issues Facing Humankind



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

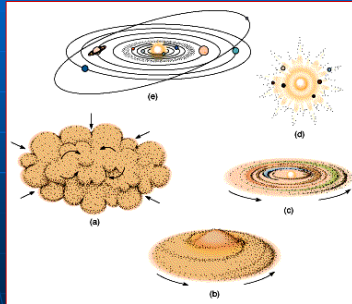


Global warming ?

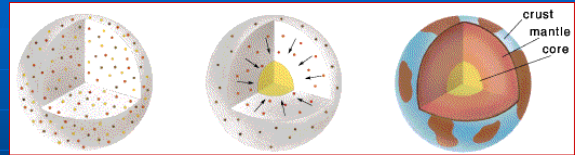
The Origin of the Solar System

Solar Nebula Hypothesis

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



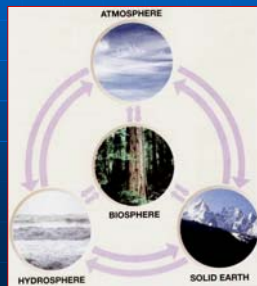
The Differentiation of Early Earth



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/cm³

The Mantle

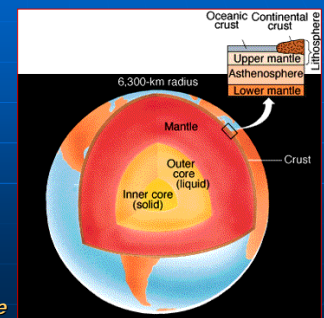
- surrounds the core
- density of 3.3-5.7 gm/cm³
- three distinct zones

The Crust

- oceanic - 3 gm/cm³
- continental - 2.7 gm/cm³

Plate Tectonic Theory explains the interactions of these zones

Why is Earth a Dynamic Planet?



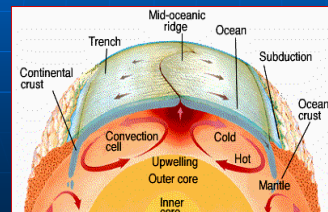
Geology and the Formulation of Theories

- 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

