INTRODUCTION TO GEOMORPHOLOGY

Definition: the science of landforms; their origin; evolution, form, and spatial distribution

* The development and changes on the earth's surface over time.

Basic Terms:

Landform: individual element of a landscape
EX: a mountain, a river, a hill, etc.

Topography: Earth's ridges, valley's & other surface features;
the change in elevation over the Earth's surface

Uniformitarianism: the theory that geologic events and others are caused by natural processes, many of which are operating at the present time and that the processes we see today operate in the same way today as they did in the past

EX: the way a volcano operates today is the same as it did 1000 yrs ago,
or 1million years ago, or 1 billion years ago

** **Types of Landforms:**

Tectonic: developed by the rearrangement of the Earth's crust,
driven by internal energy

Fluvial: those developed by moving liquid water

Glacial: those developed by glacial ice(solid water)

Coastal: those developed by waves

Eolian: those developed by wind

** Landforms and systems change, but tend to be in some form of an equilibrium
state, when viewed over geologic time.

***Steady-state*:**

***Dynamic Equilibrium*:**

Geomorphic Processes: relationship between external and internal processes and forces

* **Internal Processes:** those processes which occur or originate **within Earth's crust;** *volcanism, diastrophism (mountain building), plate tectonics (massive crustal rearrangements)*

* **External Processes:** those processes which occur **on the Earth's surface**; weathering & erosion by *fluvial, glacial, eolian, & coastal*

EARTH'S INTERNAL STRUCTURE

Characteristics:

* arranged in concentric layers
* heavier elements towards the center
* each layer distinct in chemical composition or temperature
* result of cooling since formation of the earth, some 4.6 billion years before present(BYBP)

** How do we know?
--- only by *indirect evidence*; **Seismic waves**

* by analyzing the behavior of **seismic waves**; their speed and direction

* waves change with changes in the Tº and density of material

**cooler=higher velocity; hotter=slower velocity

** density may reflect or refract the waves

** 3 types of **seismic waves**:

***P waves*: push or compressional waves**

***S waves*: shear or shake waves**

***L waves*: surface waves, the ones we feel**

The Earth's Layers:

Inner Core: *solid and rigid

*consists of iron (FE) and nickel(Ni)

* 3200 mi below sea level (bsl), 760 mi thick

Outer Core: *liquid (molten), more plastic

* Consists of Fe and Ni but at lower pressure so its melting temperature is lower=liquid

* 1800 mi bsl; 1400 mi thick

* **generates 90% of the Earth's magnetic field**

** ***Gutenberg discontinuity:*** an uneven, broad transition zone between the **Outer Core** and the **Lower Mantle**

* ***discontinuity:*** a physical difference or change, esp. density, between two layers

Lower Mantle: * solid

* Consists of oxides of Fe, magnesium (Mg) and silicon (Si)

* 415 mi bsl; 1385 mi thick

Upper Mantle: * partially molten

* Consist of silicate minerals

* 25 mi bsl; about 380 mi thick

** Upper & Lower Mantle comprise about 80% of Earth's volume

Asthenosphere: * molten

* between 43 - 155 mi bsl

* source of **magma** which pushes up into the crust & onto the surface

Lithosphere: Uppermost, solid portion of mantle, plus the crust

* varies between 25 & 50 miles thick