Earth Science
Chapter 1

SECTION 1 Essential Questions:

1. How do the areas of study within Earth science compare?
2. What are Earth's systems?
3. What are the relationships among Earth's systems?

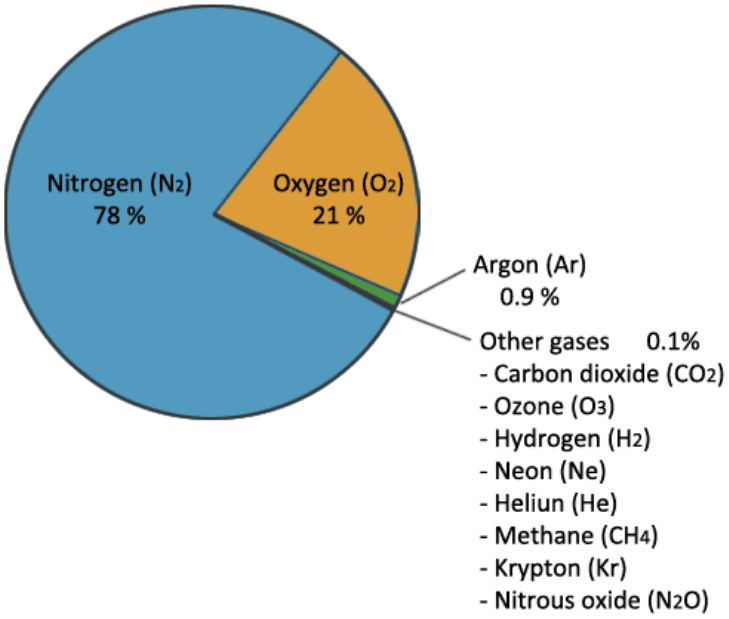
The study of Earth Science is broken into 5 major areas of specialization:

- Astronomy: study of objects beyond earth's atmosphere
  - galaxies, stars, exoplanets, ….
- Meteorology: study of forces and processes that cause the atmosphere to change and produce weather
- Geology: study of earth's history, materials and processes that make up the earth
- Oceanography: study of earth's oceans
- Environmental Science: Study of the interactions of organisms and their surroundings

Earth's Systems: 1. Geosphere: earth's surface down to earth's center

- Crust, Mantle & Core
  - study of earth **materials**: rocks & minerals
  - study of earth **processes**: including both physical and chemical changes
  - study of earth's **history**: including both living and nonliving

2. Atmosphere: the gasses that surrounds the earth
   - 78% N_2, 21% O_2, .93% Ar, .04% CO_2



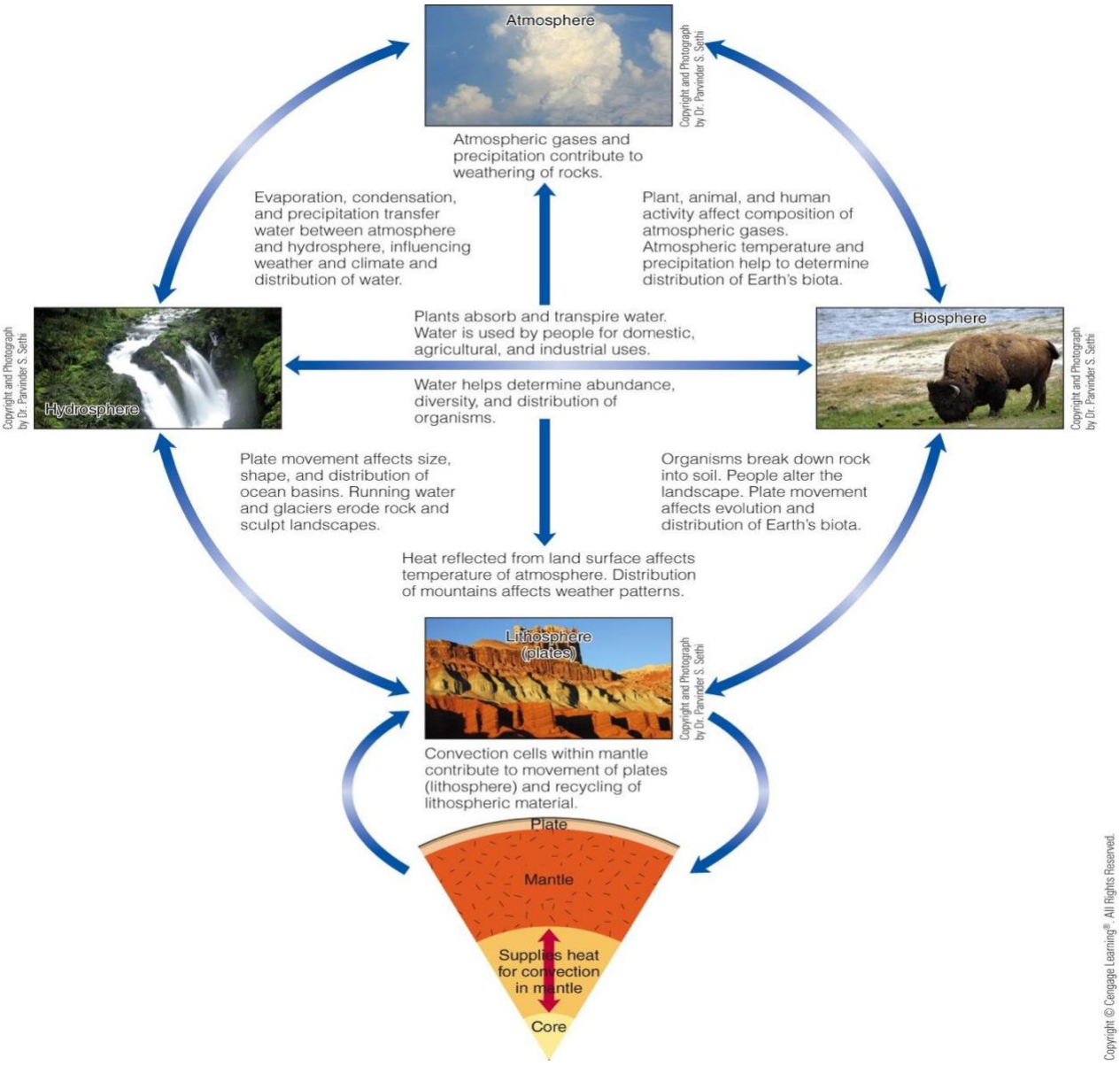
3. Hydrosphere (ice & liquid water)
   - 97% saltwater
   - 3% fresh water: lakes, rivers & ice
   - cryosphere: permanently frozen water

4. Biosphere: all organisms & the environments that live in
   - life can be found in extreme environment: caves, bottom of oceans, upper atmosphere, in rocks,

Example: The microscopic tardigrade, or water bear, can survive heat, cold, desiccation, lack of oxygen and radiation. The tiny animal has even been shown to survive a 10-day trip into space. To survive these conditions the tardigrade puts itself into a form of non-reproductive suspended animation.

*** All 4 systems are interconnected & interdependent!***

- life changes the atmosphere, without the atmosphere there would be no life.
- volcanoes change the atmosphere
- running water changes the topography of the crust



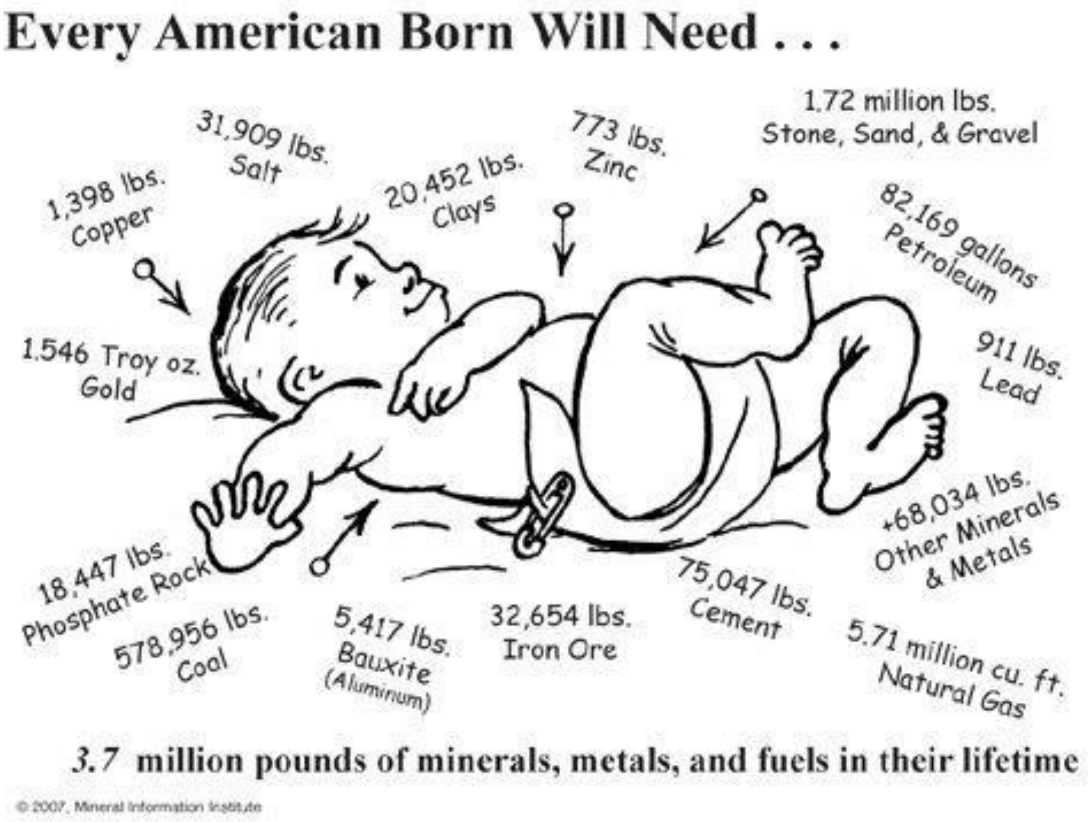
How Does the Study of the Earth Benefit Us?
How do these Systems Affect our Lives?

- An understanding of the dynamic nature of the planet allows us to:

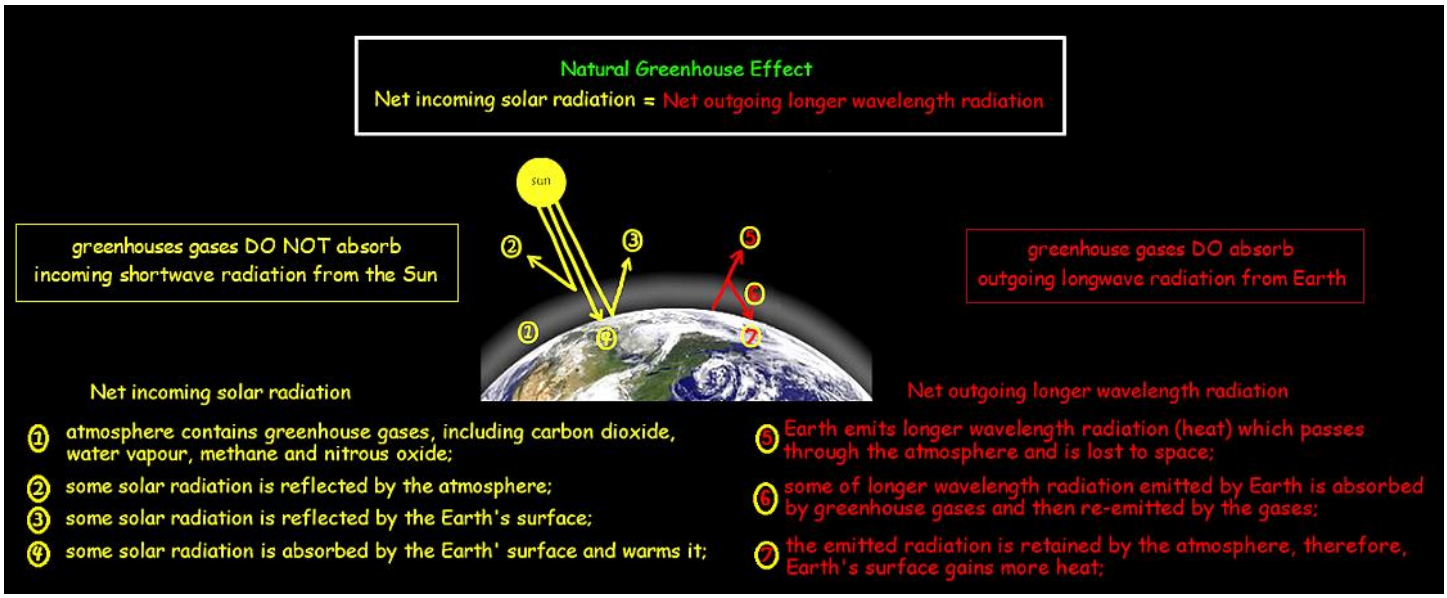
  - Appreciate the balance in between the earth's systems
  - Make appropriate choices about our interaction with the environment
  - Ensure that a quality future will be left to our children as we make difficult decisions regarding natural resource consumption
  - Better understanding of natural events
  - Economics and Politics
  - Consumers and Citizens
  - Sustainable Yield and Development

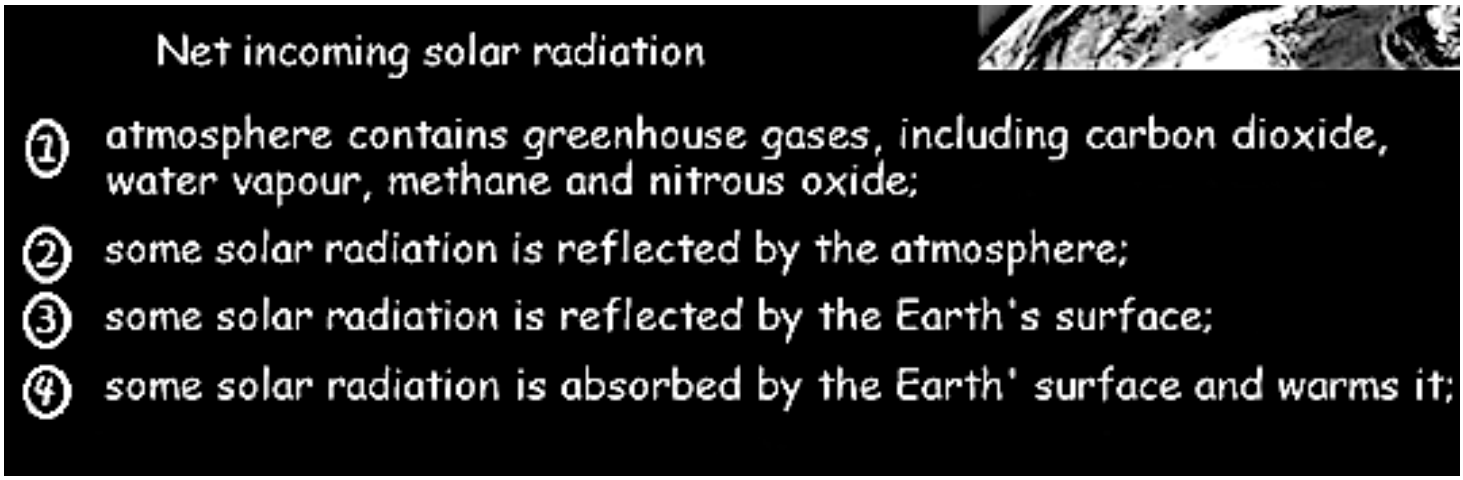
Global Geologic and Environmental Issues Facing Humankind

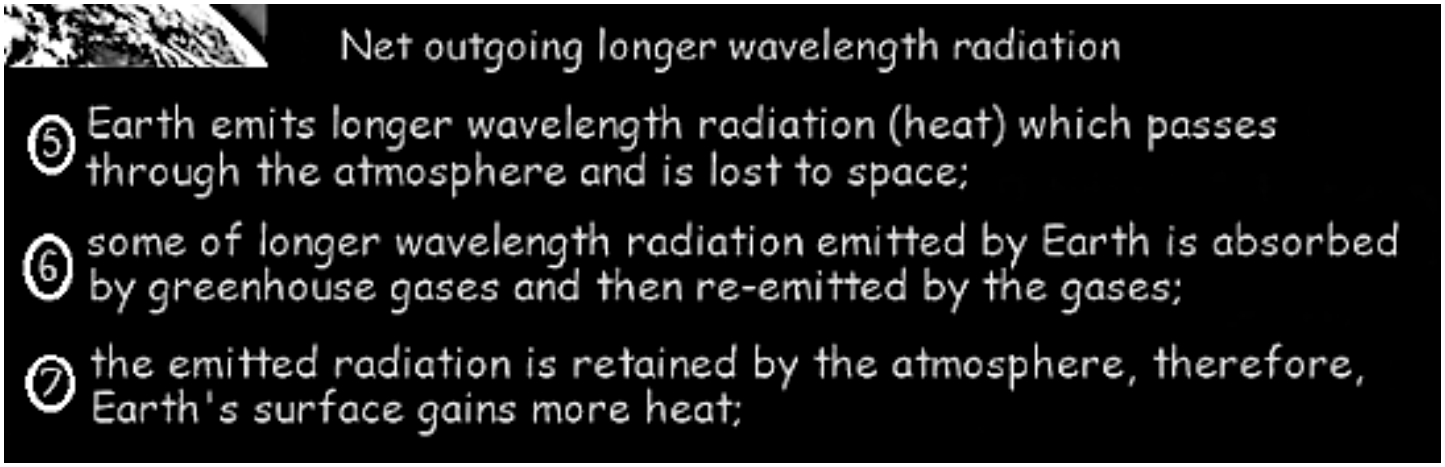
  - Overpopulation: what are the problems of overpopulation?



- Global Warming (climate change)
  - greenhouse effect







Measurements

Measurement	Base Unit & Symbol	What are you measuring?
Length	Base Unit: meter(m) millimeter(mm), centimeter(cm), meter(m), kilometer(km)	Distance
Time	Base Unit: seconds(s) seconds(s), minutes(m), hours(h), years(y)	Interval of time between two events
Volume	Basic Unit: liter or cubic meter(m^3) Millimeter(mL), liter(L) 1L = 1 m^3 1mL = 1cm^3	Amount of space something takes up
Area	Basic Unit: square meters(m^2) square centimeter(cm^2)	Amount of surface
Mass	Basic Unit: gram(g) millimeter(mm), kilogram(kg)	Amount of mass
Temperature	Basic Unit: kelvin(K) 0 kelvin = -273 Celsius(^oC) Example: 23^oC + 273K = 296K 352K – 273 = 79 ^oC	Average kinetic energy

Metric System Conversion

Name	Symbol	Power	Quantity
Peta	P	10^{15}	1,000,000,000,000,000
Tera	T	10^{12}	1,000,000,000,000
Giga	G	10^{9}	1,000,000,000
Mega	M	10^{6}	1,000,000
Kilo	K	10^{3}	1,000
Hecto	h	10^{2}	100
Deka	Da	10^{1}	10
Base	-	10^{0}	1
Deci	d	10^{1}	.1
Centi	c	10^{-2}	.01
Milli	m	10^{-3}	.001
Micro	μ	10^{-6}	.000001
Nano	n	10^{-9}	.000000001
Pico	p	10^{-12}	.000000000001
Femto	f	10^{-15}	.000000000000001

Bigger ⧗ Smaller

_____ > _____ > BASE > _____ > _____

Conversions Allows you to be able to convert from one unit to another.

Example- 1 centimeter to kilometers

This line is (____) = 0.00001 kilometers

Rather than write 0.00001 kilometers we can shorten it by converting to another unit to avoid writing a ton of zeros or decimal places.

0.00001 km = .01m = 1 centimeter (cm)

Scientific Notation- because scientists work with such small and large numbers, there can be a lot of confusion when counting zeros. We can express these numbers as powers of 10.

- Speed of light = 2.9979×10^{8} m/s OR 299 792 458 m/s

- Mass of Jupiter = 1.90×10^{27}kg OR
  1,900,000,000,000,000,000,000,000,000 kg

- Mass of a proton = $1.6726231 \times 10^{-27}$ kg OR
  0.000000000000000000000000016726231kg