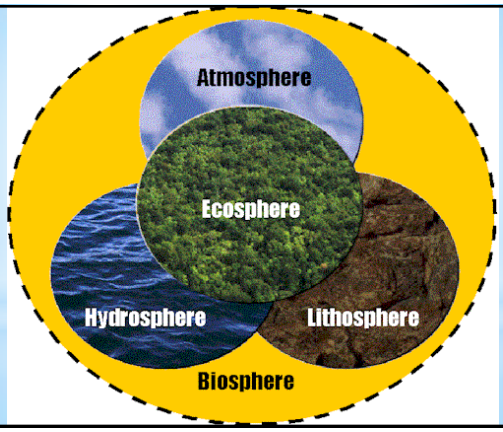
*ECOLOGY

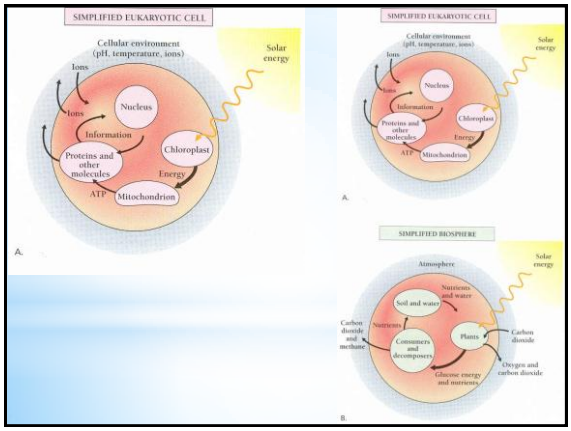
"Everything living and non-living on Earth, and how it all interacts"

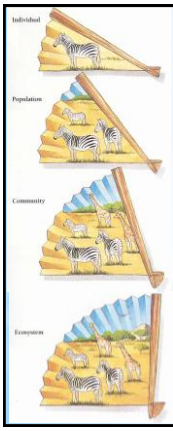


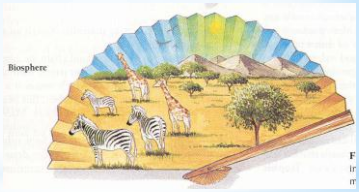
Genoa, Italy: The Bull

Montreal, Quebec, Canada: 1967 World's Fair

Cornwall, England: Project Eden



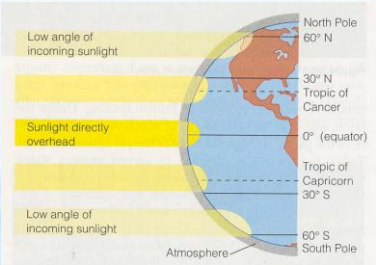


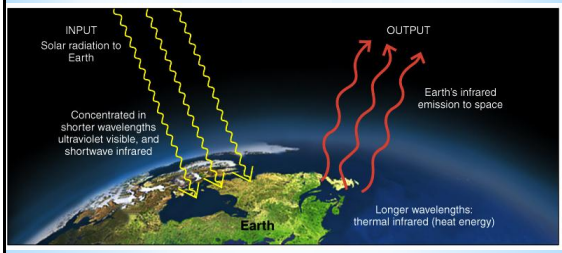


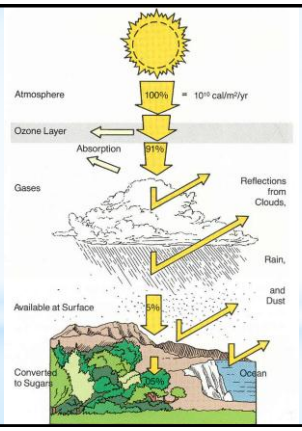
*Abiotic Factors

"non-living factors and components of an environment that affect living organisms"

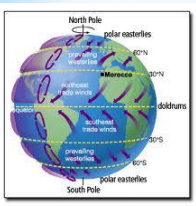
*Light

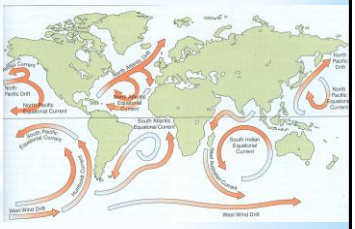






*Air and Water Currents

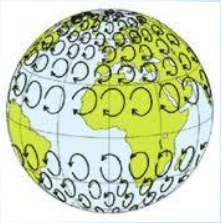


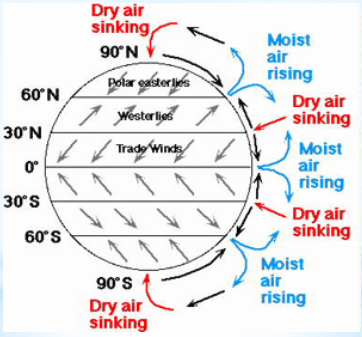


*Coriolis effect

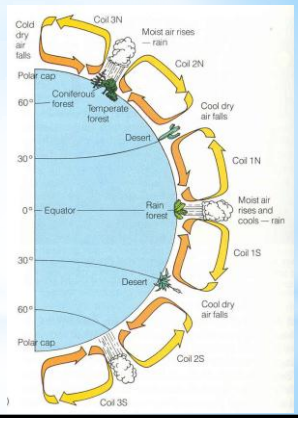
*The rotation of the Earth causes wind deflection and currents

*http://www.youtube.com/watch?v=Wda7azMvabE





The rising and falling of cool or warm, dry or moist air creates distinct global climate zones.

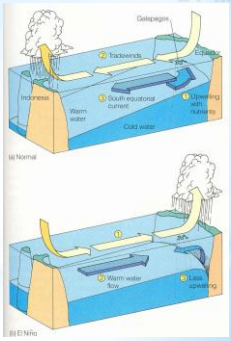


*El Nino

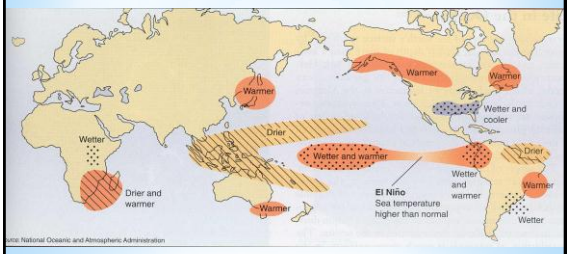
Typically, Pacific winds flow from the East to the West. Approximately ever 3-7 years they may slow and even reverse, causing an El Nino effect.

The El Nino Southern Oscillation suppresses nutrient-rich upwellings and creates more rain and storms.

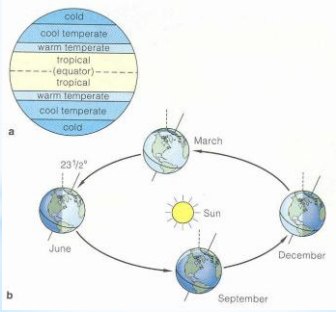
Cooler, wetter weather in the SE US, and dryer weather in Southern Africa and SE Asia.

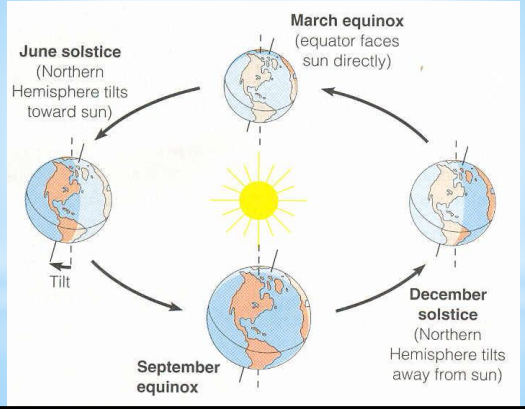


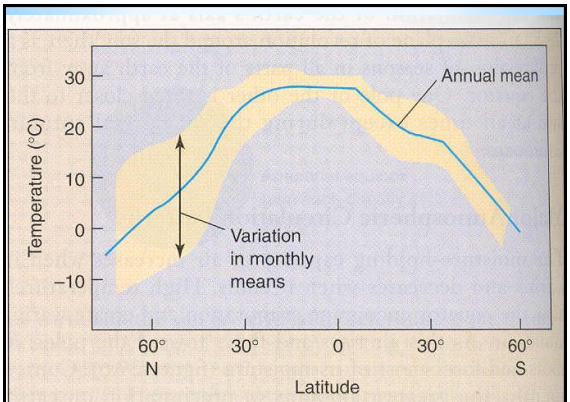
El Nino Temperature and Precipitation Effects Across the Globe



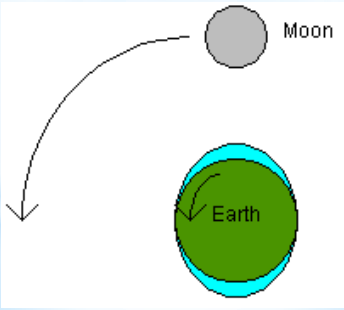
*Temperature



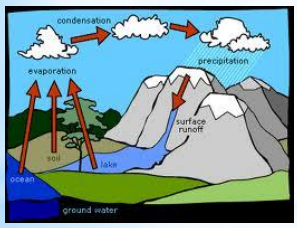




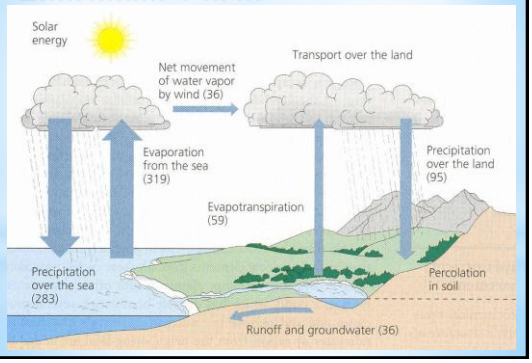
*Pressure and Gravity



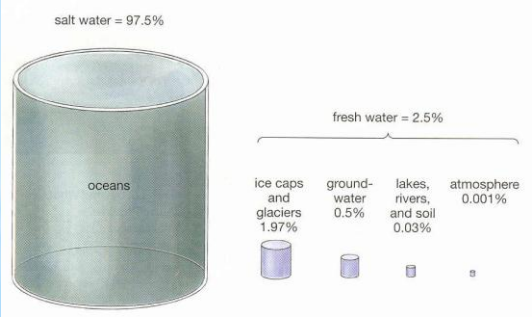
*Water

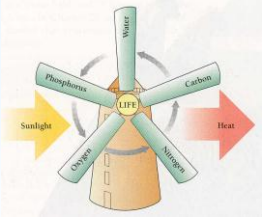


*Hydrologic Cycle



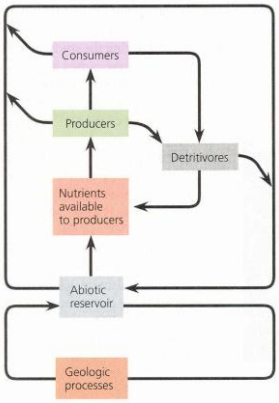
*Water of the World



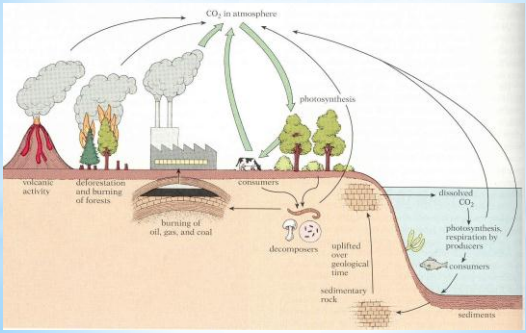


*Biogeochemical Cycles

*How chemicals cycle around the biosphere:



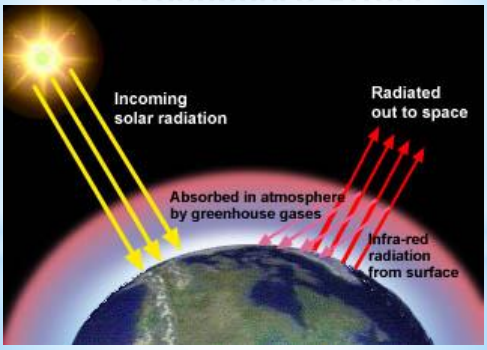
*Carbon Cycle



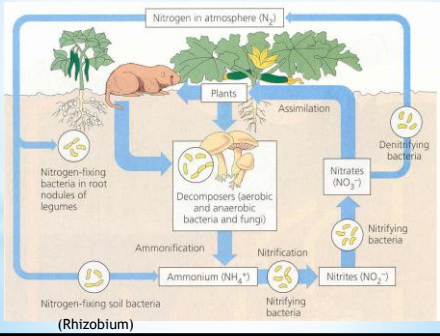
About the Carbon Cycle:

- *Only 0.04% in atmosphere, but this is critical to living organisms -- plants fix 635 billion tons of Carbon a year
- *Ocean has huge amounts of carbon reservoired in carbonate and bicarbonate ions (shells, coral reefs)
- *Fossil fuels are by far the greatest reservoir = 25 million billion tons C
- *Human activities have increased CO2 levels 30% in 250 years, exacerbating The Greenhouse Effect

*Greenhouse Effect



*Nitrogen Cycle

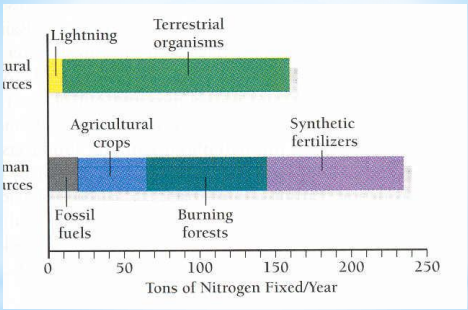


(Rhizobium)

About the Nitrogen Cycle:

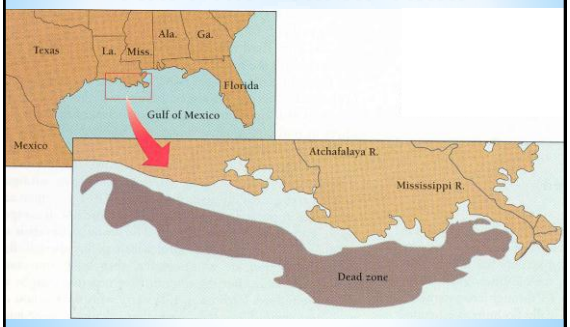
- *78% atmosphere is N_2… a powerful triple bond holds the atoms together
- *Only VERY high heat (like lightning or volcanic activity) OR the nitrogenase enzyme can break this bond
- *N-fixing is very energy expensive! Only carried out by bacteria (*Rhizobium*, cyanobacteria)
- *Once NH^{4+} is made, it is converted to NO_2 or NO_3
- *Humans have altered this cycle:

  By doubling the amount of fixed N entering cycle, we change the soil, make Greenhouse gases and acid rain, and create "Dead Zones"

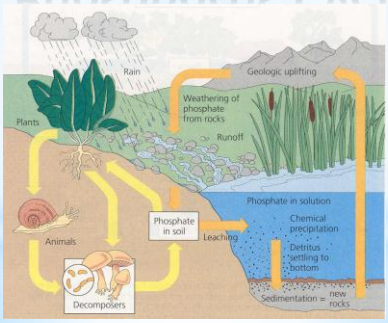


*adding N to the cycle

*The Gulf "Dead Zone"



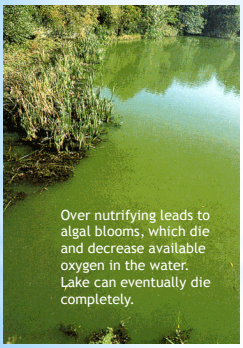
*Phosphorus Cycle

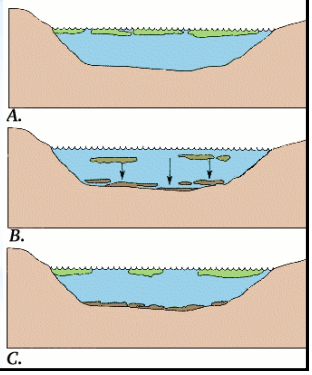


About the Phosphorus cycle:

- *Non-gaeseous cycle, so Phosphorus cycles more slowly
- *P atom essential to all known life (DNA, ATP)
- *Often trapped in rock, sometimes leaches or becomes unavailable in soil: least available nutrient in the biosphere?
  - = limiting nutrient!
- *Human activity adds extra P causing eutrophication

*Eutrophication





*Important lessons from the biogeochemical cycles

1. Abiotic environment is principal reservoir for elements
2. Introduction of elements almost always requires primary producers
3. Microorganisms play a crucial role