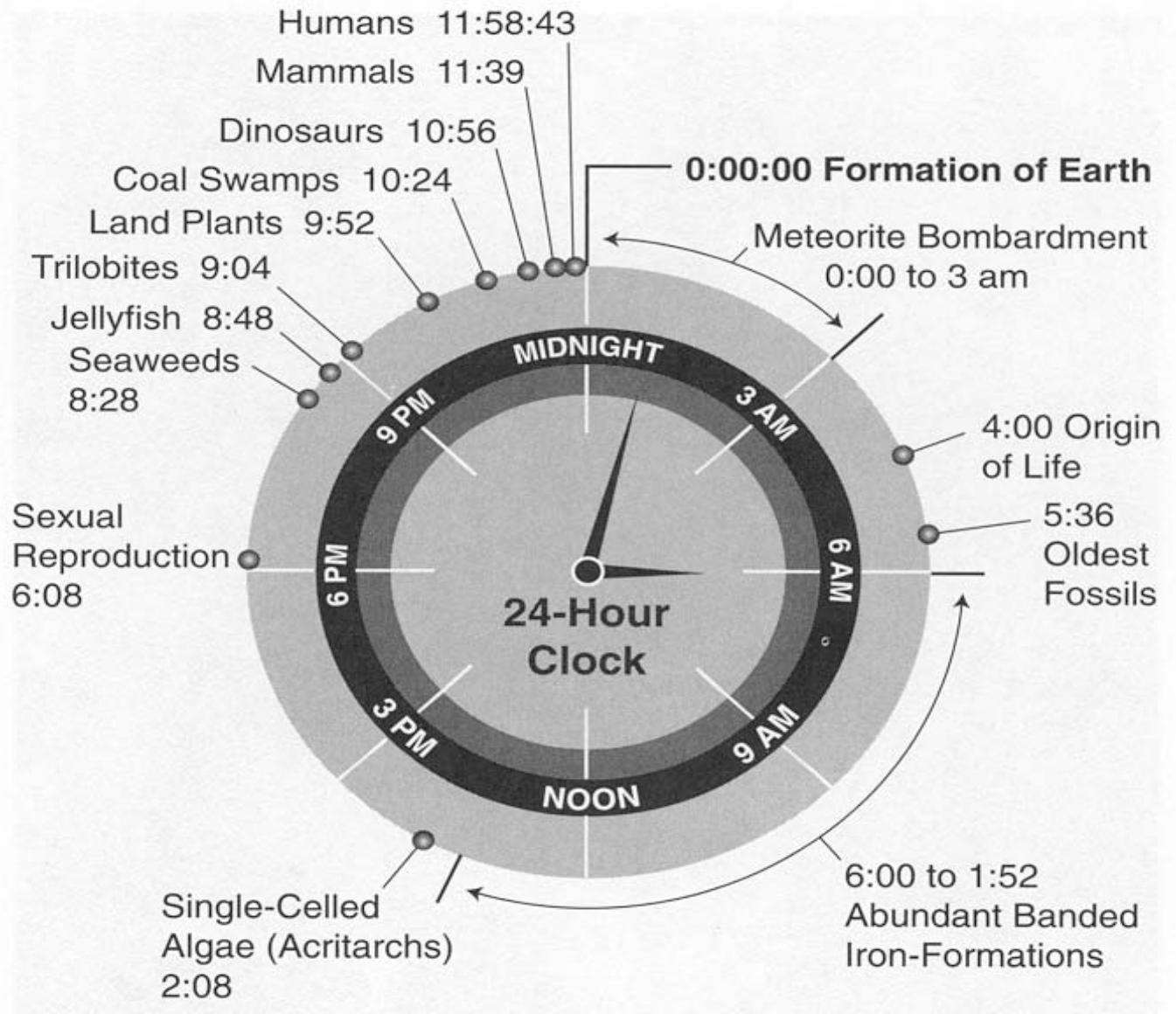


AP Environmental Science

A decorative graphic consisting of a thick yellow horizontal bar that spans the width of the slide. Below this bar, on the right side, are several thin white horizontal lines of varying lengths, creating a stepped or layered effect.

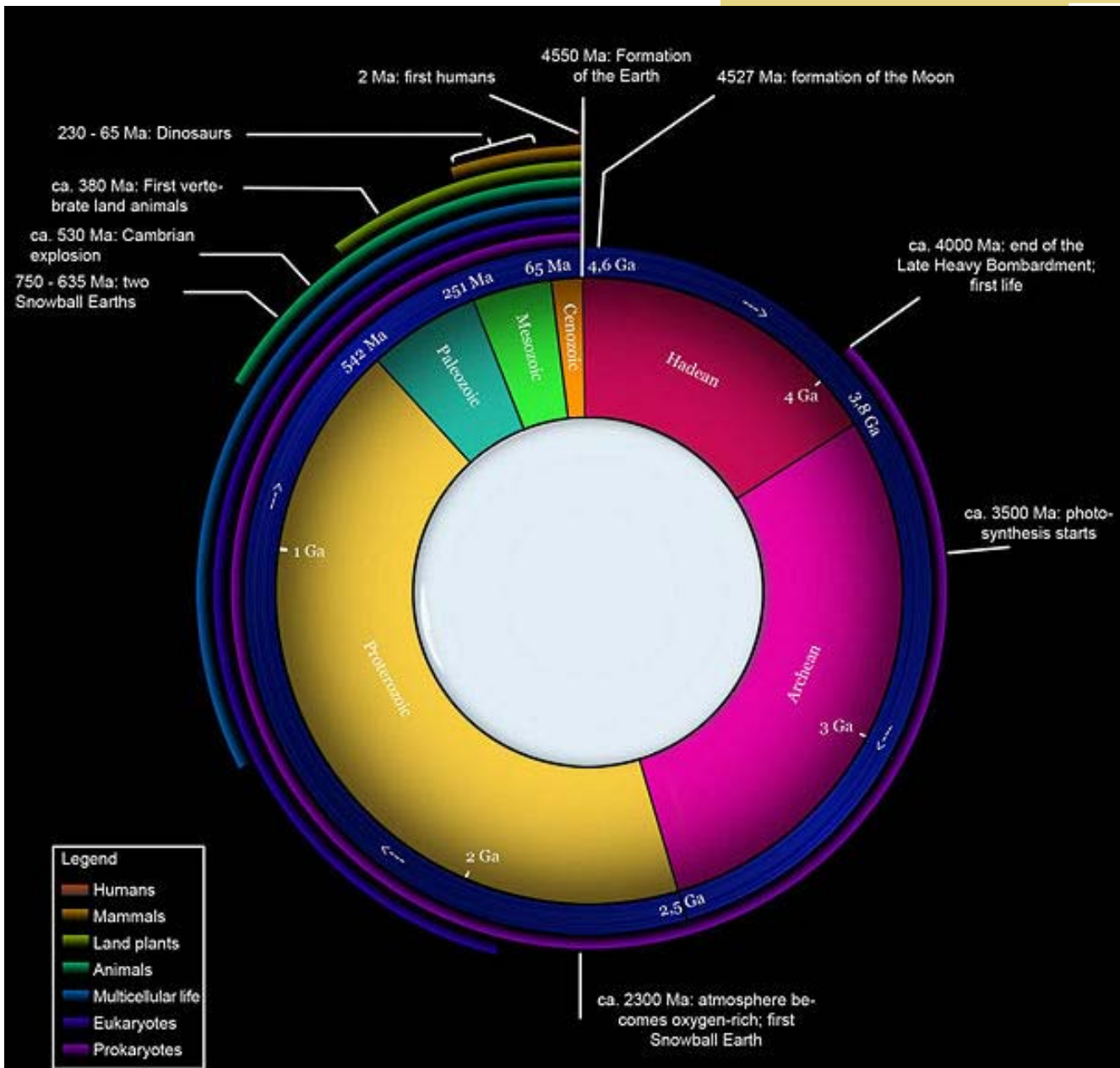
Earth Systems: Part 2

Geologic Time



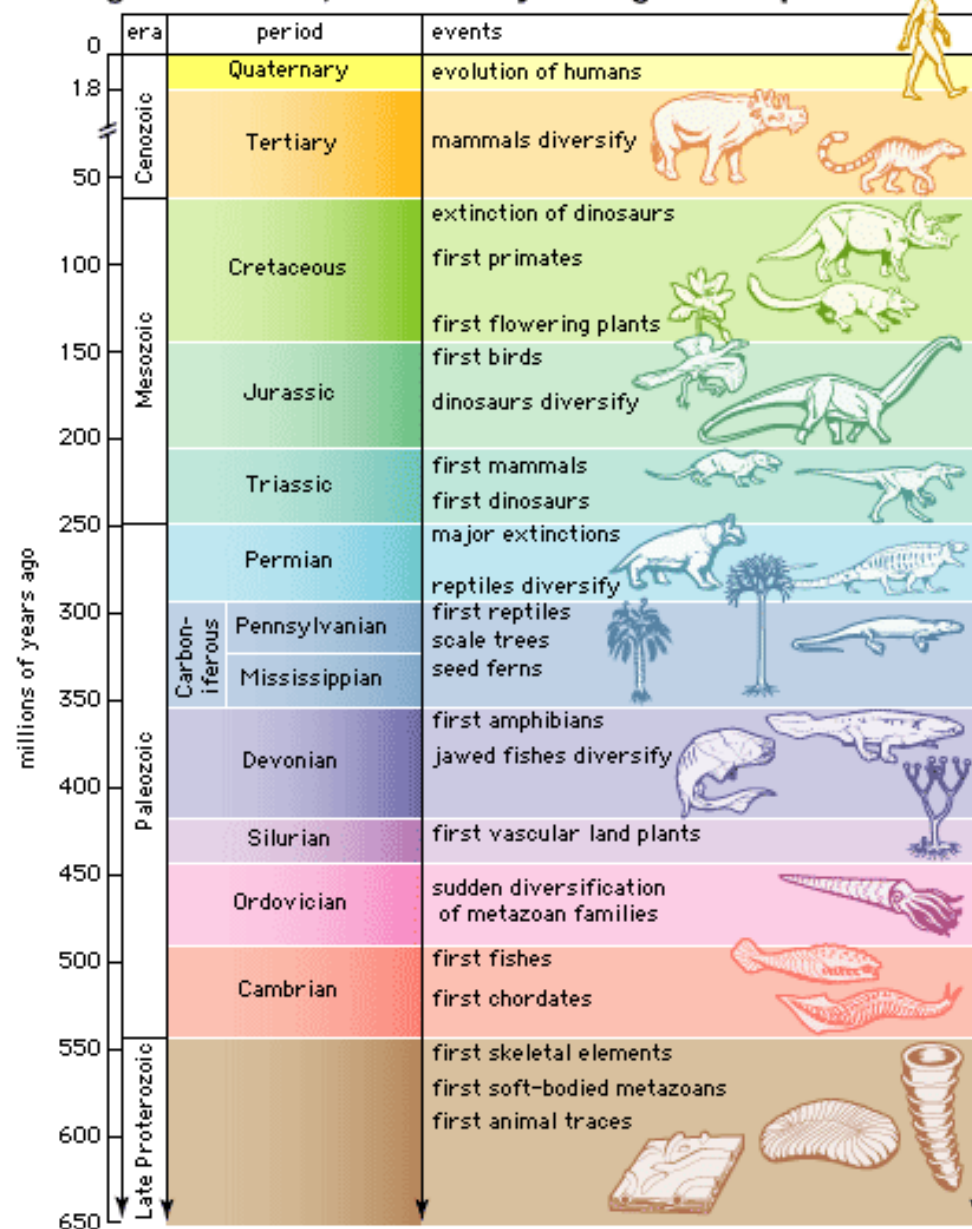
Time after time

- The geologic time scale is broken up into several pieces
 - Eons (4 total, ½ billion years or more)
 - Era (12 total, several hundred million years)
 - Periods (defines periods of life)
 - Epochs(tens of million years)
 - Age (millions of years)



EON	ERA	PERIOD	MILLIONS OF YEARS AGO
Phanerozoic	Cenozoic	Quaternary	1.6
		Tertiary	66
	Mesozoic	Cretaceous	138
		Jurassic	205
		Triassic	240
	Paleozoic	Permian	290
		Pennsylvanian	330
		Mississippian	360
		Devonian	410
		Silurian	435
		Ordovician	500
		Cambrian	570
	Proterozoic	Late Proterozoic Middle Proterozoic Early Proterozoic	
Archean	Late Archean Middle Archean Early Archean		3800?
Pre-Archean			

Geologic time scale, 650 million years ago to the present



Time after time..

- Hadean Eon 4.6-4.0 BYA
 - Formation of the Earth's crust and bombardment by comets and asteroids
- Archean Eon 4.0-2.5 BYA
 - First life appears, plate tectonics established, oxygen poor atmosphere
- Proterozoic Eon 2.5 BYA – 542MYA
 - First multicellular animals toward the end, 4 major mountain building episodes (orogeny) [Grenville & Pan-African] and the oldest known and most severe glaciation event

- Phanerozoic Eon 542 MYA-present
- Paleozoic Era 542-252MYA
 - **Cambrian Period**- Began with the Cambrian explosion, first skeletonized animals
 - **Ordovician Period**- ended with a mass extinction
 - **Silurian Period**-estuarine, freshwater and terrestrial ecosystems developm, major terrestrial life
 - **Devonian Period**- age of fishes, first land vertebrates, diversification of the vascular plants

- **Mississippian Period**-first terrestrial tetrapods
- **Pennsylvanian Period**- "coal age"-major plant fossils that make up the major coal seams
- **Permian Period**- the end of this era is marked by the most extensive mass extinction in the past 600 million years → rise of dinosaurs and modern critters, lots of insects, major dominance of coniferous plants

- Mesozoic Era 252-65.5 MYA
 - **Triassic Period** –recovery from previous mass extinction, rise of the dinosaurs, early mammals, first coral reefs
 - **Jurassic Period** – “Age of the Dinosaurs”, first birds(aves), first parasites
 - **Cretaceous Period**- extinction of the dinosaurs, birth of the angiosperms

- Cenozoic Era 65.5MYA – present
- Paleogene Period
 - **Paleocene Epoch** – “Age of Mammals” begins, seeded vascular plants dominant
 - **Eocene Epoch** –maximum extent of warm and tropical vegetation, evolution of marine mammals
 - **Oligocene Epoch**- appearance of most of the still living mammal families

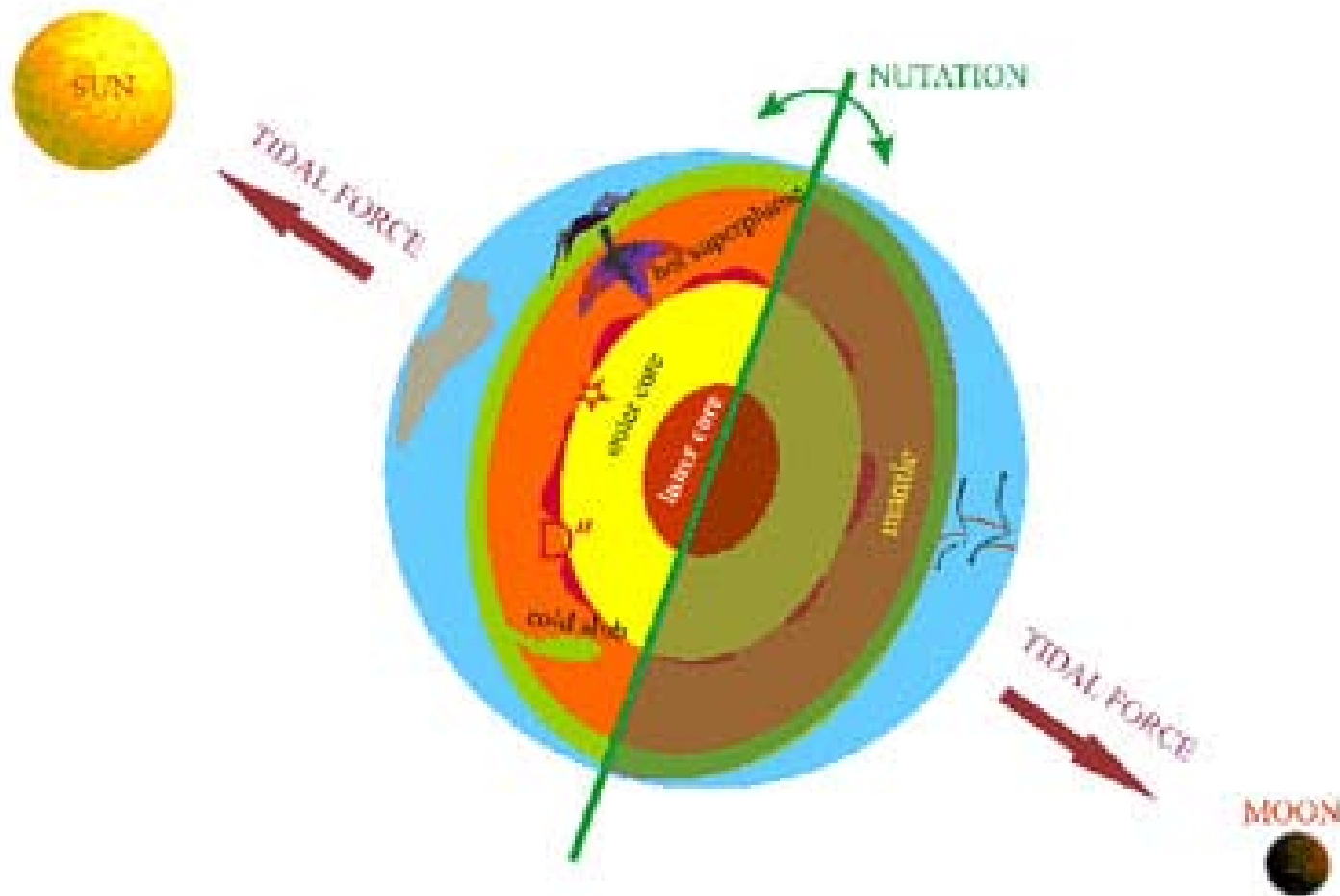
- Neogene Period

- **Miocene Epoch** – most of the extant marine invertebrates exist, major ocean circulations form, seasonal climates dominate the north hemisphere
- **Pleistocene Epoch**- human geographic expansion and cultural development, first major human-influenced extinctions
- **Holocene Epoch**- present day- climate warming following the last ice age, continents drying out, polar regions contract, plant communities change with climate

Earth's Anatomy

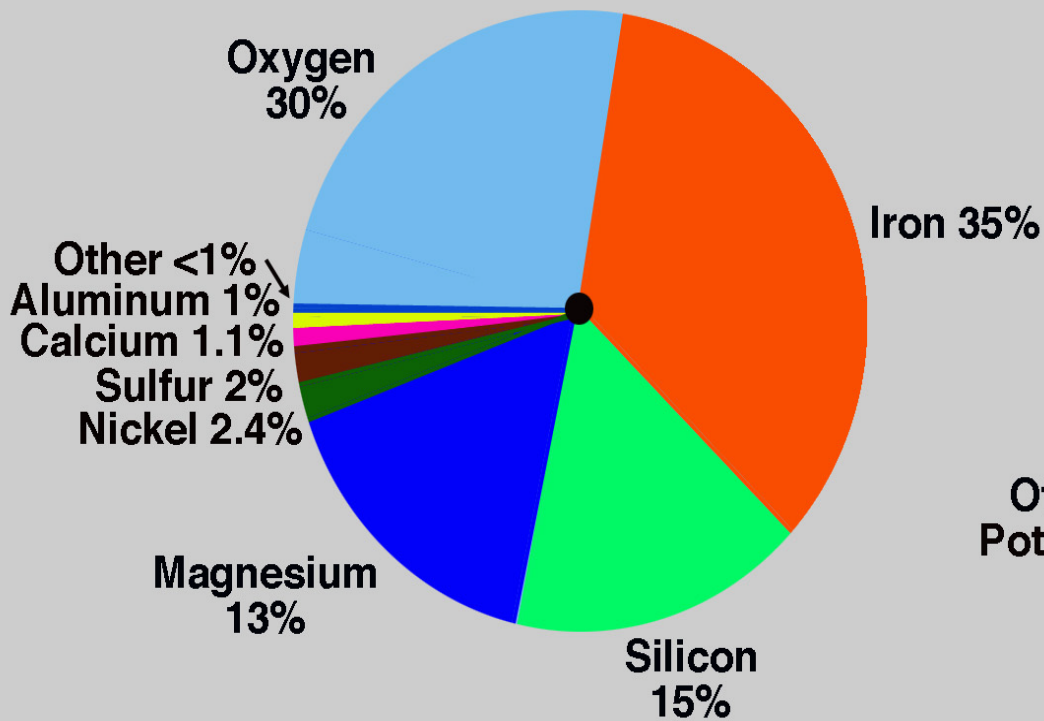
Welcome to Earth, third rock from the sun..

- Earth is the fifth largest planet and the largest terrestrial planet
- The shape of the Earth is an oblate spheroid-"squished ball"
- The diameter across the equator is 43 km larger than the pole to pole diameter
 - Diameter is roughly 12,742km
- Mass = 5.98×10^{24} kg

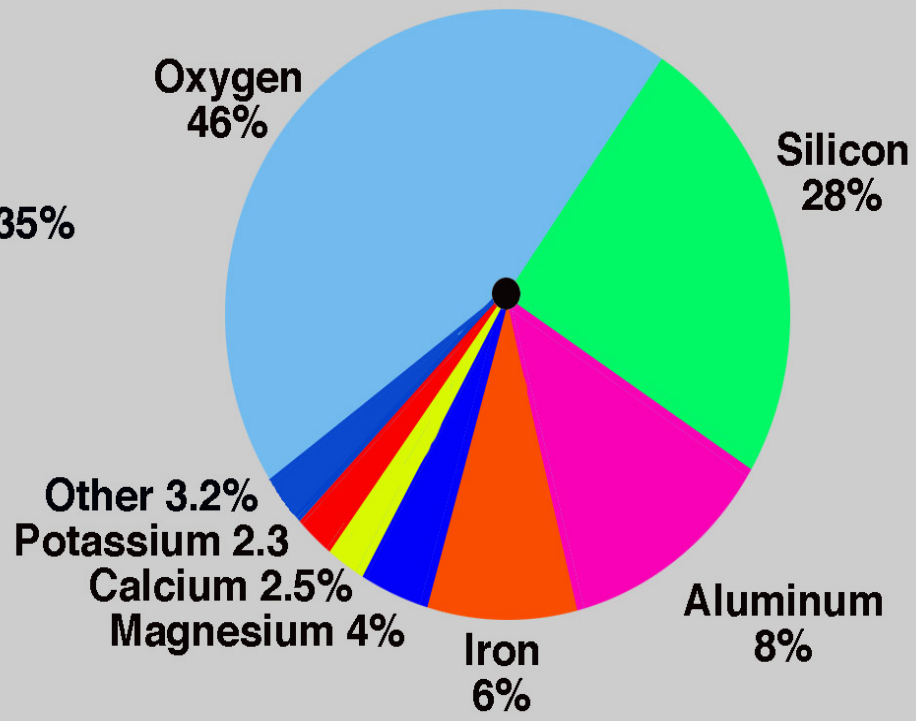


Tidal forces that cause the planet to be an oblate spheroid

- Chemical composition-
 - 32.1 % Iron
 - 30.1 % Oxygen
 - 15.1 % Silicon
 - 13.9 % Magnesium
 - 2.9 % Sulfur
 - 1.8 % Nickel
 - 1.5% Calcium
 - 1.4% Aluminum
 - 1.2% Other trace elements



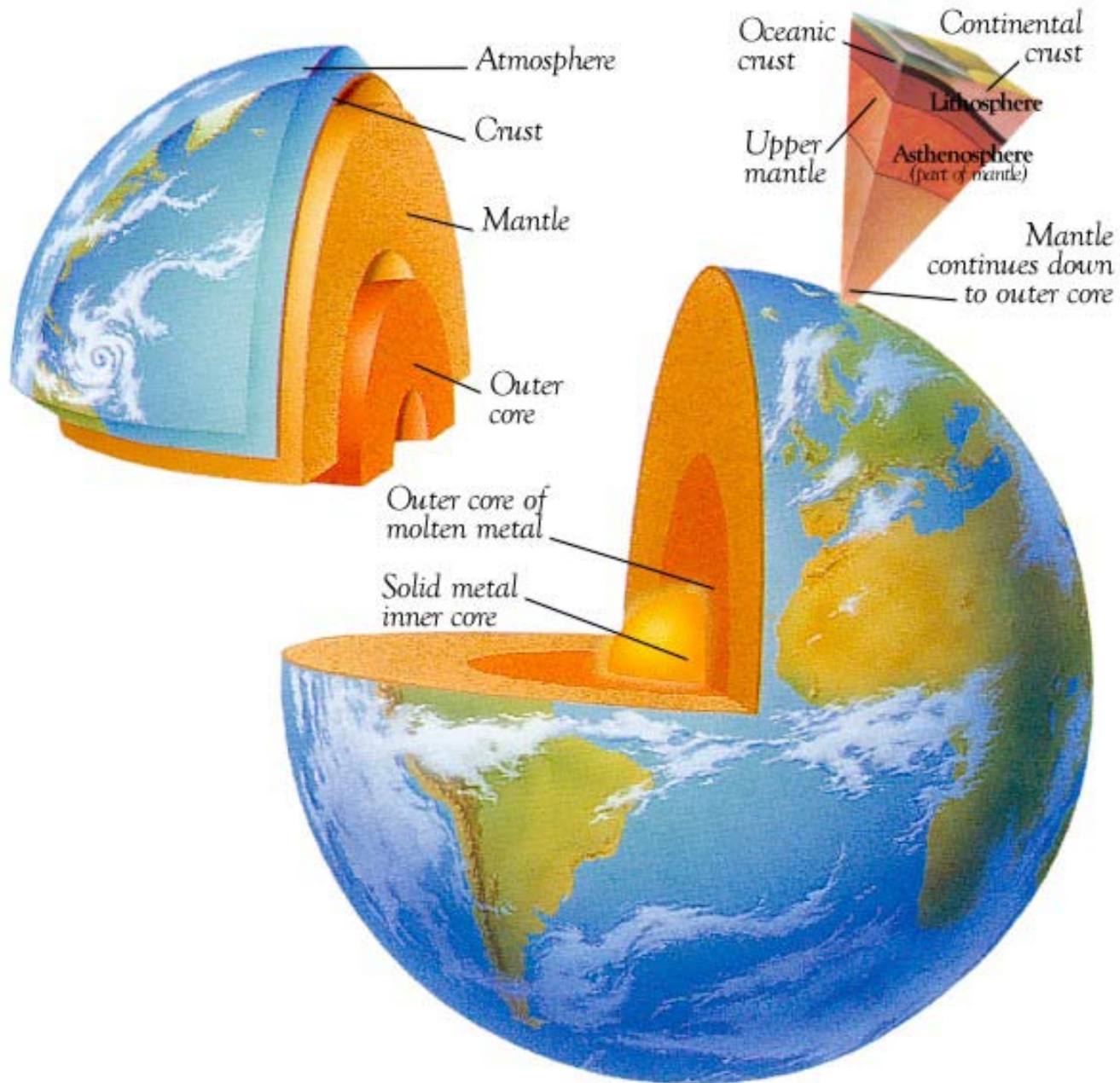
Whole Earth

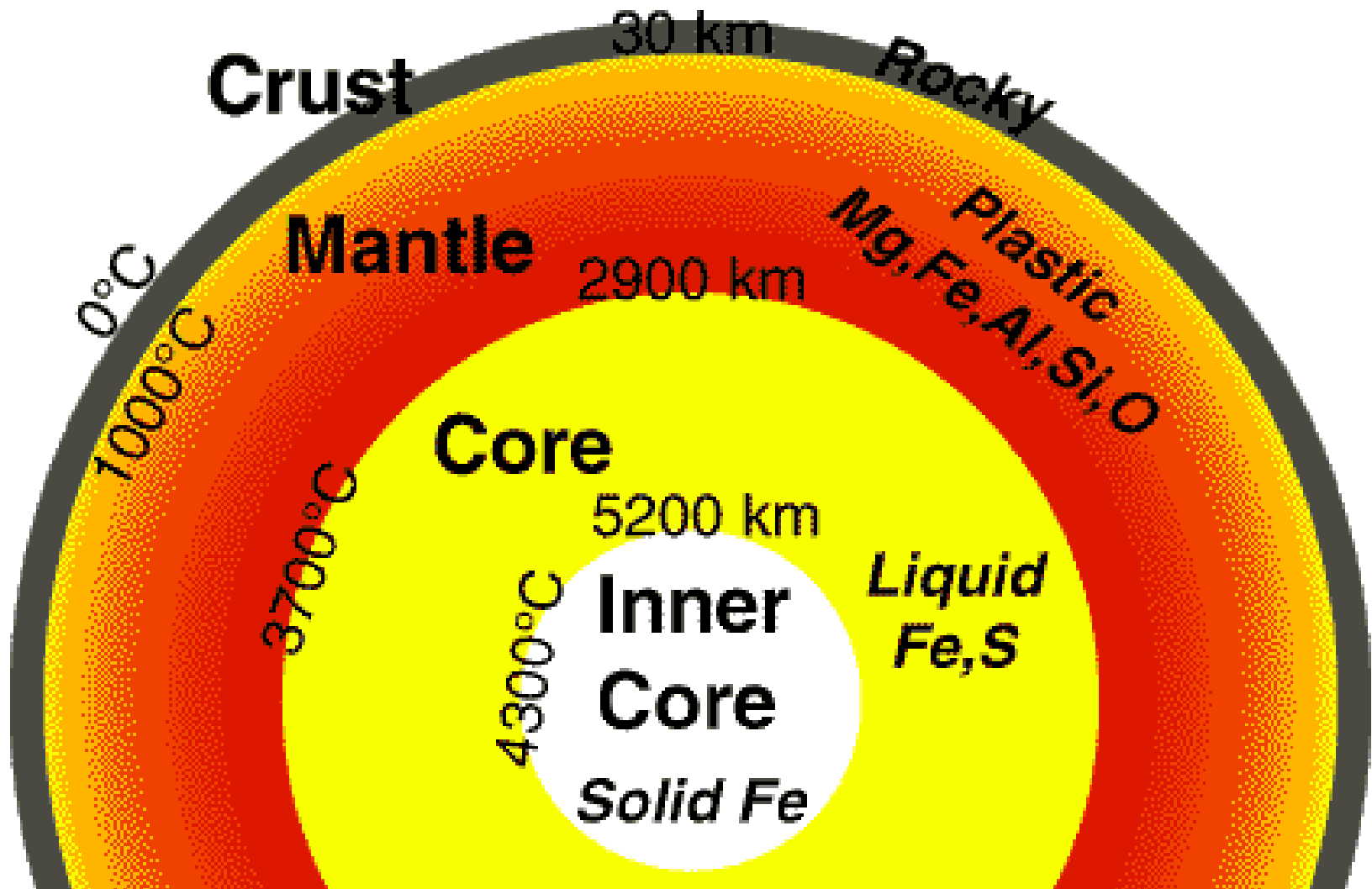


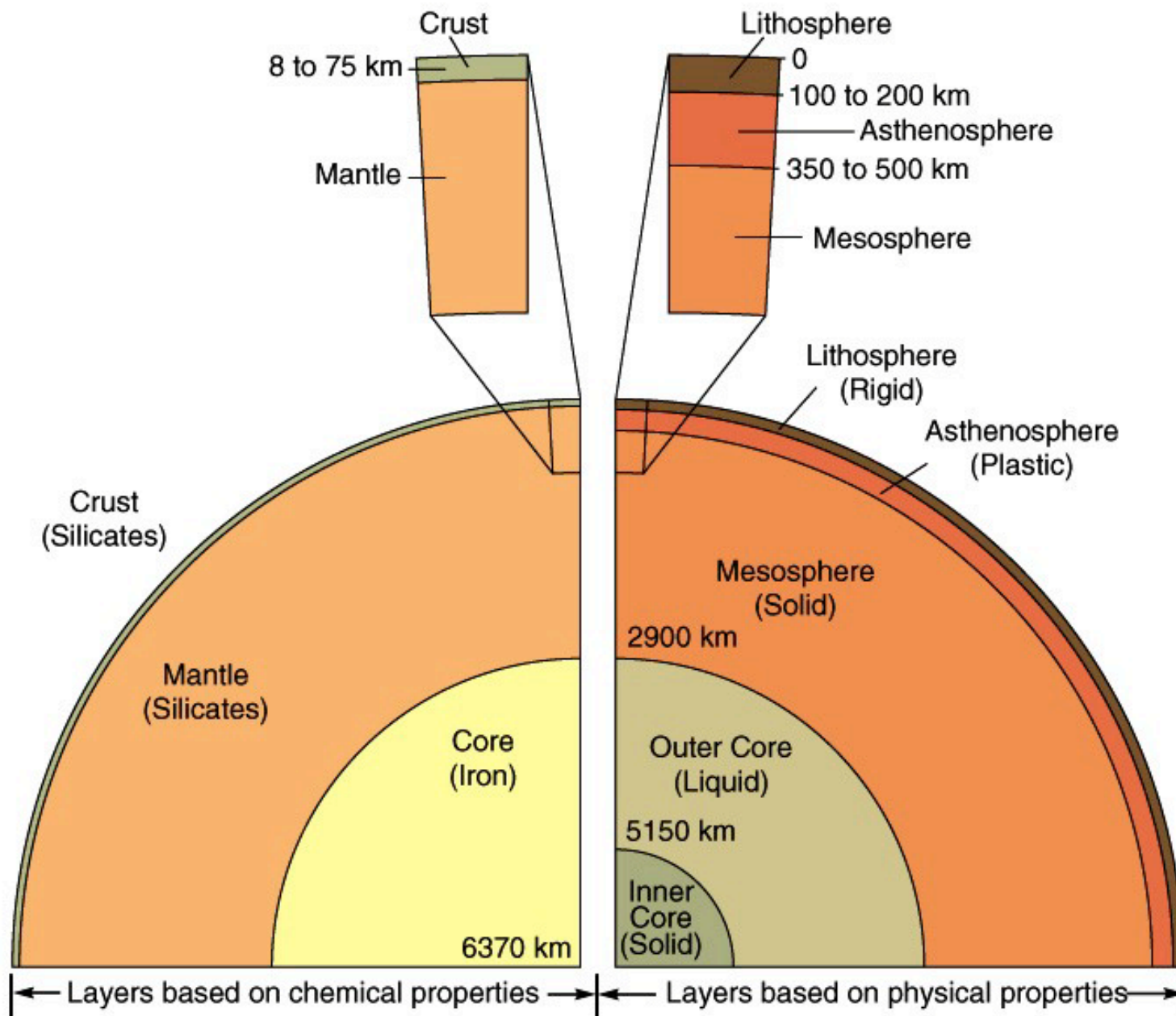
Crust

- The Earth has several layers
 - The Crust- the hard outer shell
 - Thin and floating on molten mantle (Lithosphere)
 - Two main types Oceanic (6-11km) and Continental (30 km)
 - Broken up into several large plates called tectonic plates
 - The Mantle
 - Begins between 10-30km below the crust
 - 2,900km thick, 80% of the Earth's Volume
 - Divided into the inner and outer mantle

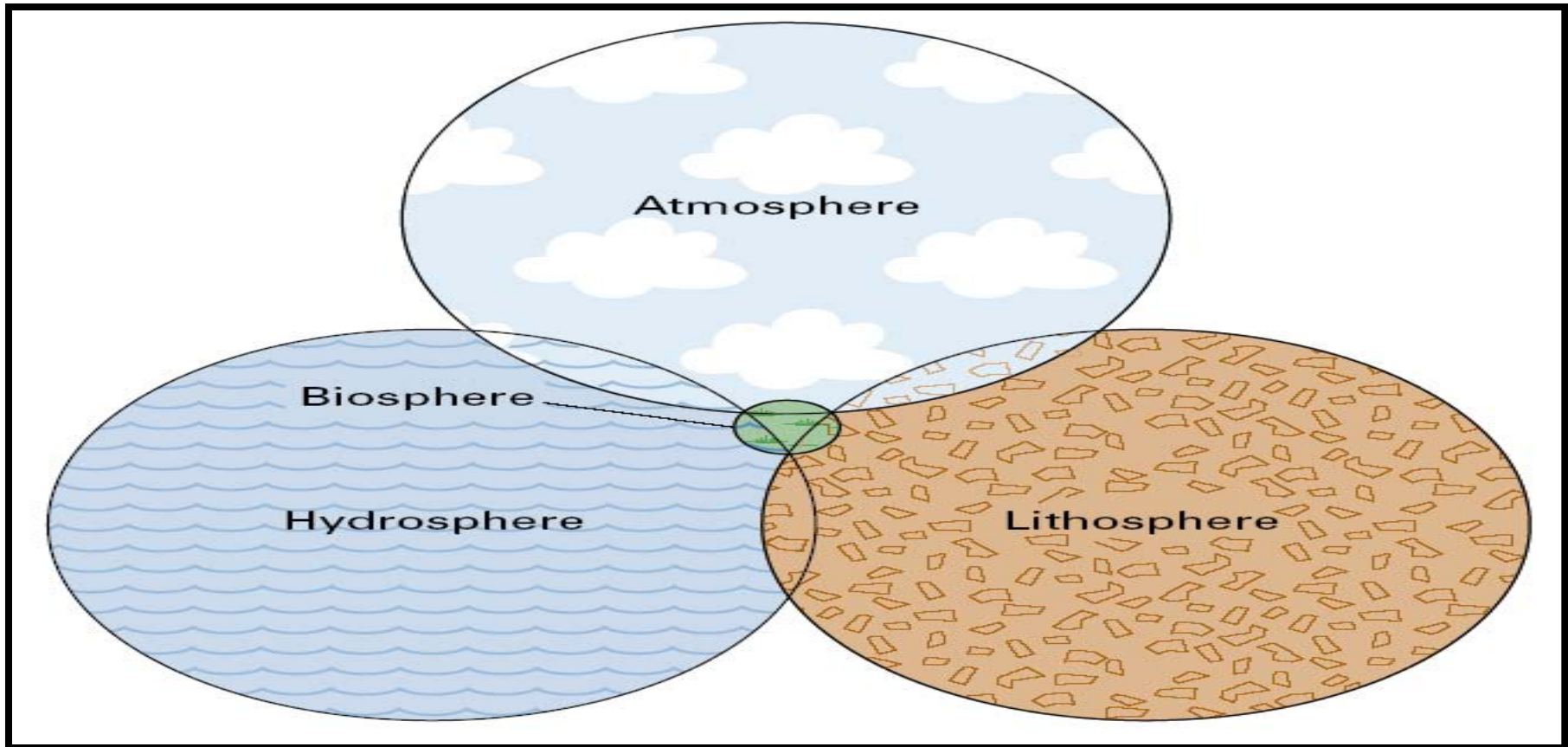
- Outer mantle (10-300km) 1,400 - 3,000°C
 - Molten rock, part closest to crust is thicker and slower moving, plastic-like consistency (Asthenosphere)
- Inner mantle (300-2,890km), 3000°C
- **The Core**
 - Found 2,900km below the surface
 - Dense ball of iron and nickel
 - Two layers
 - Outer core-molten metal, 2,200km thick
 - Rotates around the inner core and creates Earth's Magnetic field
 - Inner core- solid due to pressures, even though its 3,700°C , 1,250km thick







- The Earth is also divided up into four spheres
 - Biosphere, Lithosphere, Hydrosphere and the Atmosphere

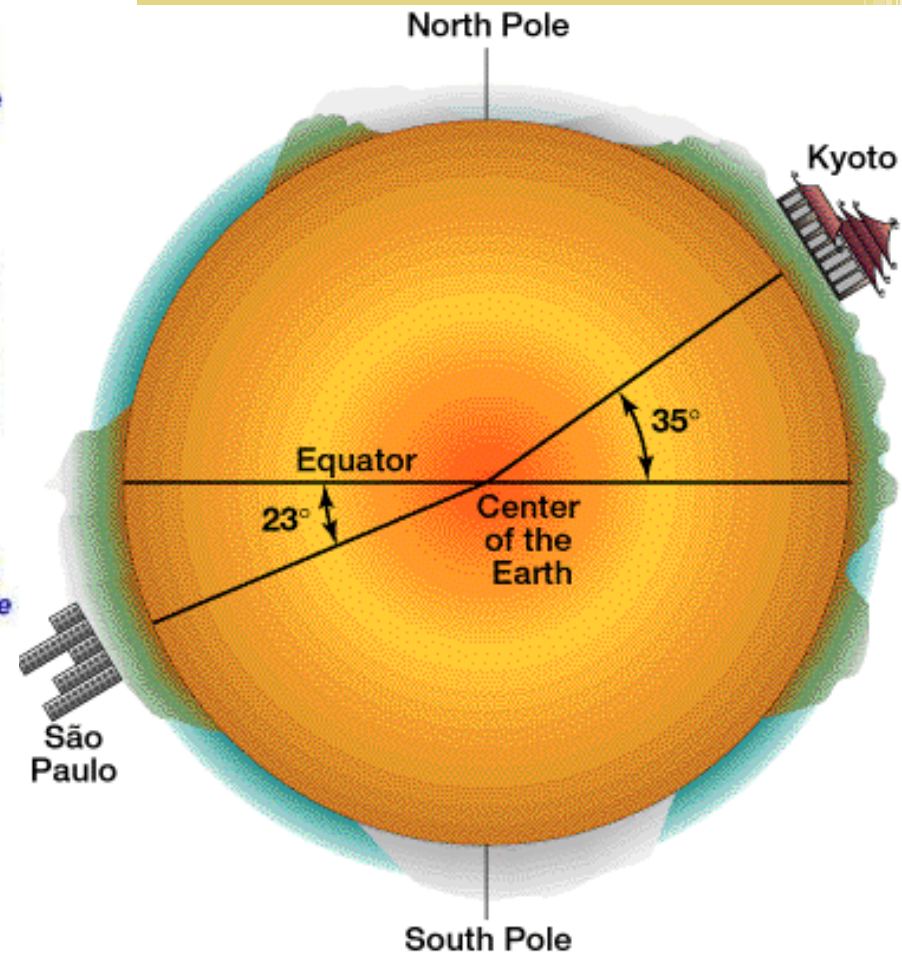
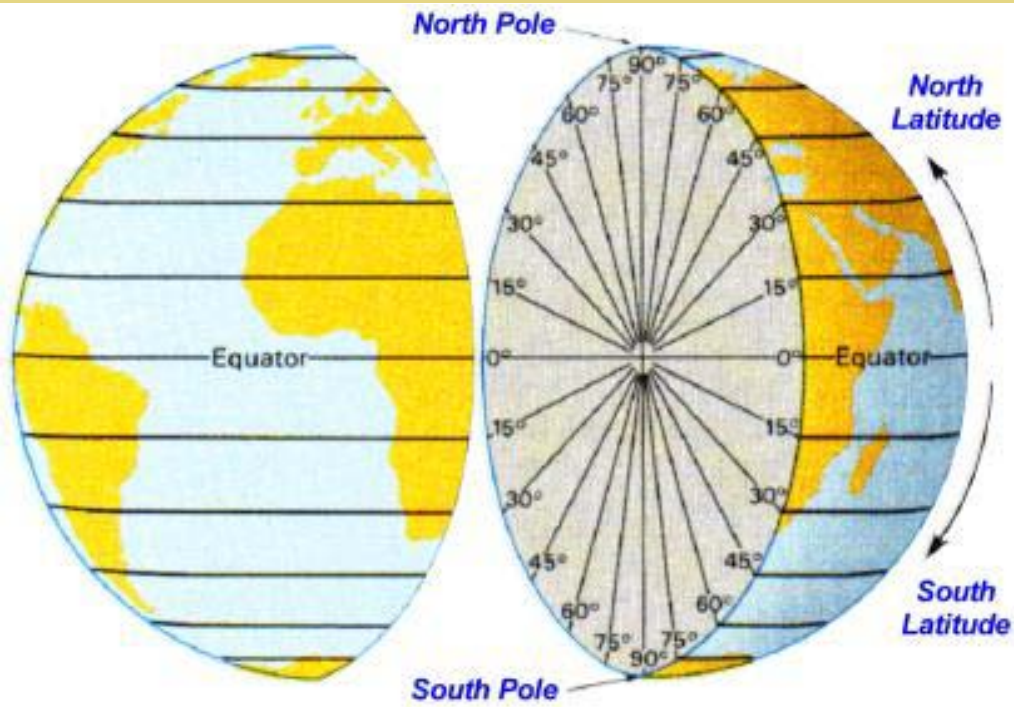


- **Lithosphere**- "rocky sphere" the outermost portion that provides a platform for life, contains the crust and the uppermost portion of the mantle
 - The asthenosphere is located just underneath- moves the tectonic plates
- **Hydrosphere**- "water sphere" the liquid realm of the Earth, principally the mass of water in the worlds oceans
 - 70% of the surface is covered with water
 - 366.3 trillion gallons

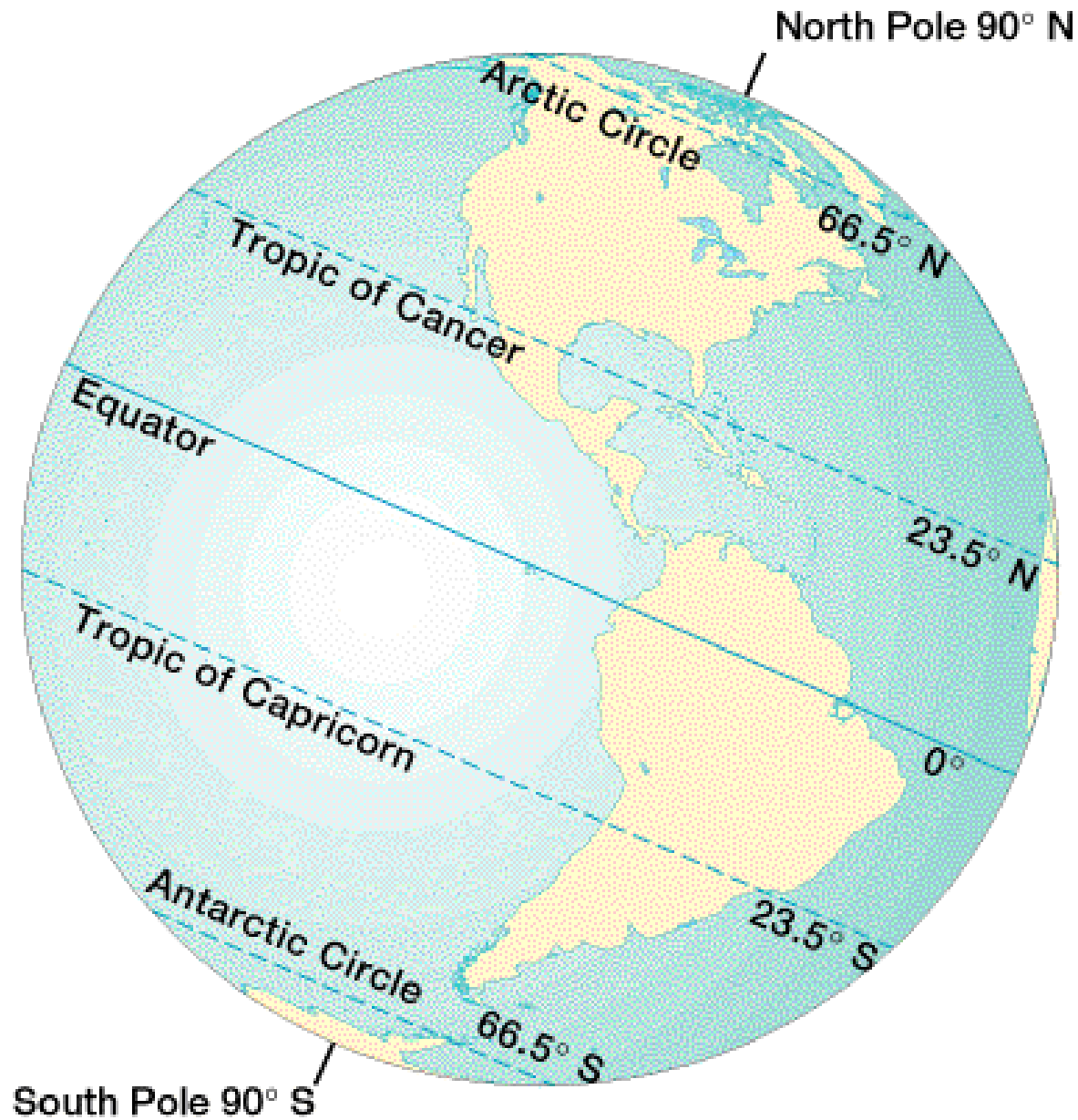
- **Biosphere**- "Life sphere" Most of the biosphere is contained within a thin layer of the planet called the life layer
 - Overlaps with all of the other spheres
 - 2200-4000 Gigatons of Biomass (2.2-4 Trillion tons)
- **Atmosphere**- "Air sphere" The gaseous layer that surrounds the Earth. It supplies some of the basic features that support and sustain life on this planet
 - 4 Major layers, 99% is Nitrogen and Oxygen

Mapping our planet..

- The Equator divides the world into Northern and Southern Hemispheres
- **Latitude**-angular measurement of the distance north or south of the Equator
 - Range: 0-90° N or S
 - 1° is roughly 69 miles on the surface
- Parallels of Latitude - Imaginary lines that connect points of equal latitude, thus slicing the earth into equal “layers” like on a wedding cake

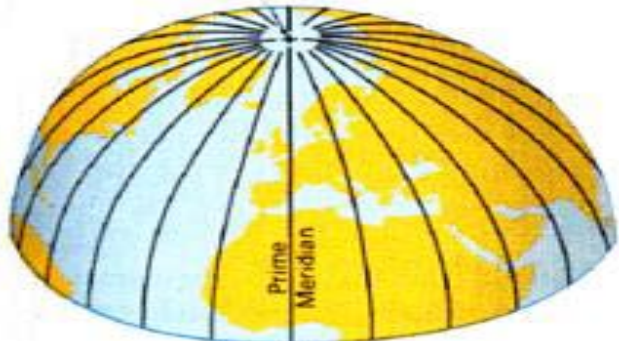


Important Parallels



- The Prime Meridian divides the world into eastern and western hemispheres
- ***Longitude*** the angular measurement of distance east or west of the *Prime Meridian* or Greenwich Meridian.
 - Range: 0-180° E or W

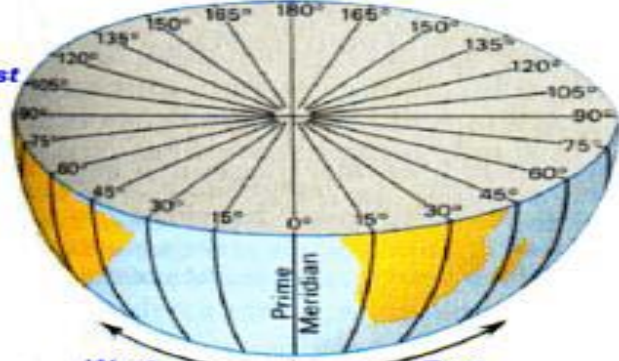
North Pole



Prime Meridian

West

East

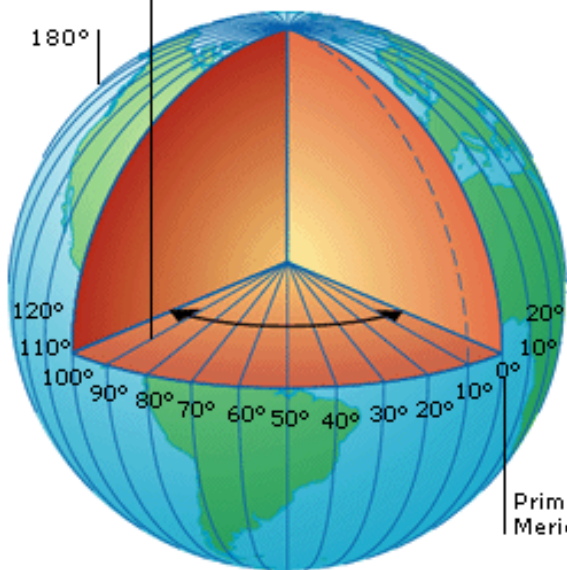


West Longitude

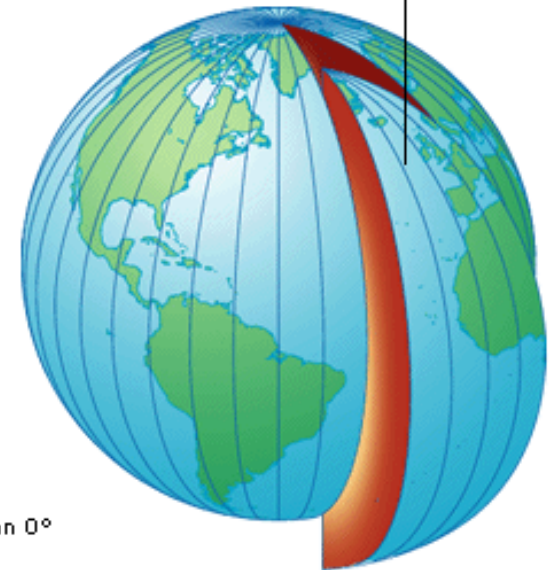
East Longitude

South Pole

Lines of longitude are measured from the center of the Earth



Lines of longitude divide the world up into segments

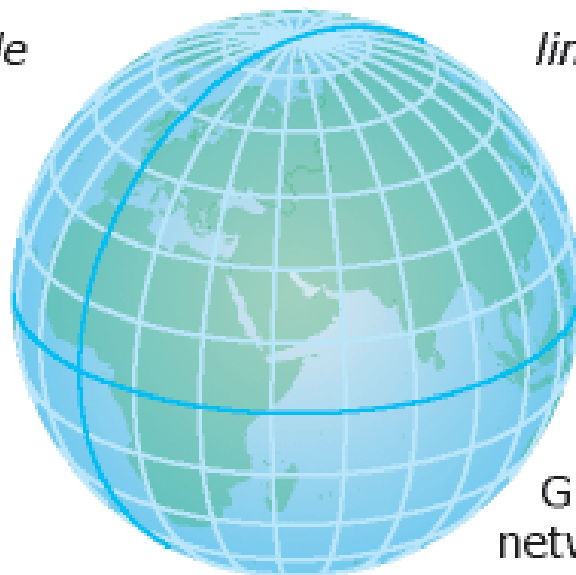




Parallels
lines of latitude



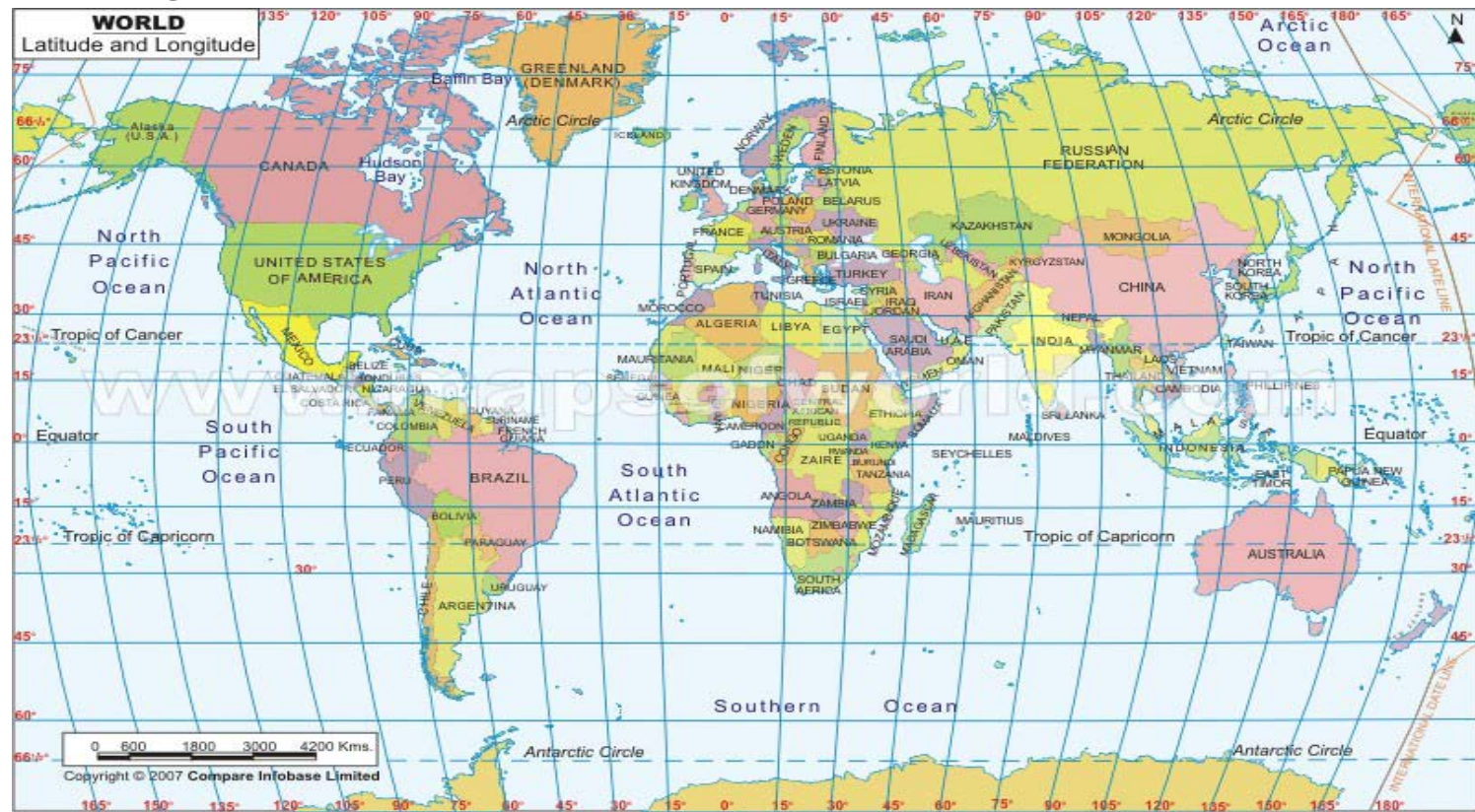
Meridians
lines of longitude



Graticular
network

Geographic Grid

- The combination of longitude and latitude that makes every point on this Earth easily identifiable and locatable



World Address of Major Cities

Berlin, Germany

Beijing, China

Paris, France

Moscow, Russia

London, England

Rio de Janeiro, Brazil

World Address of Major Cities

Berlin, Germany -52.9°N 12.5°E

Beijing, China – 39.95°N 116.5°E

Paris, France – 48.8°N 2.25°E

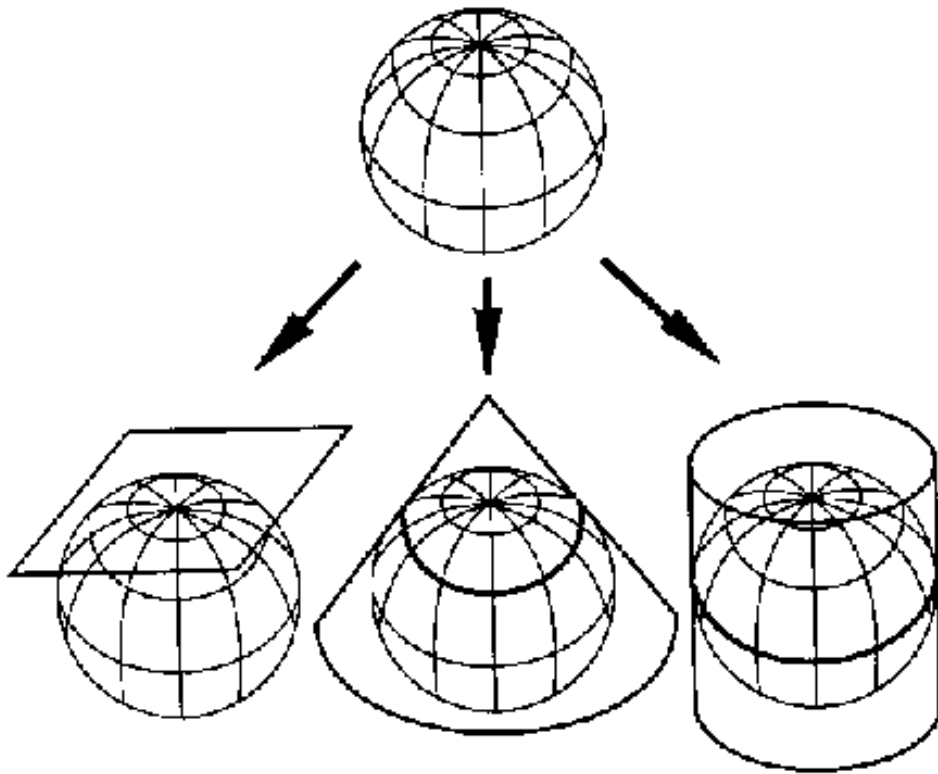
Moscow, Russia – 55.8°N 37.6°E

London, England – 51.5°N 0.1°W

Rio de Janeiro, Brazil - 22.95°S 43.2°W

Map Projections

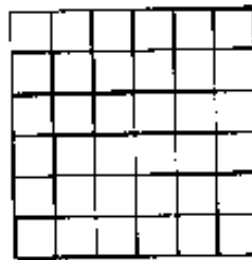
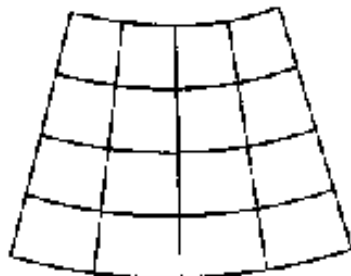
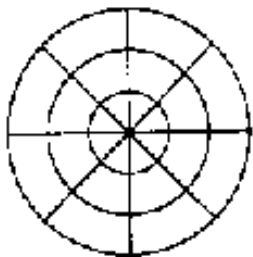
- Mapping the surface of the Earth is difficult because it is round and maps are typically flat
- 3 major types of map projections are used
 - Conic
 - Cylindrical/Mercator
 - Azimuthal

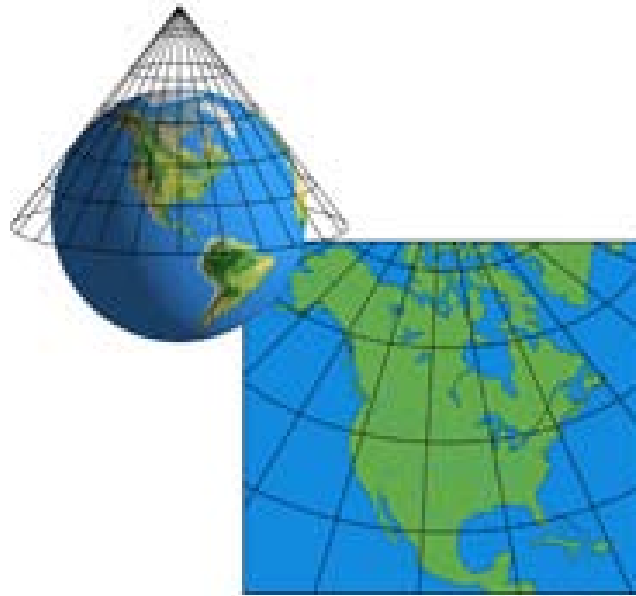


Flattenable Surface

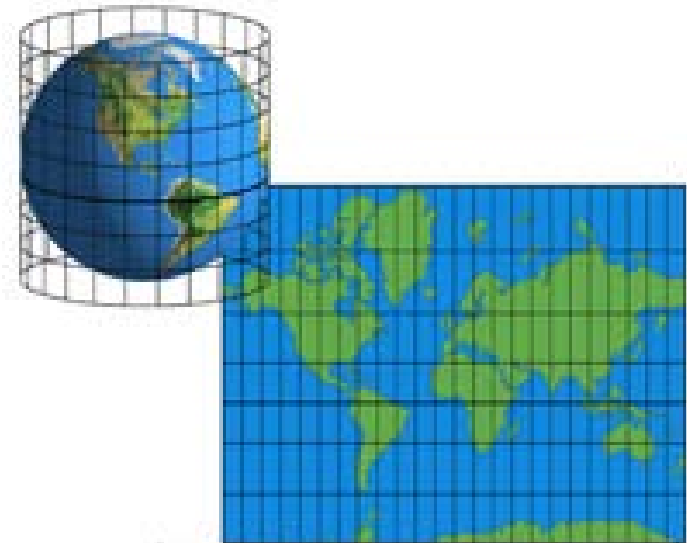
Conic Surface

Cylindrical Surface





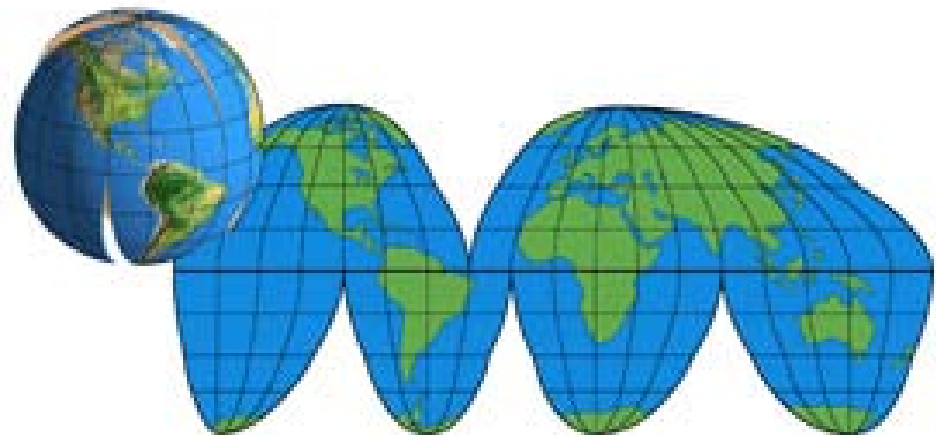
conic projection



cylindrical projection



plane projection



interrupted projection

www.visualdictionaryonline.com

- Conic Projections
 - Good for northern/ southern locations
distorts near the edges-equator
- Mercator Projections
 - Good for equatorial locations but distorts
near the poles
- Azimuthal /Planar
 - Limited scope or area covered, but
preserved the ideas of direction on the map