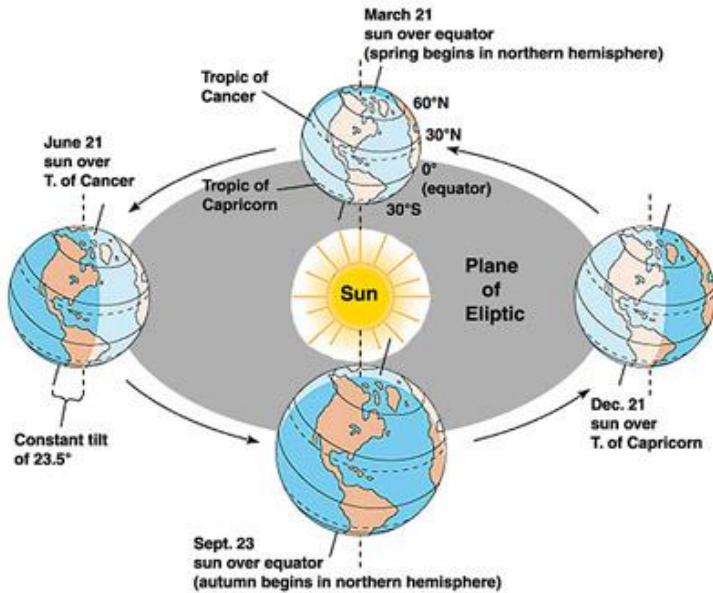
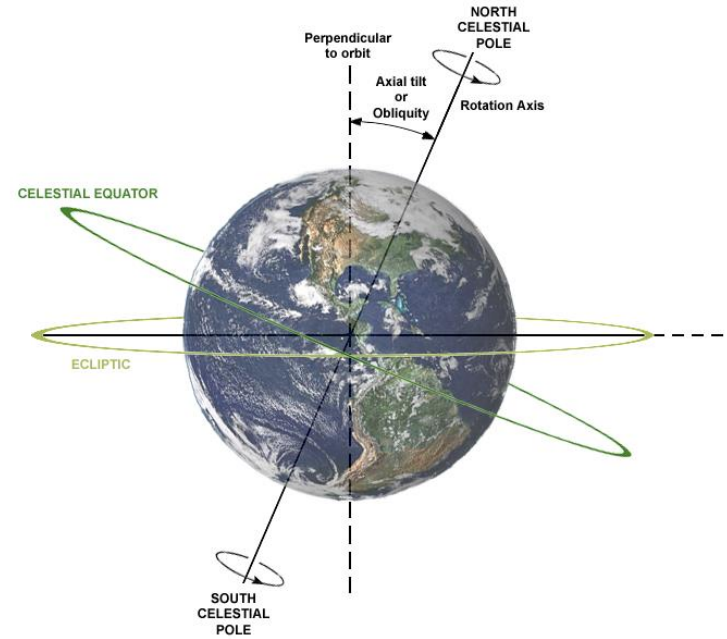




# Planet Earth

## Part 1



# Earth Facts

- Earth is a **terrestrial planet** (rocky body), third from the Sun.
- Earth has a *single natural satellite*, the **Moon**.
- Earth has **LIFE!**
- Of the four terrestrial planets in the Solar System:
  - Earth is the largest both in size and mass.
  - Earth has the highest density, the strongest magnetic field, and the fastest rotation.
  - Earth has the highest surface gravity equal to 9.798 m/s.

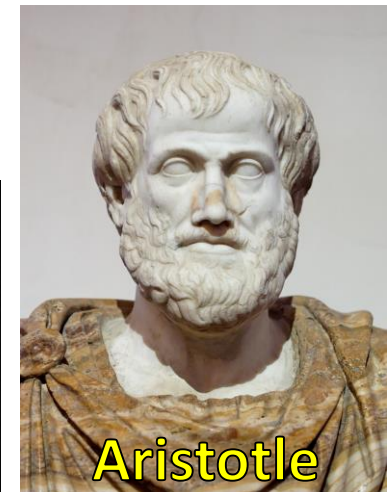
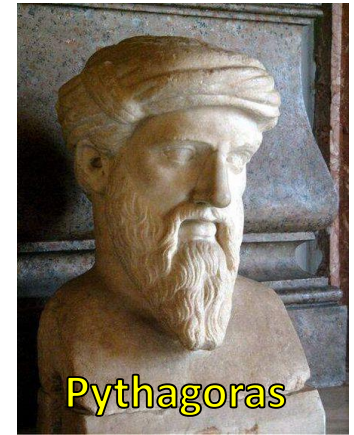


From the Earth's surface, the apparent sizes of the Sun and the Moon are approximately the same.

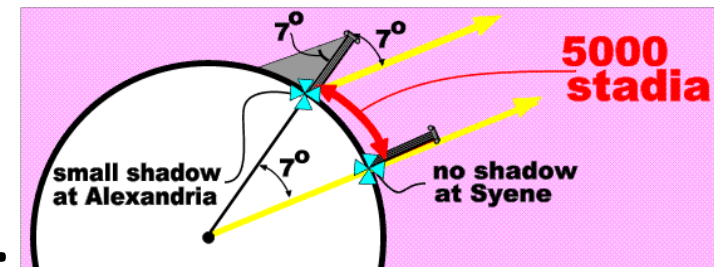
# Earth Shape and Size

Earth's shape is nearly round/spherical:

- First noted by **ancient Greeks** (Pythagoras, 6<sup>th</sup> century BC).
- **Aristotle** (4<sup>th</sup> century BC) provided physical and observational arguments supporting the idea of a spherical Earth:
  - Travelers going south see southern constellations rise higher above the horizon.
  - The shadow of Earth on the Moon during a lunar eclipse is round.



- Greek astronomer **Eratosthenes** estimated Earth's circumference around 240 BC to be 250000 *stades* (*the number is believed to be very accurate!*).





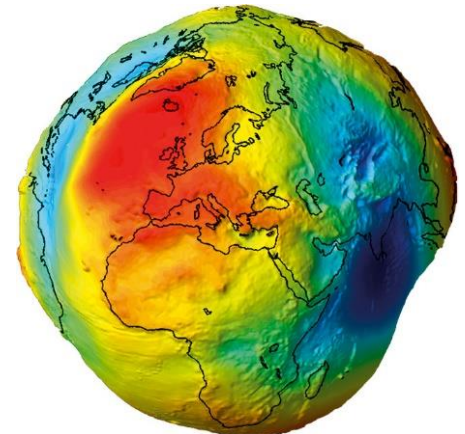
# Earth Shape and Size



- **Ferdinand Magellan (1480-1521):** 1<sup>st</sup> expedition around the world that **proved** that Earth is round (Spanish expedition to East Indies, 1519-1522; Magellan did not complete the entire voyage as he was killed during the Battle of Mactan in the Philippines; expedition was completed by Juan Sebastián Elcano).



- Modern measurements show Earth to be a **sphere flattened along the axis from pole to pole** such that there is a bulge around the equator (resulting from the planet's rotation).
- Mean radius is 6371.0 km; the diameter at the equator is 43 km larger than the pole-to-pole diameter.



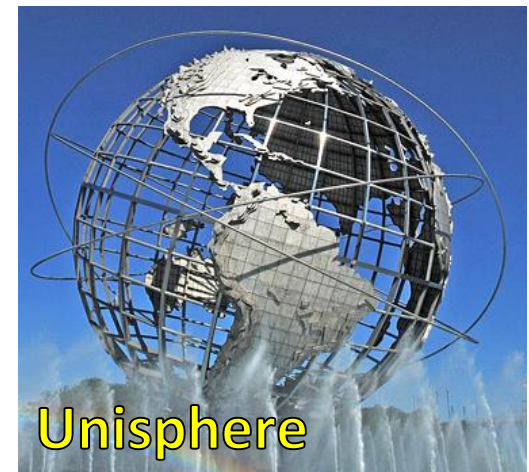
# The Globe

The Globe is a three-dimensional scale model of Earth (also called **geographical globe** or **terrestrial globe**).

- The earliest known example of the terrestrial globe was constructed **by Crates of Mallus** (who lived on the territory of modern-day Turkey) in the **mid-2<sup>nd</sup> century BC**.
- The oldest surviving terrestrial globe is the **Erdapfel** (“earth apple”), created in **1492** by Martin Behaim in Nuremberg, Germany. It was made of a laminated linen ball in two halves, reinforced with wood and overlaid with a painted map.
- The world’s largest geographical globe is the **Unisphere** in Queens, New York (120 feet in diameter, 12 story high!)



Erdapfel

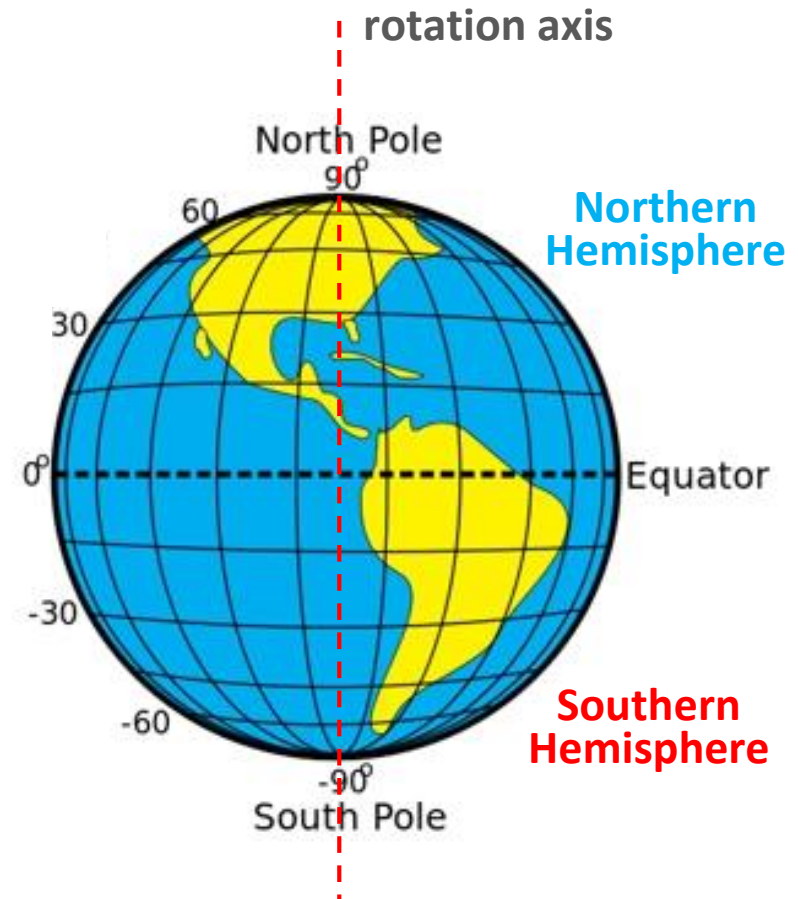


Unisphere

# Earth's Axis, Poles and Equator

Our planet Earth spins around on an imaginary line running through it. This line is called the Earth's axis. The two points where axis meets the surface are called the **Geographic North Pole** and the **Geographic South Pole**.

- The area around the North Pole is called the **Arctic**, while the area around the South Pole is called the **Antarctic**.
- The **Equator** is an imaginary line on the Earth's surface which is at equal distance from the North Pole and South Pole. It is about 40,075 km (24,901 mi) long; 78.7% is across water and 21.3% is over land.
- The Equator divides Earth into the **Northern Hemisphere** and **Southern Hemisphere**.



# North Pole vs South Pole

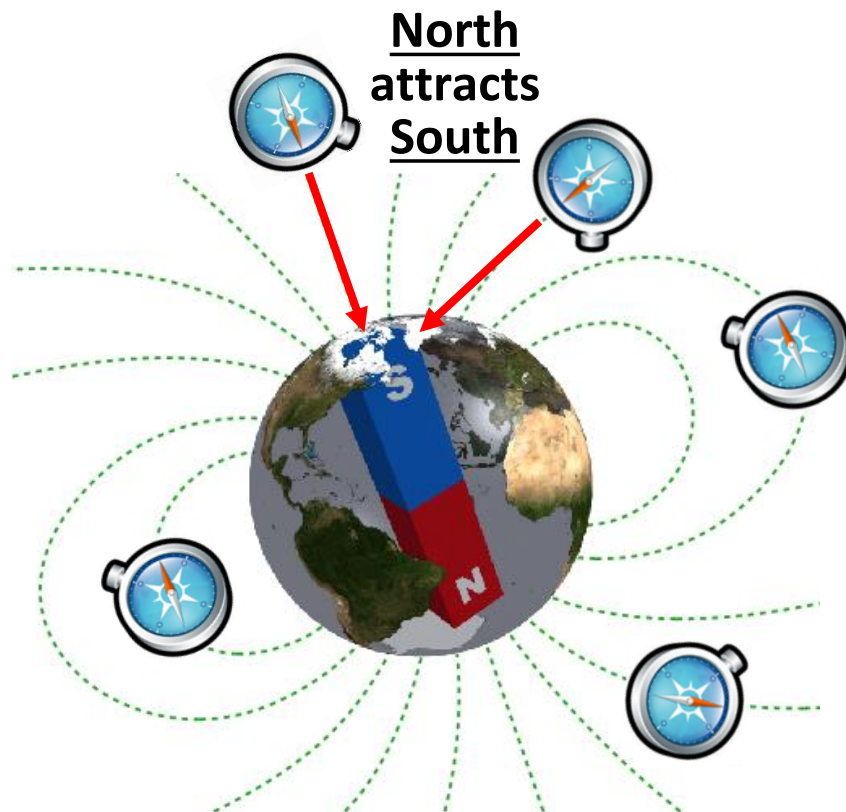
Arctic	Antarctic
Basically is a frozen ocean	Continent
A little bit of ice	90% of all ice on Earth
Half of the world's remaining oil deposits	No oil deposits
Temperature from $0^{\circ}\text{C}$ to $-49^{\circ}\text{C}$	Temperature from $-25^{\circ}\text{C}$ to $-72^{\circ}\text{C}$
Polar bears	Penguins





# Compass

- Compass is a **magnetized piece of metal that can spin freely** to align itself with Earth's magnetic field.
- The **N (north) tip** of the compass always points towards the **North Pole of the Earth**.



The magnetic compass was first invented as a device as early as the Chinese Han Dynasty about 206 BC (“**wet**” compass). The compass was used for maritime navigation by ~1120. The “**dry**” compass was invented in Europe around 1300.



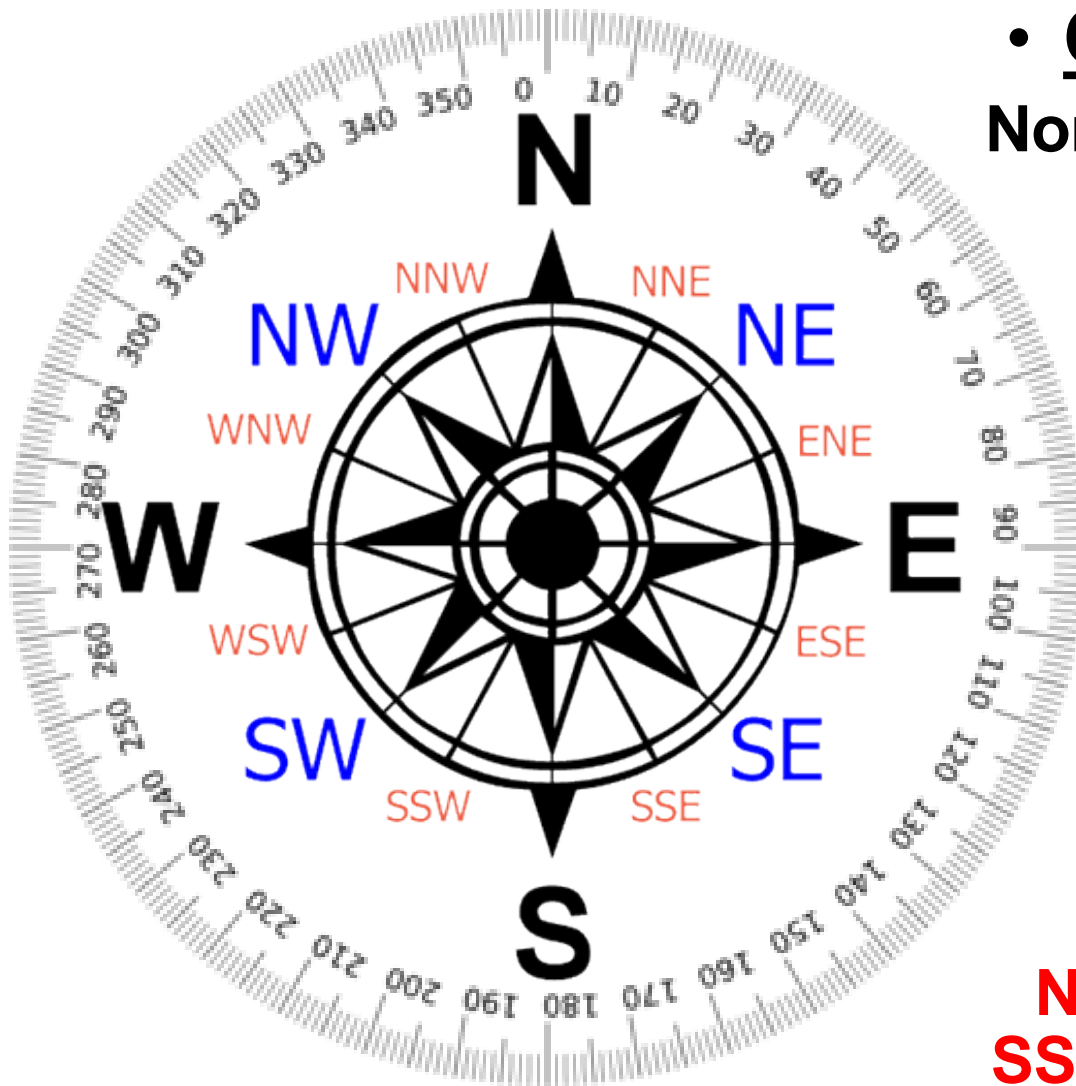
**Wet Compass**



**Dry Compass**



# Compass Rose



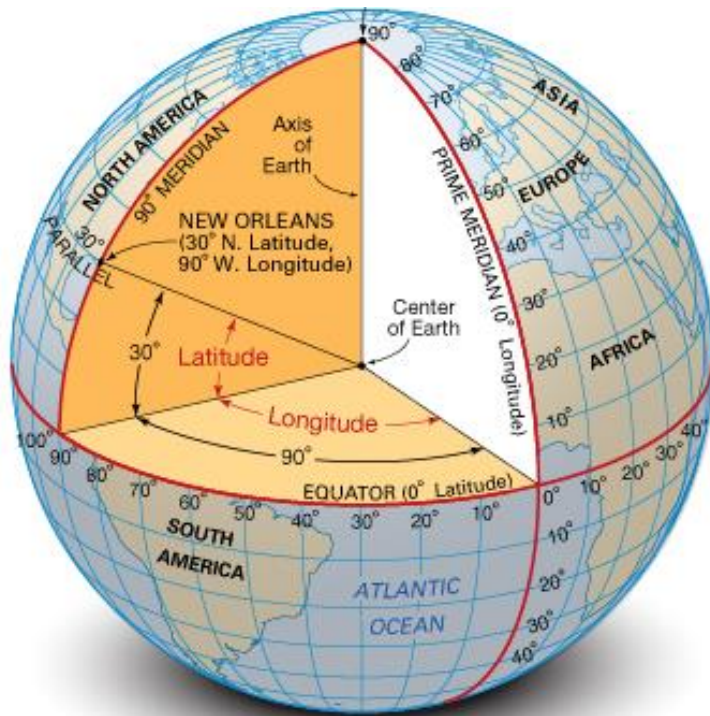
- Cardinal directions:  
North, East, South, West

- Half-cardinal (*intercardinal*) directions:  
Northeast,  
Southeast,  
Southwest,  
Northwest

- Intermediate directions:  
NNE, ENE, ESE, SSE,  
SSW, WSW, WNW, NNW

# Coordinates on the Globe

- Every location on Earth's surface can be specified by a set of numbers and letters using a geographic coordinate system.
- A common choice of coordinates is **latitude** and **longitude**, forming the *grid system*, and **elevation**.



New Orleans, N30° W90°

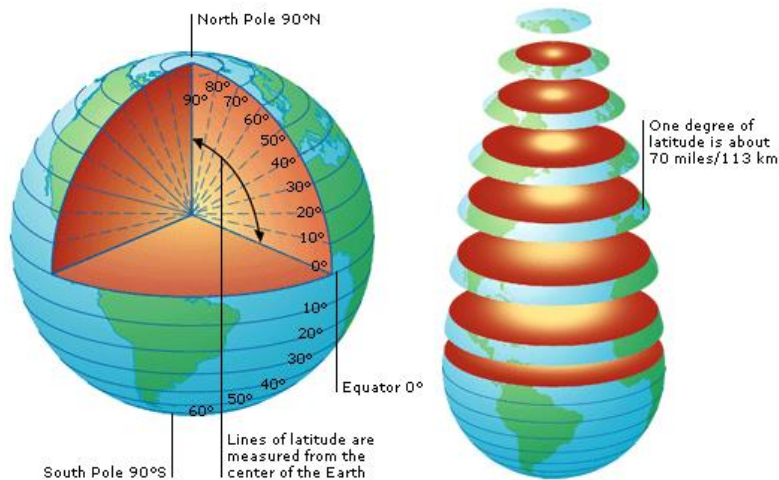


Washington DC, N39° W77°

# Latitude and Longitude

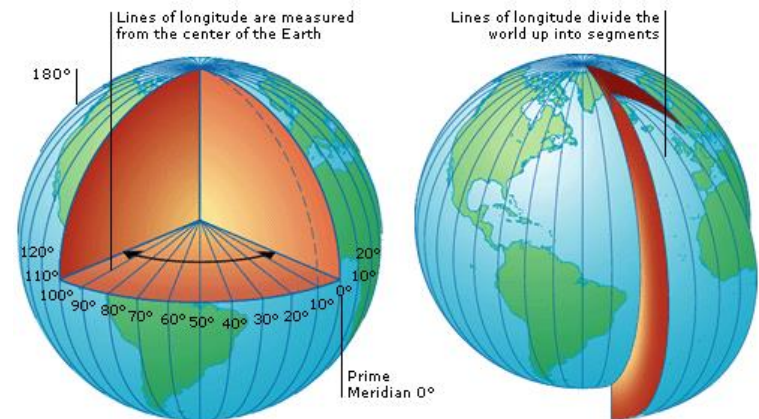
Latitude and longitude are measured in degrees ( $^{\circ}$ ) with submultiples of minutes ( $'$ ) and seconds ( $''$ ).

**Latitude** lines (**parallels**) run horizontally. They are parallel to and an equal distance from each other.



Zero degrees latitude is at the **Equator**. The latitude directions are **North (+)** and **South (-)**. North Pole is 90°N, South Pole is 90°S. Each degree of latitude corresponds to approximately 70 miles (113 km).

**Longitude** lines (**meridians**) run vertically, perpendicular to the Equator. They meet at the Poles and are spaced widest at the Equator.



Zero degrees longitude is called the **Prime Meridian** (goes through Royal Observatory, Greenwich, UK). The longitude directions are **East (+)** and **West (-)**.



**Exercise:** on the 1<sup>st</sup> day of October, a **tiger** was detected by surveillance cameras at the following locations: **N40°55'12" and W73°03'**; **N40°51'40" and W73°12'**; **N40°52'13" and W72°85'**.  
**Identify the towns that might be at risk...**

