**THE UNIVERSE**

**ASTRONOMY** is the study of what is beyond earth (usually called “space”)

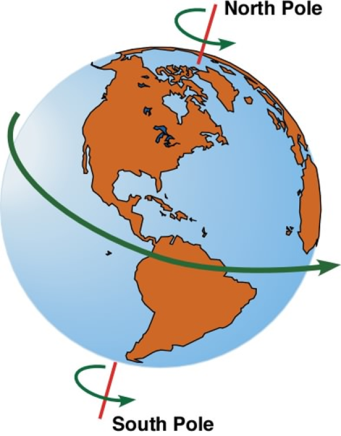
The **UNIVERSE** is everything that exists including all matter and energy. (We often call the universe “space”.) It includes:

1. **GALAXIES** – huge collections of gas and dust and millions of stars and planets.

\*The “Milky Way” is a galaxy!

1. **SOLAR SYSTEMS** – a sun and all of the objects that travel around it.

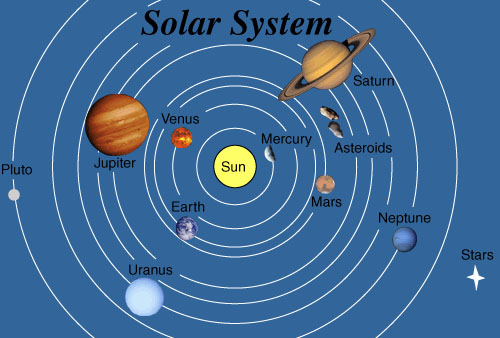
\*Note: There’s not just ONE solar system! There are many in space!

1. **STARS** – a large collection of matter which emits a huge amount of energy through nuclear fusion. Stars also form patterns called **CONSTELLATIONS**.
2. **PLANETS** – large pieces of matter that revolve around a star.
3. **MOONS** – pieces of matter that revolve around a planet.
4. **SATELLITES** – objects that orbit around another object.
5. **COMETS** – chunks of ice/dust that travels in long orbits around the sun.
6. **ASTEROIDS** – small rocky objects in space
7. **METEORS** – streaks of light caused by meteoroids.
8. **METEOROID** – a lump of rock/metal trapped by Earth’s gravity.
9. **METERORITE** – a meteoroid that has reached the ground.

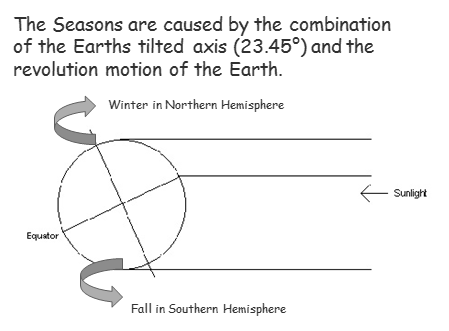
**OUR SOLAR SYSTEM**

PLANETARY MOTION

**ROTATION** - The spinning of an object around its axis. It is because of Earth’s rotation we have daytime and nighttime. The Earth rotates on its axis every 24 hours.

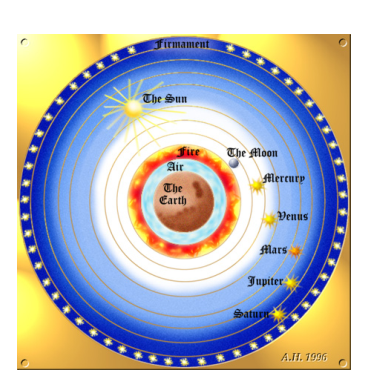


**REVOLUTION** - The movement of one object travelling around another. Earth travels in a counter clockwise direction, relative to the North Pole, once a year (every 365.25 days) around the sun. *(You know how a year has 365 days? The .25 is the reason we add an extra day every 4 years… aka Leap Years!!! Very cool!)*

The seasons (summer, autumn, winter and spring) are caused by the combination of the Earth’s tilted axis (23.45°) and the revolution motion of the Earth.

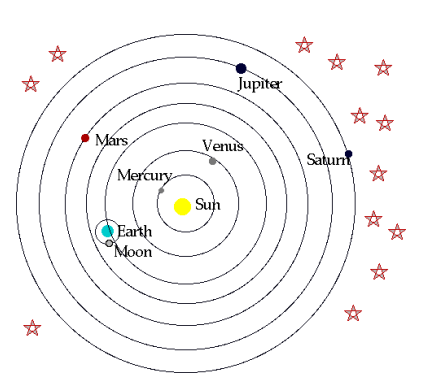
**THE ORIGIN OF THE UNIVERSE**

Our solar system is located on the perimeter of our galaxy which is called the Milky Way. The Milky Way is 13.7 billion years old, and is just one galaxy (there are between 100 and 500 billion galaxies in the universe!)

**COSMOLOGY** – is the study of the origin and changes in the universe.

Theory #1 – Geo-Centric Theory

* In ancient times people believed that the Earth did not move. They saw things moving in the sky and assumed they were moving around the Earth.
* **PTOLEMY** was a Greek astronomer who first wrote about the “**EARTH CENTERED UNIVERSE**”. He also believed that the stars were only slightly farther away from Earth than the moon, sun and other planets.

Theory #2 – Helio-Centric Theory

* In 1500 AD, **COPERNICUS** suggested that the solar system existed with the Sun at the center. (“**SUN CENTERED UNIVERSE**”)
* It was not until the 1600’s when **GALILEO** used the first telescopes, that people began to accept that the sun was the center of our universe.

[](http://www.google.ca/imgres?q=the+big+bang+theory&num=10&hl=en&safe=active&tbo=d&biw=1366&bih=643&tbm=isch&tbnid=4wGw1VAUoeSjJM:&imgrefurl=http://en.wikipedia.org/wiki/List_of_The_Big_Bang_Theory_episodes&docid=LA_VrQaop3xZdM&imgurl=http://upload.wikimedia.org/wikipedia/commons/thumb/1/13/TBBT_logo.svg/200px-TBBT_logo.svg.png&w=200&h=247&ei=OmHrUKi1KbKu0AG-Dw&zoom=1&iact=hc&vpx=875&vpy=127&dur=1715&hovh=197&hovw=160&tx=102&ty=98&sig=109533165629554843285&page=1&tbnh=146&tbnw=118&start=0&ndsp=21&ved=1t:429,r:5,s:0,i:102)Theory #3 – The Big Bang

* Scientists can prove that galaxies are moving apart!
* This means they must have once been closer together… and before that they must have been really really close. This mass would have been under extreme pressure and temperature.
* The **BIG BANG** is sometimes called “**TIME ZERO**”, they estimate it was between 10-15 billion years ago. Ever since then the universe has been expanding outward!!!

Other Theories

There are hundreds of ideas about the beginning of the universe depending on which culture you examine. Some popular ideas come from the following basis: 1. Ex-Nihilo (Out of nothing), 2. Creation, 3. Chaos, 4. Earth diver

**TELESCOPES**

The main purpose of a telescope is to gather light. The light forms images that can then be seen and recorded. There are two main types:

1. **REFRACTING TELESCOPES** 
   * Bends light as it passes through a specialized lens.
   * There is a limit to how big the lens can be. They eventually bend and sag under their own weight!



1. **REFLECTING TELESCOPES**

* Uses a concave mirror to gather light.
* The mirrors can be supported from underneath, so they are able to be built quite large!

**OBSERVATORIES**

The BIGGEST light reflecting telescopes are located in OBSERVATORIES which are large buildings with open domes, usually located on large hills or mountains!



The more dense the atmosphere the more difficult it is to see things in space because light is absorbed and scattered.

Putting telescopes up high in observatories helps the problem to a small extent.

**HUBBLE SPACE TELESCOPE**



The Hubble Space Telescope has been in orbit around Earth since 1990. It is about 375 km above Earth. Many famous images have been taken using Hubble. Hubble has had many repairs since its time in space to improve its functioning.