# The Universe

The Big Bang Theory: The universe was created in one giant explosion about 13.7 billion years ago, and is constantly expanding even today from this location.

Two observations that help support the Big Bang Theory are..

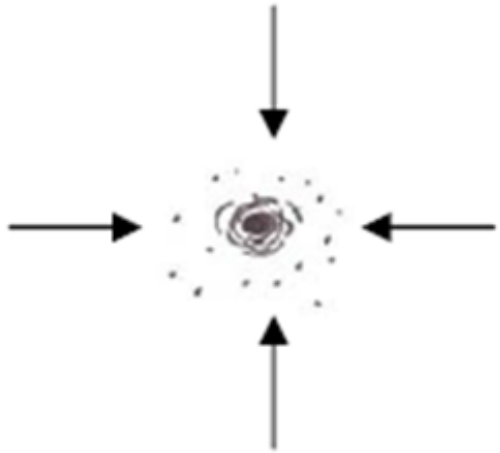
♦ galaxies are moving apart from a central location.

♦ red shift- The light most galaxies give off is close to the red end of the spectrum because as they move farther out, the energy becomes weaker & stretched out. This light energy is longer and is the color red.

# How a star is formed

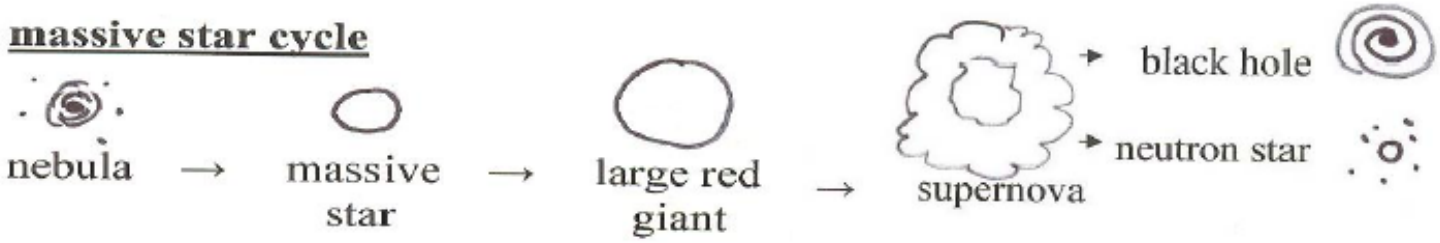
In space, dust & gas get pulled together by **gravity**.

This object is called a nebula.



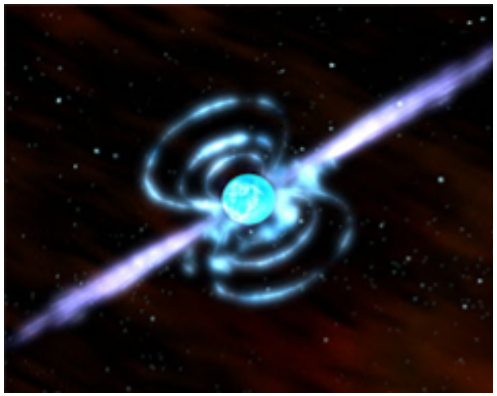
This gravity produces great heat, when hot enough, **nuclear fusion** occurs which causes hydrogen protons to join together producing the massive energy just as our sun does.

The nebula, depending on its size, becomes a massive star or a low mass (smaller) star-

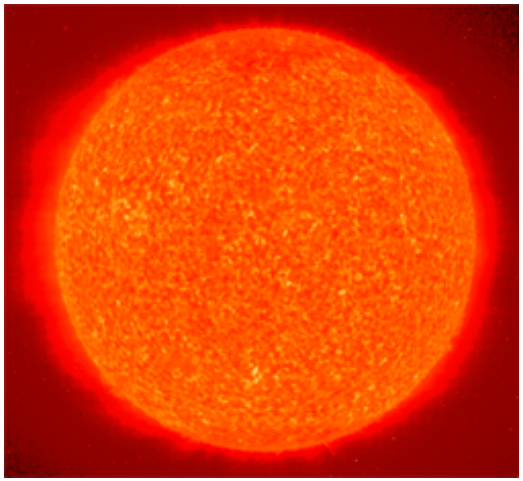


The large red giant has so much mass & energy that it eventually explodes outward into a supernova and becomes a **black hole**. A black hole has so much gravitational energy that not even light can escape from it.

If the red giant is not as big, after the supernova explosion, just the star's core is left. This is called a **neutron star**.

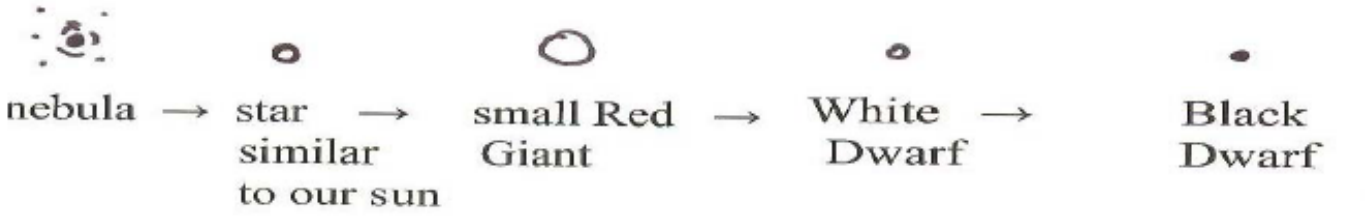


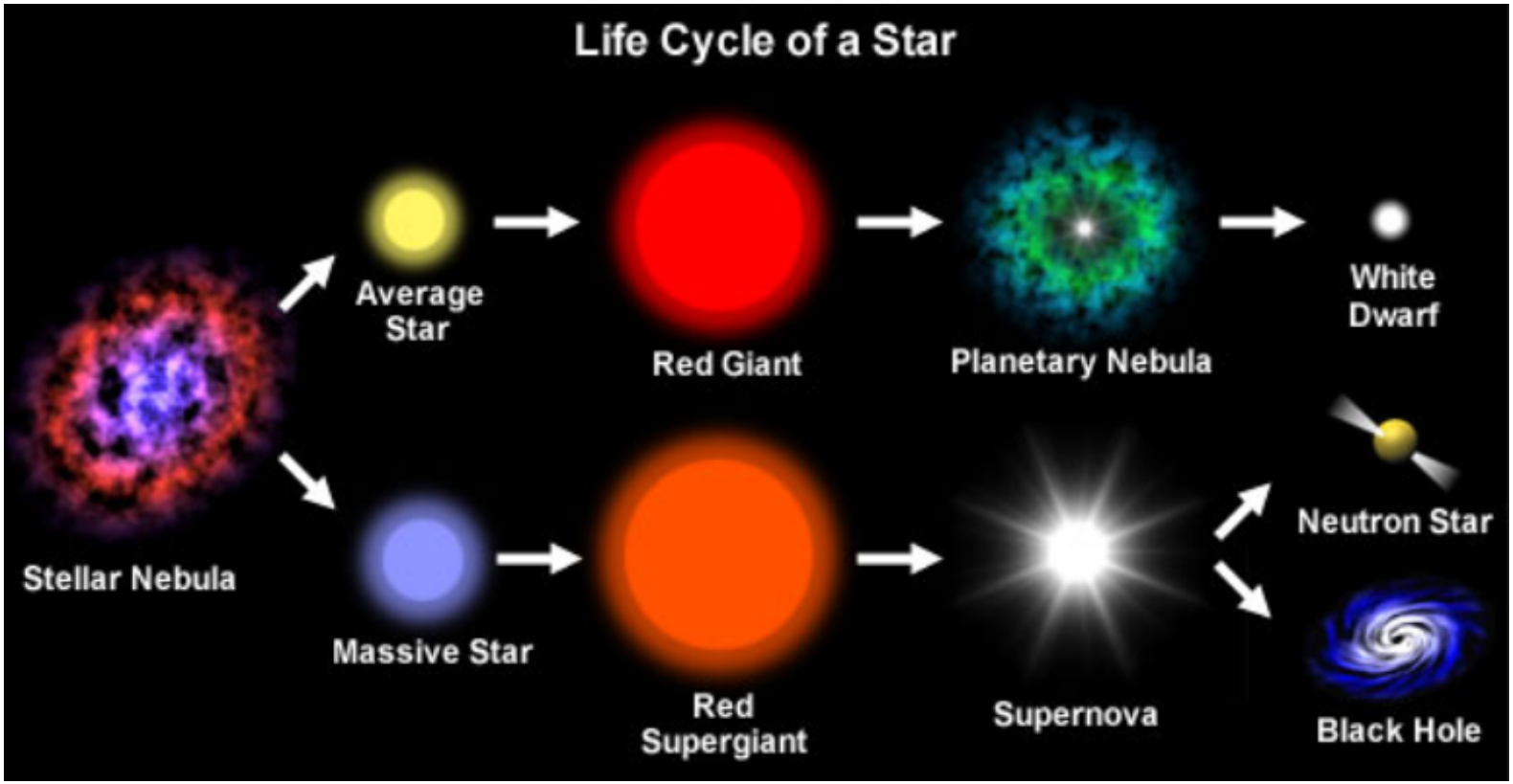
If a red giant is 1.5 times the mass of the sun it is considered a large red giant.



## Low mass star cycle

This low mass star, like our sun, will eventually expand becoming a Red Giant, condense to form a White Dwarf & then burn out becoming a Black Dwarf.




Life Cycle of a Star
Average Star
Red Giant
Planetary Nebula
White Dwarf
Stellar Nebula
Massive Star
Red Supergiant
Supernova
Neutron Star
Black Hole

# Tools used by astronomers

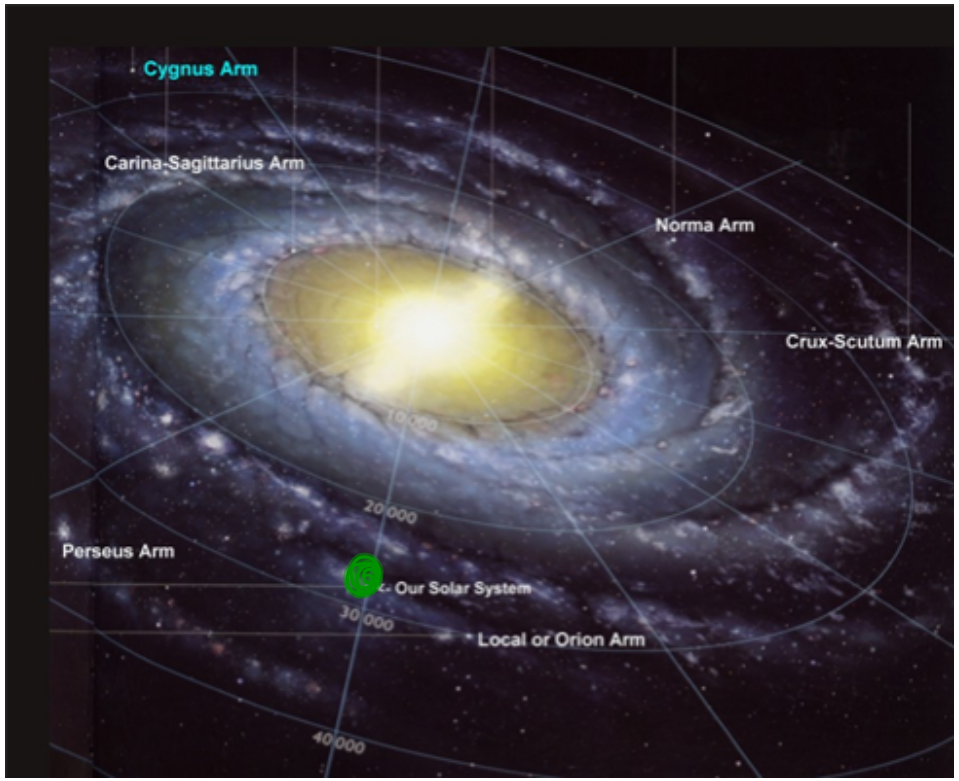
**Telescopes**- with optical telescopes, astronomers see closer the objects in outer space such as moons, planets, galaxies.

**Satellites-** Are used to transmit signals from outer space such as pictures, topographic maps. Just like cell phone satellites allow our signals to travel from place to place.

**Probes**- are sent by scientists to collect data on far away planets that humans can never get to. Probes send data back by signals & some even retrieve samples from planets.

**Galaxies**- are a large group of stars. There is said to be a billion of them in the universe.

**Our solar system-** the sun, our earth and the 7 others belong to the Milky Way Galaxy. Scientists are not sure but curious to know if there are other solar systems out their which support life like ours does.



There are 3 different kinds of galaxies. Galaxies are characterized by their shape.

1). Spiral →

2). Eliptical →

3). Irregular

Why does the earth & other planets in our solar system revolve around the sun?

Gravitational force is the reason.

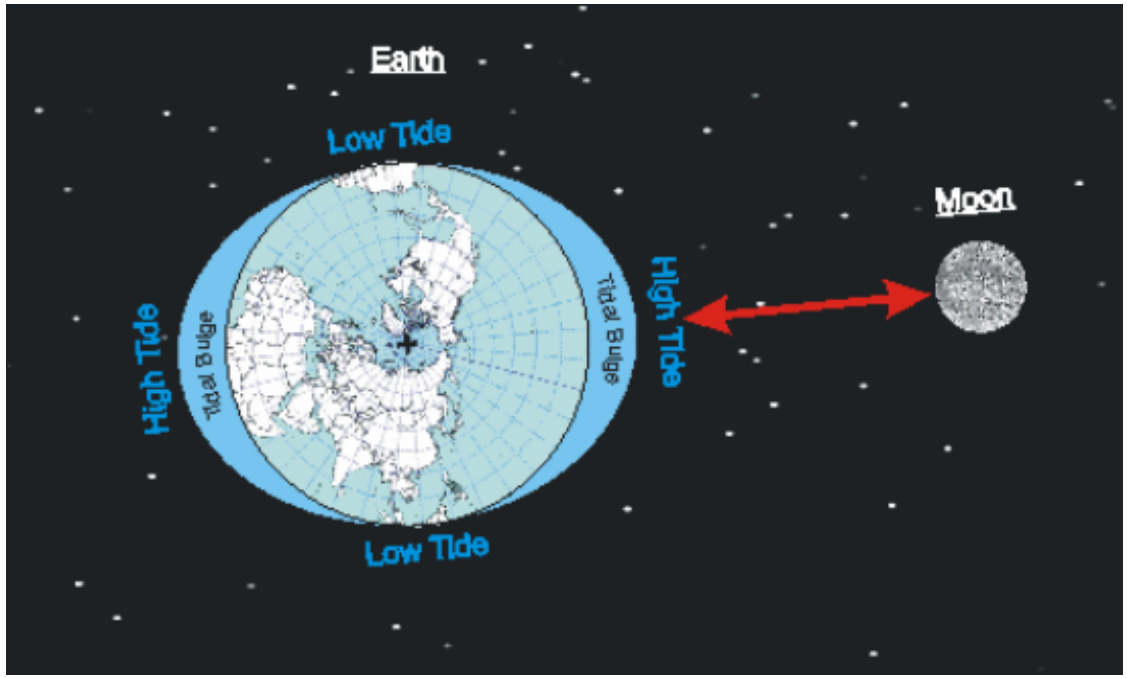
Newton proposed the ***Law of Universal Gravitation*** that says between any two objects there is attraction (gravity) that is proportional to the masses of the objects and the distances between them.

This means that the more massive an object is, it has a stronger pull of gravity on objects that are less massive than itself.

Our sun is more massive than the planets so they all revolve around the sun.

Our planet earth is more massive than our moon so this is why the moon revolves around our earth.

This is why we have tidal waves.



The earth **rotates** on its axis. This brings different parts of the earth in contact with the sun → **The reason we have night & day!**

The Earth **revolves** around the sun.

One complete revolution of the Earth around the sun takes one year.