

## Earth Science in Physics

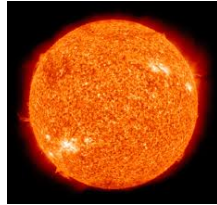
### Objectives

Explain how stars like our sun use nuclear fusion to create energy.

Identify the different stages of stellar evolution.

Explain Hubble's Law.

Explain what causes plate tectonics.

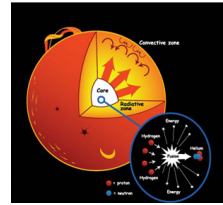


## Nuclear Fusion

A nuclear reaction in which atomic nuclei of a low atomic number fuse to form a heavier nucleus with the release of energy.

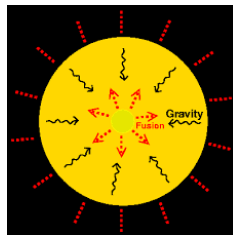
Takes place in the core of stars where temps are hot enough.

In the core of a star like our sun, hydrogen atoms are fused into helium atoms and energy is released in the form of light & heat .



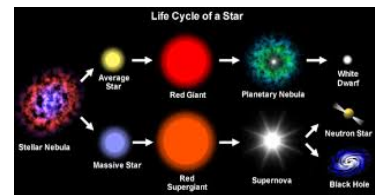
## Lifecycle of a Star

Driven by force of gravity & pressure from nuclear fusion.



## Lifecycle of a Star the size of our Sun

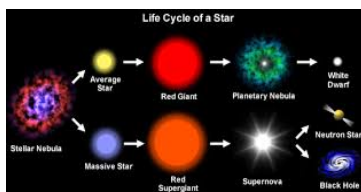
When hydrogen fusion stops, core shrinks making it hotter in core. This triggers fusion of helium into carbon & outer layer of star is pushed back. The star is a **Red Giant**.



Average stars like our Sun end with carbon.

## Lifecycle of more massive stars

When almost all He is gone, core shrinks down more increasing the temp and fusion of He & C create oxygen atoms. (Ne, Mg, Fe)



Massive stars end with Iron.

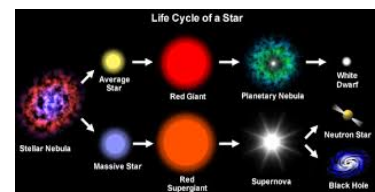
## Lifecycle of more massive stars

Core fused with Iron is very dense.

Star explodes - **Supernova**

Mass not great enough - **neutron star**

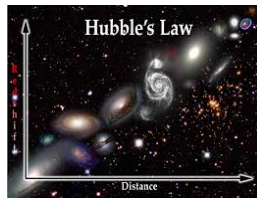
Mass so great that core collapses due to gravity - **black hole**



Massive stars end with Iron.

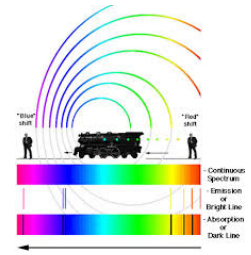
## Hubble's Law

- Explains our **expanding** universe.
- The **distant galaxies** we see in all directions are **moving away from the Earth**, as evidenced by their **red shifts**.
- The **farther away** an object is, the **faster it is moving away**.



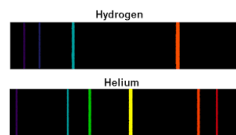
## How did Hubble make this discovery?

- Doppler Effect**: apparent change in the frequency of a wave that is caused by the apparent motion between the observer and the source of the wave.
- Use spectrum of light to see if star is moving towards or away from us.
  - Look at the change in frequency of light



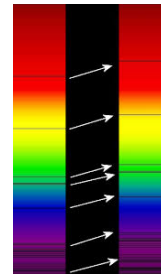
## Spectral Lines of Elements

- All objects that emit light, like stars, give off certain spectral lines.
- Spectral lines help identify elements that make up stars.



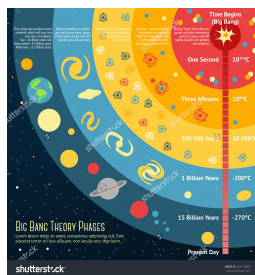
## Hubble's red shift discovery

- Hubble examined light from stars in the distant galaxies and found that the pattern of spectral lines of the elements shifted toward the red end of the spectrum.
- Red Shift** - objects that are moving away from us
- Blue Shift** - objects that are moving towards us
- Greater the shift, the faster they are moving away.



## Evidence of the Big Bang Theory

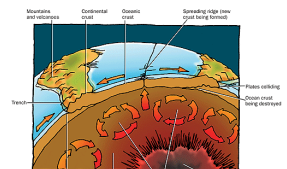
- Big Bang Theory**: Universe began as a single point and has been expanding since.
- Hubble's Law supported the idea of the Big Bang.
- If the expanding universe was ran in reverse, everything would move back to one central point.



## Convection Currents within Earth's Interior

**Convection currents**: movement caused by the gain and loss of heat energy.

- Mantle closest to the core gains heat energy and becomes less dense than the surrounding cooler mantle and rises towards the crust.
- As it reaches the crust, the mantle cools and becomes more dense than the surrounding mantle and sinks back down toward the core.



**Convection currents in the mantle cause tectonic movement.**

**Internal thermal energy is generated by radioactive decay.**

Assignments . . .



- Earth Science Study Guide

