

# Chapter 24

## Stars, Galaxies & the Universe

### Distance units

- To talk about space we need to come up with distance units a little more appropriate than just miles. Otherwise it would be like measuring from here to New York in inches!
- **AU** – astronomical unit – distance from the Earth to our Sun, about 93 million miles or 150 million kilometers- use this unit when talking about things in our solar system.
- **Light Year**- distance light would travel in one year- a distance measurement, not a time measurement!!- 5,900,000,000,000 miles ( $5.9 \times 10^{12}$  miles). Use this unit when talking about distances between stars & galaxies.

# How big are we talkin' about?

- Earth → Sun → Solar System → Galaxy → Universe

Earth: diameter 7,926 miles

Sun: diameter 870,000 miles Over 1 million Earths could fit inside the Sun

Sun is 93 million miles away = 1 AU (astronomical unit)

Solar System: 80 AU's in diameter

1 Light Year = 5,900,000,000,000 miles (  $5.9 \times 10^{12}$  miles)

Closet star to the Sun = **Proxima Centauri** = 4.22 Light Years away

**Milky Way Galaxy** = 100,000 light years across  
& 12,000 light years thick

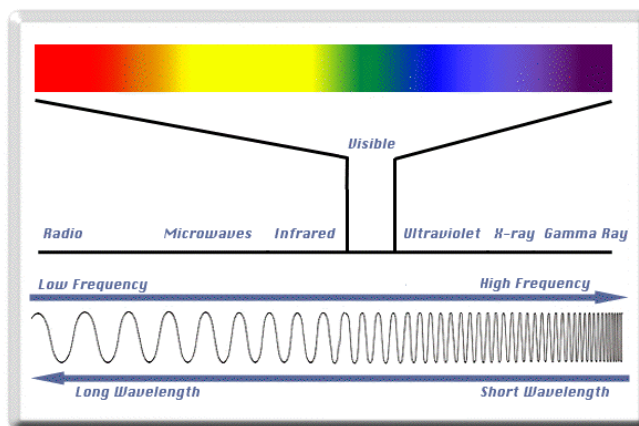
Nearest Galaxy to ours is **Andromeda** = 2 million light years away

**Universe** is estimated to be 156 billion light years across

## The Electromagnetic Spectrum

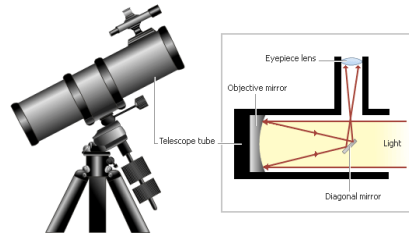
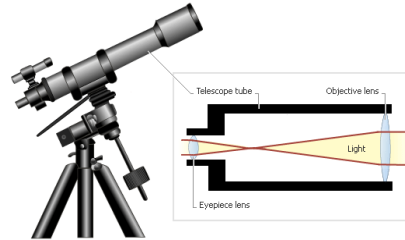
We observe stars by the EMR (electromagnetic radiation) they give off.

Most telescopes are "light" telescopes but telescopes that collect all different wavelengths in the spectrum are now used.



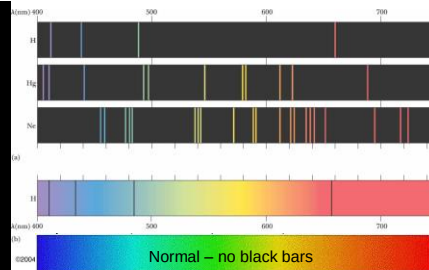
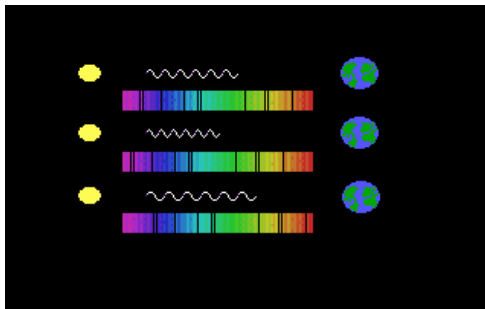
# Telescopes

- Refracting Telescope: collects and focuses light using convex lenses
- Reflecting Telescope: uses a curved mirror to bounce the light onto a small area
- Radio Telescope: Uses a large parabolic dish to collect and focus radio waves

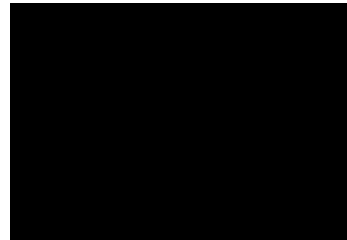
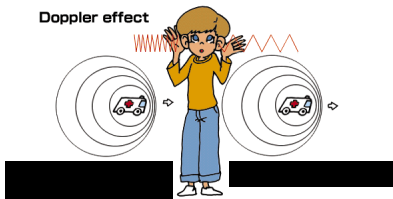


## Spectrograph

Used to determine temperature & chemical make up of a star



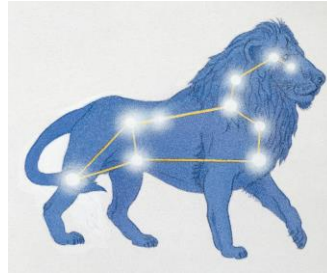
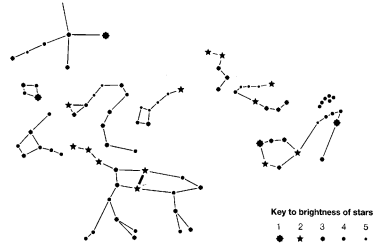
## Coming or Going?



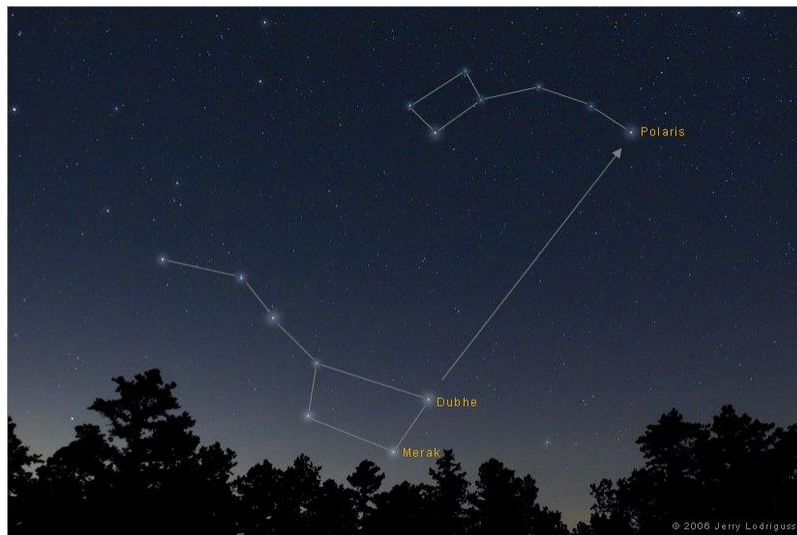
## Star Characteristics

**Constellation:** a group or pattern of stars in the night sky that appeared as symbols or figures to ancient star gazers

77 Recognized Constellations



## Polaris – The North Star



## Classifying Stars

- 3 characteristics used to classify stars:
  - size, temperature and brightness

### Size:

**Neutron star** — about 20 kilometers in diameter. 1 teaspoon weighs 1 billion tons!!

**White dwarf**— about the diameter of the Earth

**Medium Size**— about the size of our sun

**Red Giant**— several times the diameter of our Sun

**Super Red Giant** — can be the diameter of our entire solar system

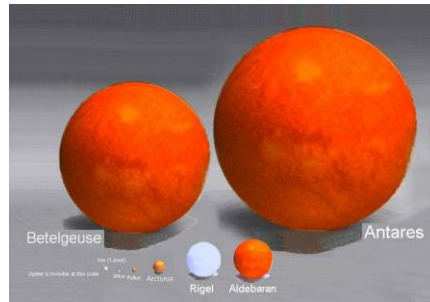
### Surface Temp

**Red** - about 3,000 degrees Centigrade

**Yellow**— about 6,000 degrees Centigrade

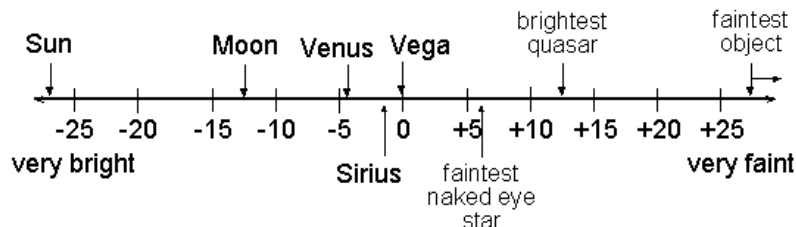
**White** — about 10,000 degrees Centigrade

**Blue** — about 50,000 degrees Centigrade



## Star Brightness

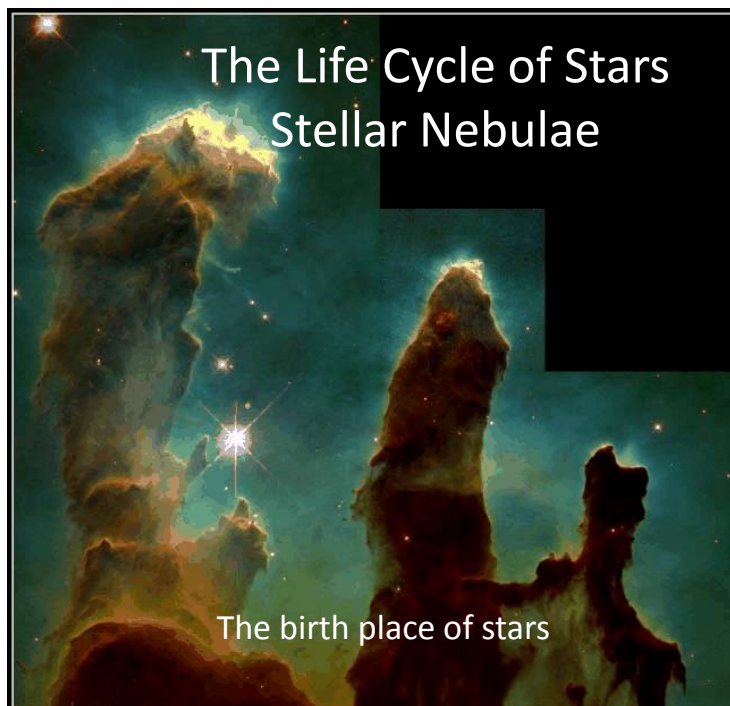
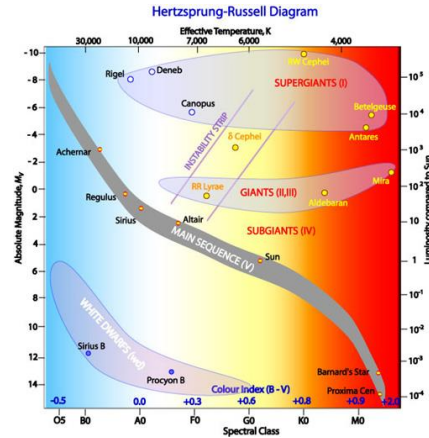
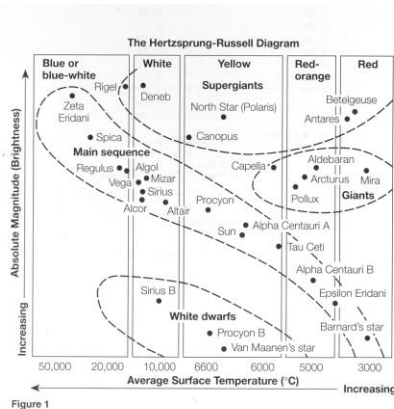
- the amount of light given off by the star
  - Apparent Magnitude** — the brightness as seen from the Earth. As the distance from the star increases, the apparent magnitude of that star would decrease.
  - Absolute Magnitude** — the brightness the star would have if it were a standard distance from the Earth.



Apparent brightnesses of some objects in the magnitude system.

# Hertzsprung – Russell Diagram

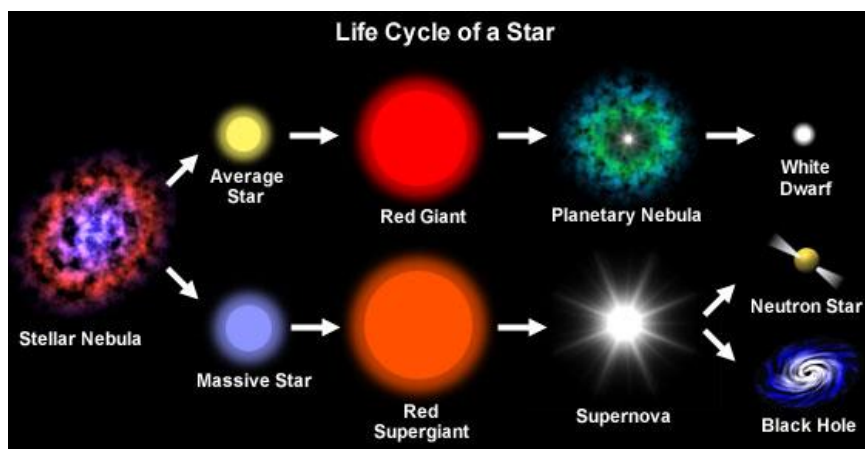
- a chart that compares Color, Surface Temperature and brightness of stars.



# Star Life Cycle

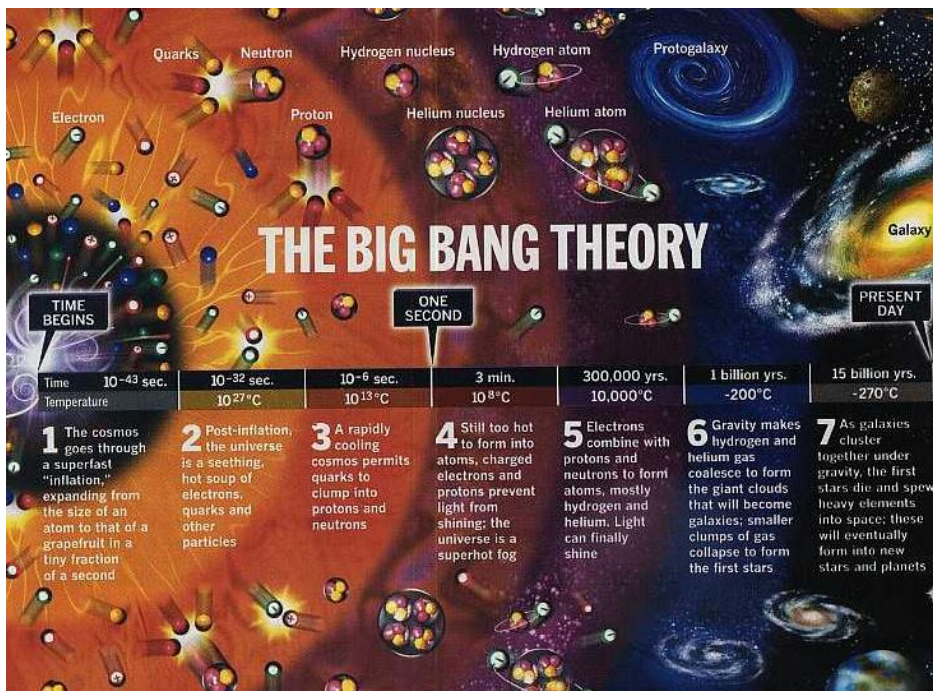
- **Nebula** – a huge gas cloud made up mainly of Hydrogen that collapse down on itself and compresses the gas down into a **Protostar**
- Star is “born” when the **protostar** has contracting tight enough for Hydrogen to fuse into Helium, this releases the light and energy we normally associate with a “normal” star.
- **How long a star lives depends on its initial mass** – the more mass stars use their fuel faster than less massive stars!
  - Stars **smaller** than the Sun have lives up to **200 billion** years
  - **Medium Stars**, like our Sun – have lives about **10 billion** years
  - **Massive Stars** – have very “short” life spans – about **10 million** years

# Star Life Cycle



# Where did it all begin?

- We (as Christians) know!
  - Genesis 1:1 In the beginning **GOD** created the heavens and the earth.
- They (as evolutionists) say the
  - “Big Bang” Theory

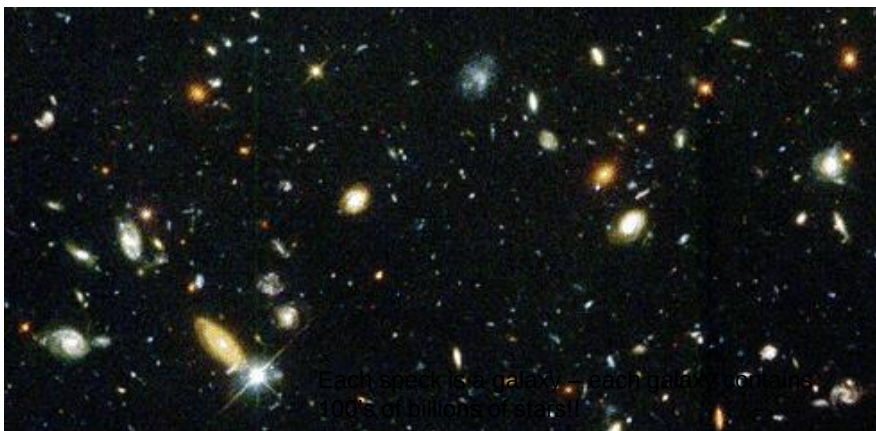


## Big Bang Theory

- The Big Bang **Theory** says that the entire universe began **15 to 20 billion years** ago.
- Scientist have viewed thousands of galaxies and can measure the fact that all galaxies are moving away from each other.
- If you could run the film “backwards”, it would appear that all of the galaxies come together at a single incredibly dense point.
- Scientist CANNOT Explain where this dense point came from. WE CAN:
  - [Gen 1:1](#) – In the beginning, God created the Heavens and the Earth

## Celestial Bodies

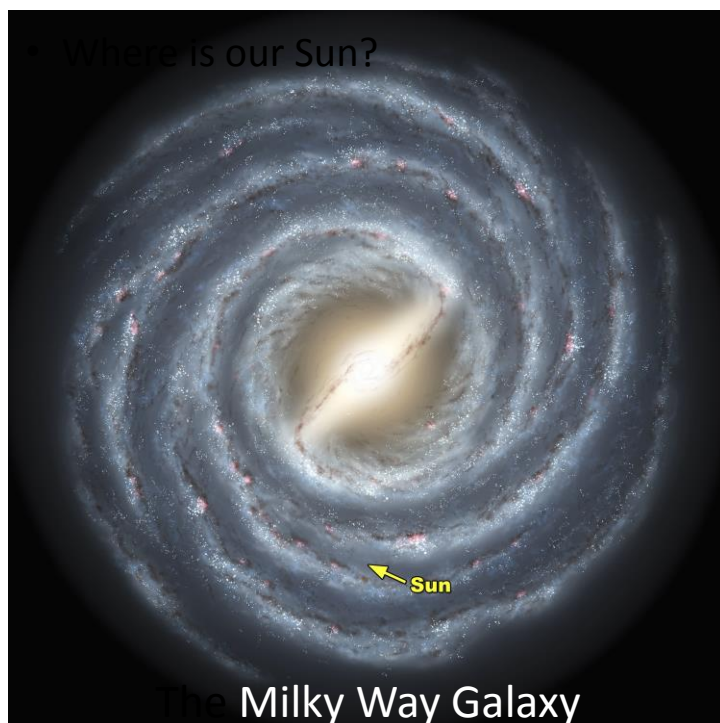
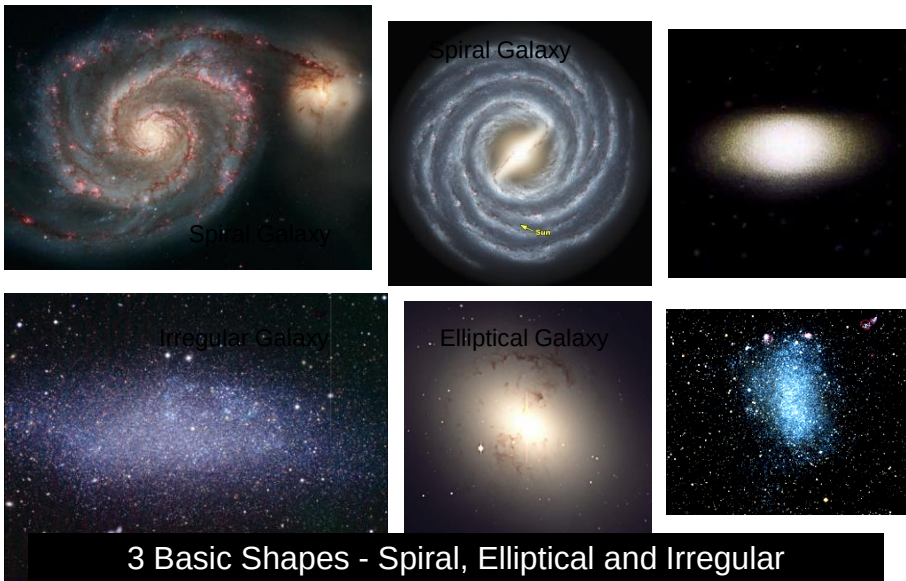
100's of billions of galaxies make up the known universe



Each speck is a galaxy – each galaxy contains 100's of billions of stars!!

This picture takes up a very small piece of the sky, it covers about the size of your “pinky” finger nail held at arms length.

## Spiral, Elliptical and Irregular



## Other Celestial Bodies



That would be all there is for  
Chapter 24.....