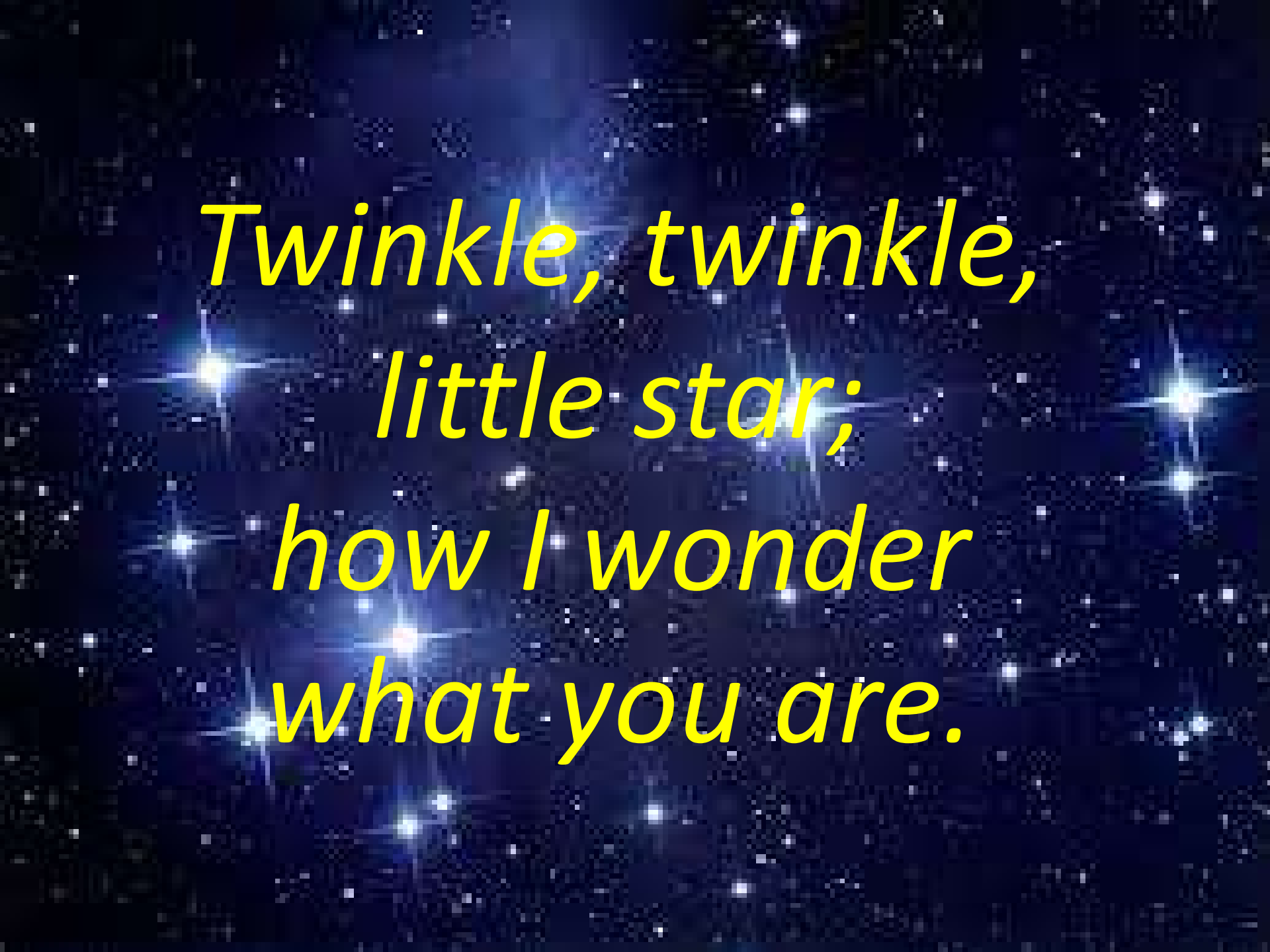
Stars

Mr. Skirbst


Twinkle, twinkle,
little star;
how I wonder
what you are.

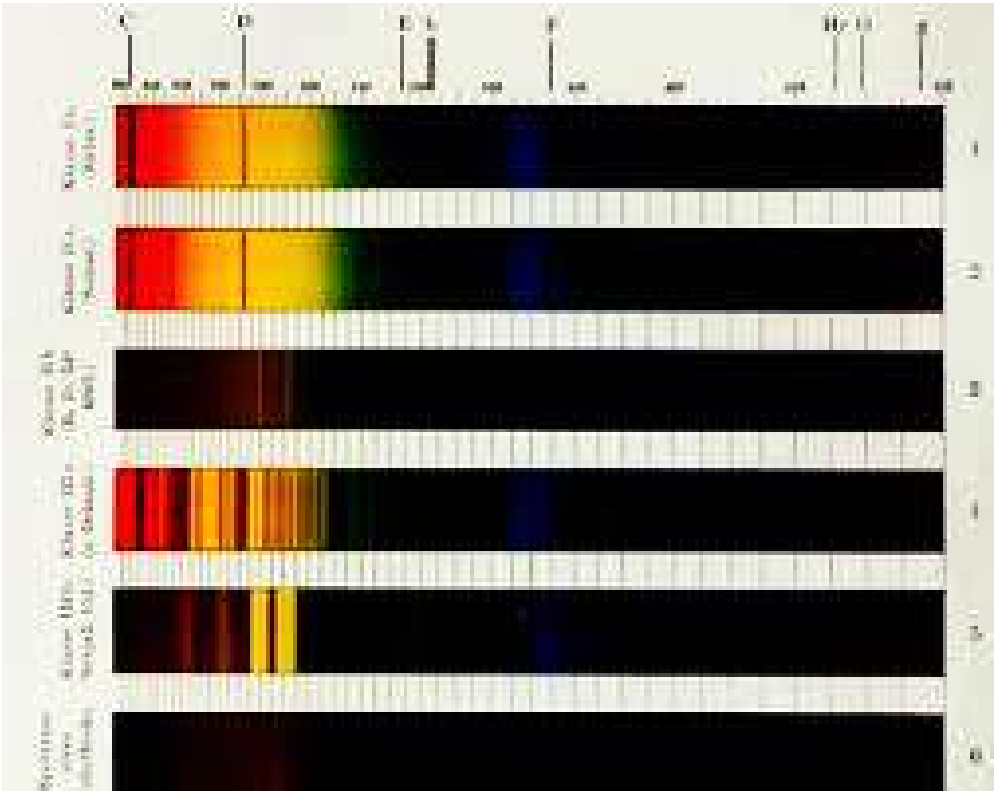
Composition

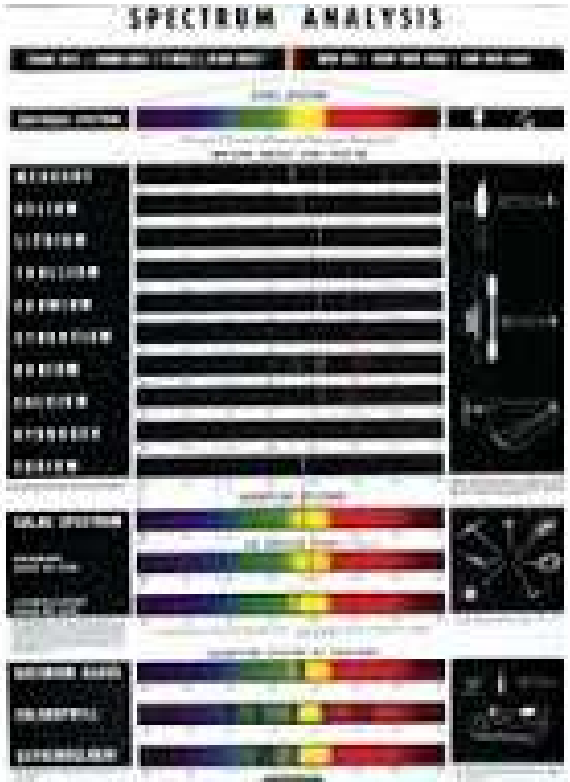
- What stars are made of…

Composition

- What stars are made of…

  - determined by spectral analysis

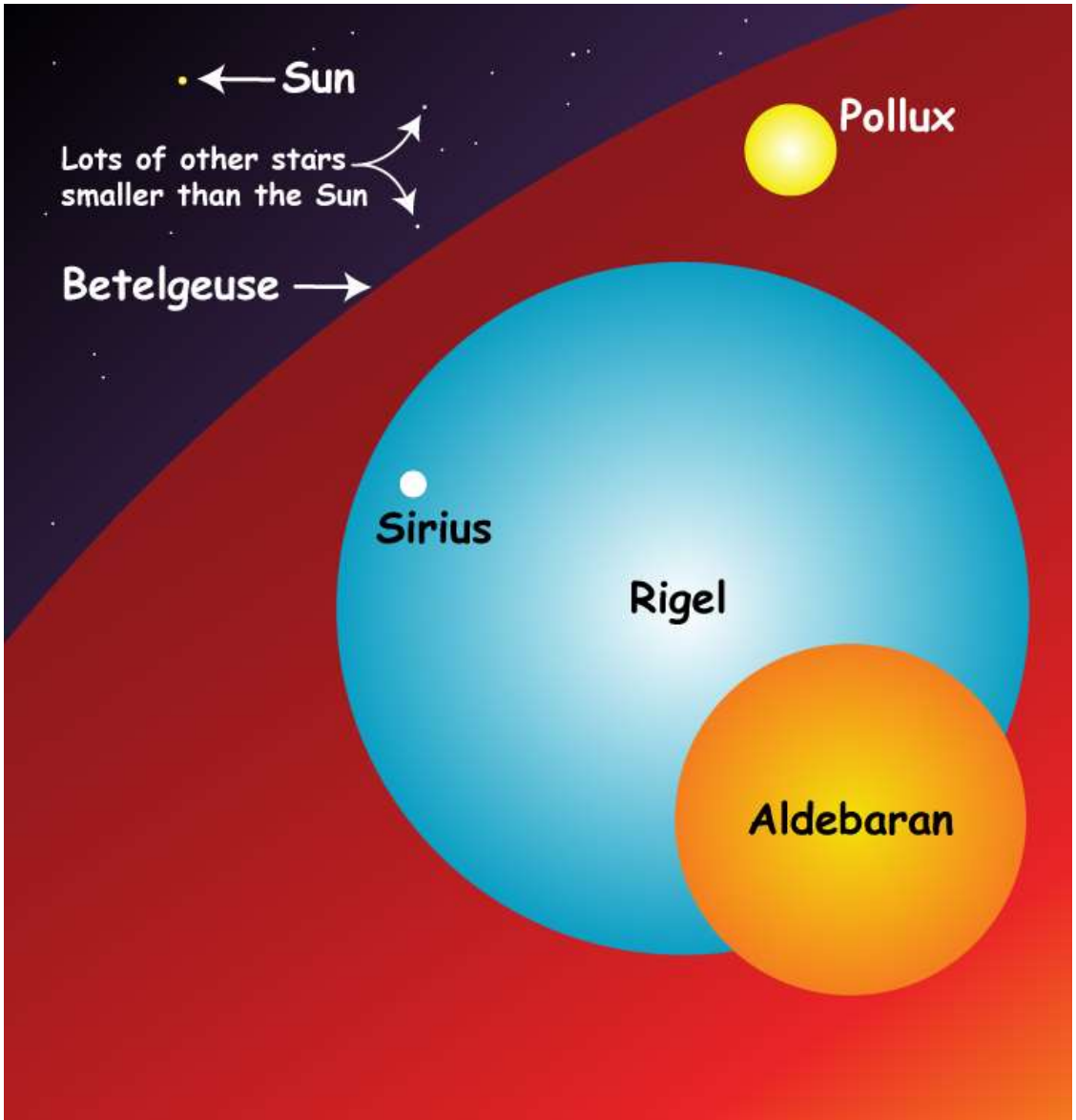




Composition

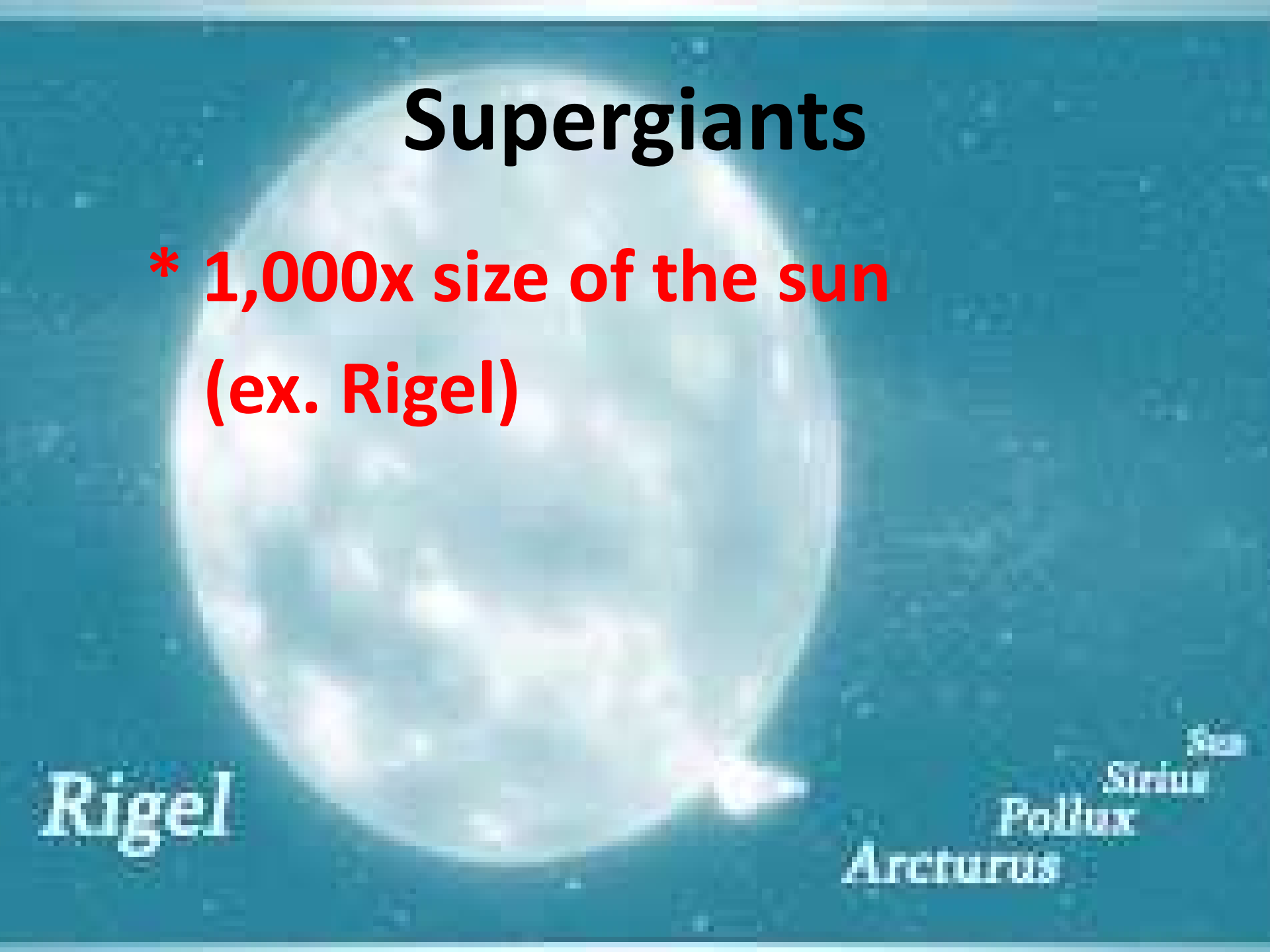
- What stars are made of…
  - determined by spectral analysis
    - hydrogen (60 – 80%)
    - helium (20 – 30%)
    - other (O, C, Ne, N)

5 Star Sizes


Sun
Lots of other stars
smaller than the Sun
Betelgeuse
Pollux
Sirius
Rigel
Aldebaran

Supergiants

* 1,000x size of the sun (ex. Rigel)



Giants

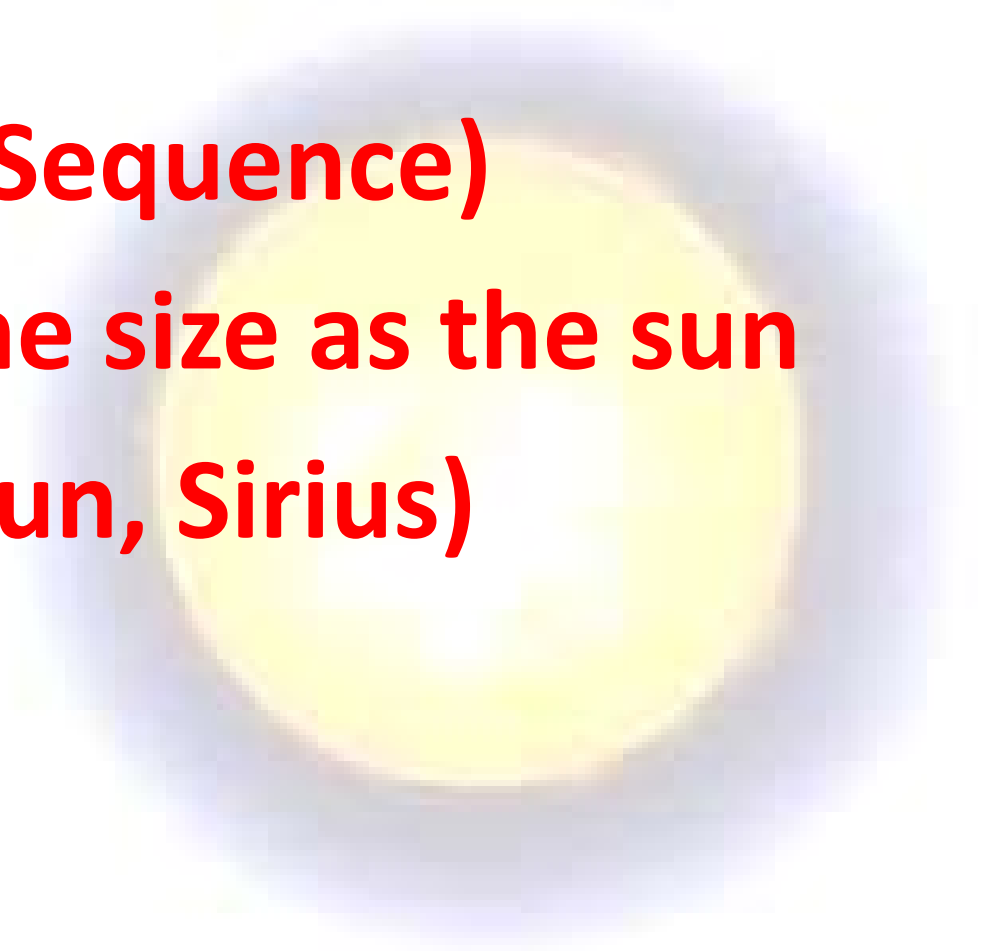
* 10 - 100x size of the sun (ex. Aldebaran)

Medium

(Main-Sequence)

* same size as the sun

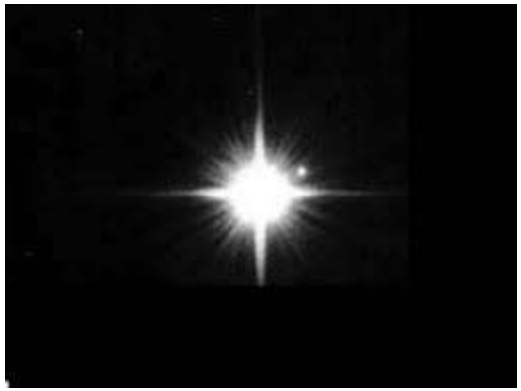
(ex. Sun, Sirius)



White Dwarfs

* smaller than the Earth

(ex. Van Maanens)

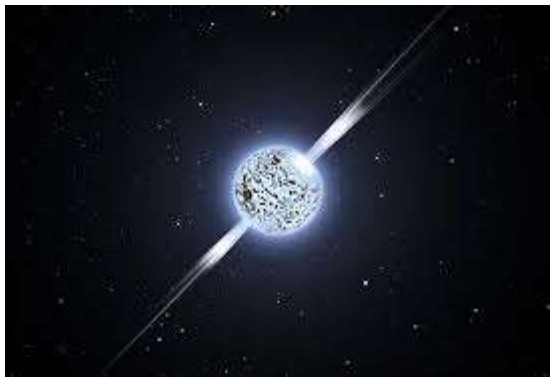


Neutrons

*** only several kilometers in diameter**

Neutrons

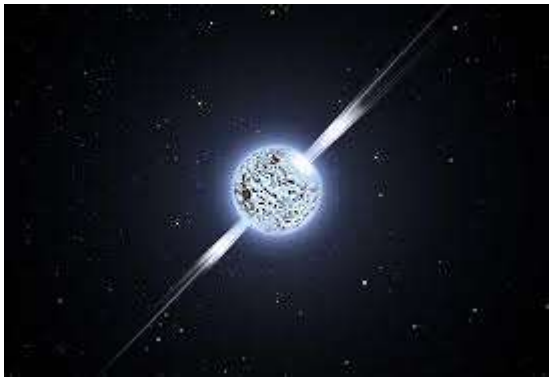
*** only several kilometers in diameter**



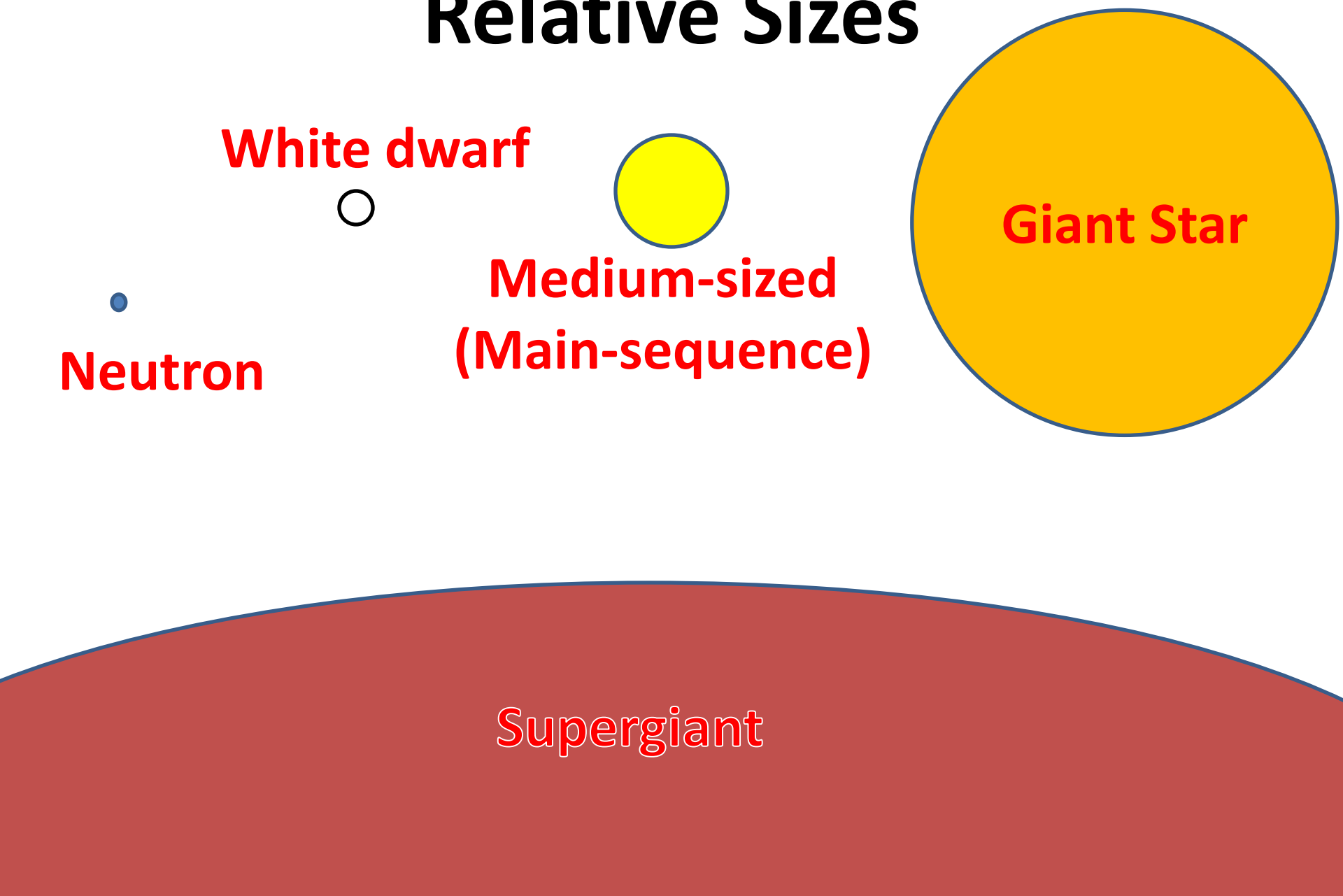
Neutrons

* only several kilometers in diameter

* a teaspoon would have a mass greater than the entire Earth!



Relative Sizes



Star temperature

Star color indicates surface temperature

COLOR	*TEMP (oC)*
Blue	35,000
White	10,000
Yellow	6,000
Red-Orange	5,000
Red	3,000

Star Brightness

Absolute brightness (magnitude)

- light actually given off

Star brightness

Absolute brightness (magnitude)

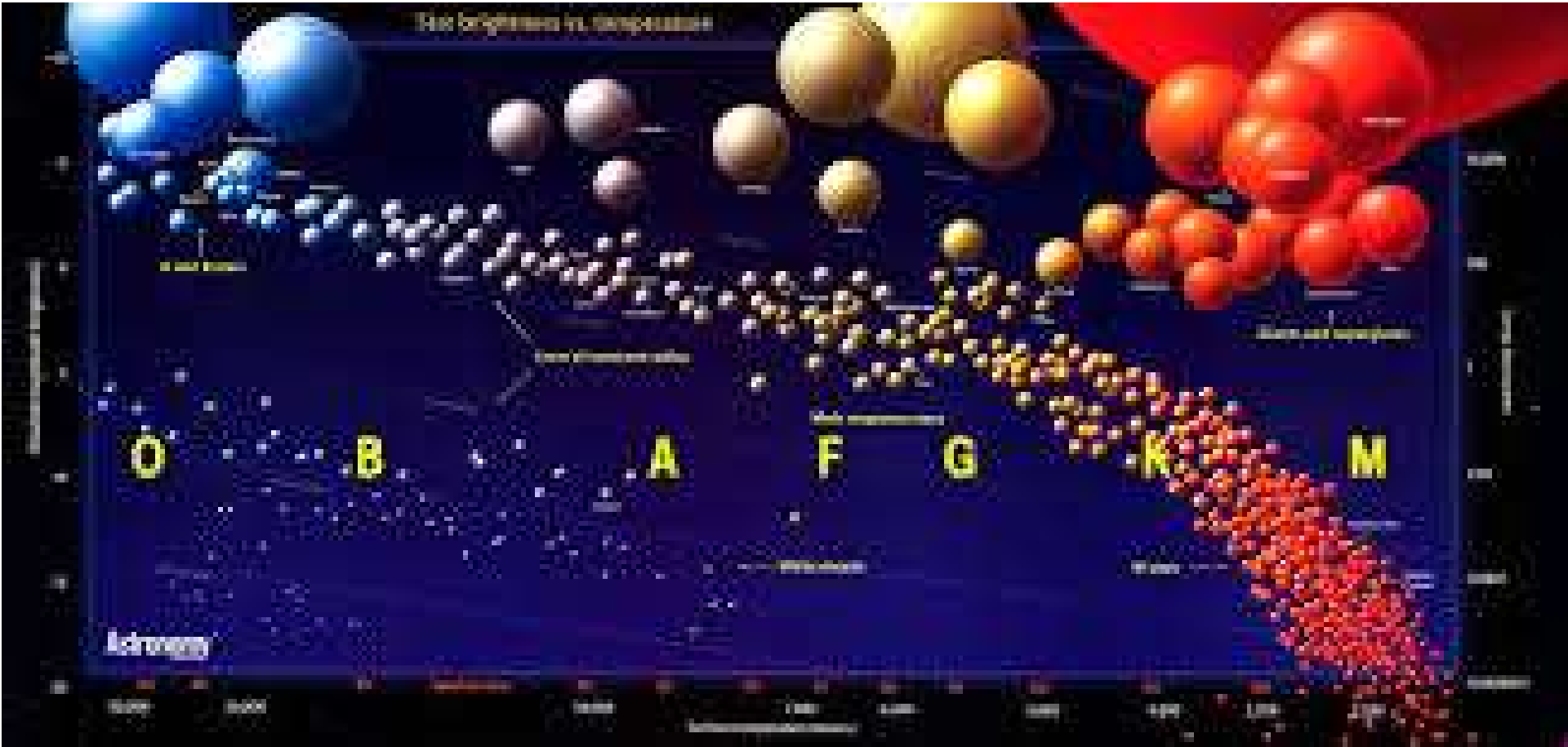
- **light actually given off**

Apparent brightness (magnitude)

- **light observed by someone**

H-R Diagram

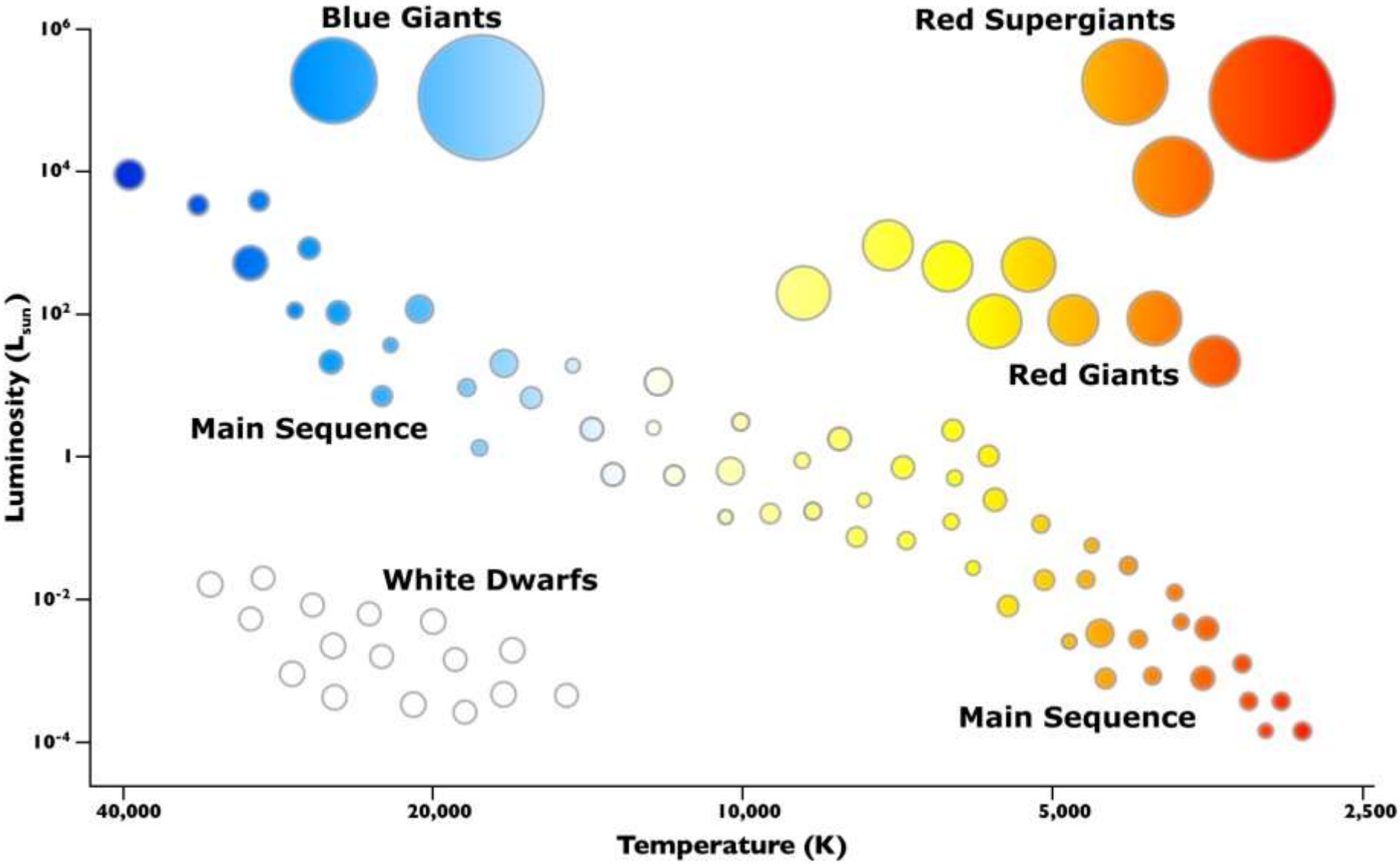
Hertzsprung-Russell Diagram



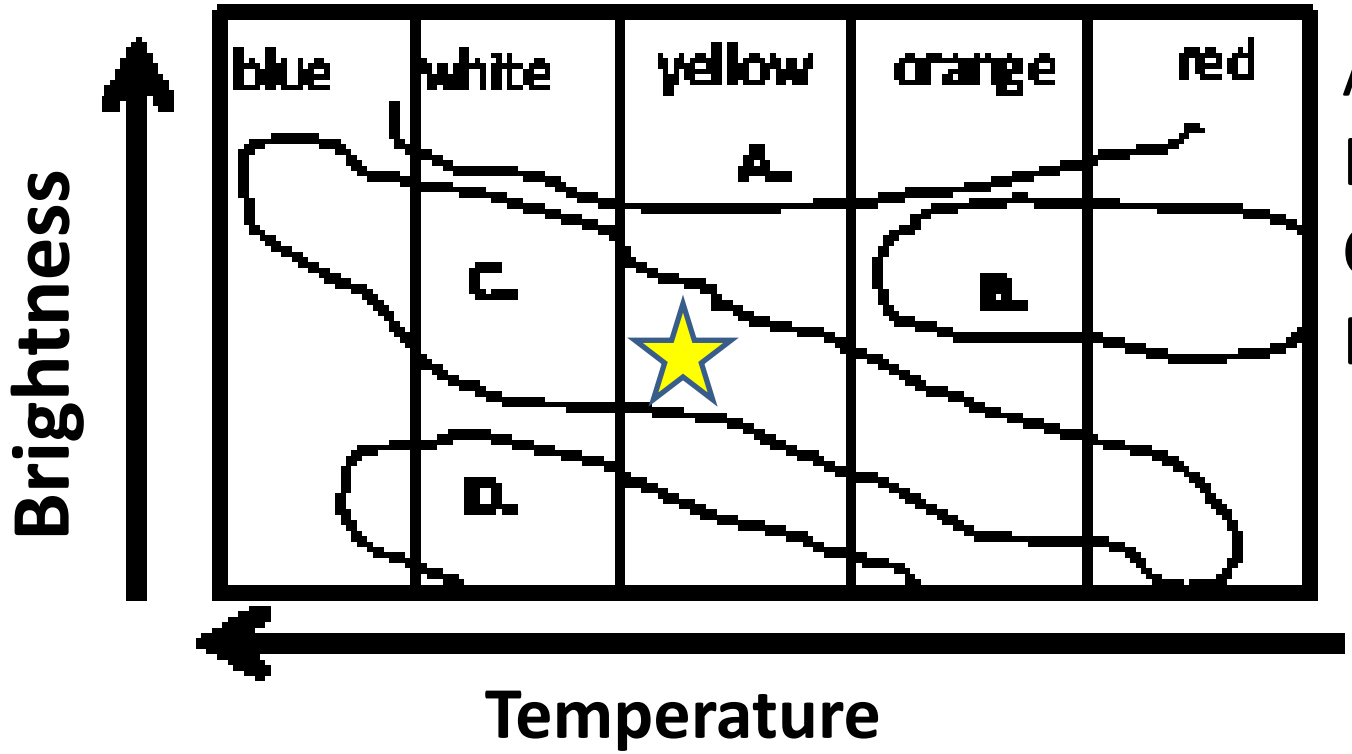
H-R Diagram

Hertzsprung-Russell Diagram

* Relates absolute magnitude and surface temperature of stars

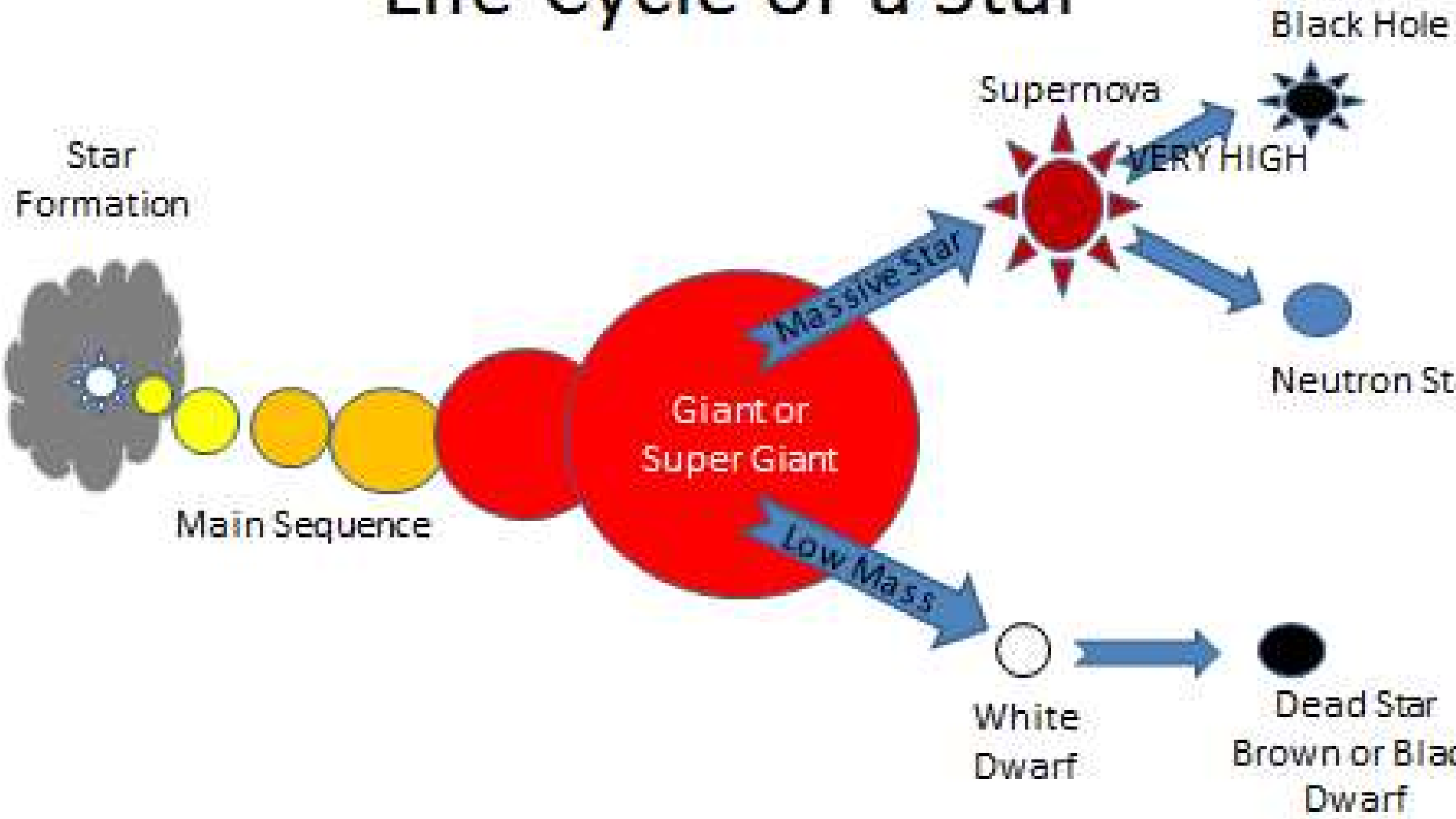

Blue Giants
Red Supergiants
Red Giants
Main Sequence
White Dwarfs
Main Sequence
Luminosity (L_{sun})
10^6
10^4
10^2
1
10^{-2}
10^{-4}
40,000
20,000
10,000
5,000
2,500
Temperature (K)

H-R Diagram



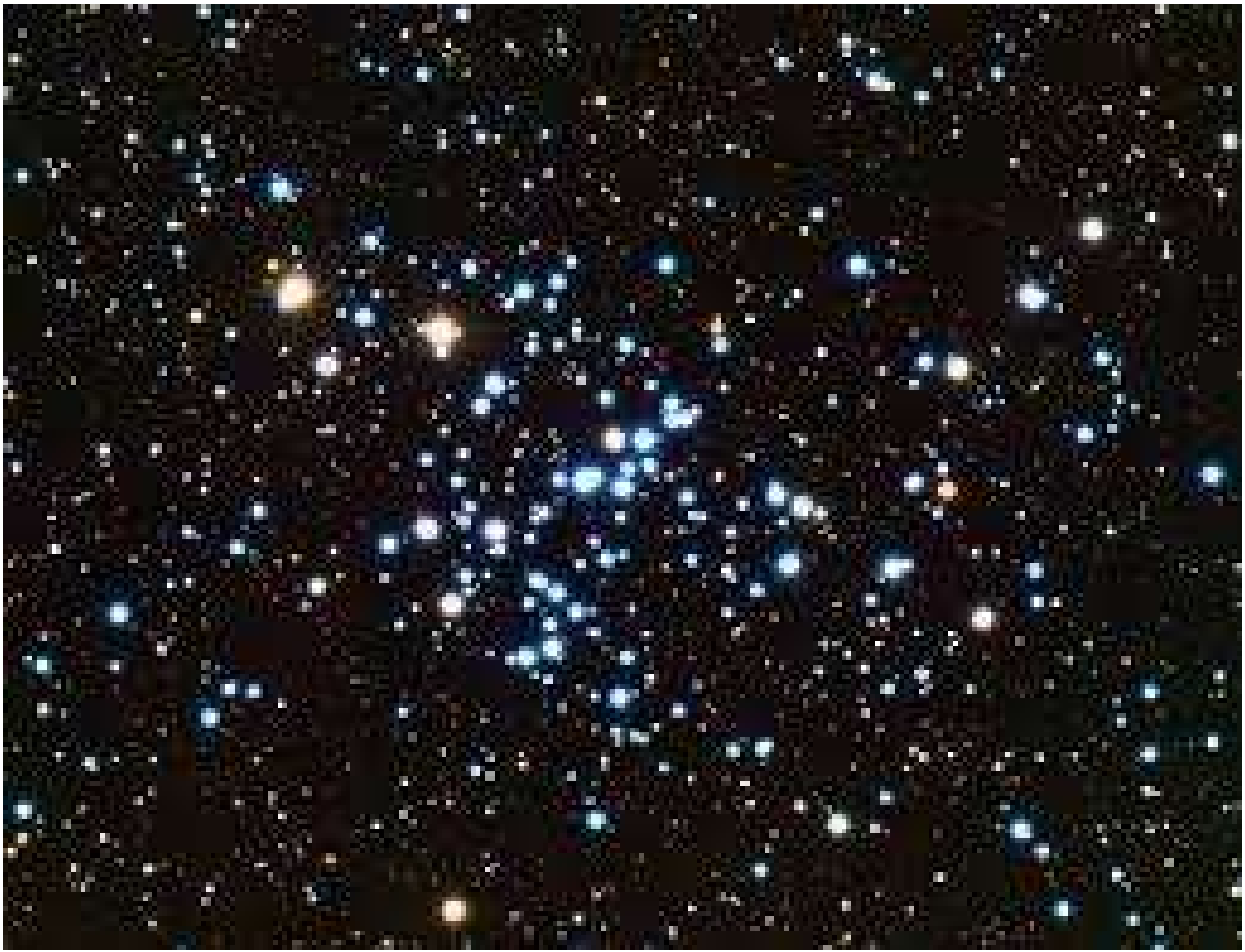
A. Supergiant
B. Giant
C. Main Sequence
D. White Dwarf

Life Cycle of a Star

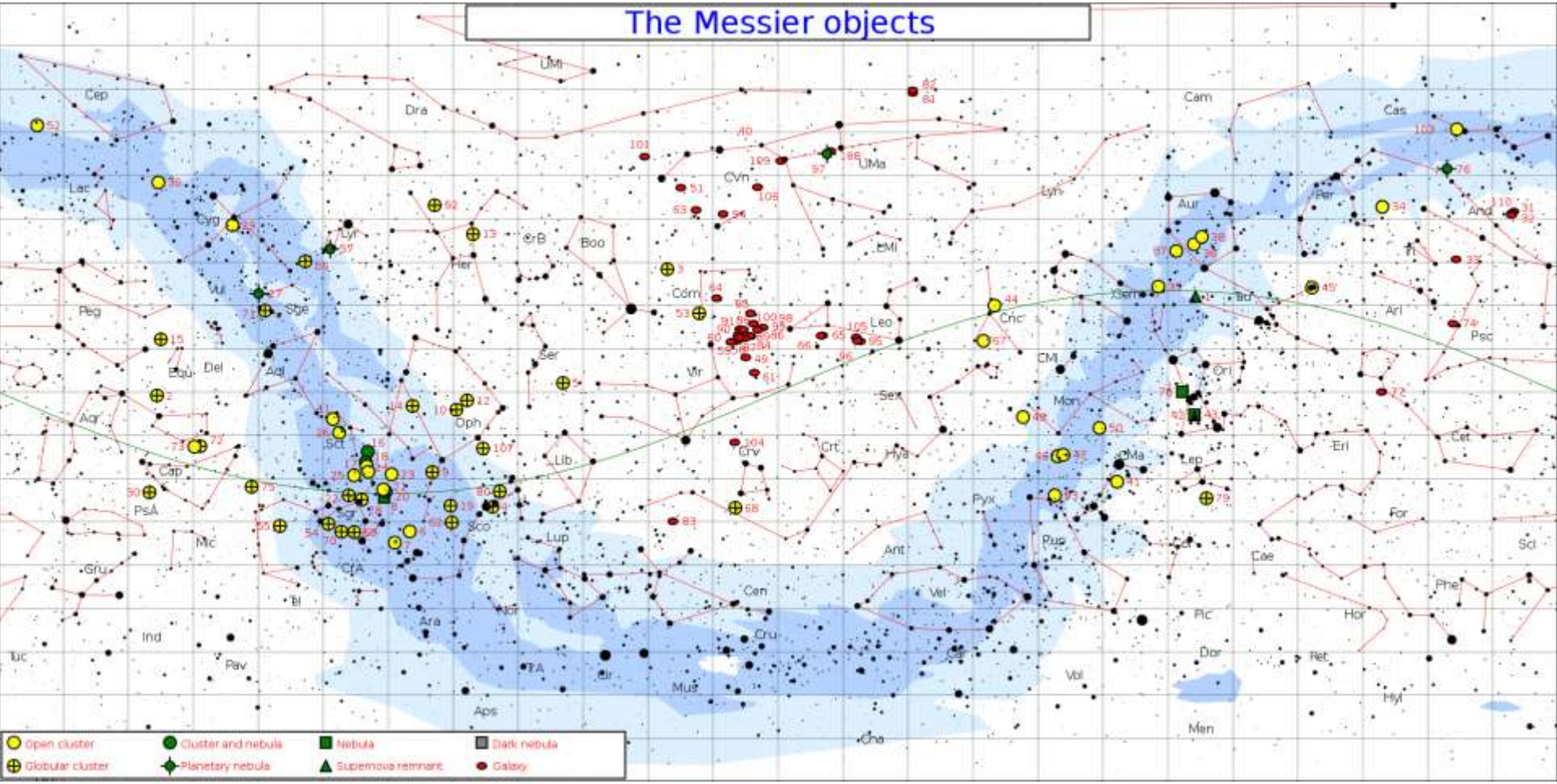


H-R Diagram H-R Diagram Animation

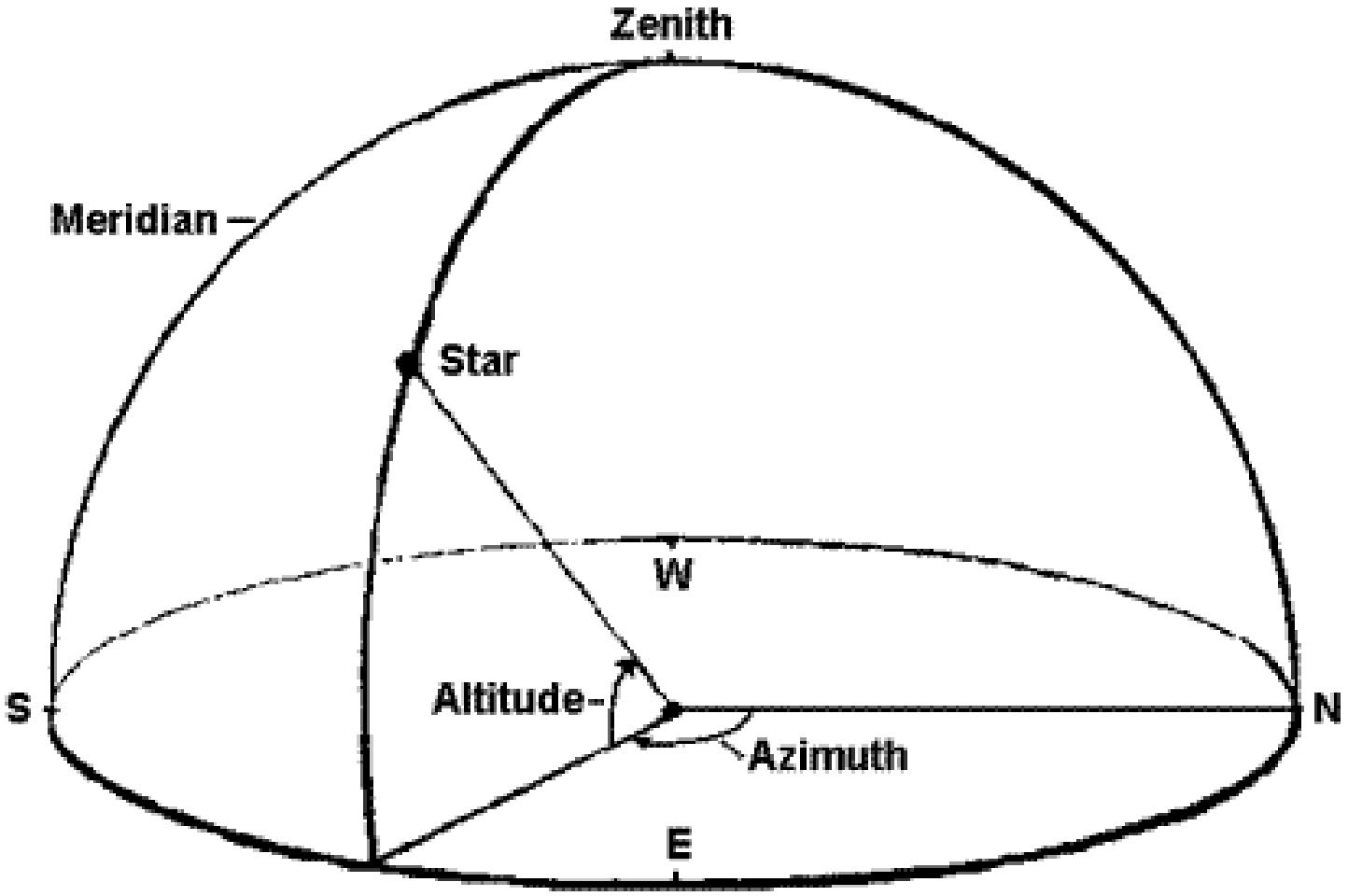
Location of Stars



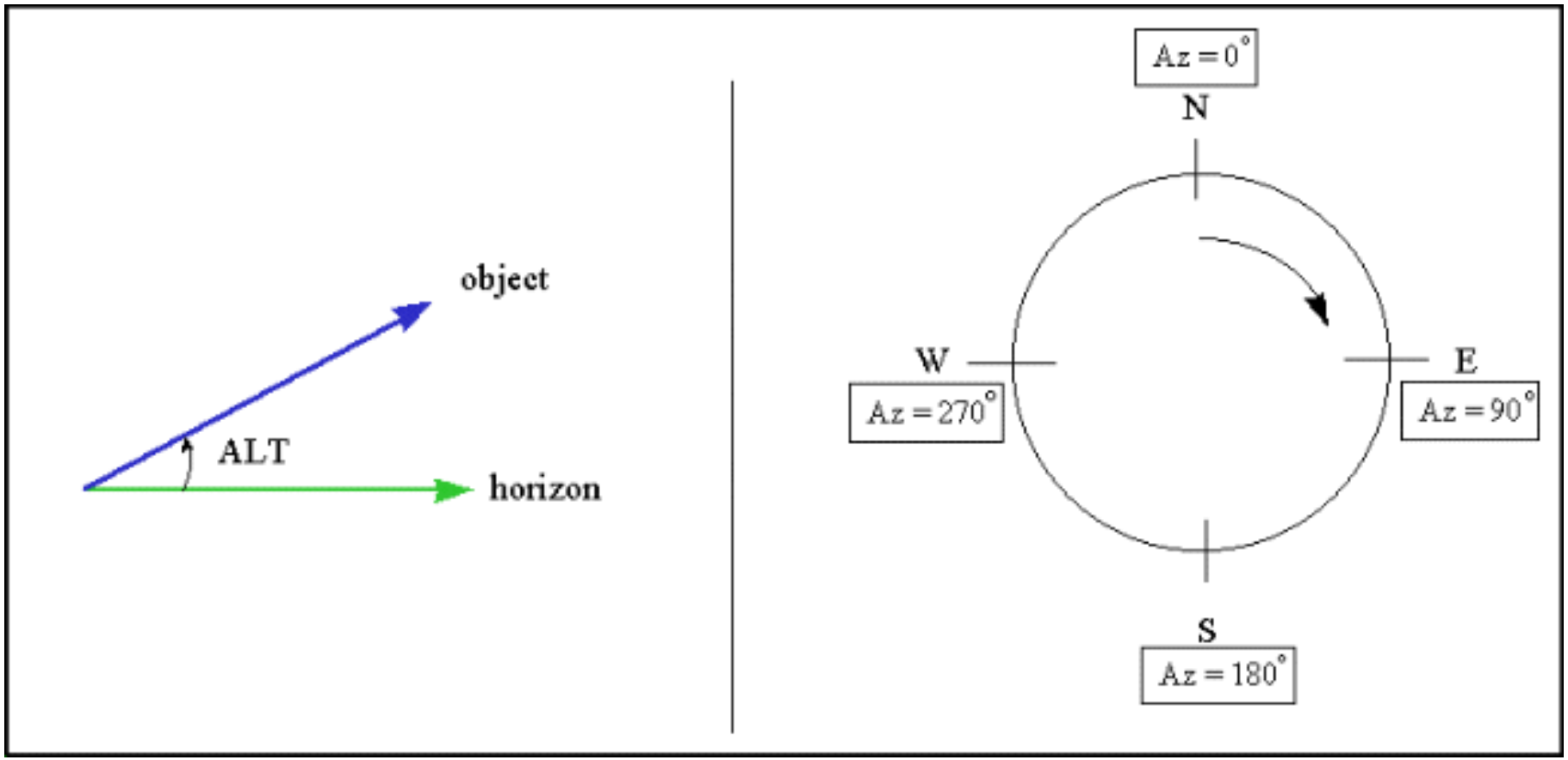
Location of Stars



Location of Stars



Location of Stars



Location of Stars

Altitude - angle (height) above horizon

Azimuth - angle (direction) from North

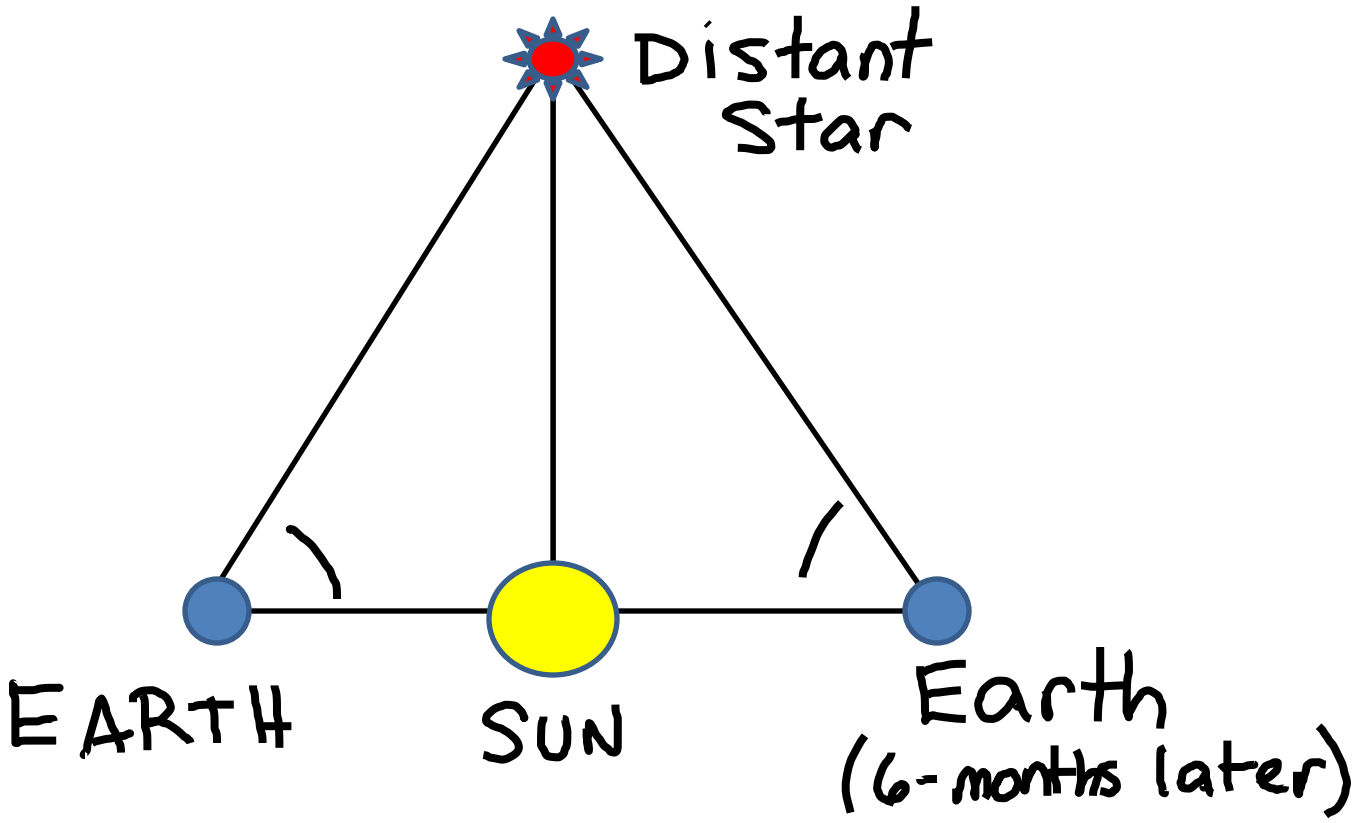
Star Distances

Parallax Method

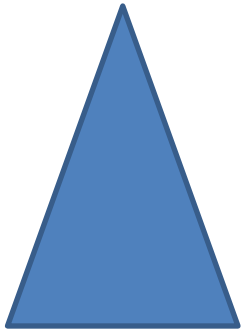
Using similar triangles to calculate distance

Star Distances

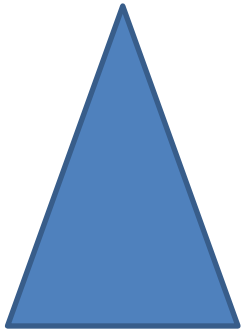
Parallax Method

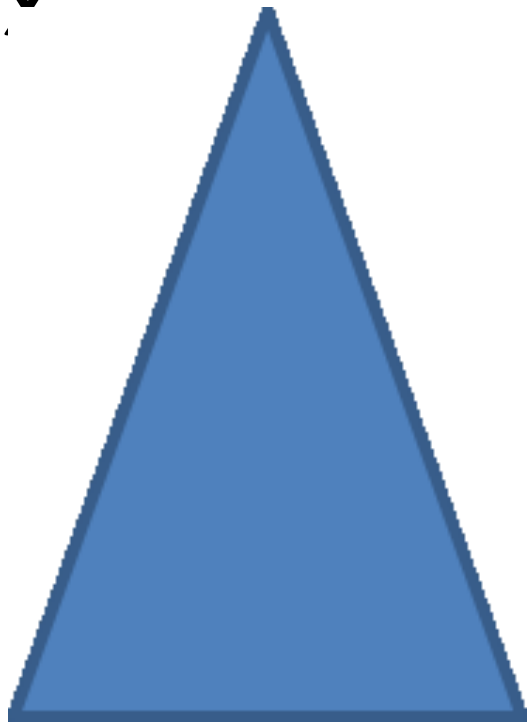


Parallax

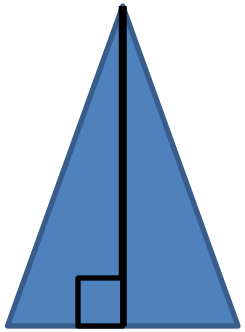


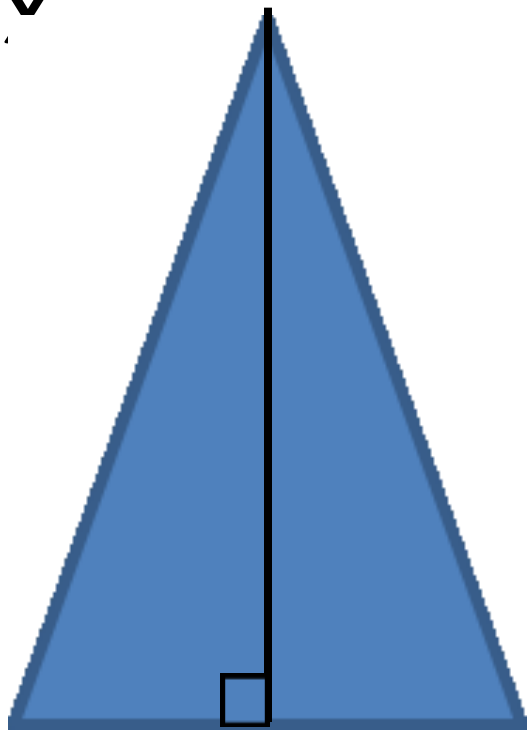
Parallax



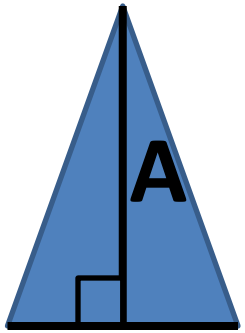


Parallax

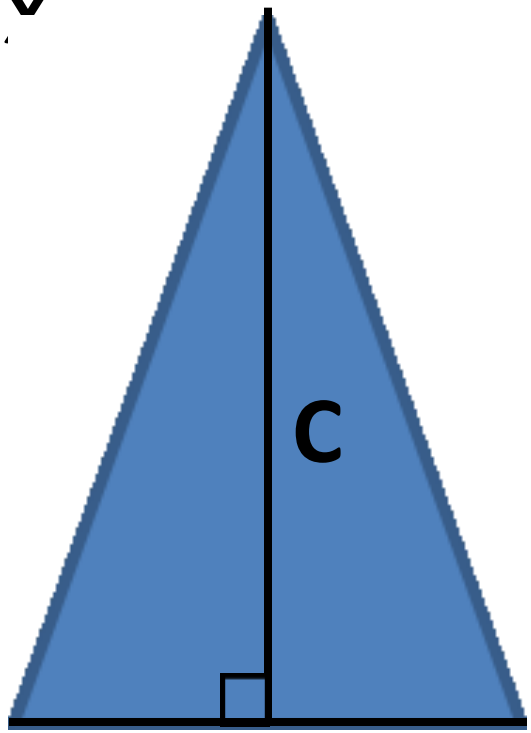




Parallax

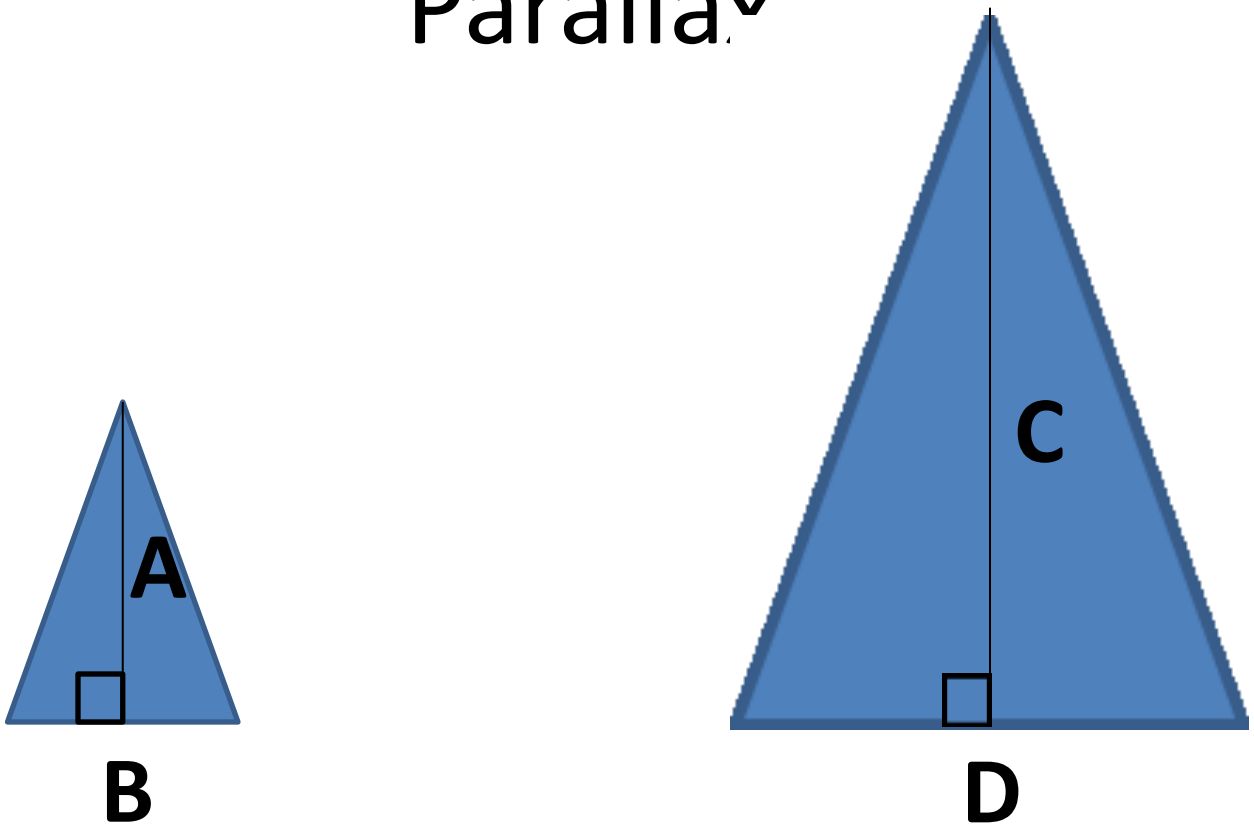


B



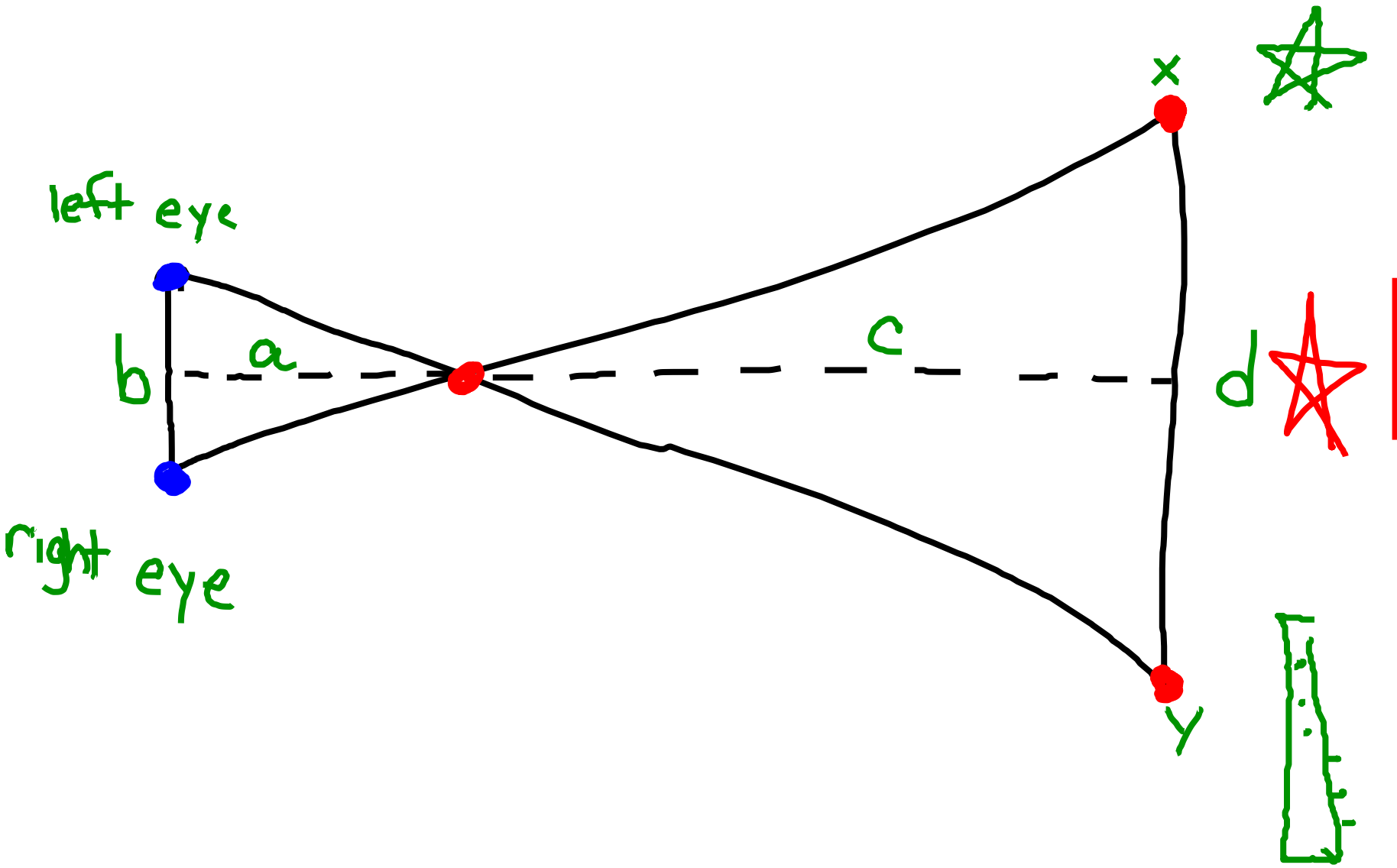
D

Parallax

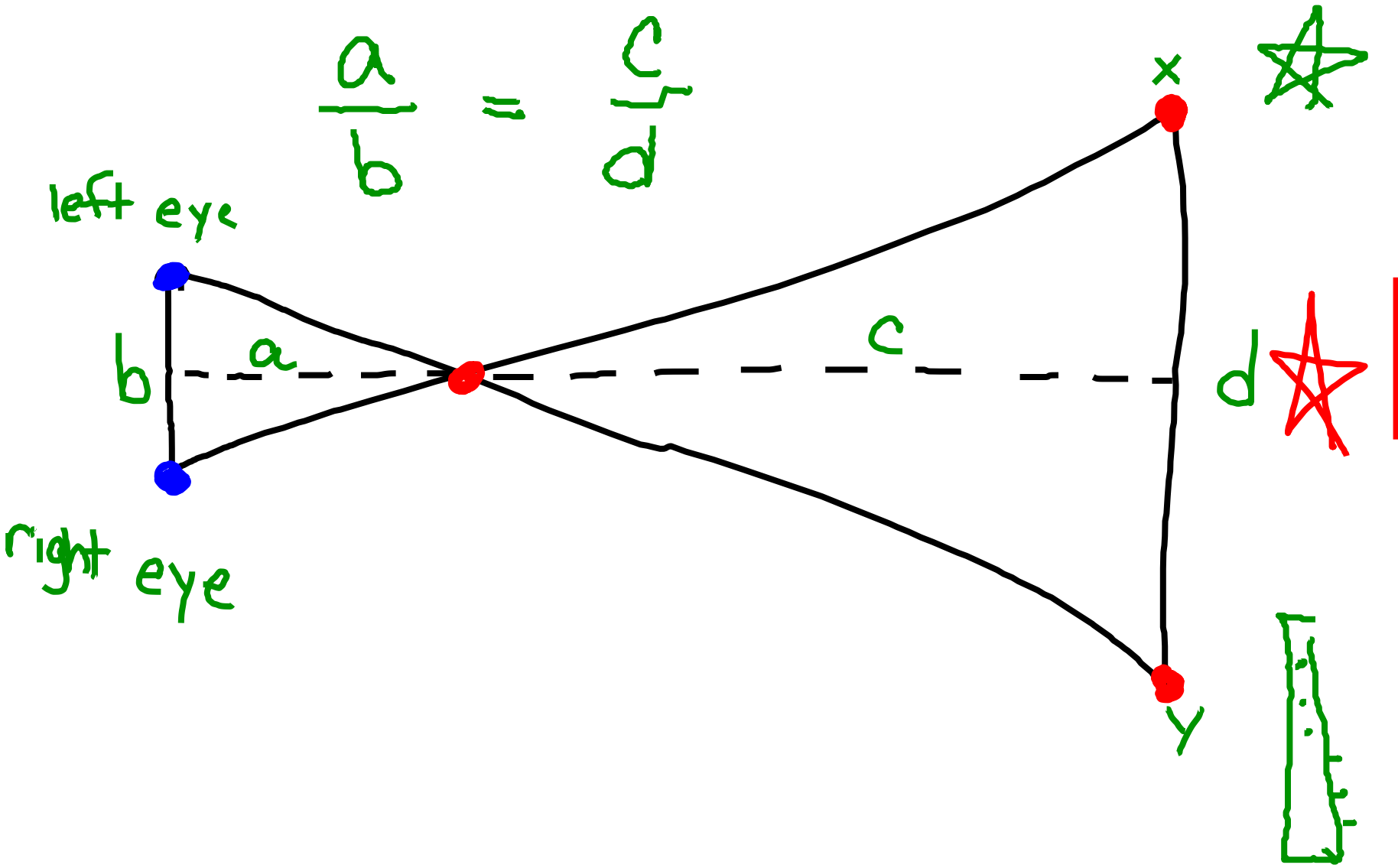


$$\frac{A}{B} = \frac{C}{D}$$

Parallax



Parallax



Star Distances Lab

Similar triangles:

$$\frac{a}{b} \approx \frac{c}{d}$$

a=

b=

c=

d=

Star Distances Lab

Similar triangles:

$$\frac{a}{b} \approx \frac{c}{d}$$

a= 0.3 m

b= 0.06 m

c= X

d= 2.2 m

Star Distances Lab

Similar triangles:

a= 0.3 m

b= 0.06 m

c= X

d= 2.2 m

$$\frac{a}{b} = \frac{c}{d}$$

$$\frac{0.3}{0.06} = \frac{x}{2.2}$$

Star Distances Lab

Similar triangles:

a= 0.3 m

b= 0.06 m

c= X

d= 2.2 m

$$\frac{a}{b} = \frac{c}{d}$$

$$\frac{0.3}{0.06} = \frac{x}{2.2}$$

$$0.06x = 0.66$$

Star Distances Lab

Similar triangles:

a= 0.3 m

b= 0.06 m

c= X

d= 2.2 m

$$\frac{a}{b} = \frac{c}{d}$$

$$\frac{0.3}{0.06} = \frac{x}{2.2}$$

$$\frac{0.06x}{0.06} = \frac{0.66}{0.06}$$

$$x = 11 \text{ m}$$