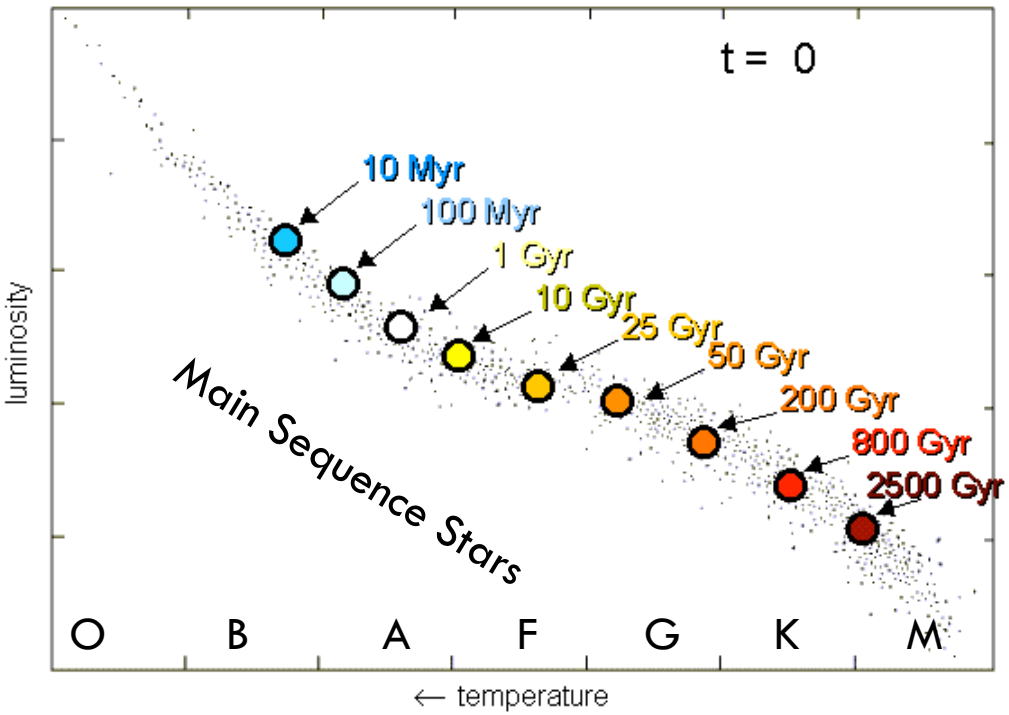
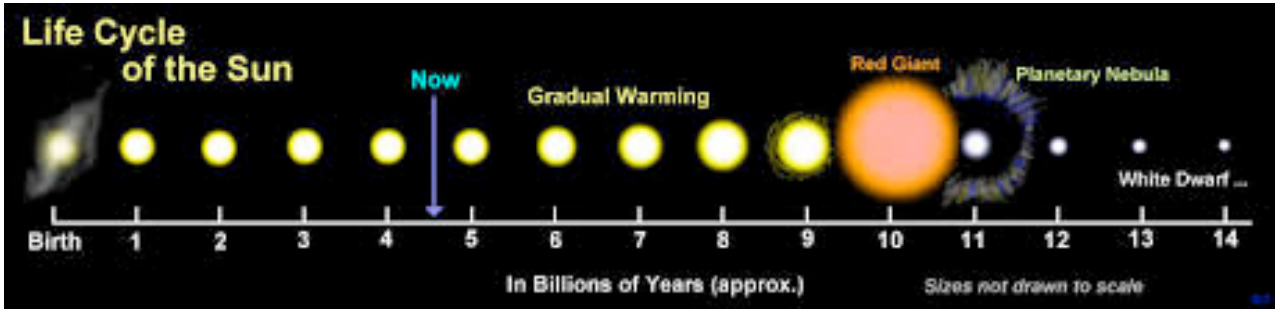
Gravity Day 7
(Death of Big Mass Stars)

How Long will the fuel last?
Mass/Gravity determine Star lifespan

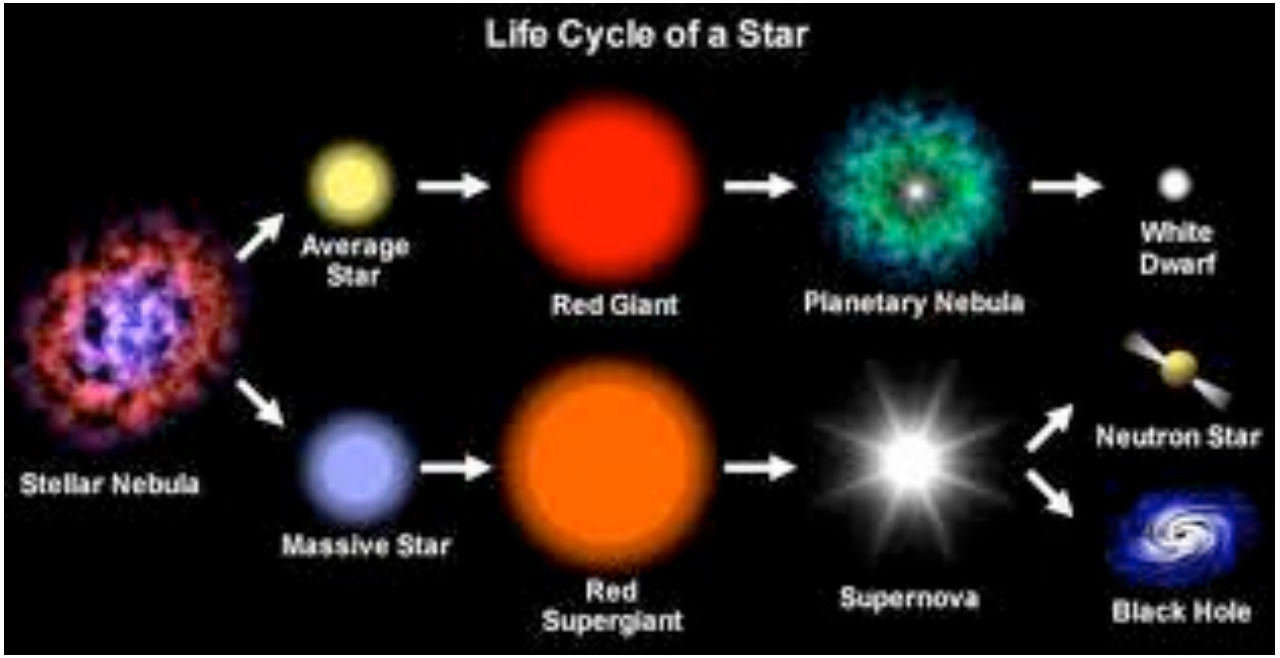
- Bigger nebula make bigger main sequence stars
- **Big Mass** = >8x sun's mass
  - blue, hot, bright
  - use fuel quickly; short lives
  - Millions of years
- **Small Mass** = <8x sun's mass
  - red, 'cool', dim
  - Use fuel slowly; long lives
  - Billions-Trillions of years
- **Our sun** =
  G class main sequence, orange & small



Life stages…it's all about mass!



Our Sun

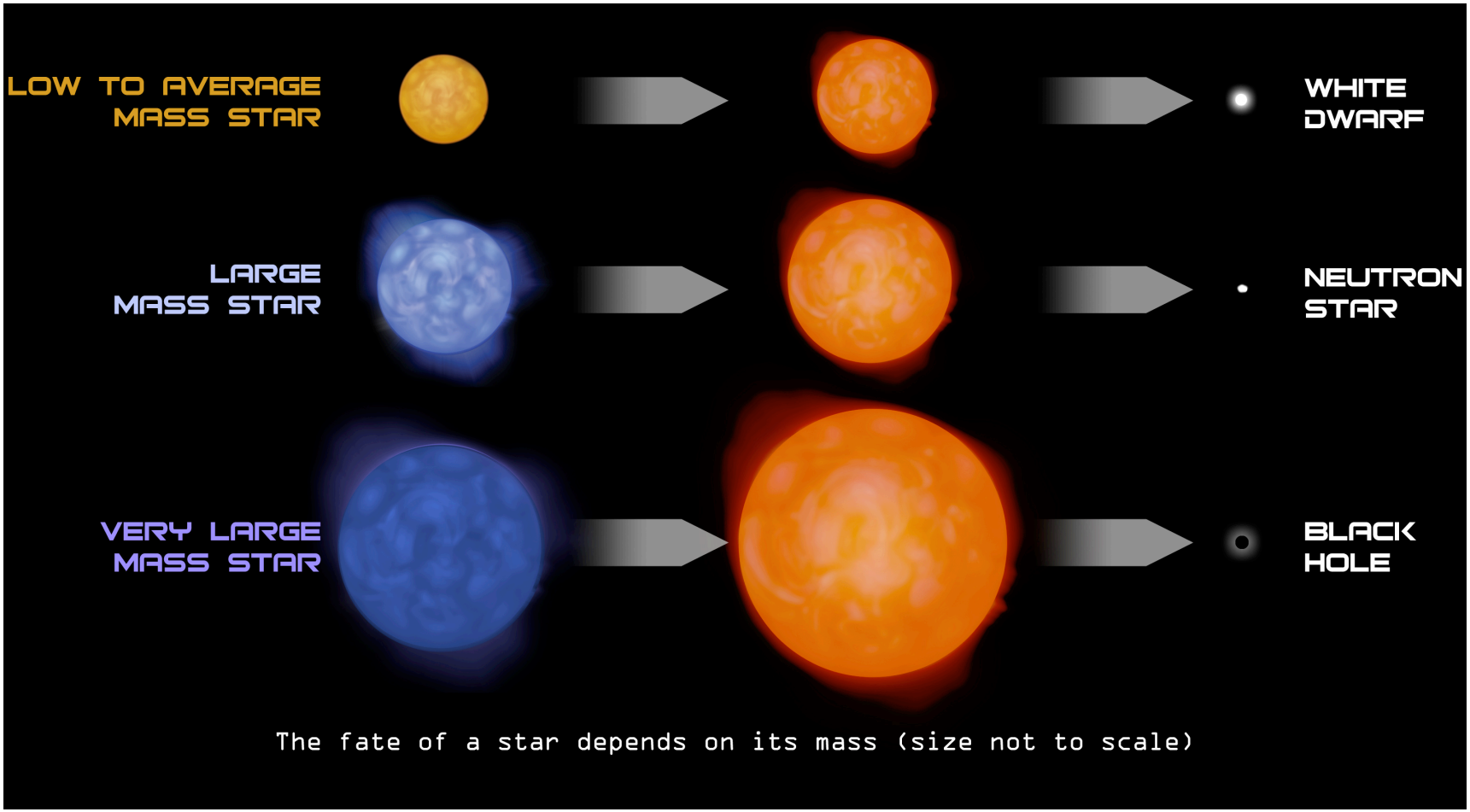


Small Mass

Big Mass

Biggest Mass

Bigger Main Sequence Stars ….make Bigger Red Giants



Supernova

- = Big mass star's outer layers explode during core's contraction as it fuses iron (Fe)
- Exploded atoms make a planetary nebula
- big stars have enough gravity to fuse up to iron
- Iron fusion absorbs heat & cools star - causing rapid core collapse
- Supernova energy = all energy of our sun's lifetime

Fusion of Elements – BBC Brian Cox

Supernova found June 7, 2011 SN2011dh

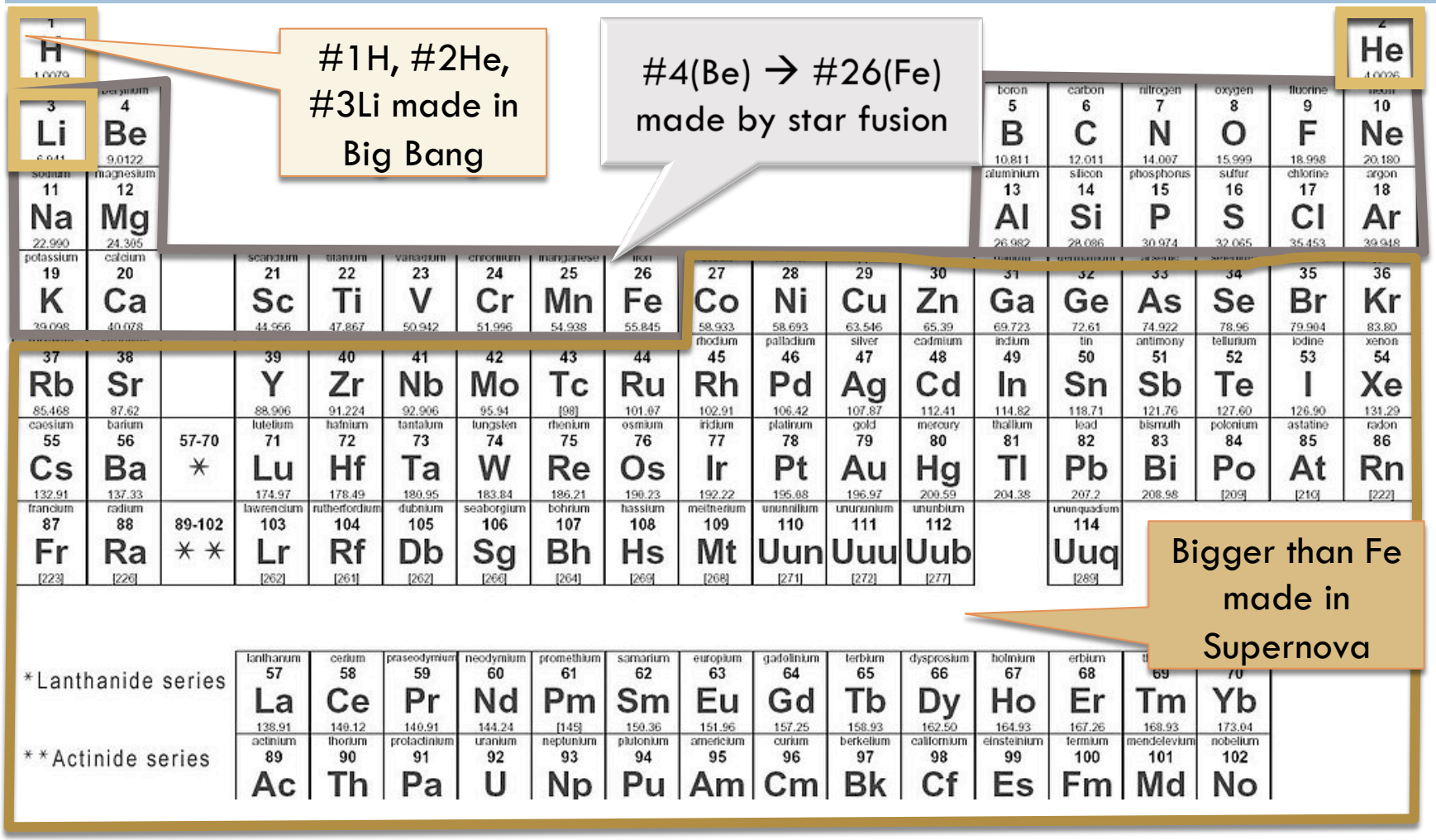
BEFORE

AFTER

Stars MAKE atoms!

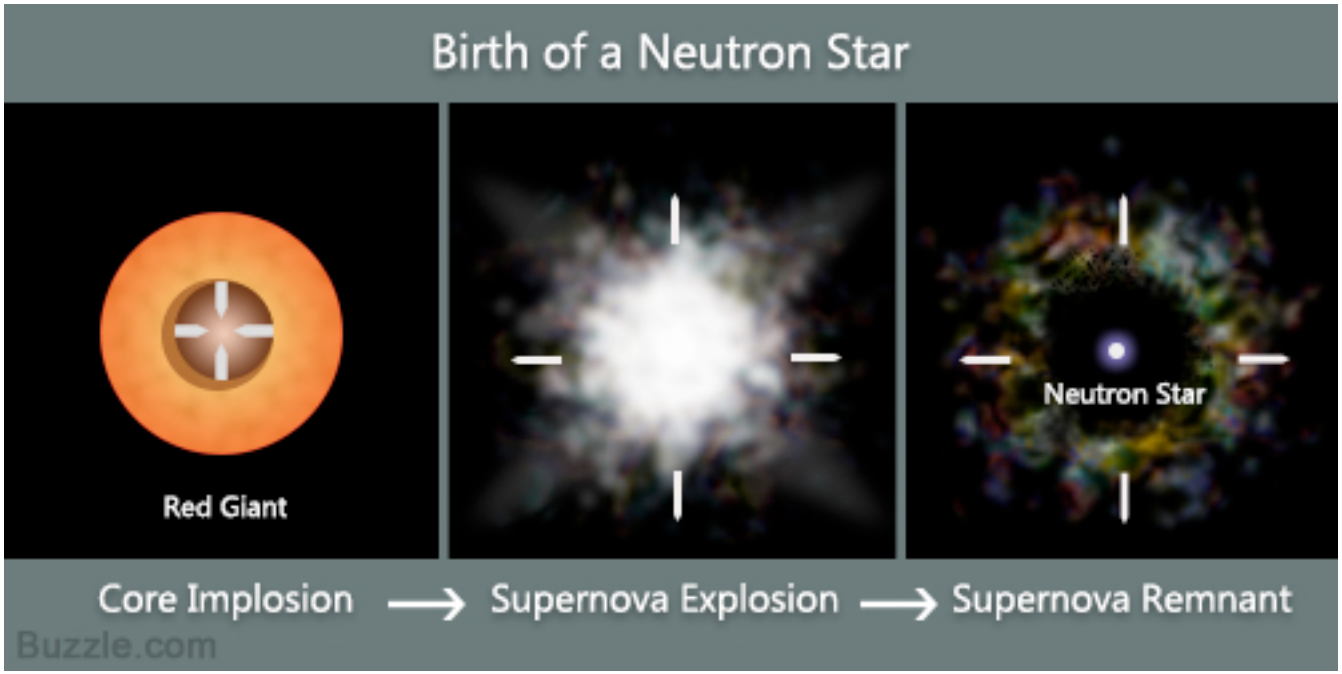
- Atoms #1-Hydrogen, #2-Helium & -#3-Lithium formed during the Big Bang
- Atoms #4 Beryllium through #26 Iron formed by star fusion
- Atoms above Iron (Fe) formed in Supernova as atoms collide/fuse during explosion

All elements beyond Li from stars



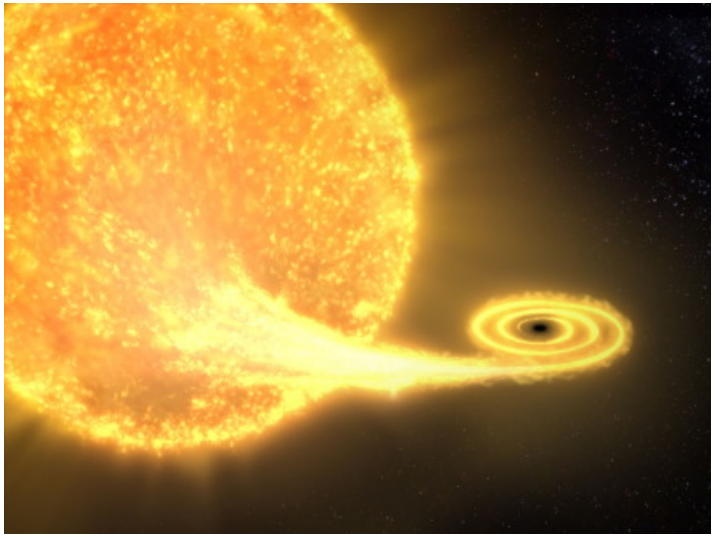
Death of Big Stars (9-20x solar masses)

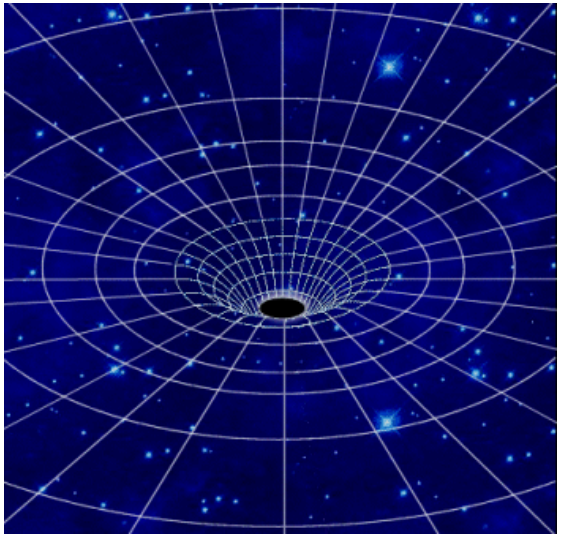
- After supernova, no fusion to hold up gravity
- Neutron Star = dead core of big mass star crushed by gravity until atoms form neutrons
- Extremely dense- size of a city

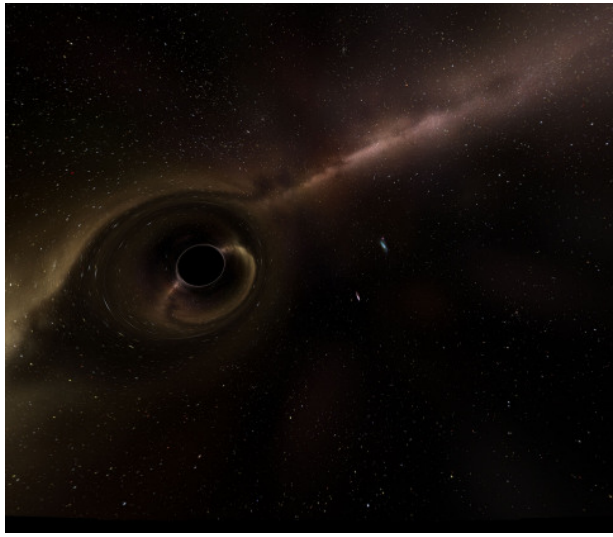


Death of most massive stars (20+ solar mass)

- After supernova, no fusion to hold up gravity
- Black Hole= dead core of biggest mass stars crushed by gravity down to a point (singularity)
- Gravity so strong, light can't escape

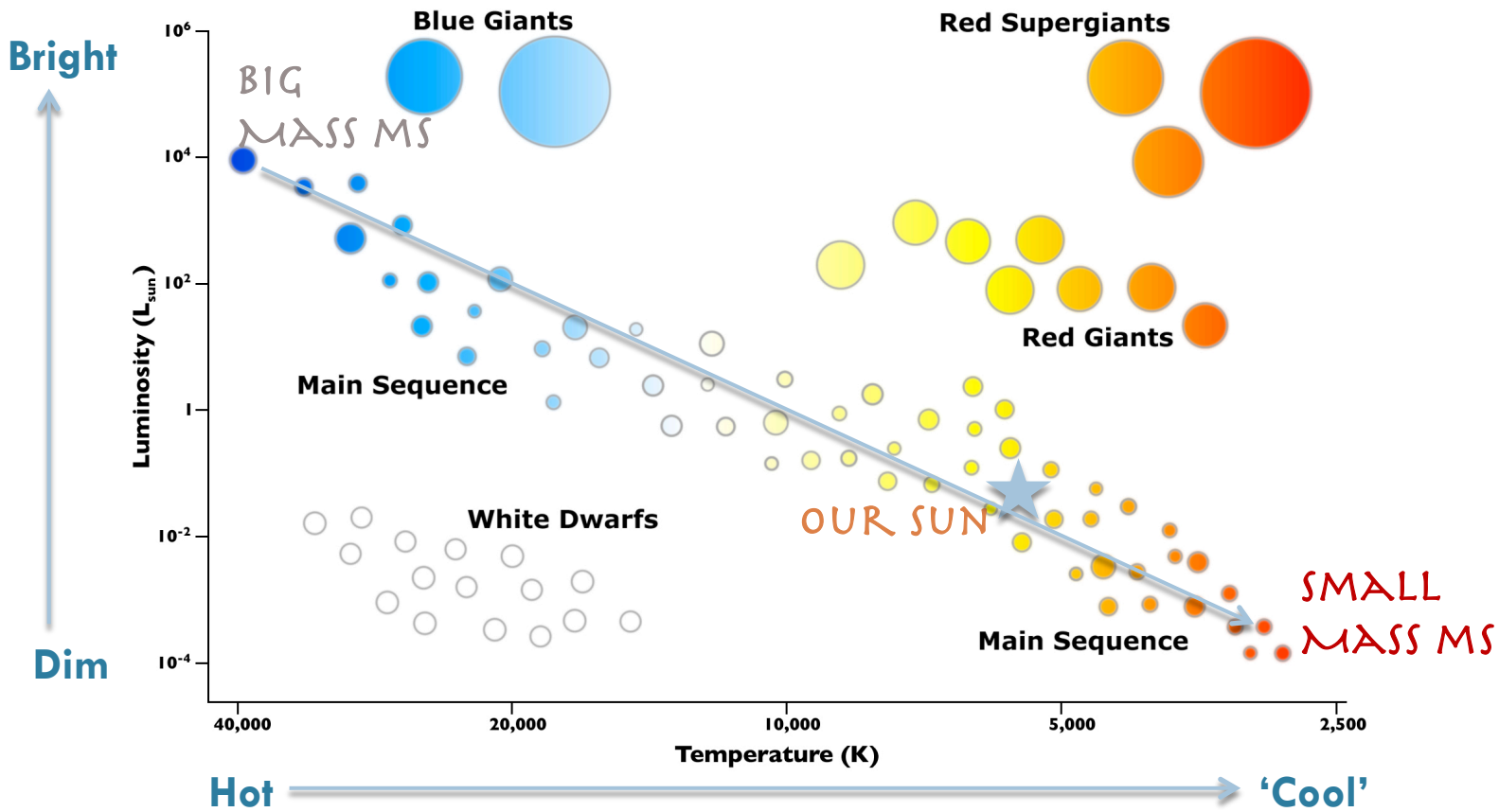






Vsauce- Travel into a Black Hole!

HR Diagram-graph of temp vs luminosity that reveals star life cycle stages.



Video-Full Lifespan of Star 5min

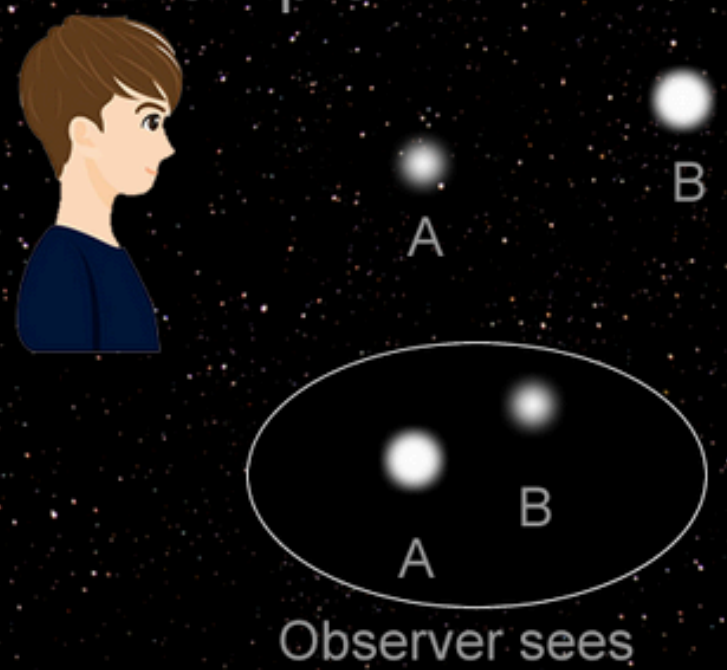
Apparent and Absolute Magnitude

An Analogy:

Cars A and B are identical. A's headlights appear brighter because it is closer.

Cars A and B are at the same distance. A's headlights appear brighter because they are intrinsically brighter.

An Example:



An observer sees two stars. Star A appears brighter than Star B because it is closer to her.

Absolute magnitude is the brightness a star would have at a distance of 10 parsecs. If stars A and B were both 10 parsecs away from the observer, Star B would appear brighter than star A.