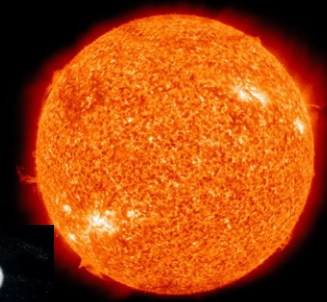
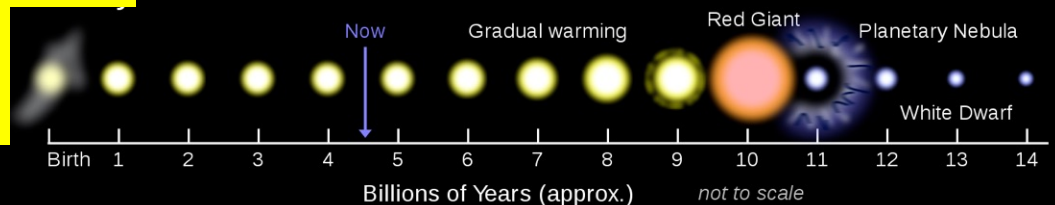
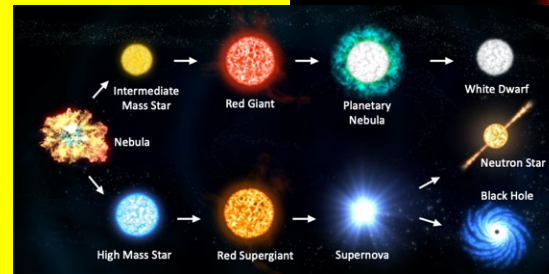


# The Life and Death of Stars

- Protostars
- Fusion
- Low-Mass Stars
- Intermediate Mass Stars
- Life Cycle Of Our Sun
- High-Mass Stars
- Neutron Stars
- Black Holes
- H-R Diagrams



# Preview File

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- Some slides appear blank because they have been removed
- Student versions have portions of the text removed which is given in the teacher version and appear as \_\_\_\_\_ which the students are to fill in
- Other slides may have ..... on them, this represents writing that has been removed on this sample

**The paid full version of your resource includes both Google Slides and PowerPoint and is Google Classroom Ready**



# Stars

When you look at the sky at night, all the tiny points of light you see are stars. Each star is a massive, burning ball of gas like our Sun. And like our Sun, each one was created and will eventually, die. In fact, **due to the speed of light, most of the stars you see in the sky are already gone.**



# Stars

1



- All stars begin their lives as a nebula, which are huge clouds of dust and gases **(mainly hydrogen and helium)**
- These dust clouds bump into each other and combine
- As the clouds get bigger, their gravitational pull gets stronger and they attract more particles
- **Once enough particles are together a protostar forms**
- **Protostars become stars and fusion begins**



# Star – Life Cycle

- Fusion - combining two hydrogen atoms to form a helium atom and huge amounts of energy
- Eventually that fuel runs out and the star becomes either a Brown, Red or White Dwarf, A Neutron Star or a Black hole
- **What the Star becomes depends on its initial mass**

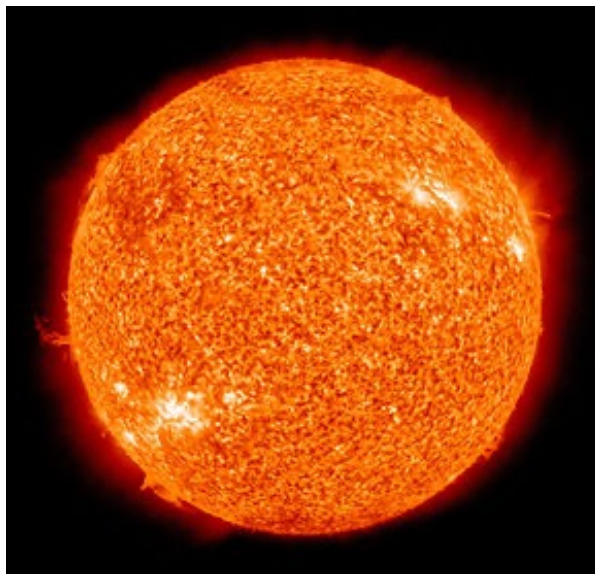
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# Low-Mass Stars

- Brown and Red Dwarfs – less mass than our Sun (between 8-40% our Sun's mass)
- Use fuel slowly - Last for 100 billion years
- Low mass stars simply die by burning up their fuel to leave behind white dwarfs (about the size of the Earth) which themselves cool and turn into black dwarfs

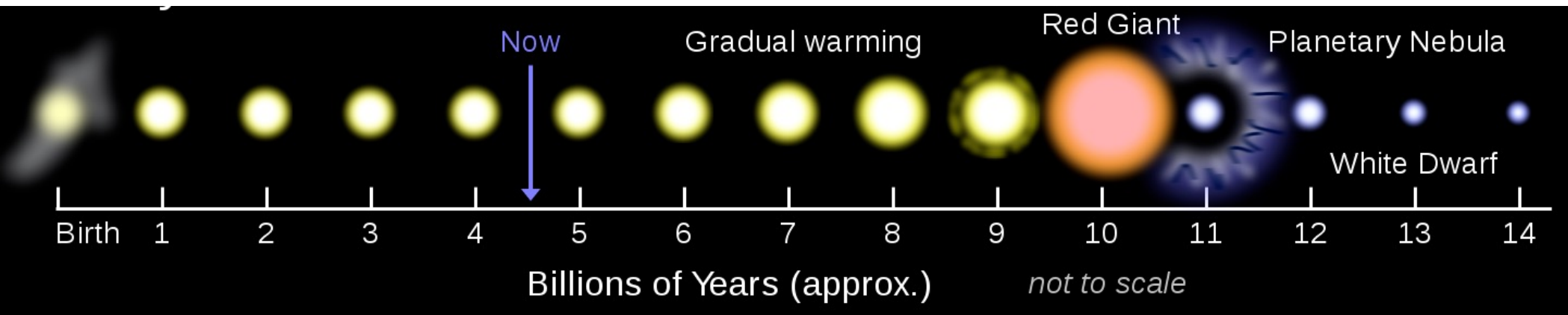
# Intermediate-Mass Stars

- Like our Sun (40-800% the mass)
- Last about 10 billion years
- Core collapses when hydrogen is used up which causes their outer layer to expand
  - Turns into a Red Giant



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# Life Cycle Of Our Sun

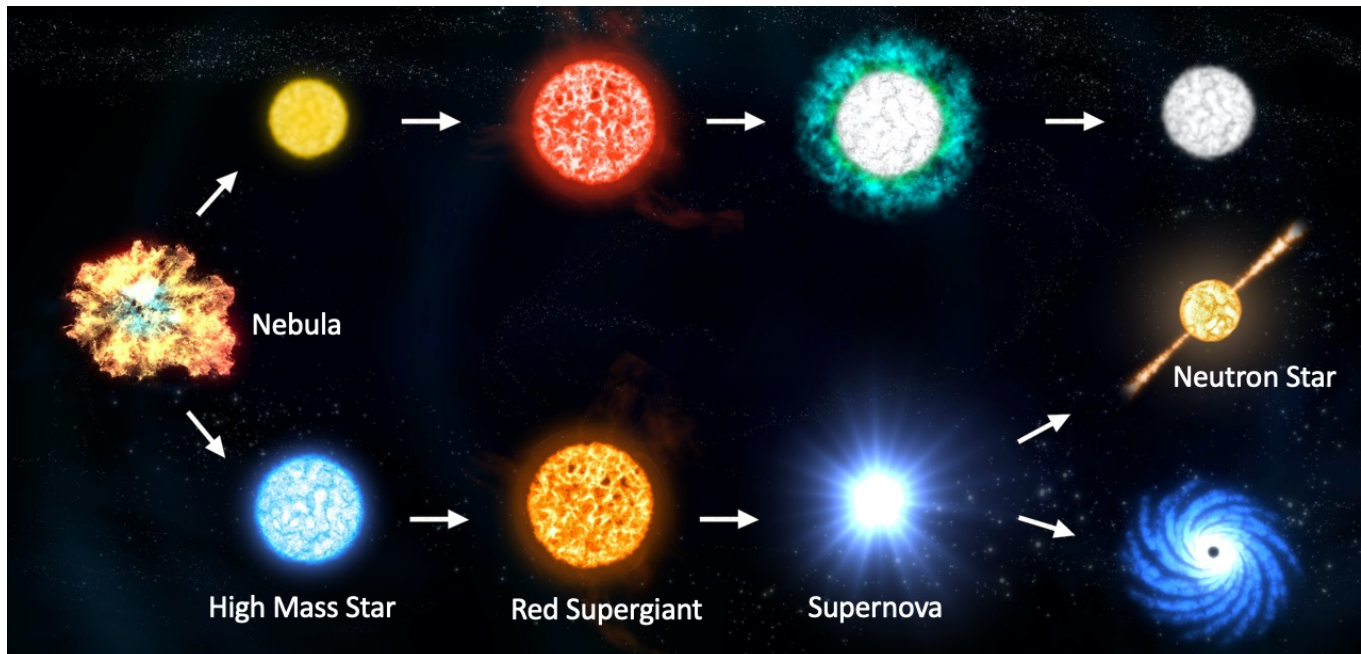


- Our sun is in the main sequence where it fuses hydrogens to make Helium
- In about 4.5 – 5 billion years, it will leave the main sequence and become a Red Giant
- In about 10 billion years, it will die out



# High-Mass Stars

- 8-25X larger than our Sun
- Consume their fuel very fast – die more quickly and more violently
- Star explodes creating a Supernova followed by a Neutron Star



# Neutron Stars

- Neutron Stars are made of neutrons because their protons and electrons were smashed together when the star collapsed
- They are incredibly dense (A LOT of matter stuffed into a very small area)
  - i.e. Two times the mass of our Sun in a sphere 19 km in diameter!
  - A sugar cube worth of neutron star material would weigh 400 billion kg!



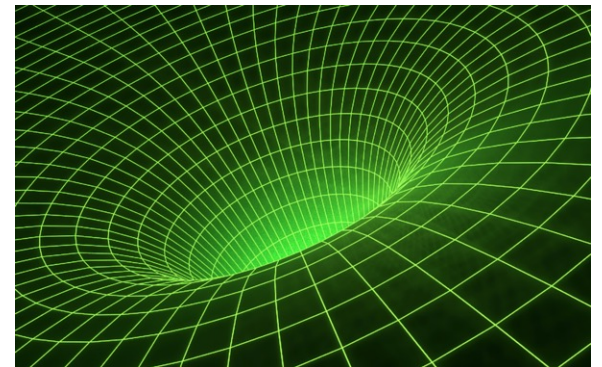
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# Black Holes

- Can occur with stars whose masses are more than 25X of our Sun
- A black hole is a region of spacetime that has a gravitational acceleration so large that light can't even escape
- It's created from the remains of a massive supernova explosion

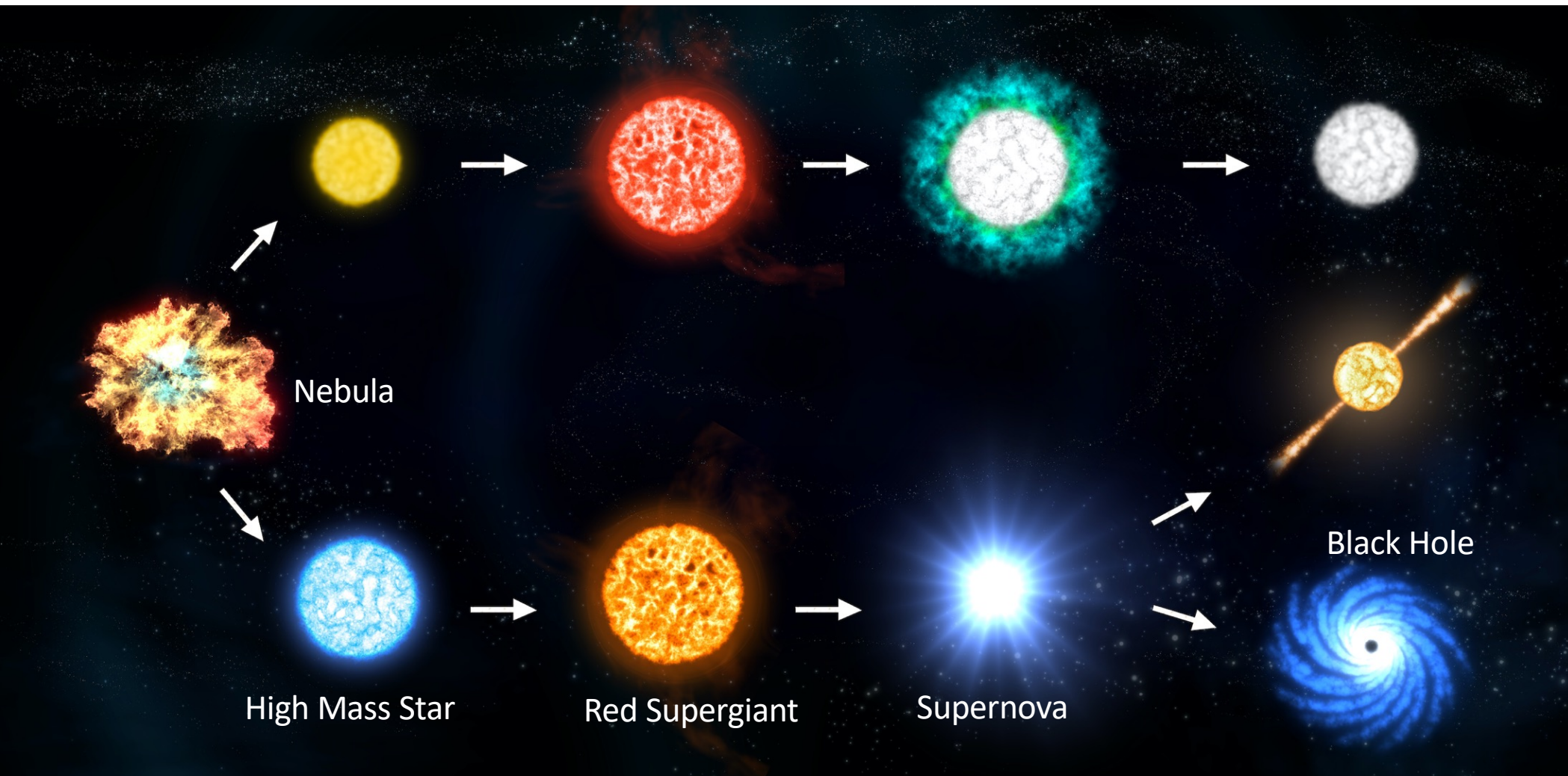


Messier 87 taken on April 11, 2018. The first direct visual evidence of the supermassive black hole



The warping of spacetime due to an immense gravitational force

# Star Life Cycle



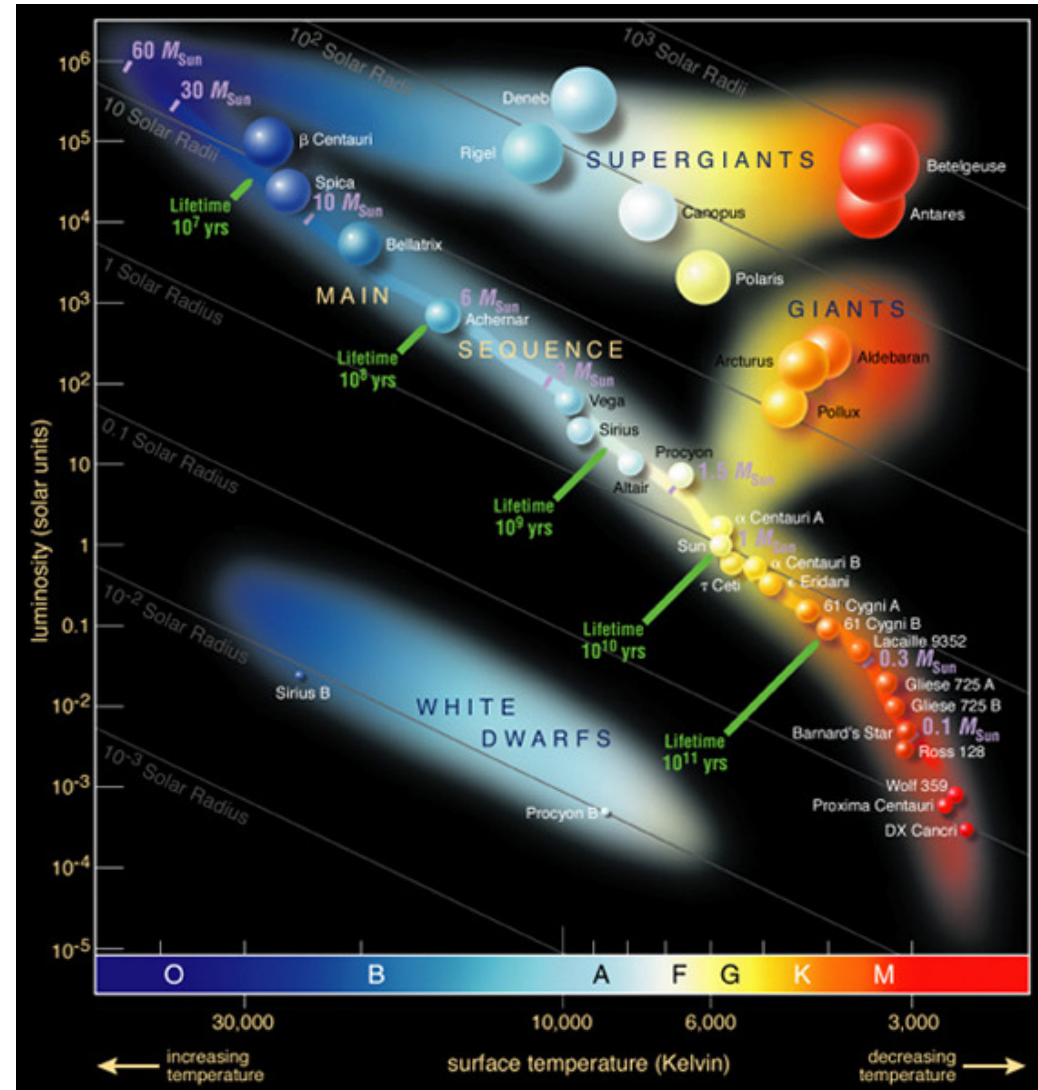
# Black Holes

- We cannot “see” a Black Hole, we can only detect the gravitational effects created by one
- Their gravity is so strong that they can swallow up surrounding planets, stars and light



# H-R Diagrams

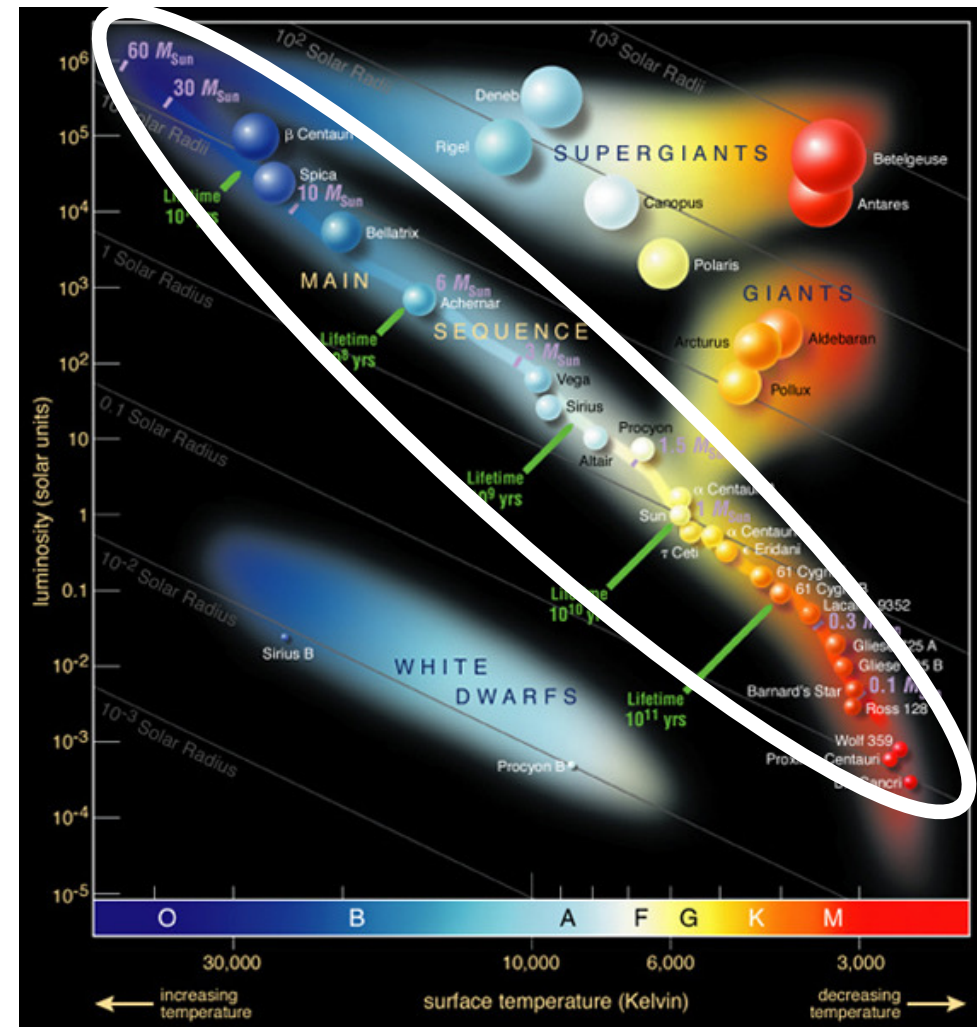
Stars can be arranged on a chart based on their luminosity and temperature using a Hertzsprung-Russell (H-R) diagram



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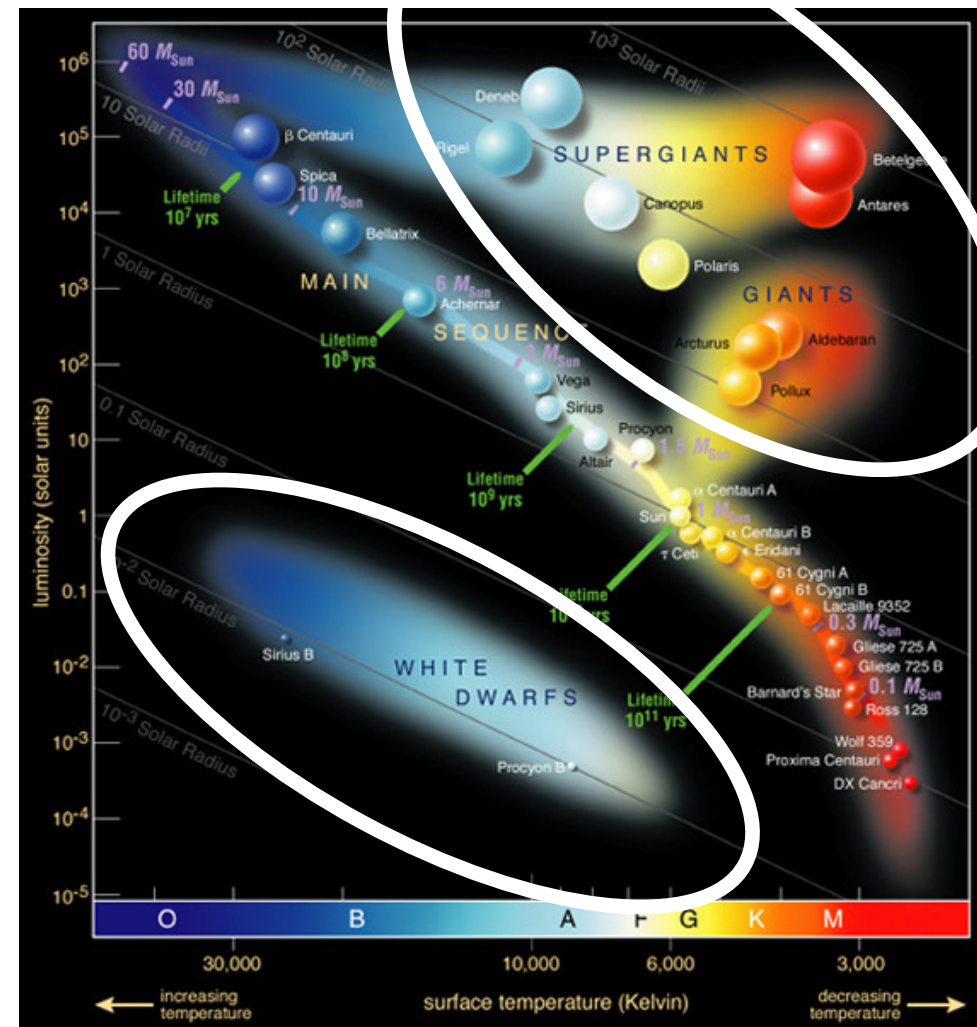
# H-R Diagrams

- About 90% of stars are located on the Main Sequence
- Main Sequence stars form helium from hydrogen atoms in their cores



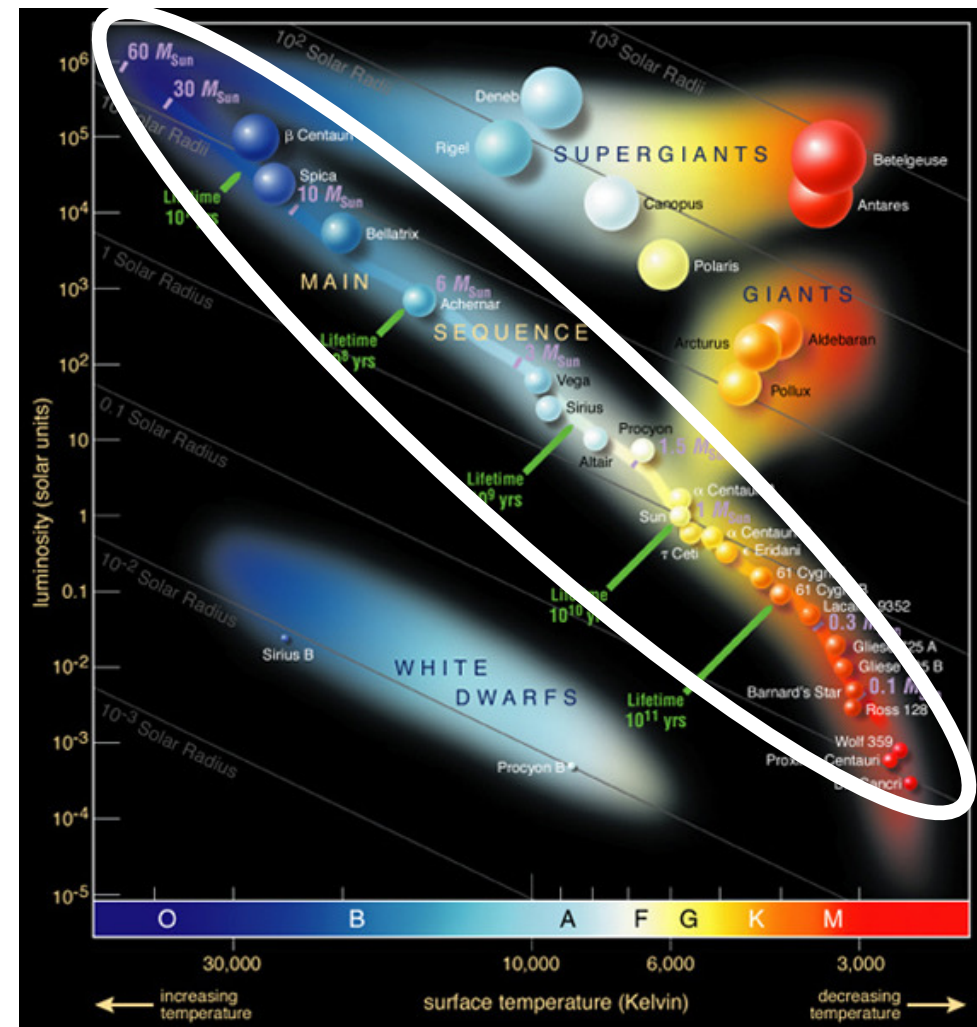
# H-R Diagrams

- Once the star stops fusing helium from hydrogen atoms in their cores, they leave the main sequence
- When they leave the Main Sequence they will form Giants, Supergiants, and White Dwarfs



# H-R Diagrams

- How long a star stays on the Main Sequence depends on size
- Larger stars burn their fuel faster and therefore, spend less time on the Main Sequence compared with lower mass stars



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