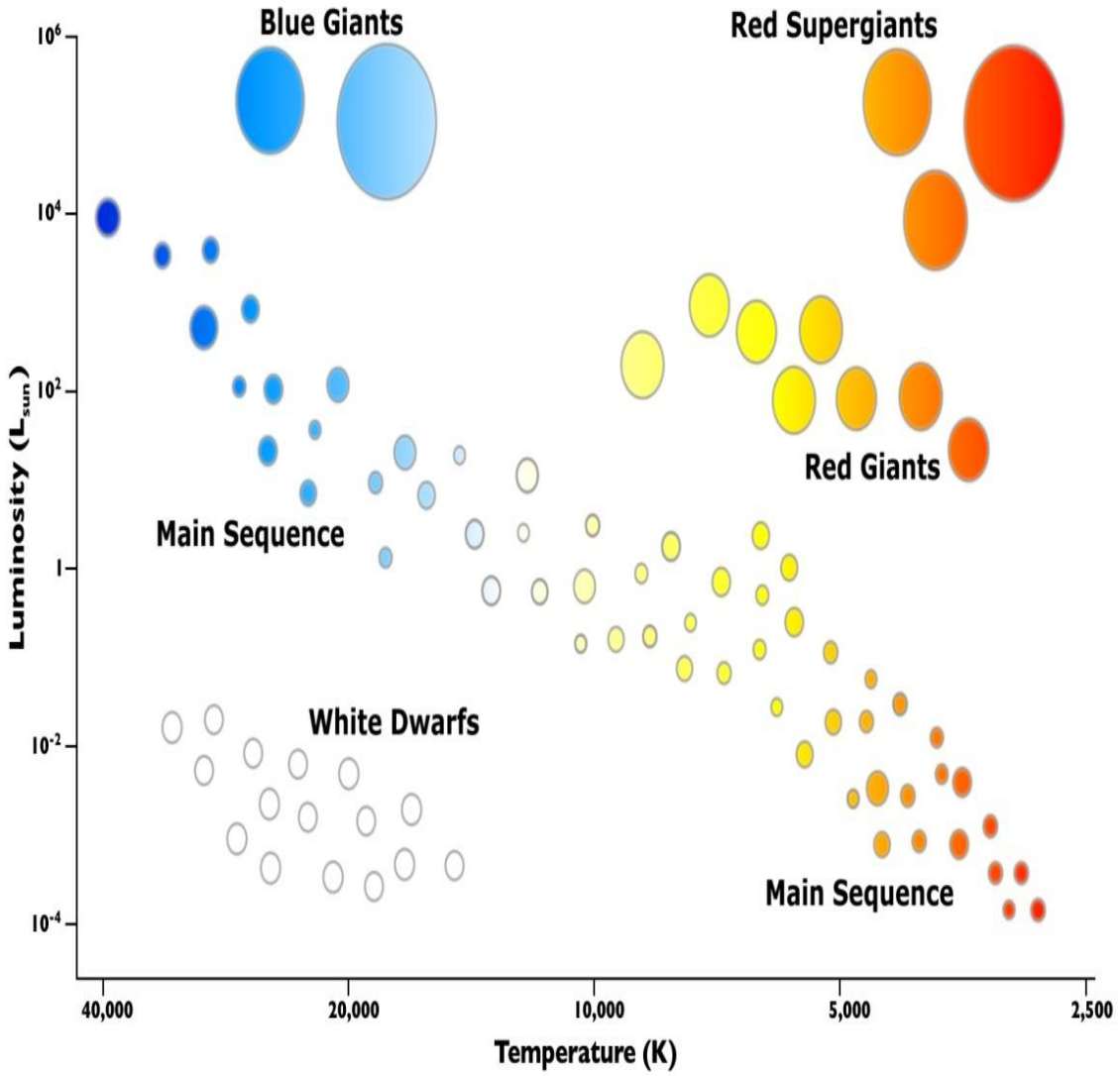
The H-R Diagram:

The Hertzsprung-Russell diagram named after Ejnar Hertzsprung and Henry Russell is a graph which astronomers use to help us understand stars. Across the bottom we plot the stars' temperature and down the side we plot the stars' absolute magnitude. By charting stars this way we begin to see a pattern.



Star Size:

A star's temperature and color depend directly on how big the star is. The bigger a star is the hotter it will be. This is because the stronger gravity of larger stars causes them to burn their fuel more quickly raising the star's temperature.

How can gravity make a star burn its fuel faster?

The stronger an object's gravity is, the more power it has to pull its mass inward. This causes the core to be very compact and creates a lot of extra pressure. This extra pressure builds up, raising the temperature of the core. The hotter the core gets, the more of its hydrogen fuel it will burn.

Star Life:

Because large stars burn their fuel quicker than smaller stars, they run out of fuel sooner. This means that large stars do not live as long as small stars. In other words, the smaller a star is, the longer it will live. Our Sun will live about 10 billion years. It is already 5 billion years old, meaning it will live another 5 billion years. Some very large O stars only live a few hundred thousand years, while the very small M stars can live for trillions of years.

Star's position on the HR diagram is dependent on BOTH its mass and its age.

Two forces are at play to determine the size of the star:
The Force of Gravity (Fg) = tries to make the star larger
The Force of Nuclear Explosion's HEAT (Fh) = tries to 'shrink' the star

Examples:

1. White Dwarf

   Fg > Fh

2. Red Giant

   Fh > Fg

3. Main Sequence Star

   Fh = Fg