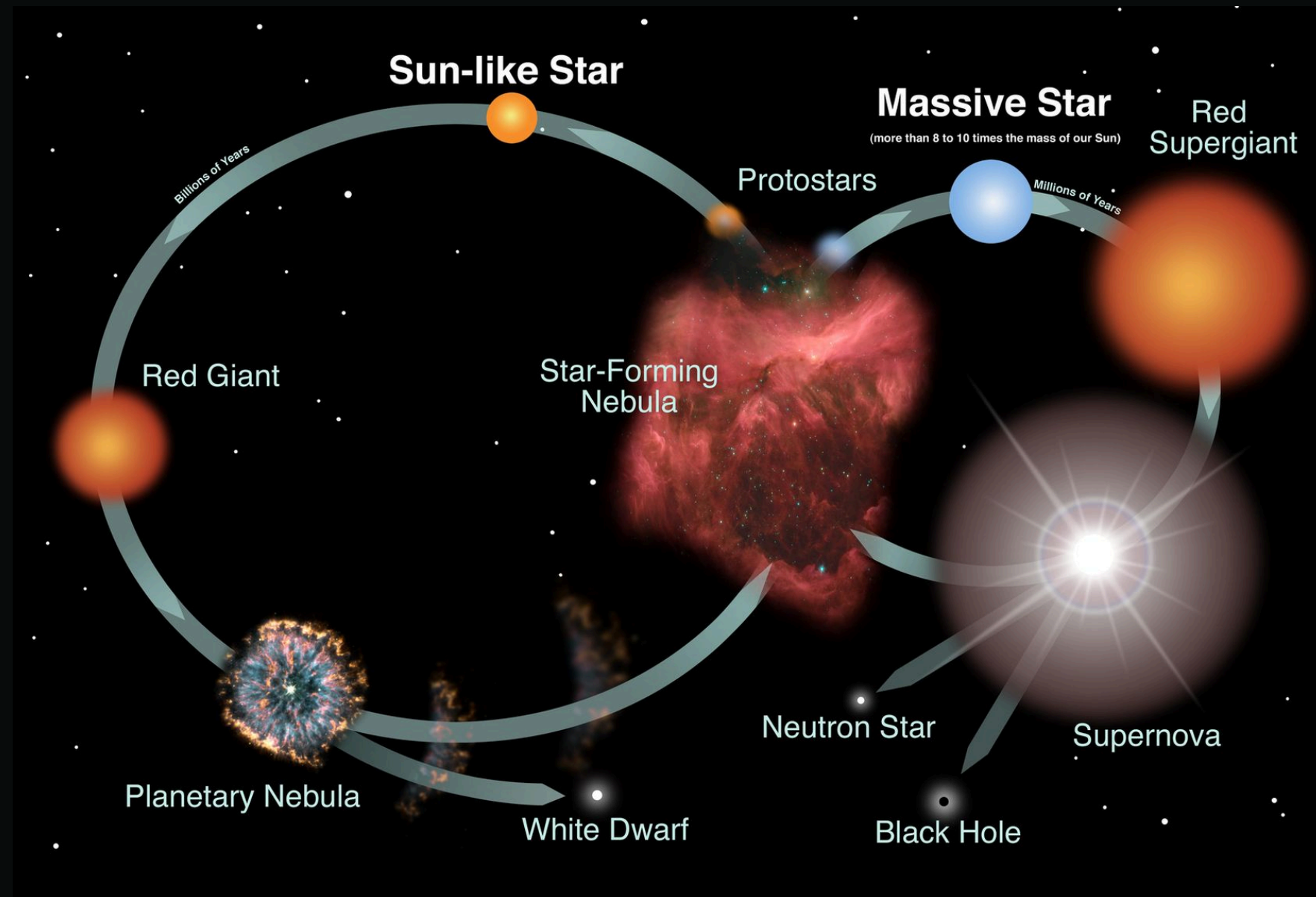




A STARS JOURNEY FROM BIRTH TO COLLAPSE

Adelaide, Rohit, Talela

The Journey



Star Formation

Main Sequence

Small Star Sequence

Death

The Formation of Stars



**The formation of a star follows a
multi-stage process**

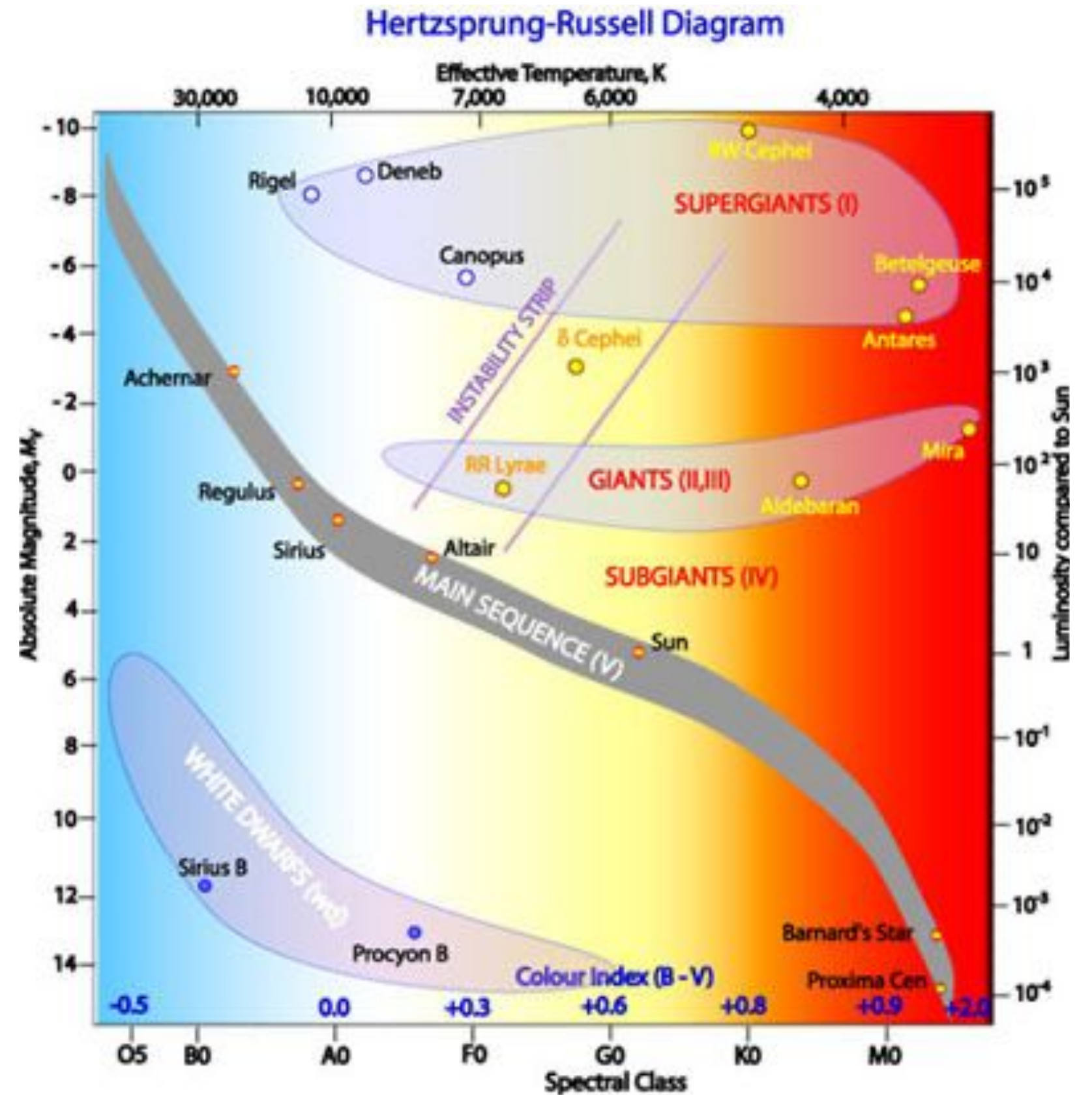
Main Sequence of Stars

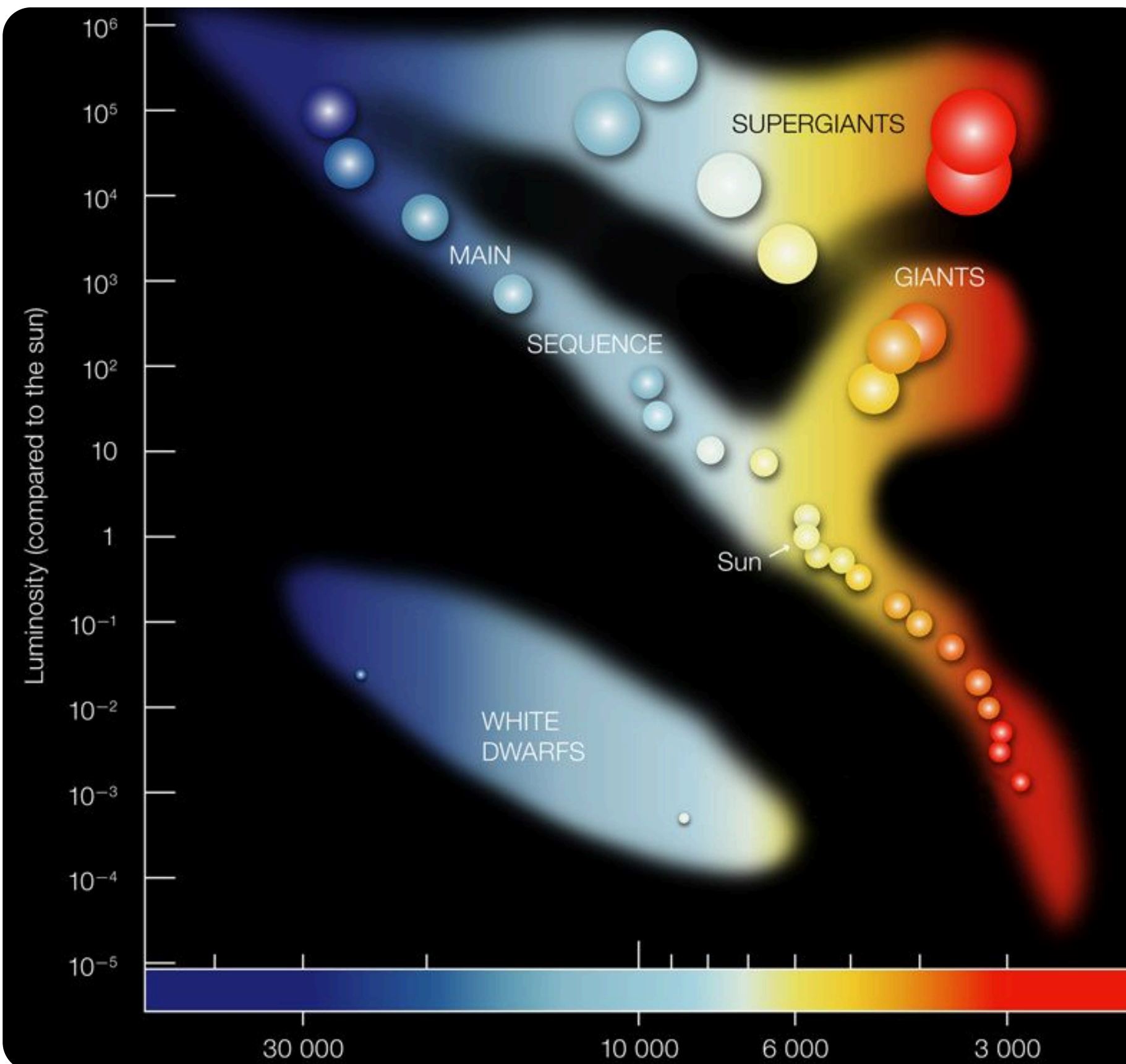


Once a star is formed, hydrogen fuses to helium and it will enter the main sequence phase

Hertzsprung-Russell Diagram

Stars are ranked from bottom to top by increasing brightness & right to left by increasing temperature



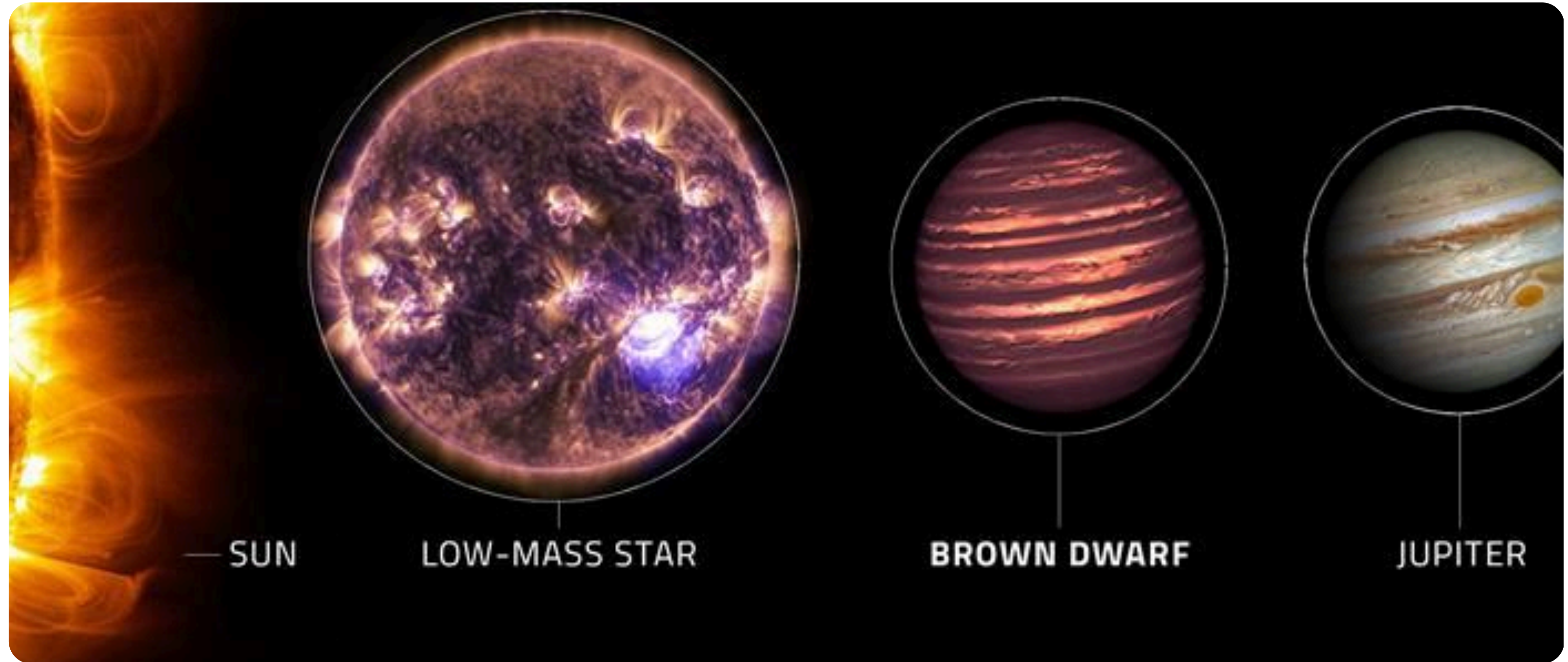


Smaller Stars in our universe make up about 99% of the stars in our universe!

These stars are similar to our sun in size and smaller

Class	Mass (in solar masses M_{\odot})	Surface temperature (kelvin)	Luminosity (in solar luminosity L_{\odot})	Lifespan of the star (years)	Percentage of all stars
O	$> 16 M_{\odot}$	33000 K	30000 L_{\odot}	11 million	0.00003%
B	2.1 - 16 M_{\odot}	10000 - 33000 K	25 - 30000 L_{\odot}	11 million - 1 billion	0.13%
A	1.4 - 2.1 M_{\odot}	7500 - 10000 K	5 - 25 L_{\odot}	1 billion - 2.2 billion	0.6%
F	1.04 - 1.4 M_{\odot}	6000 - 7500 K	1.5 - 5 L_{\odot}	2.2 billion - 10 billion	3%
G	0.8 - 1.04 M_{\odot}	5200 - 6000 K	0.6 - 1.5 L_{\odot}	10 billion - 30 billion	7.6%
K	0.45 - 0.8 M_{\odot}	3700 - 5200 K	0.08 - 0.6 L_{\odot}	30 billion - 200 billion	12.1%
M	0.075 - 0.45 M_{\odot}	2000 - 3700 K	0.0001 - 0.08 L_{\odot}	200 billion - 10 trillion	76.45%

Brown Dwarfs



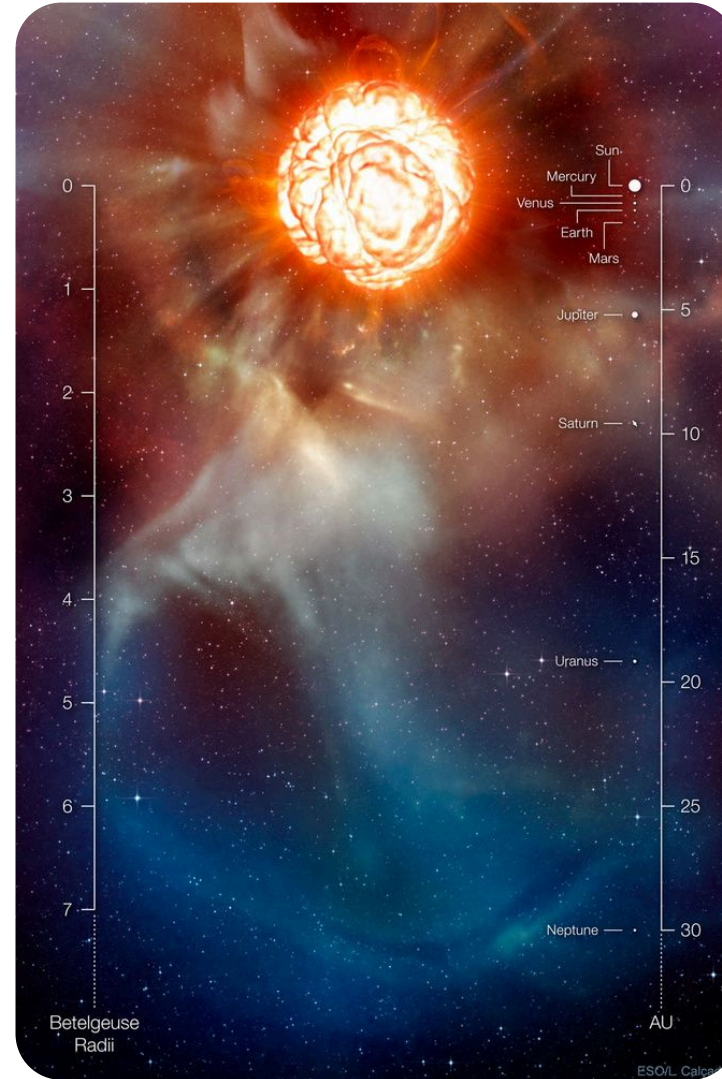
Sun-like stars

The star will stay in the main sequence for the majority of its life

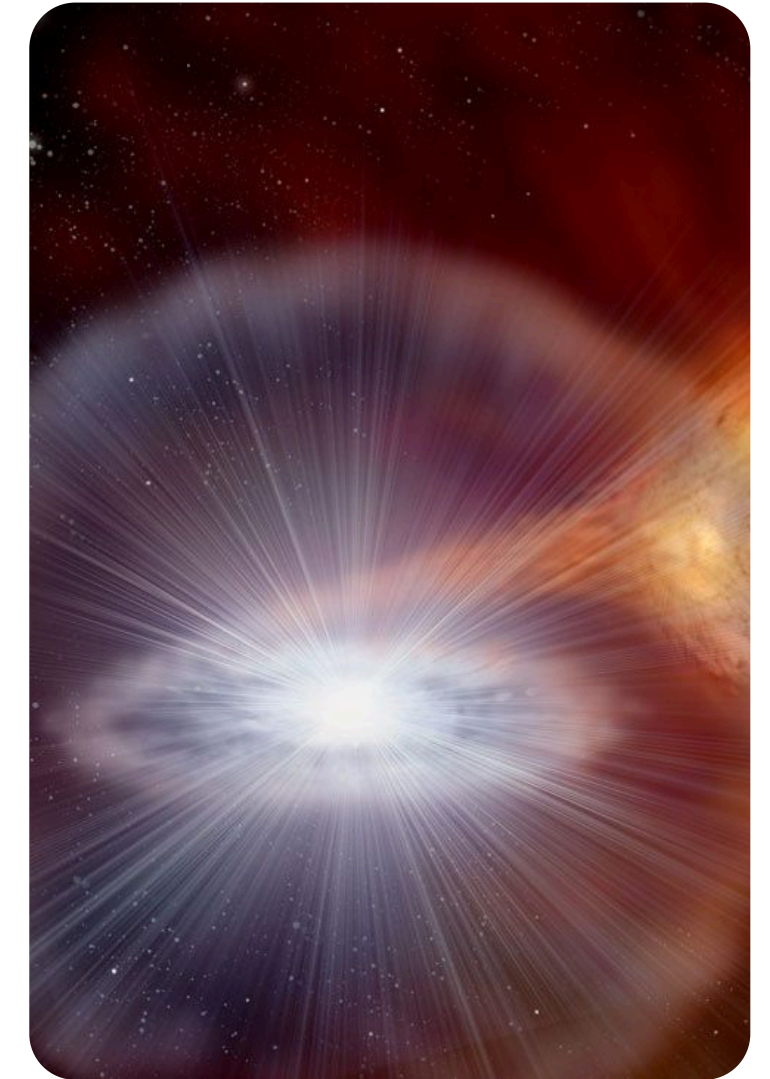
When Hydrogen fusions starts to decrease outward pressure is out of balance with gravity



Main Sequence



Red Giant

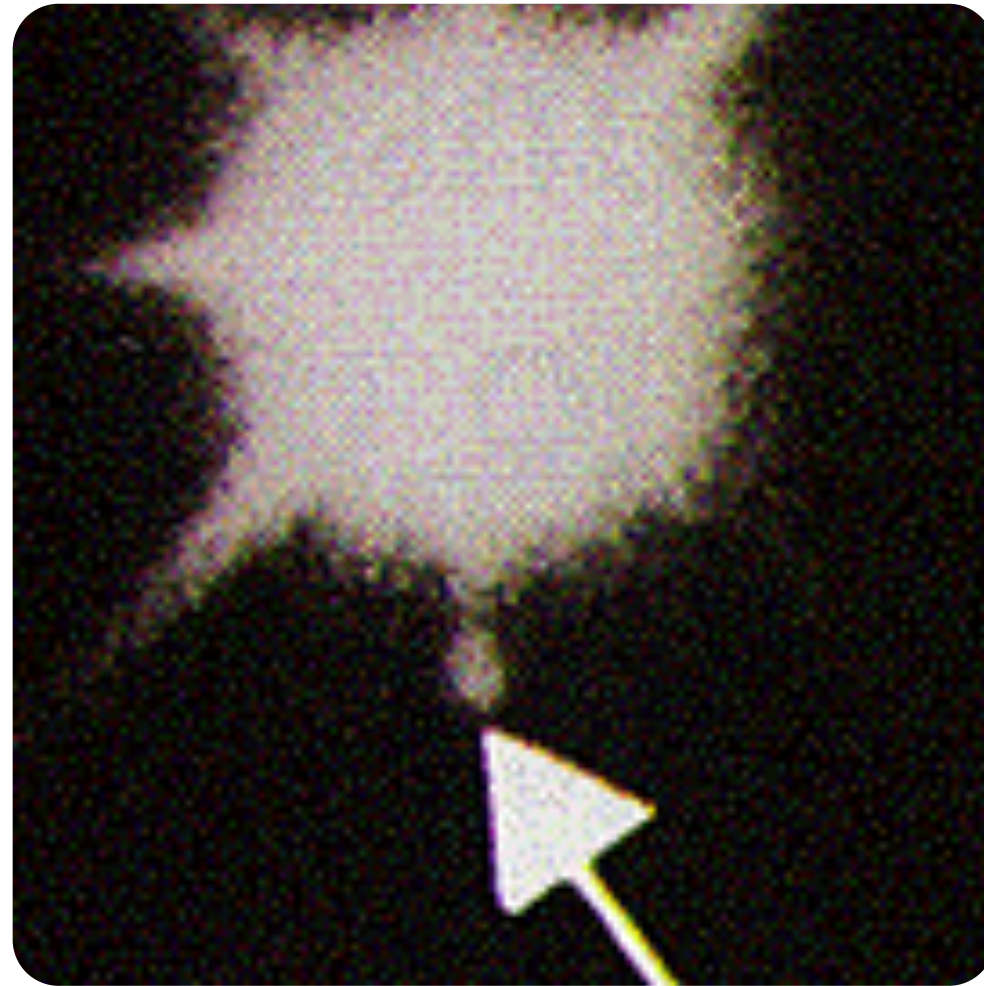


White Dwarf

The Core of the star: White Dwarfs



NEBULA



WHITE DWARF



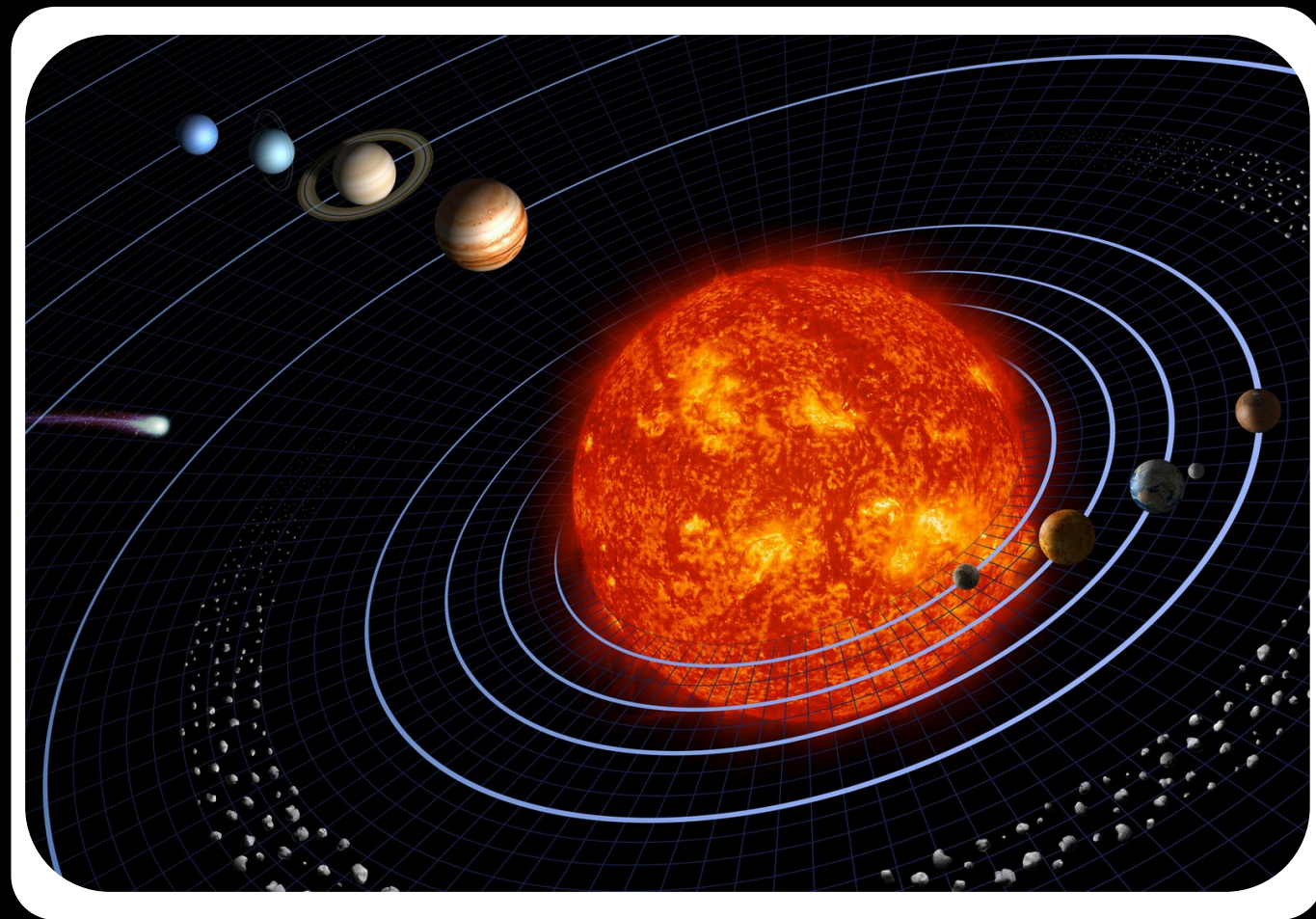
**THE DEATH OF
WHITE DWARFS?**

A deep space photograph showing a vast field of stars. On the left side, there is a large, glowing nebula with orange and red hues. In the upper right quadrant, a bright orange star is highlighted with a small green square. The rest of the sky is filled with numerous smaller stars of various colors, including blue and white.

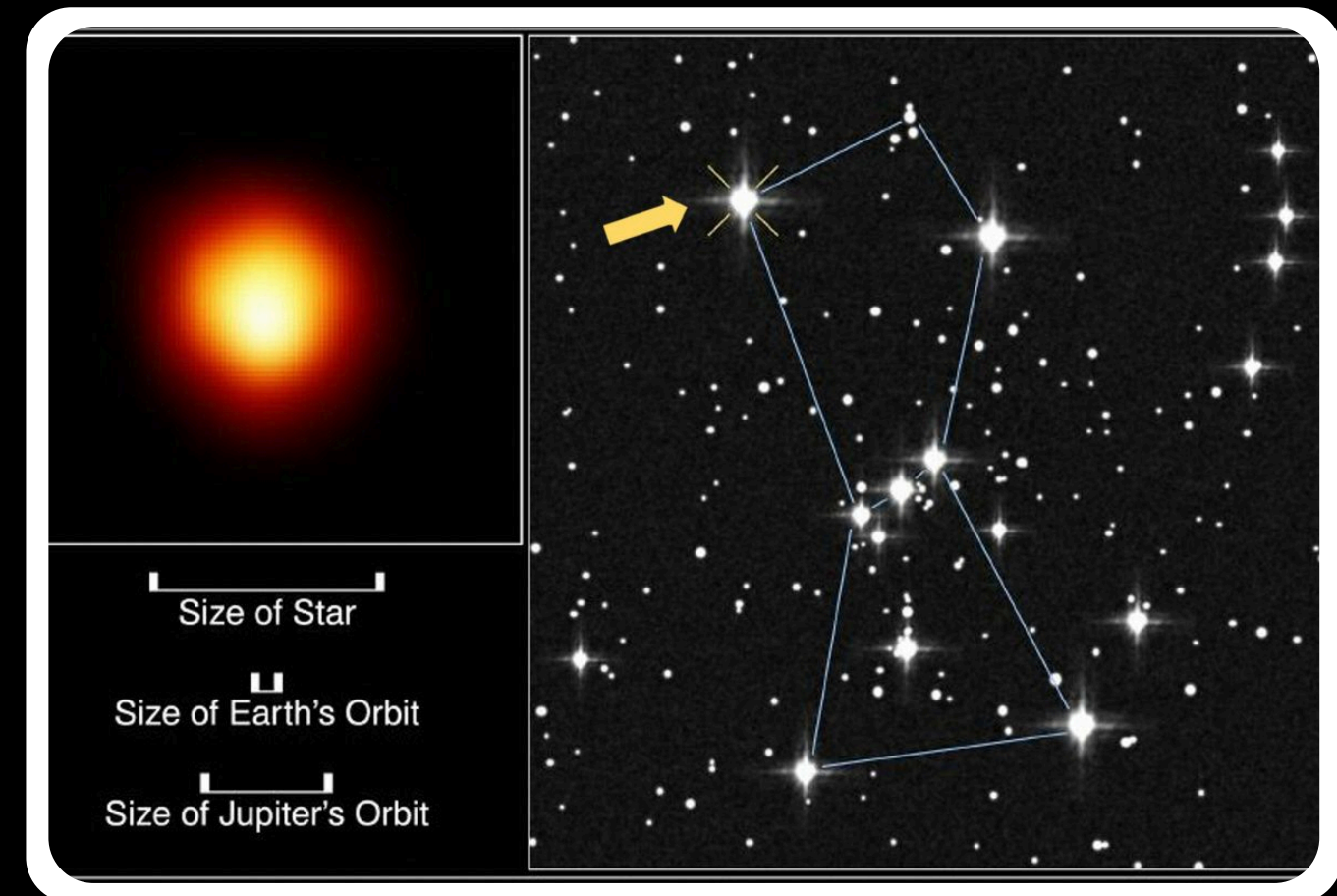
WHEN GIANTS DIE

The Threshold

What makes a star massive?

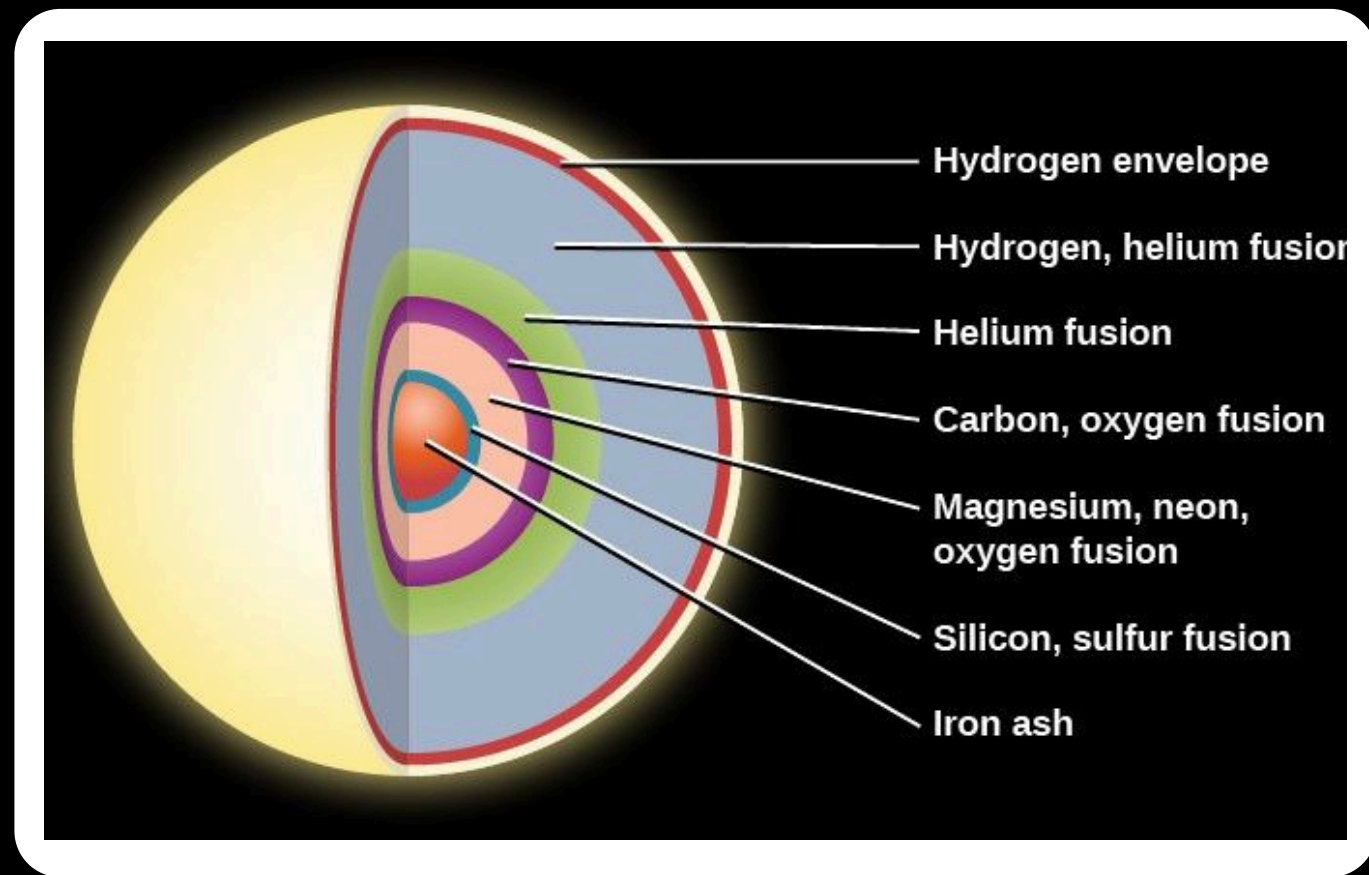


$< 8 M_{\odot} \rightarrow$ White Dwarf

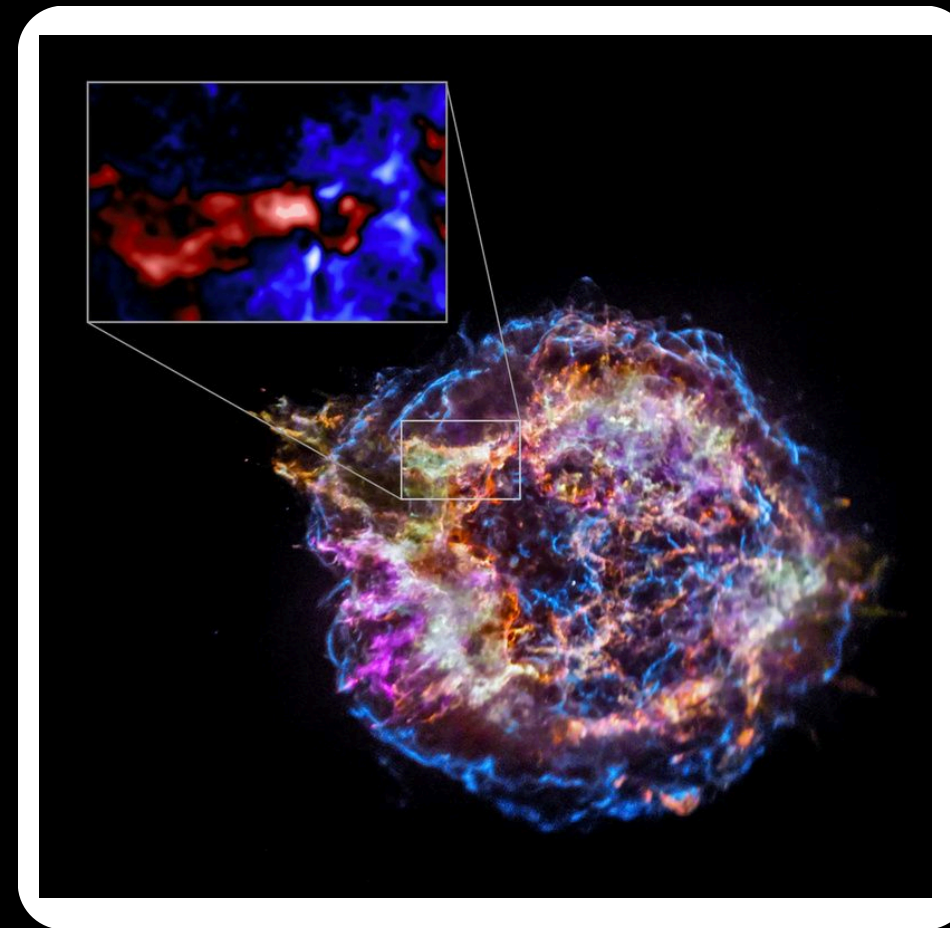


$> 8 M_{\odot} \rightarrow$ Supernova + remnant

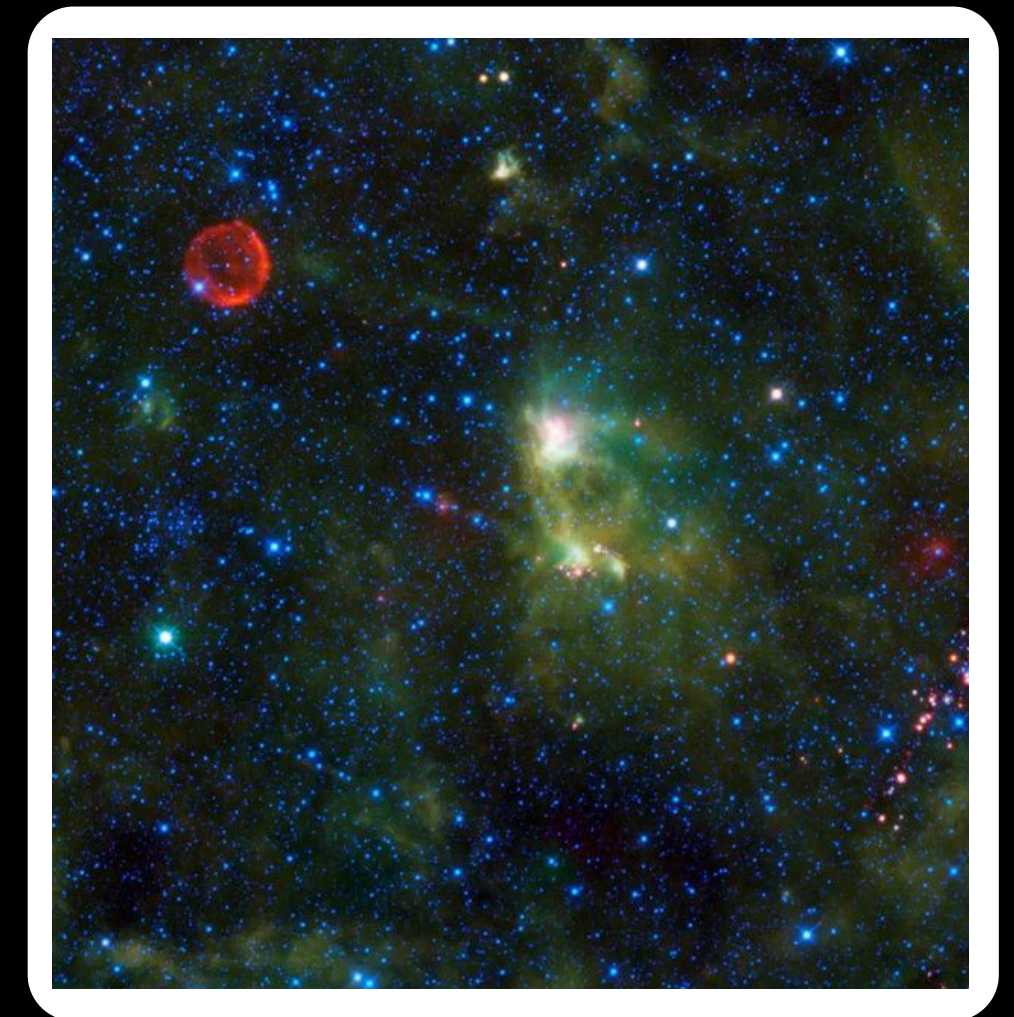
Core Collapse & The Supernova



Iron core → Free fall



Shockwave → Supernova



Releases $\sim 10^{44}$ J

The Remnants

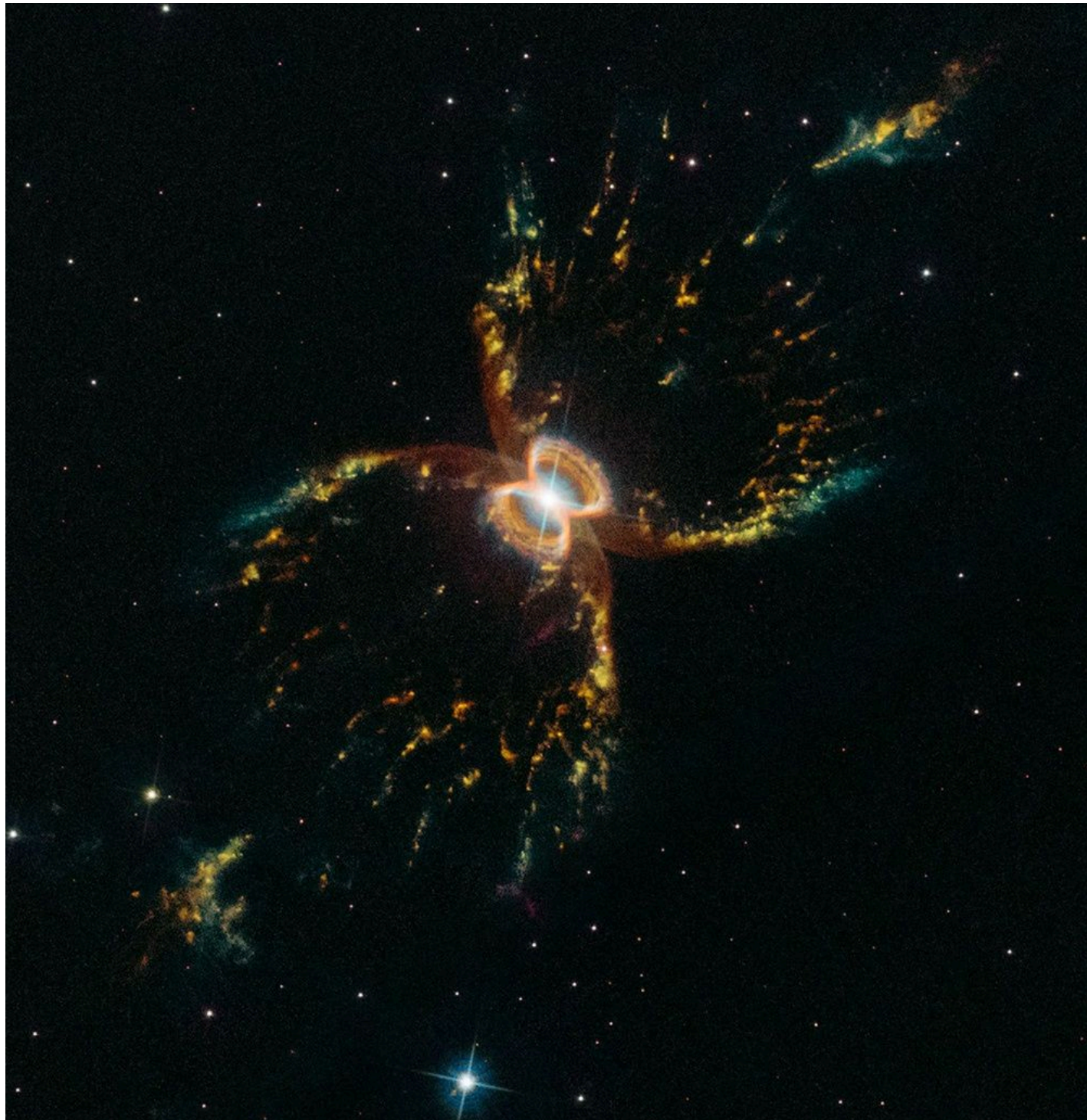
NEUTRON STAR

Remnant core $< \sim 3M_{\odot}$
City-sized - $\sim 10^{14} \text{ g/cm}^3$
Pulsars & Magnetars

BLACK HOLE

Remnant core $> \sim 3M_{\odot}$
Event horizon - singularity
Detected via LIGO waves

The mass of the remnant core decides
everything



Example of the Lifespan

Cookies!!





THANK YOU

ANY QUESTIONS ?