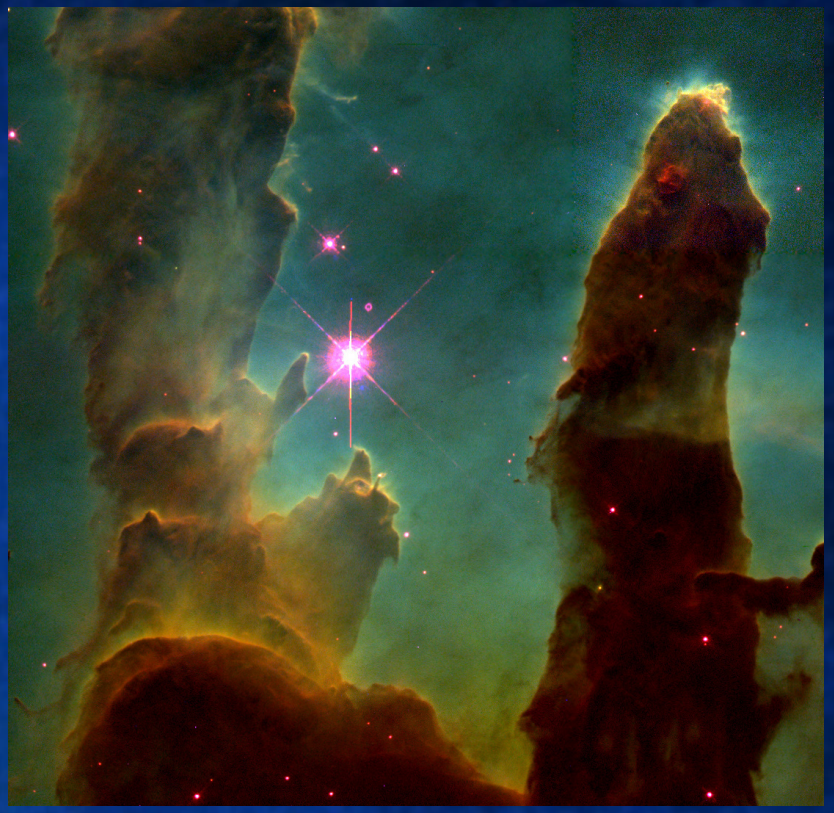
Stellar Evolution

The Life Cycle of Stars

"It's black, and it looks like a hole.
I'd say it's a black hole."

- Starts with a cloud of dust & gas. (nebula)
- An explosion from a nearby star causes compression waves to go through the nebula
- Compression waves cause the nebula to contract & spin (Due to gravitational pull)



This is a protostar!!!

- Nebula keeps spinning & materials get warmer & warmer.
- This happens over millions of years.

- When temperature raises over 10,000,000˚ C, ***Hydrogen fusion*** begins:

4 H --› 1 He

(4 Hydrogen atoms fuse to make 1 Helium)

- Star gives off radiant energy in the form of the electromagnetic spectrum
- Phase: Normal Star, main sequence star

What happens after hydrogen fusion?

- Normal stage is over!
- This is the Giant Star Phase!!!
- He --› C --› Mg --› O --› ? --› Fe
- Giant Star: 1-3 times mass of our sun
- Super Giant Star: 3-100 times mass of sun

The Star is Dying!!!

- When our sun gets to the giant stage, it will expand out to about Mars!!!

Don't worry, we won't be here to see it!

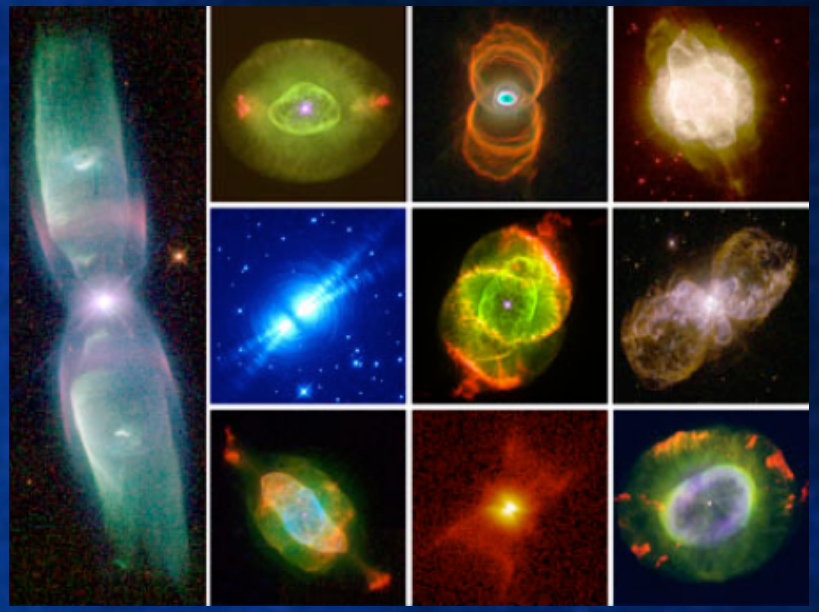
- Once all of nuclear fusion is over, the star will not be able to overcome gravity and it will explode!

Giant Stars: 1-3 times the mass of our sun

- Once our sun runs out of hydrogen to fuel fusion, the surface will expand and cool off.
- If the sun is cooling off, how is the Earth getting hotter?
- As the sun expands, the surface will get closer to the Earth, heating it up.

Nova: The death of a giant star

- Upon the fusion of iron, the star will nova
- It will become a planetary nebula
- Eventually it becomes a white dwarf until it loses heat and dies
- This is what our sun will become!

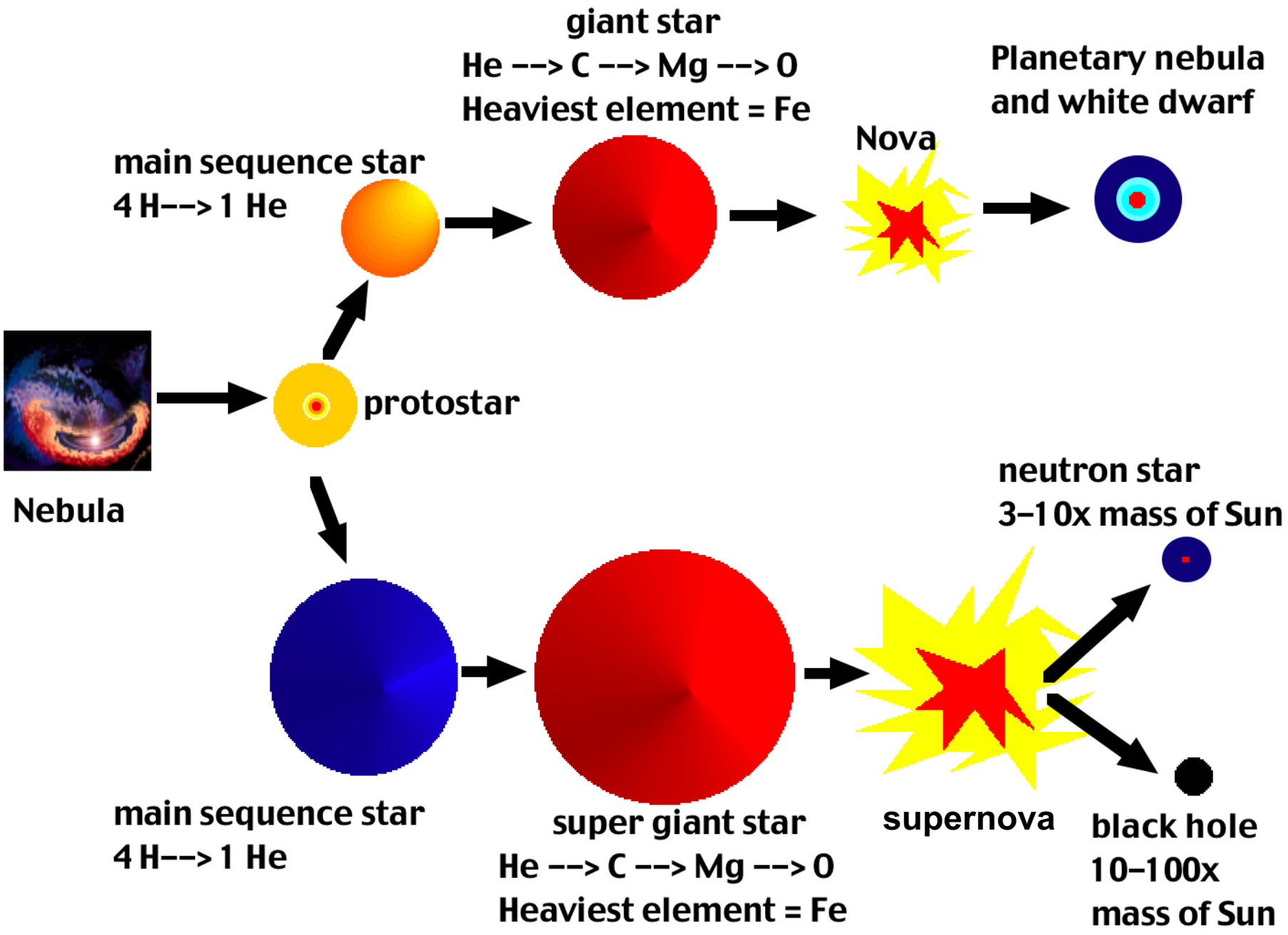


Super Giant Stars: 3-10 times the mass of our sun

- Supernova in a giant explosion, sending compression waves through space
- Will become a ***neutron star*** with millions of tons in a spoonful of mass
- Neutron stars give off radio waves sometimes

Super Giant Stars:10-100 times the mass of our sun

- Supernova in a giant explosion, sending compression waves through space
- Will become a black hole
- Gravity is so great that not even light can escape!


giant star
He --> C --> Mg --> O
Heaviest element = Fe
Planetary nebula
and white dwarf
Nova
main sequence star
4 H--> 1 He
protostar
Nebula
neutron star
3–10x mass of Sun
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He --> C --> Mg --> O
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supernova
black hole
10–100x
mass of Sun