Session 6: Stars and Their Lives

Afterschool Universe

The Main Concepts…

1. The Sun is a pretty average star.

2. Stars are born, live and die… their life cycle depends on how big they are.



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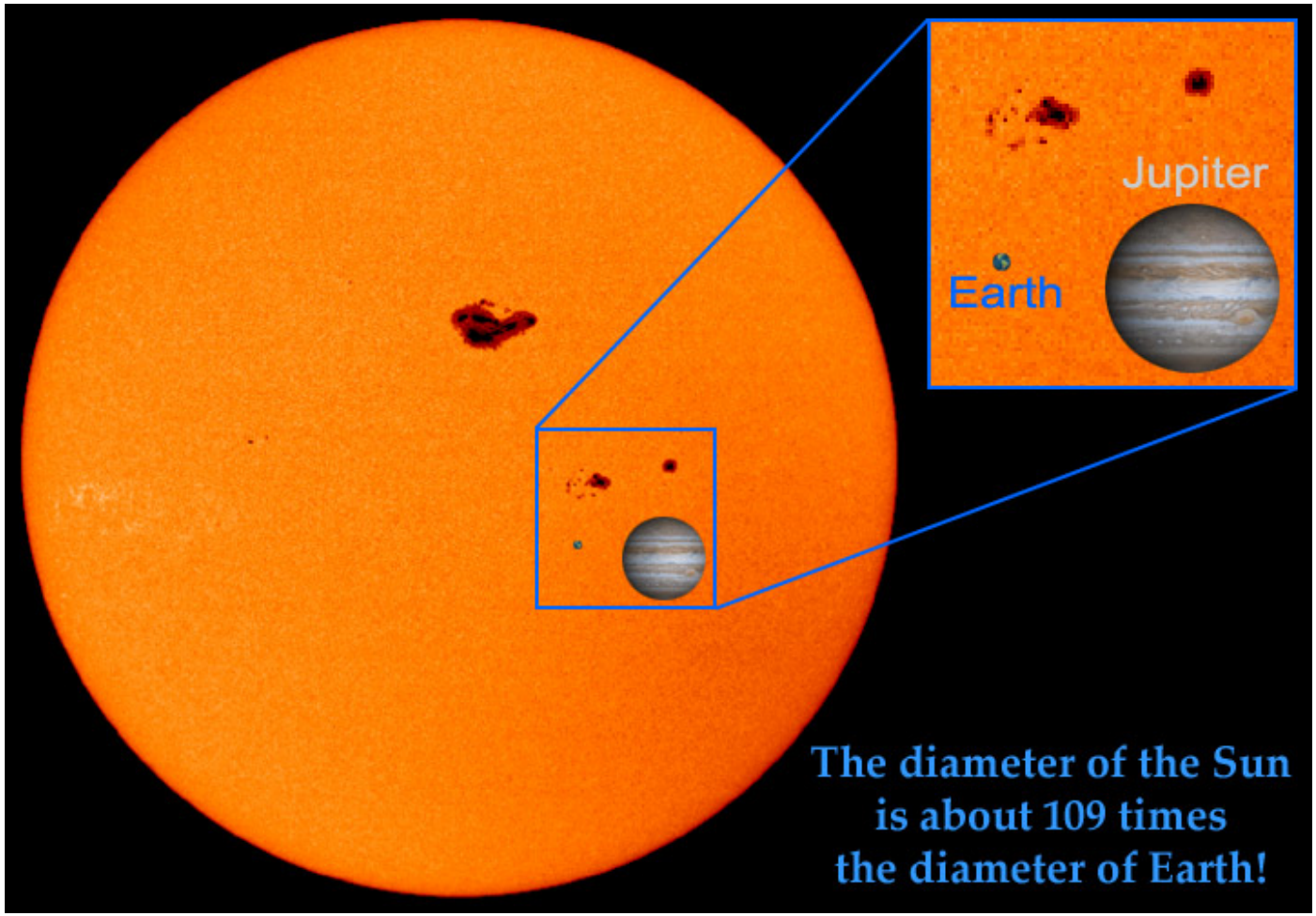
The Sun

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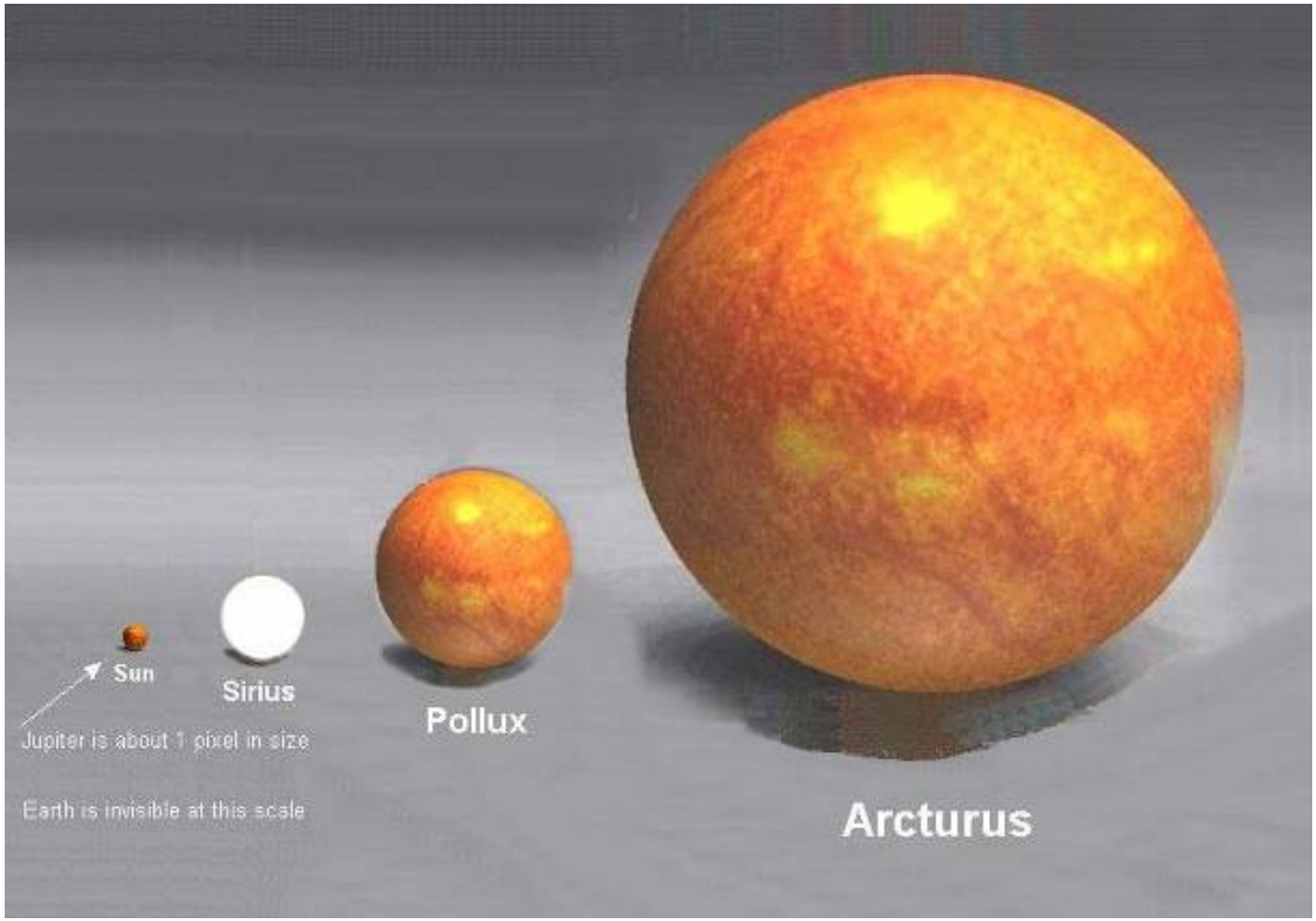
The Sun is an Average Star

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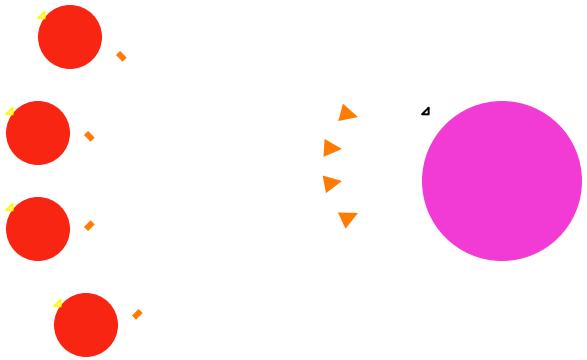
How Do Stars Work?

- Stars must have an energy source to shine
  - Nuclear fusion!
  - Combine small atoms (for example, hydrogen) to form larger atoms (for example, helium)
  - This process releases energy

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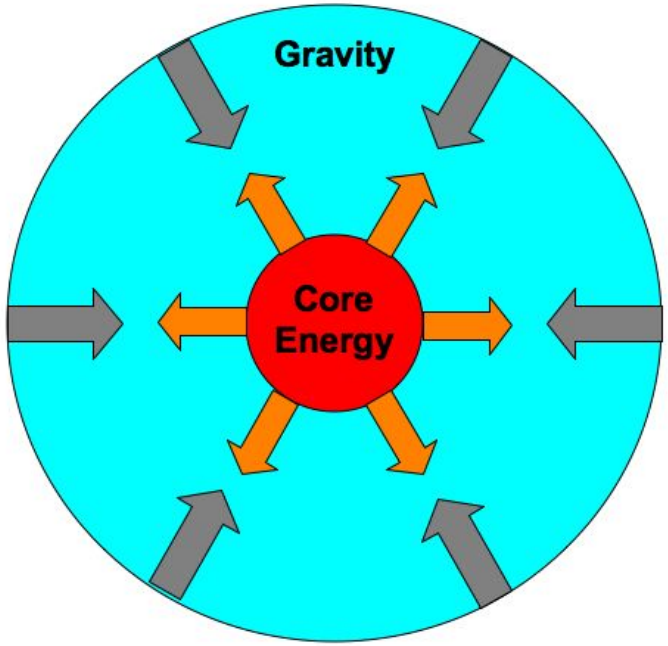
A Balancing Act

Energy released from nuclear fusion counter acts inward force of gravity

Throughout its life, these two forces determine the stages of a star's life.

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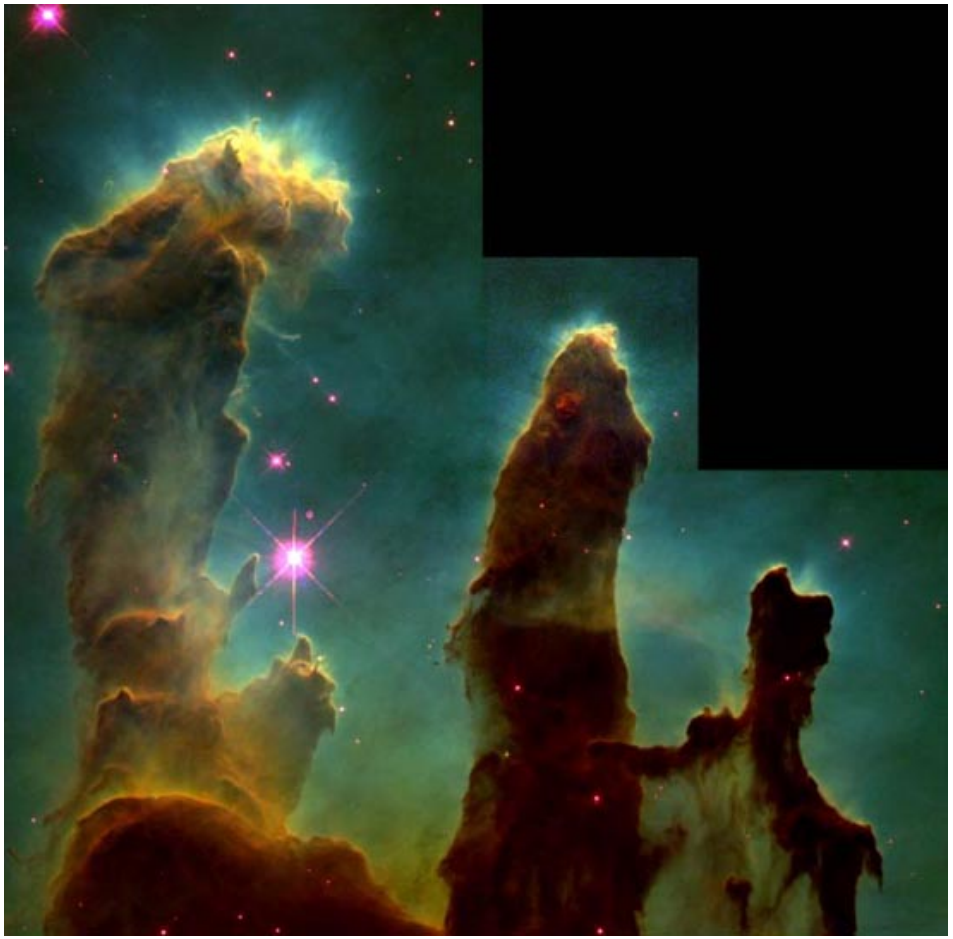
The Birth of Stars



- Stars are born in giant clouds of gas in deep space.
- Gravity causes gas to clumps. Clumps continue to collapse.
- A star is born once the center of the clump gets hot enough for nuclear fusion!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Another Star Forming Cloud


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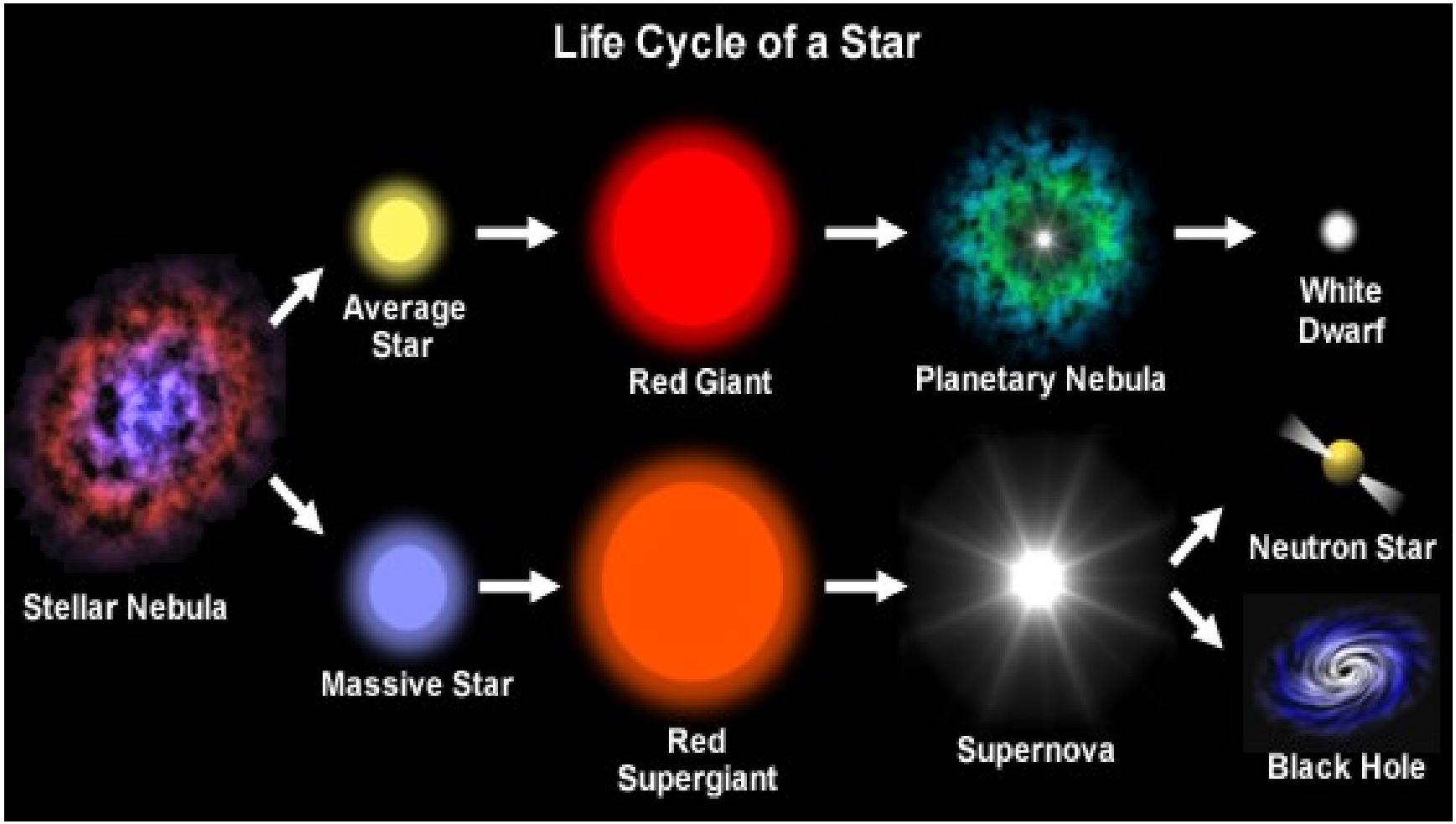
Life Cycle of Stars

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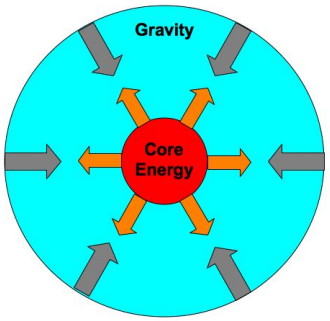
The Beginning of the End: Red Giants

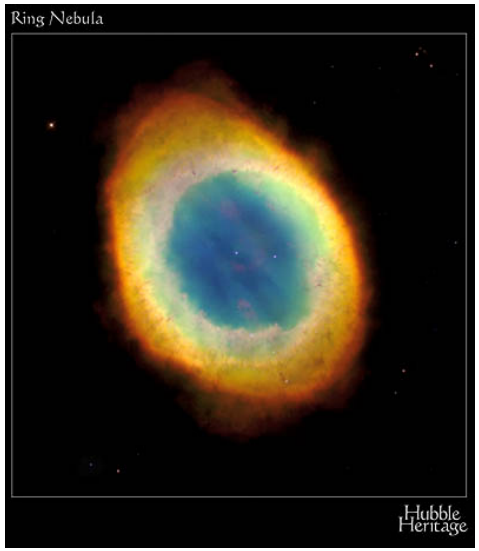
- Energy released from nuclear fusion of hydrogen balances stars against gravity
- But the hydrogen eventually runs out!
  - Core of star collapses and releases heat
  - This heat expands the outer layers
  - Star puffs up to form a Red Giant



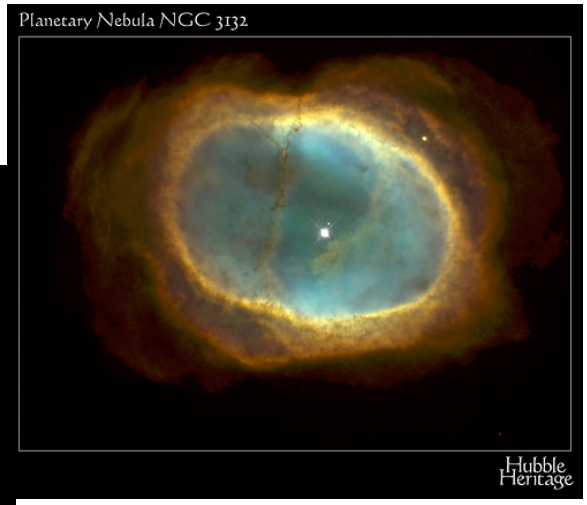


The End for Low-mass Stars

Red Giant expels outer layers gas



Planetary Nebulae



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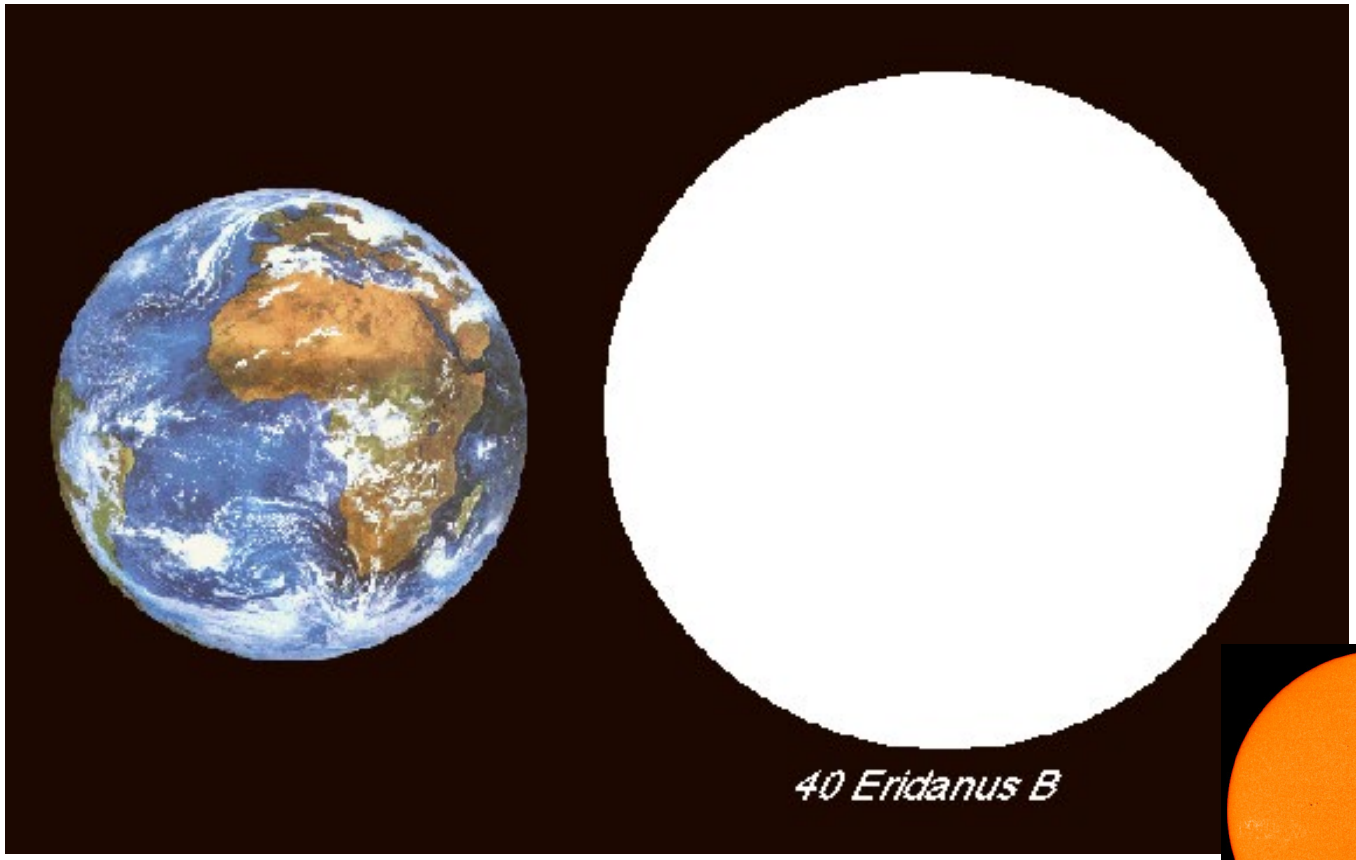
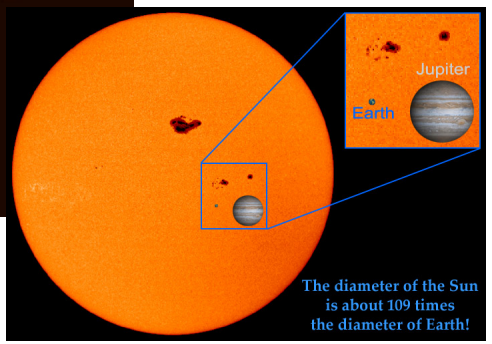
Low-mass Stars End as White Dwarfs





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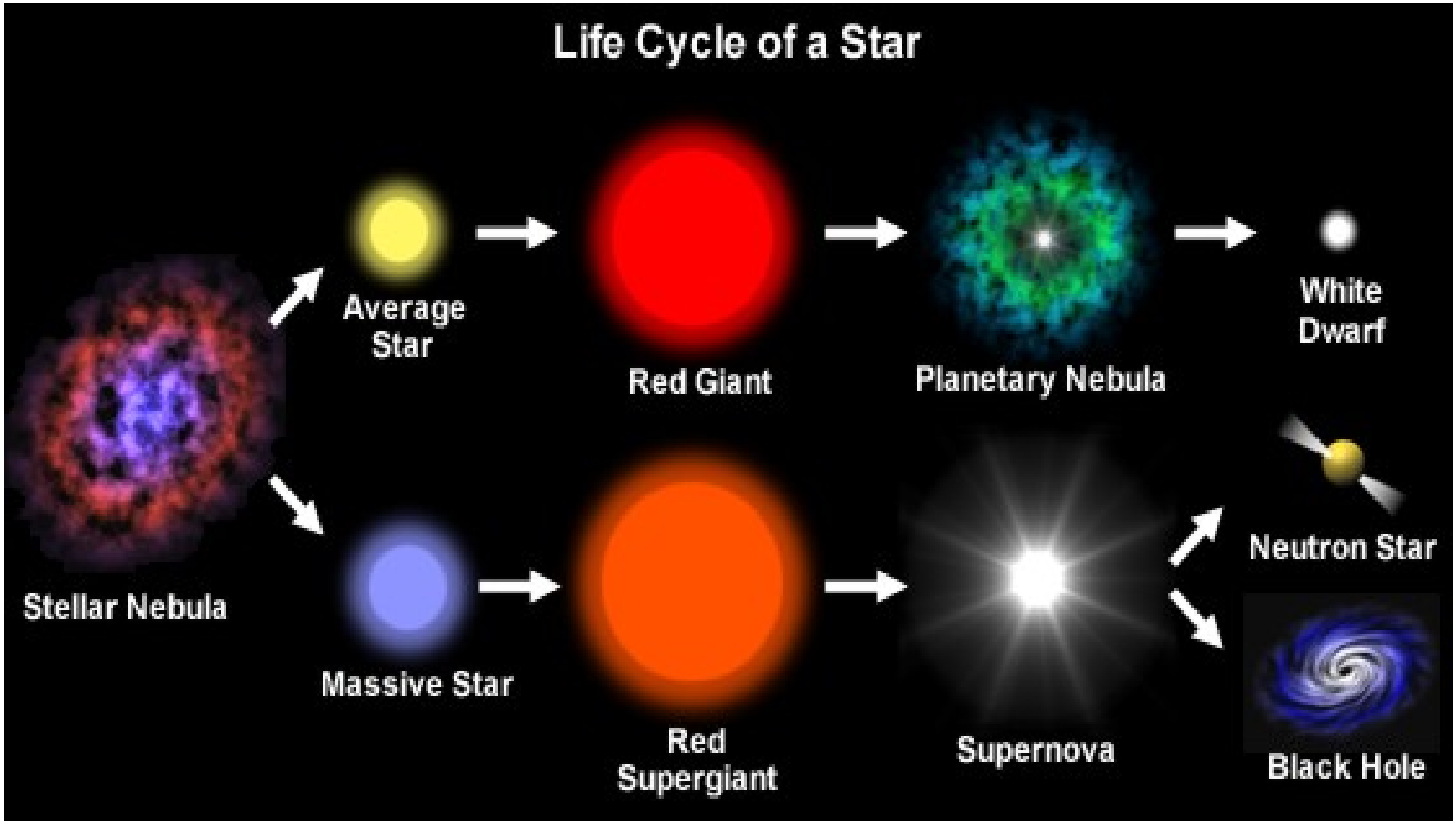
Life Cycle of Stars

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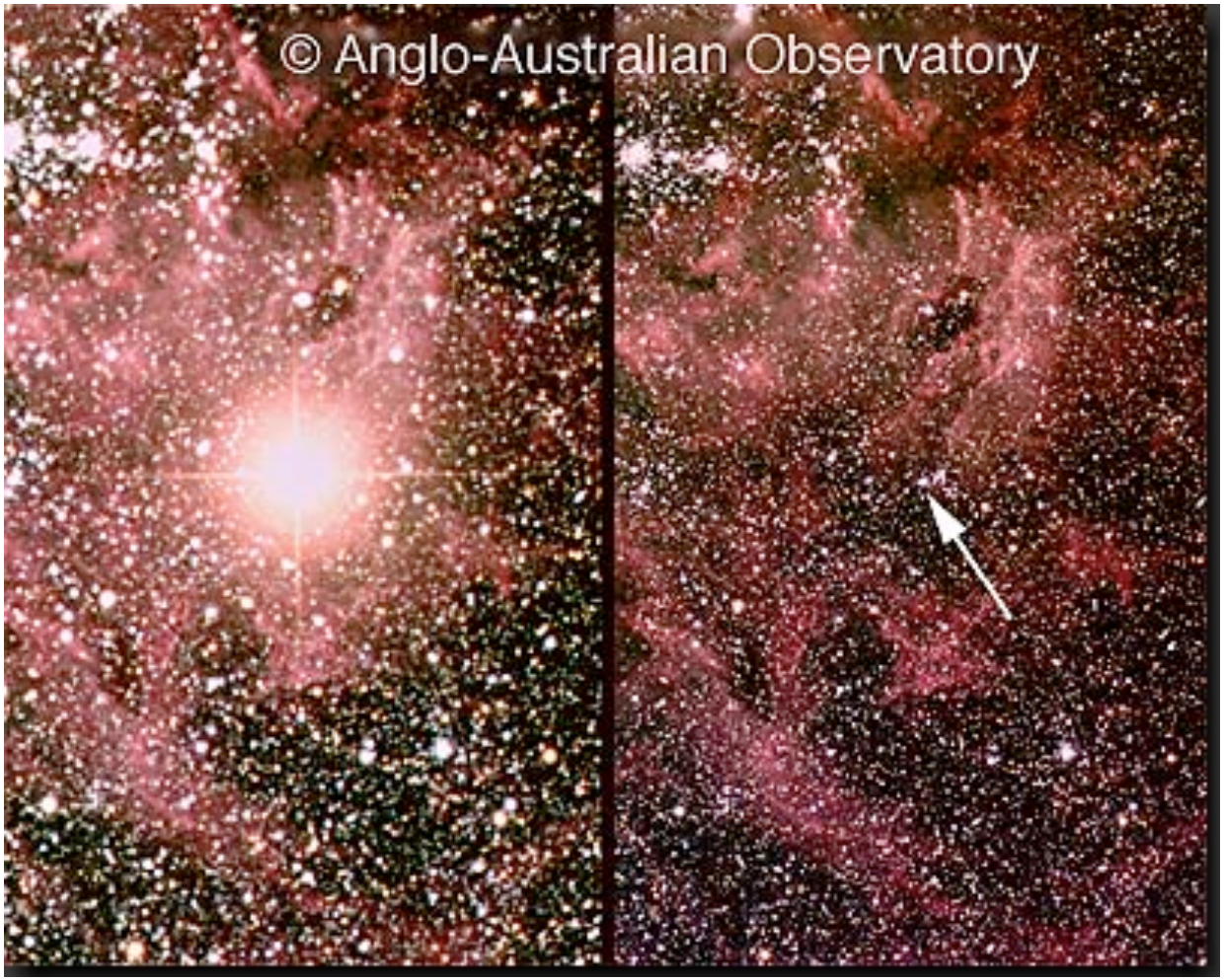
Supernova!

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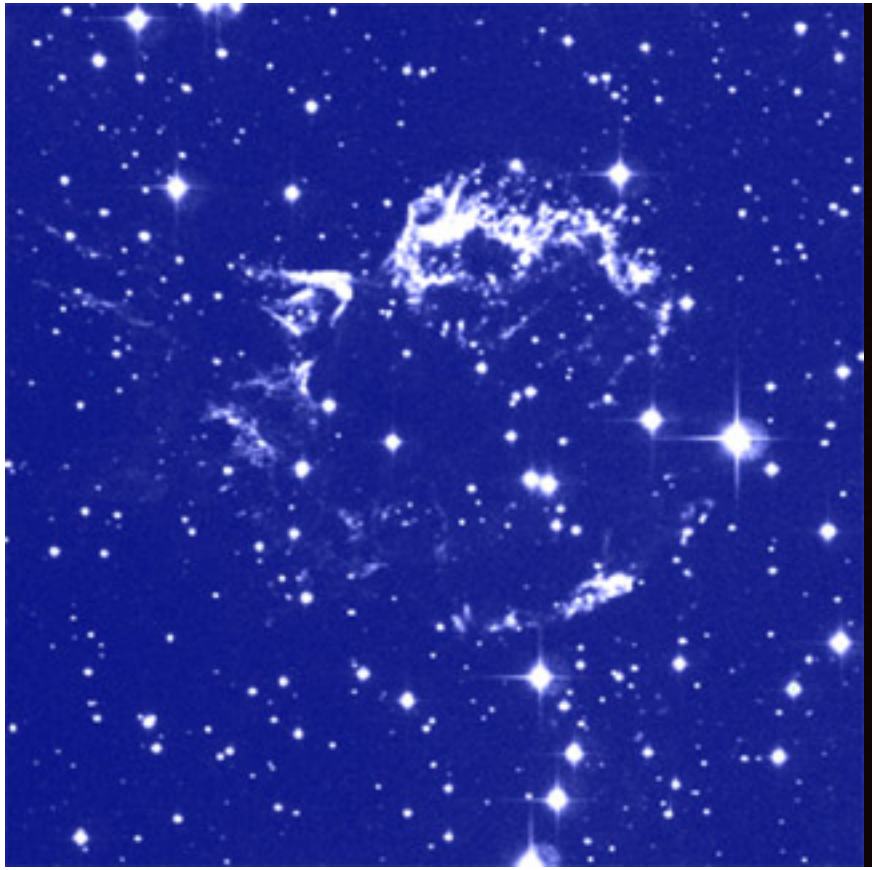
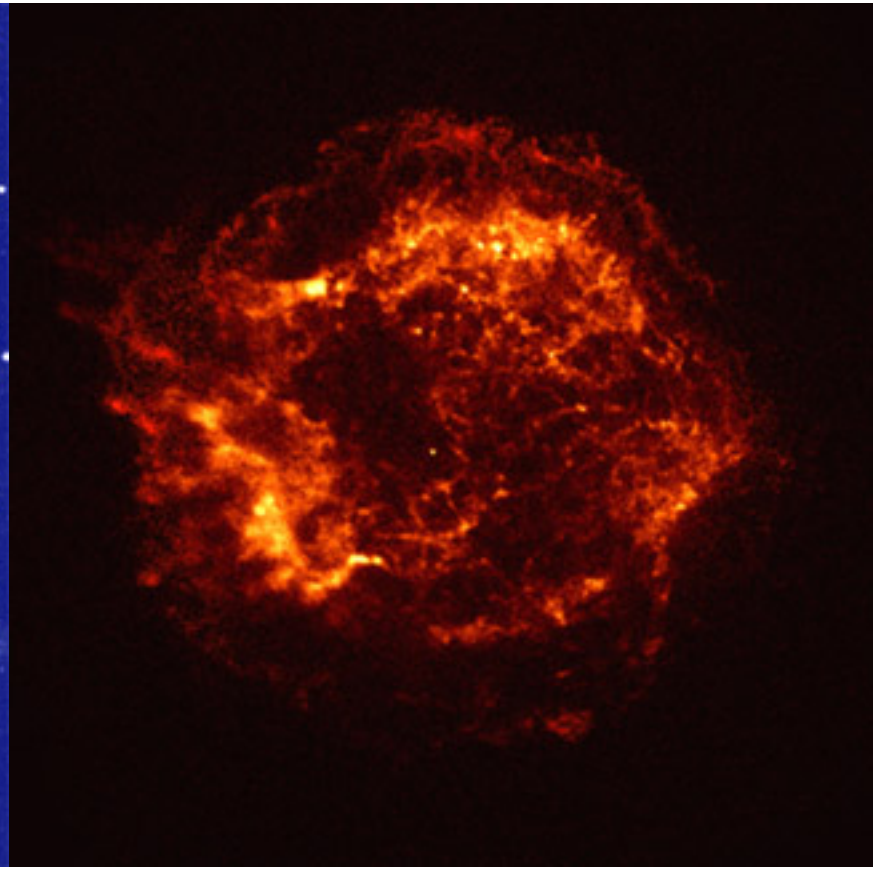
Supernova Remnants: Cas A

Optical



X-ray



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What's Left After the Supernova

Neutron Star (if original star < 20 x Solar)

- Under collapse, protons and electrons combine to form neutrons.
- Only 10 Km across, very dense

Black Hole (if original star > 20 x Solar)

- Not even compacted neutrons can support weight of very massive stars.