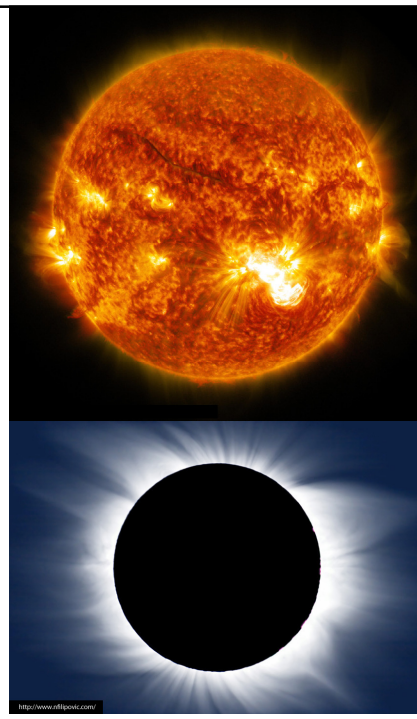


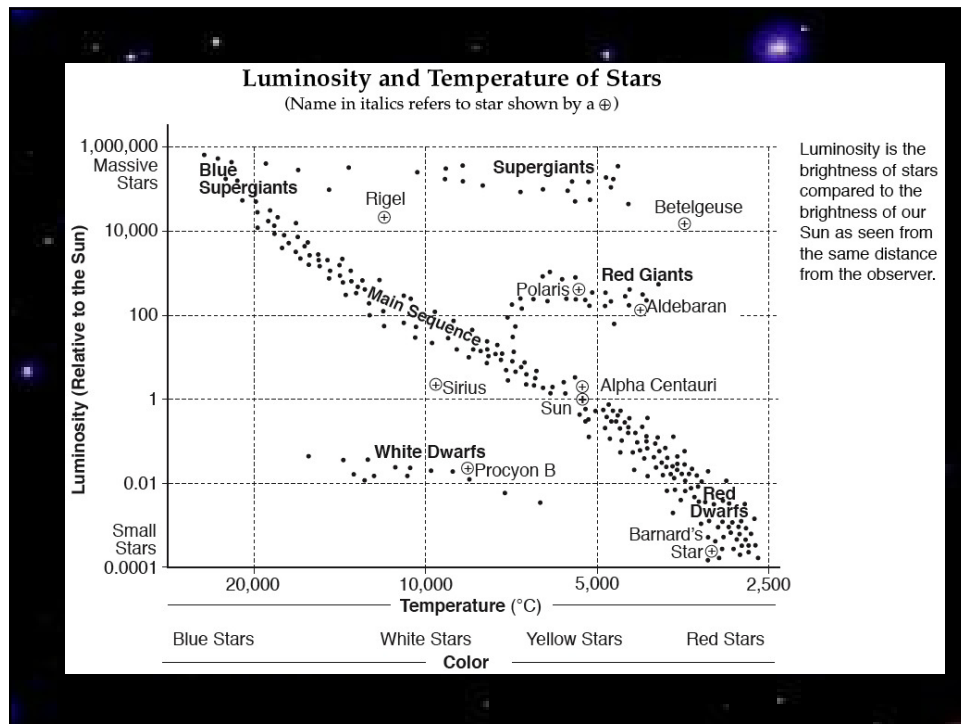
Lives of Stars



Our Sun

- Intermediate mass star
- long lived
- relatively stable
- Medium luminosity
- Yellow in colour
- Surface temp 5000 °C
- corona





Characteristic of Stars

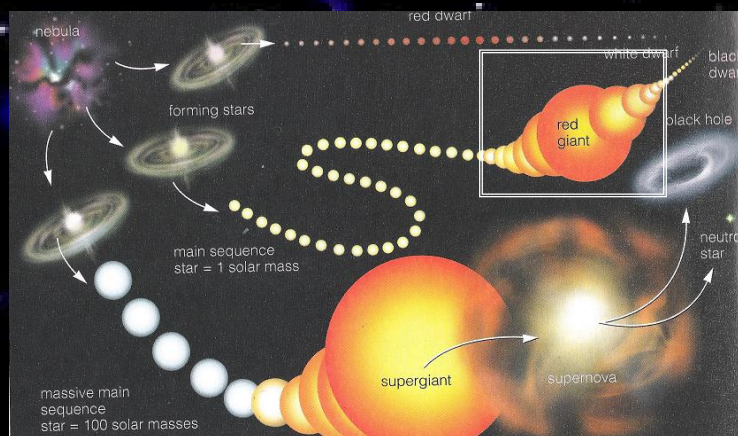
- The colour of stars is directly related to their temperature
- The life cycle of stars is directly related to their mass

The Evolution of Stars

Stars usually follow one of three typical life cycles:

- Low Mass Star
- Intermediate Mass Stars
- Massive Stars

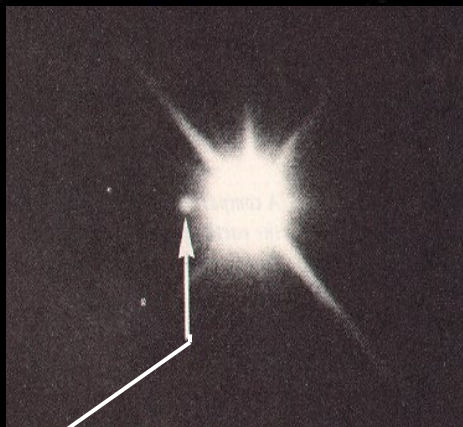
Intermediate Mass Stars



Intermediate mass stars

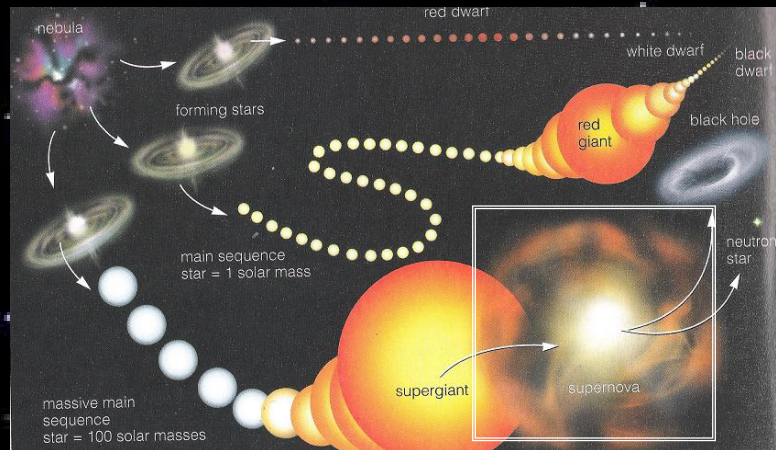
- When a star like our sun or smaller **runs out** of hydrogen at the end of its life it will form a **Red giant**
- A star the size of the Sun or smaller is said to "die" when nuclear fusion stops **occurring**. The core shrinks and the outer layers of the star drift away.
- The remaining material becomes a **white dwarf** : a small , **dim, hot** star . A white dwarf will become cooler and dimmer, until its light goes out.

White Dwarfs



Sirius B, the dense companion star to Sirius.

Massive Stars and Supernova



Supernova

- A star with a mass **ten times** or more than the **sun**, near the end of its life will form a **red supergiant** as it runs out of fuel
- an enormous **explosion** then occurs at the **end** of a large star's life
- once fusion stops, the star **collapses** under its own gravity
- shock waves cause the outer layers to **explode** outward in a rapidly expanding nebula of dust and gases

Supernova

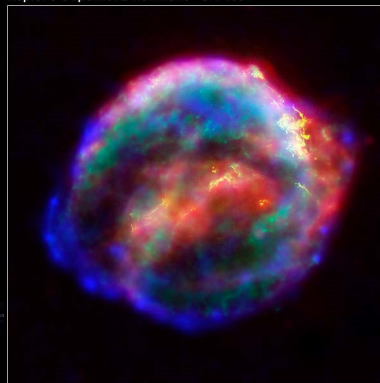


Hubble Image of Cygnus Loop Supernova

<http://www.spacetoday.org/DeepSpace.html>

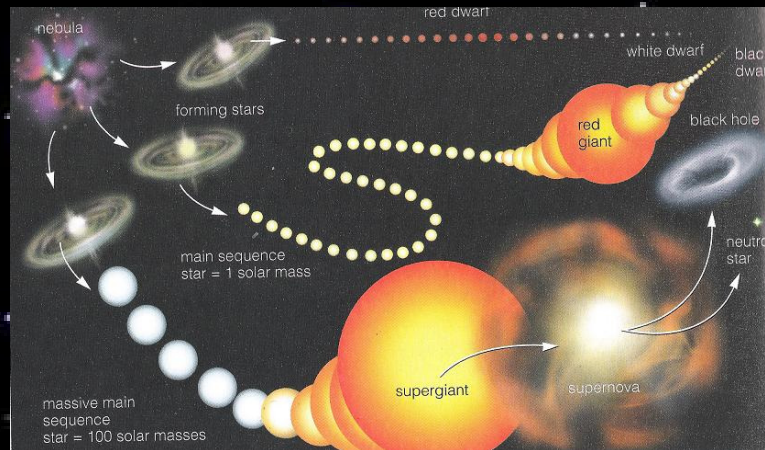
Supernova

Kepler's Supernova Remnant • SN 1604



Composite Image using Data from the Chandra Observatory, Hubble Telescope and Spitzer Telescope. <http://www.jpl.nasa.gov/news/features.cfm?feature=665>

Black Hole

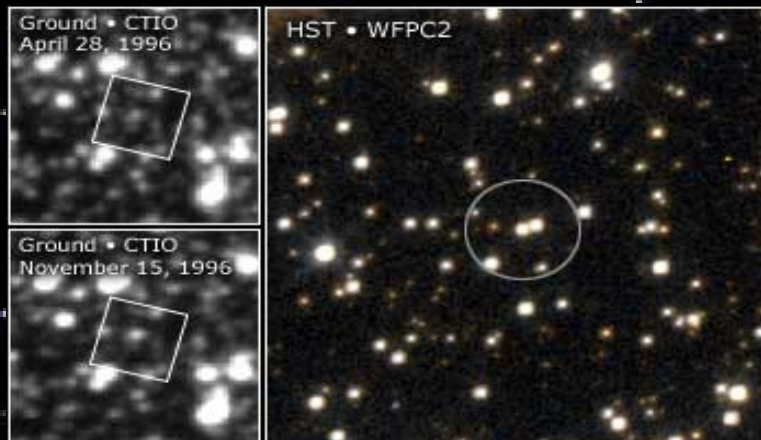


November 28th, 1998. <http://antwrp.gsfc.nasa.gov/apod/ap981128.html>

Black Hole

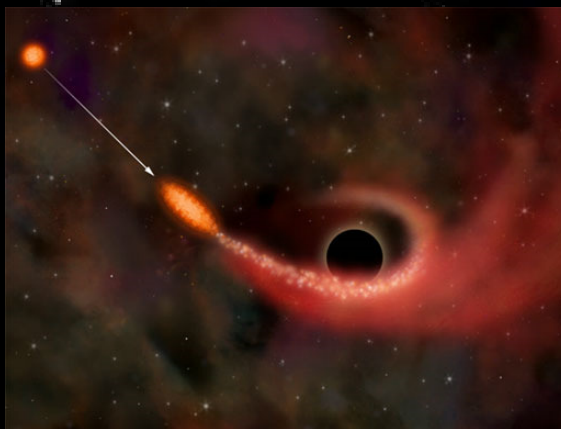
- resulting core when a star **50+** times the mass of the **sun** dies
- leaves behind a core so massive and with a force of gravity so strong that **nothing** can escape from it - not even **light**
- the word "**hole**" is misleading because it sounds as though there is nothing there, but it is actually a huge amount of **matter** packed into a sphere only a few kilometers across

Can we see a Black Hole?



On the left, one can make out the distinction in the brightness of a star, when it travels behind the black hole. Source : NASA - Notre Dame University (Indiana) <http://nrumiano.free.fr/Estars/fading.html>

Can we see a Black Hole?



The illustration above depicts a supermassive black hole ripping apart a star and consuming a portion of it, a long-predicted astronomical event confirmed by NASA's Chandra and the European Space Agency's XMM-Newton X-ray Observatories.