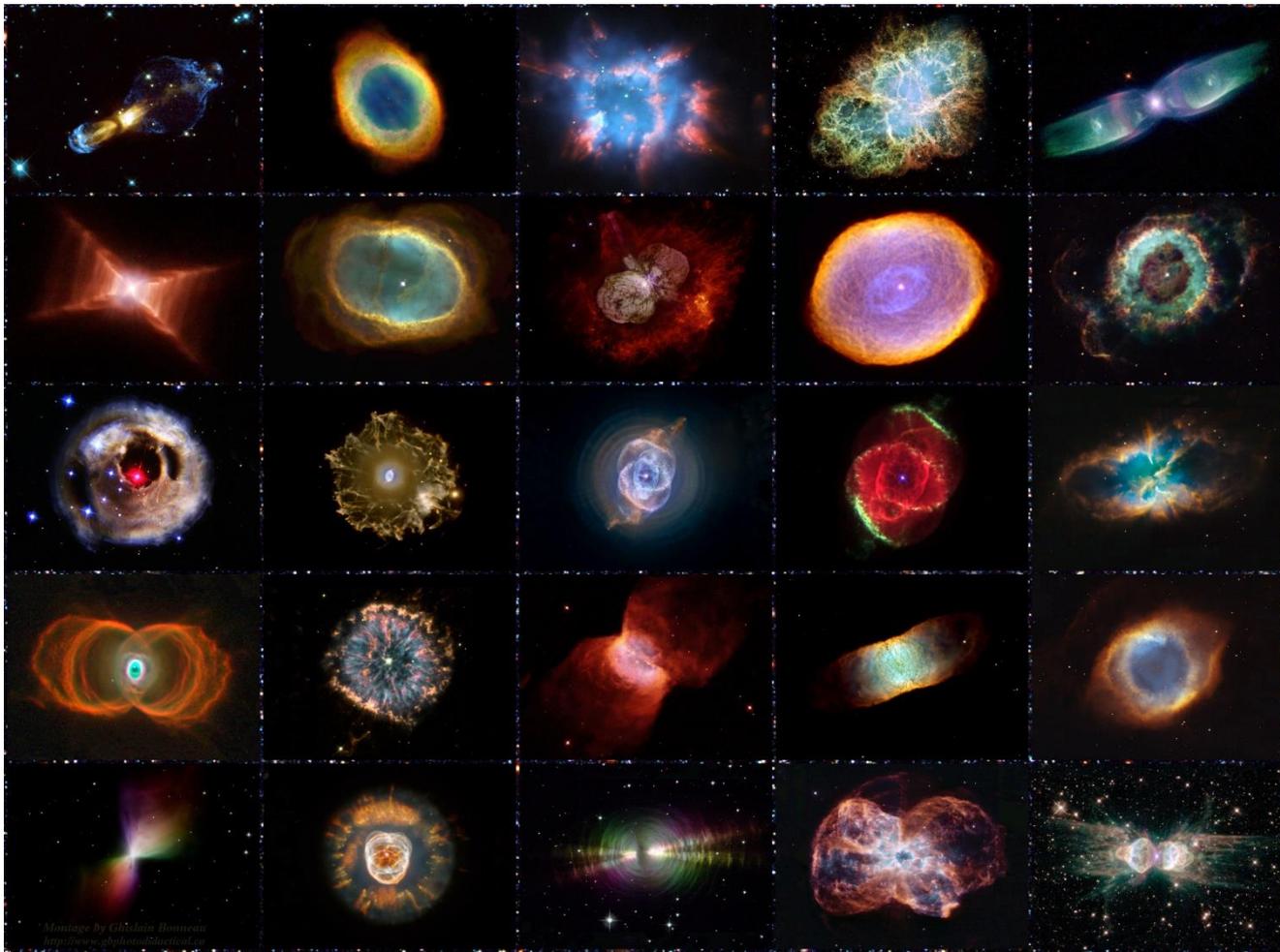


Planetary Nebula

- During helium shell flashes ejection of outer atmosphere regions



Burned-out core becomes a White Dwarf

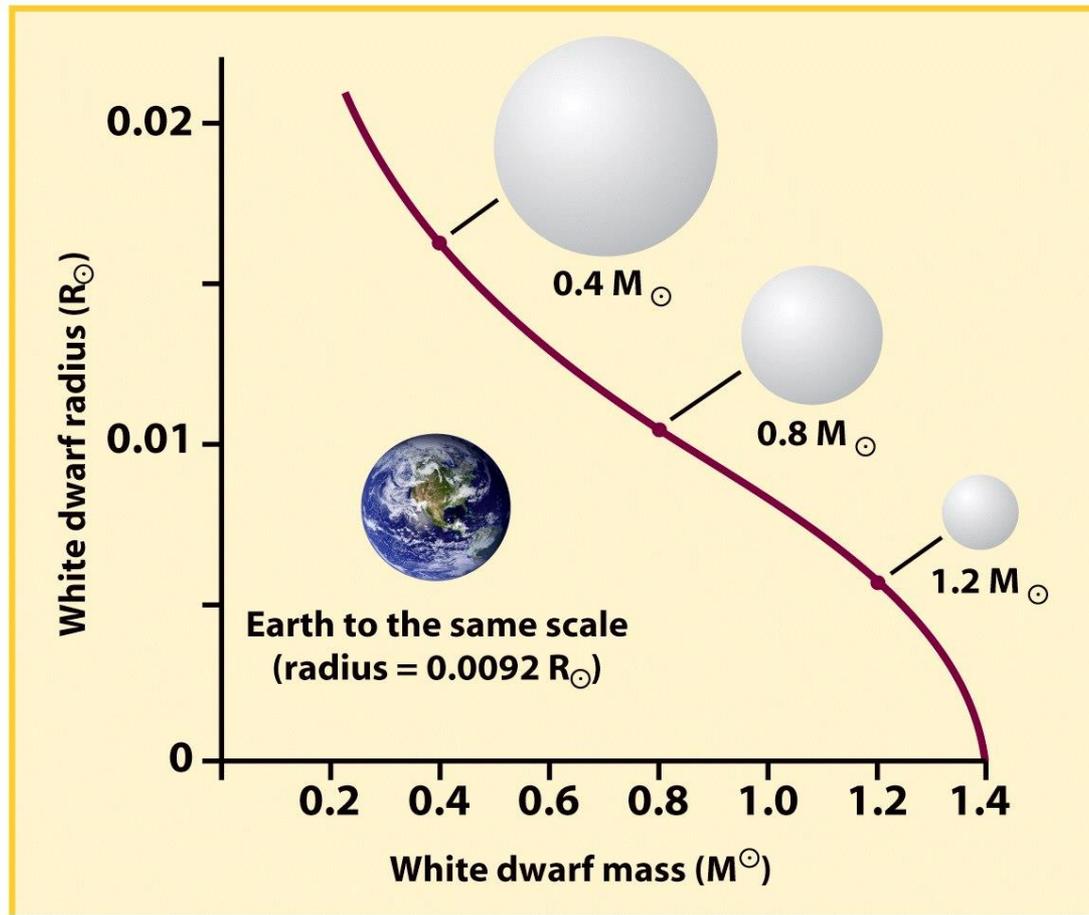
- In the exposed stellar core, *no nuclear reactions*
- It becomes a dense sphere about the size of the Earth and is called a *white dwarf*
- It is so dense that electrons are degenerate
- The degenerate-electron pressure supports the star against further collapse
- There is still thermal radiation
- As the *sphere cools*, it *becomes dimmer*
- One teaspoon white dwarf matter weighs about 5.5 tons (density about 10^9 kg/m^3)

Chandrasekhar Limit

- The Chandrasekhar Limit is the upper limit of the mass a white dwarf can have
- The limit is $1.4 M_{\odot}$
- Beyond this limit, the degenerate electron pressure can no longer hold the gravitation contraction

White Dwarfs

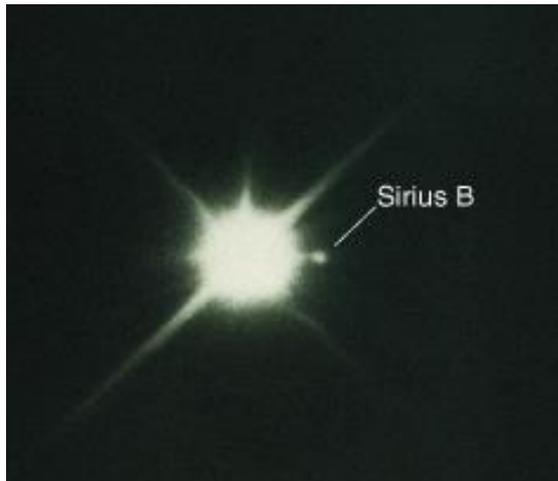
- The more massive a white dwarf, the stronger the gravitation, and the smaller the size



White Dwarfs

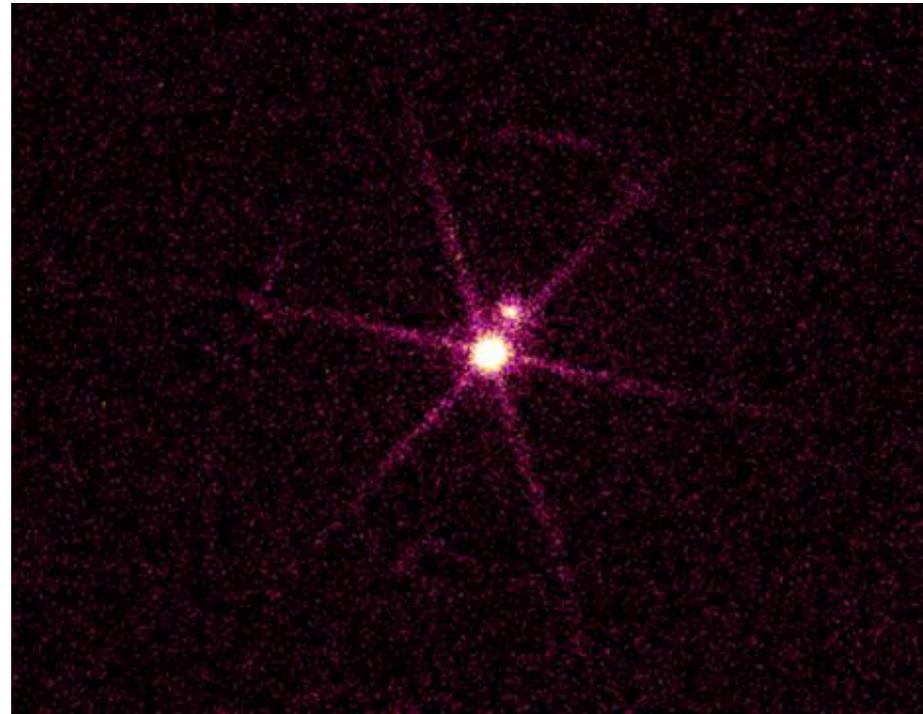
- Up to 20% of the “visible mass” in the solar neighbourhood are white dwarfs

Sirius

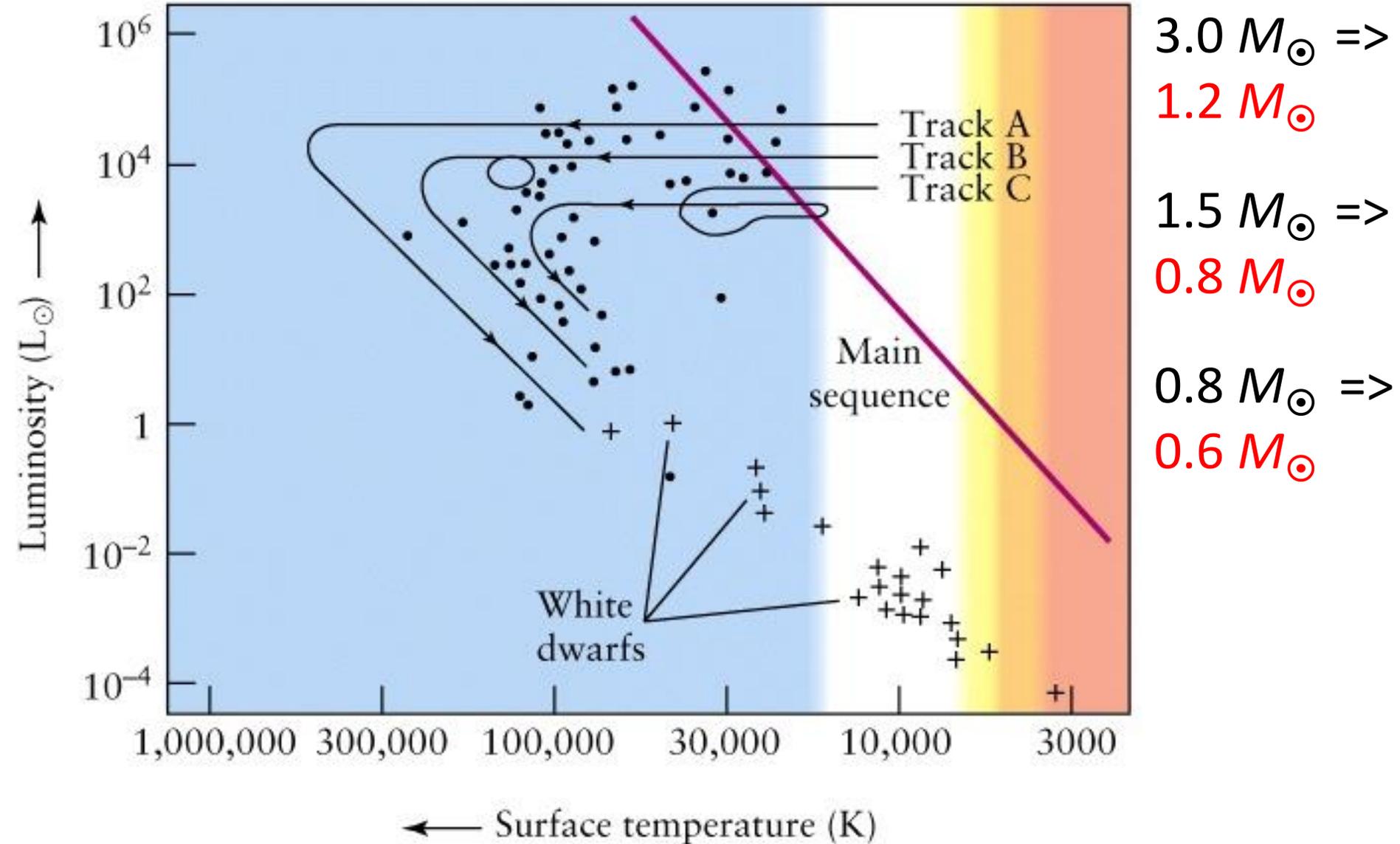


Optical

X-ray



White Dwarfs



White Dwarfs

- Types of white dwarfs

