Creation Through Explosion

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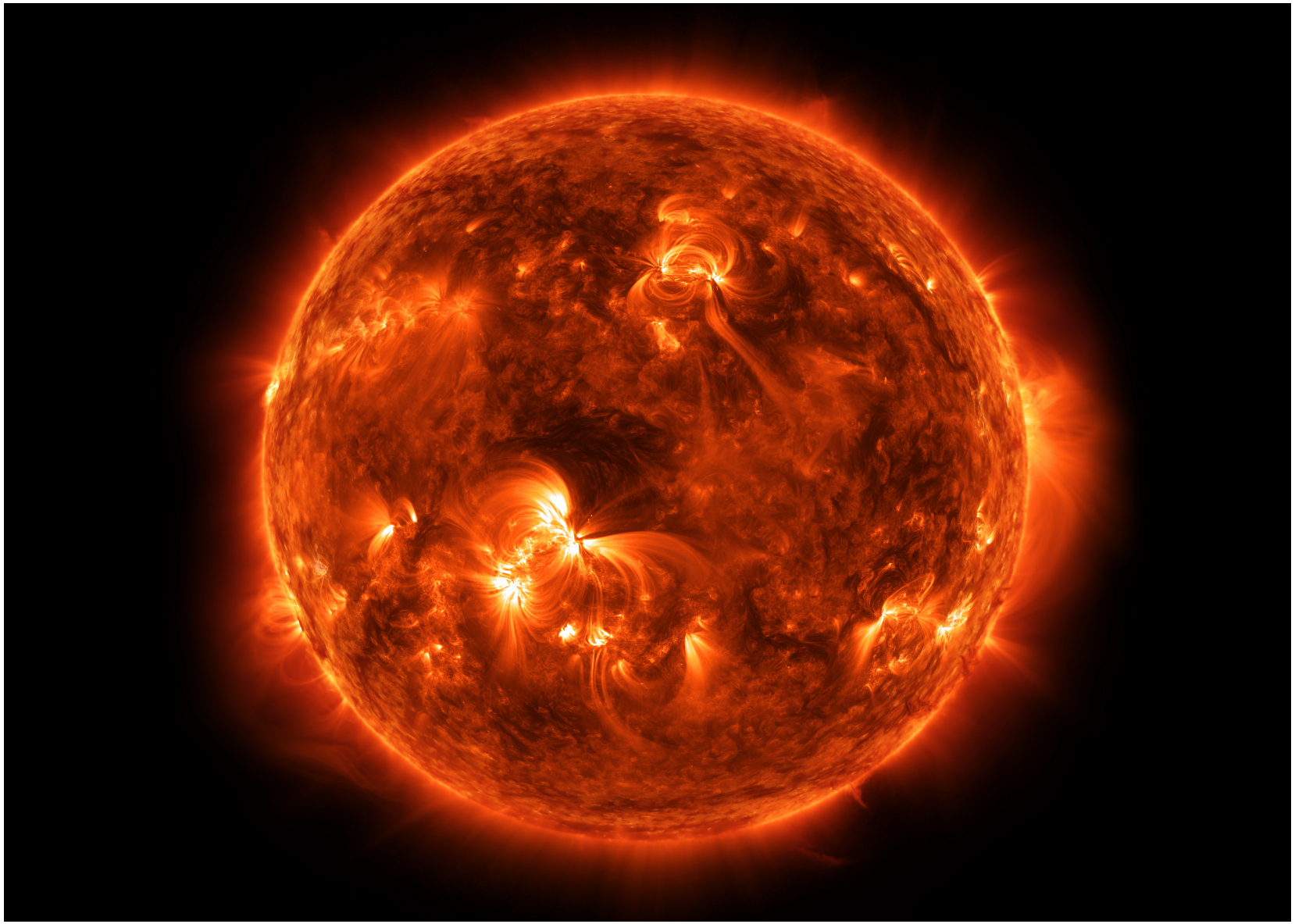
Aurora

Yosemite in winter night

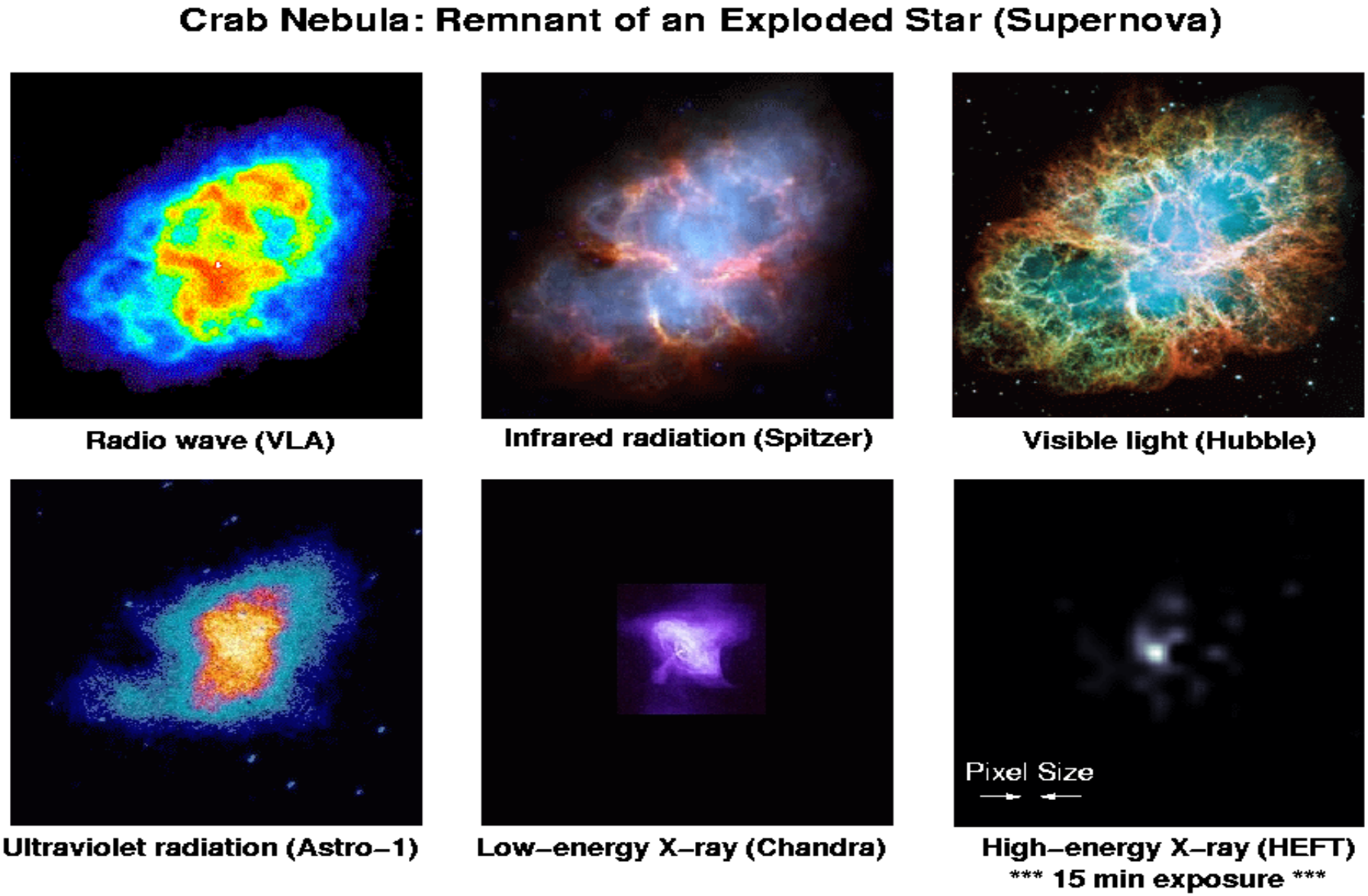
Milkyway: our galaxy



The Sun

Collision of two galaxies

Hubble Ultra Deep Field



Crab Nebula in different bands

How we came into being?

- What are we made of?
- Sun possesses a fair amount of Oxygen, Carbon, Nitrogen and heavier elements like Iron, Nickel etc.
- It seems that we got these elements from the Sun
- But how did Sun get these elements in the first place?

- How the stars are born?

· (i) There are large clumps of cold Gaseous clouds (mostly Hydrogen)

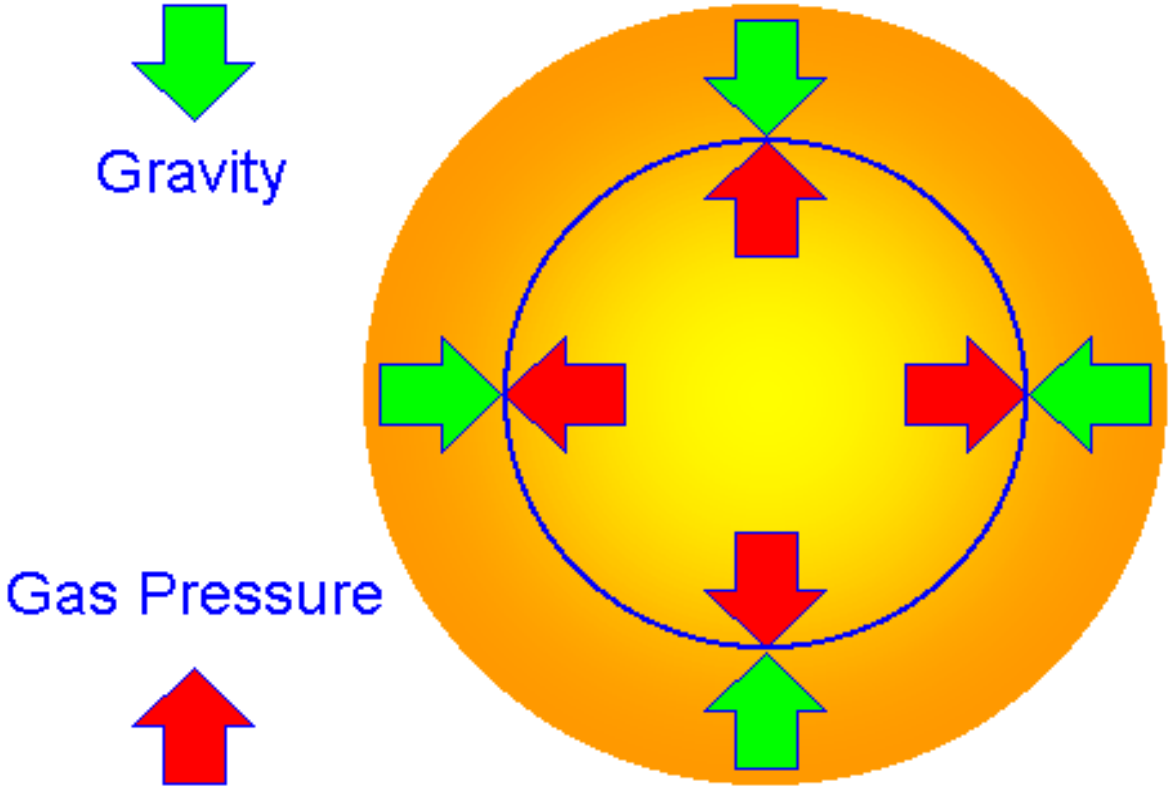
· (ii) The clumps collapse under gravitational force

· (iii) This collapse heats up the gas and it begins to radiate

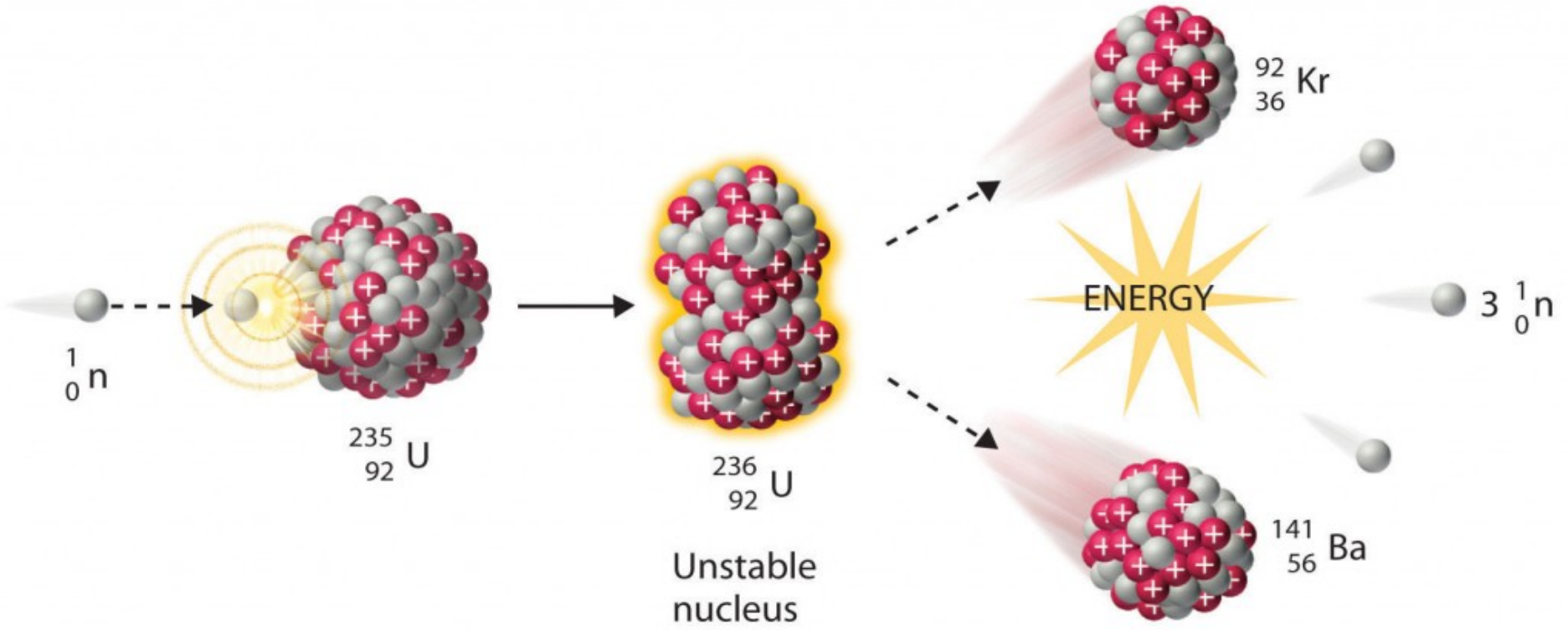
· (iv) Stars are formed when a equilibrium is reached, i.e. when
inward gravitational pressure = outward radiation pressure

· (v) Stars need to maintain this equilibrium for a steady lifetime; so they use their huge mass as the fuel for nuclear fusion: $E = Mc^2$

Hydrostatic Equilibrium

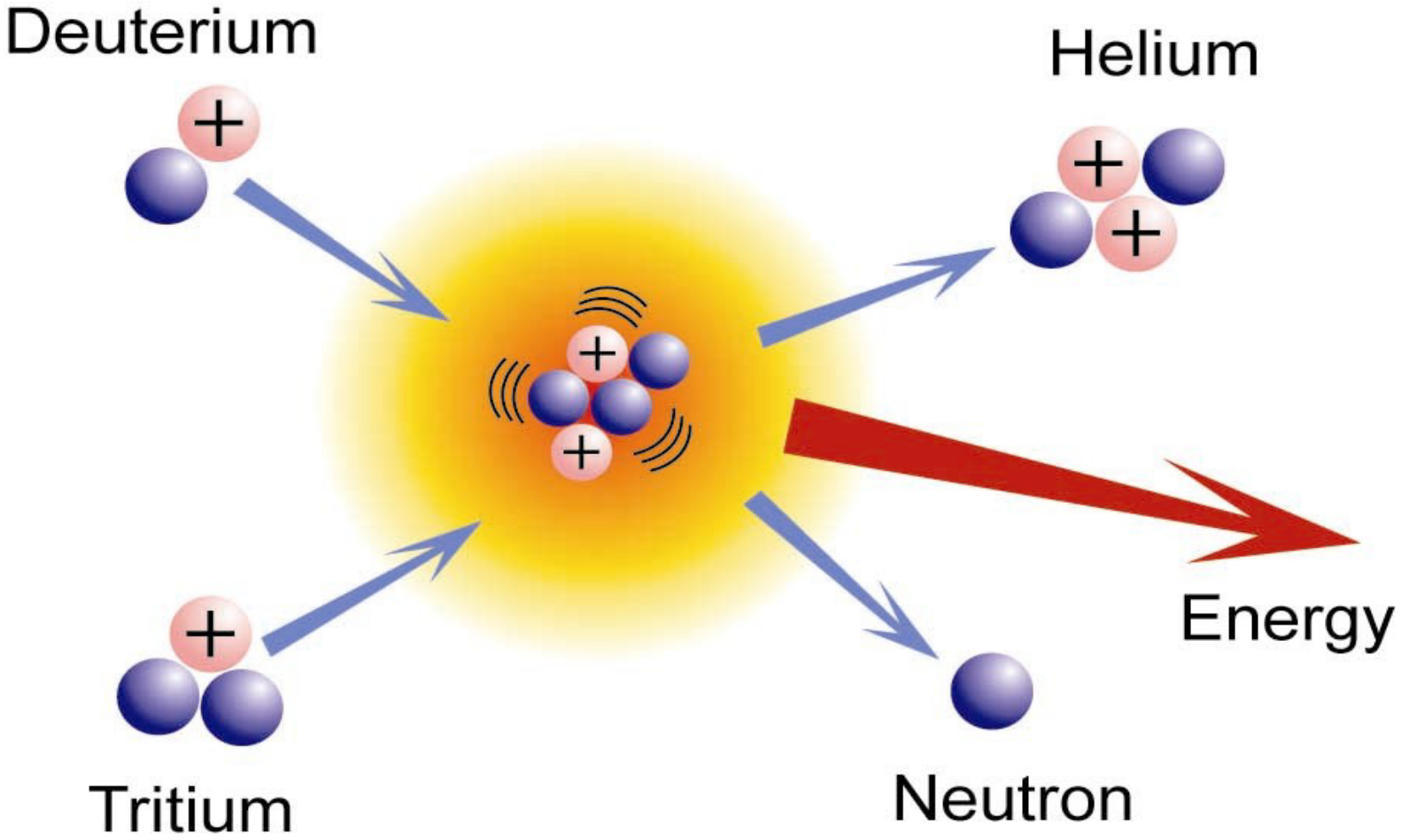


Birth of Stars



Uranium Fission

- For stars with initial mass $< 8M_{Sun}$



Hydrogen Fusion in Stars

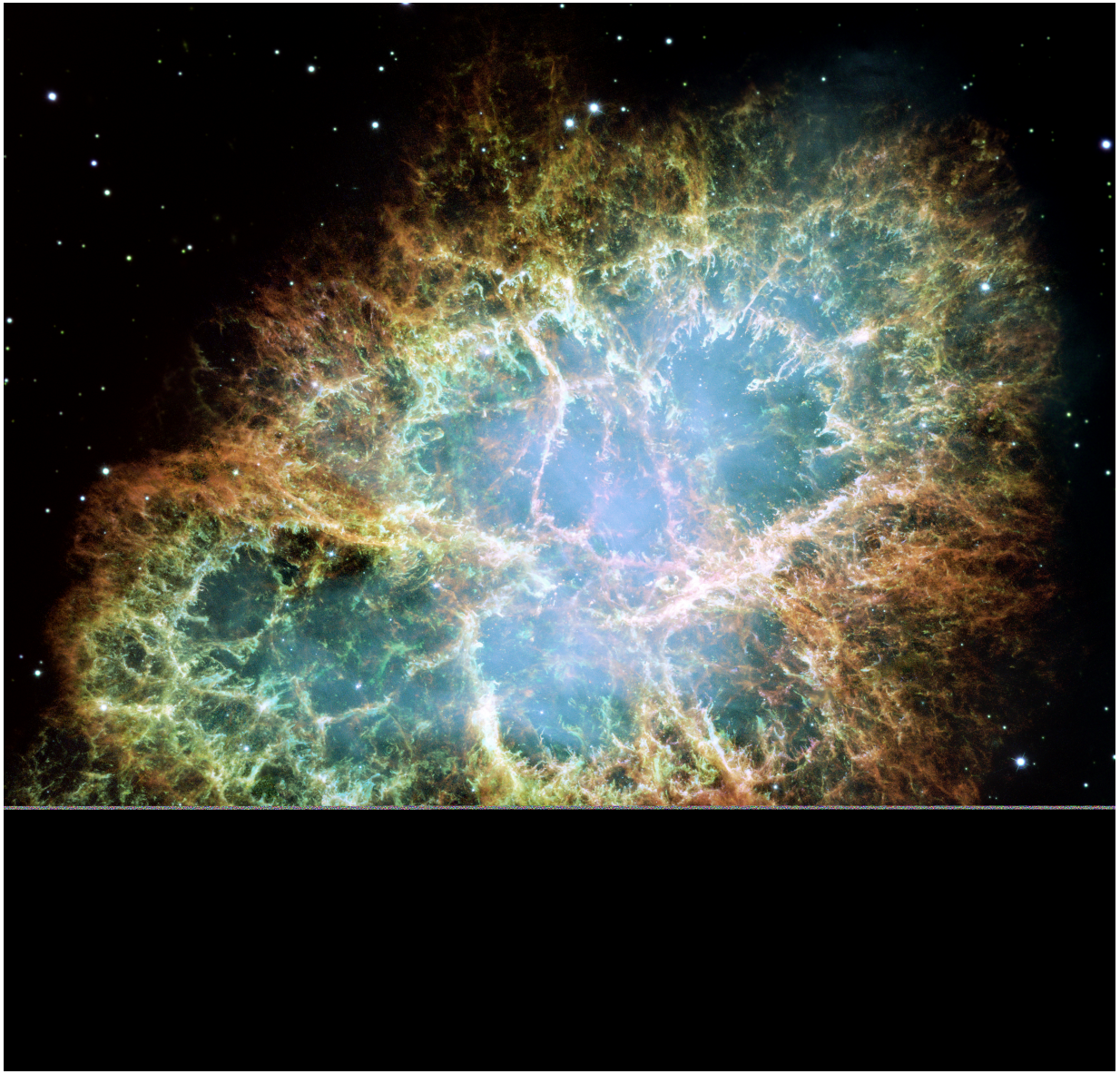
Cat’s Eye Nebula

- For stars with initial mass $> 8M_{Sun}$

· For such massive stars, the core temperature can reach up to $150 - 200$ million Kelvin or more due to enormous gravitational pressure

· At such high temperatures, these stars become able to fuse Helium and heavier elements to produce Carbon, Nitrogen, Oxygen etc. up to Iron and after that gravitational collapse is halted by Degeneracy Pressure

· Ultimately, in the dying stages of these stars, all other heavier elements are produced through violent explosion, named as Supernovae



Crab Nebula Supernova Remnant

Thank you!!!