Wednesday, February11, 2015

Grades posted.

Exams, Sky Watch returned

Astronomy in the news?

Launch of DISCOVR (Deep Space Climate Observatory: “GoreSat”) to monitor Earth (full Sun-lit face), Sun (flares, space weather), atop SpaceX Falcon 9. Second attempt to land first-stage booster on floating barge for re-use. Postponed yesterday, tracking radar glitch, scheduled for 5:07 Monday.

Postponed again, weather in Florida. Maybe tonight at 5:03. If not, then February 20.

Goal:

To understand how pressure is created in stars, how thermal pressure controls the evolution of normal stars, and why quantum pressure makes white dwarfs liable to explode in some circumstances.

Quantum Pressure -- just depends on squeezing particles,
electrons for white dwarf, to very high density
-- depends on density only
-- *does not* depend on temperature

Important Implication:

Normal ★ Radiate excess energy, pressure tries to drop, star contracts under gravity, and gets **hotter** (and higher pressure)

White Dwarf Radiate energy, *temperature does not matter*, pressure, size, remain constant, star gets **cooler**

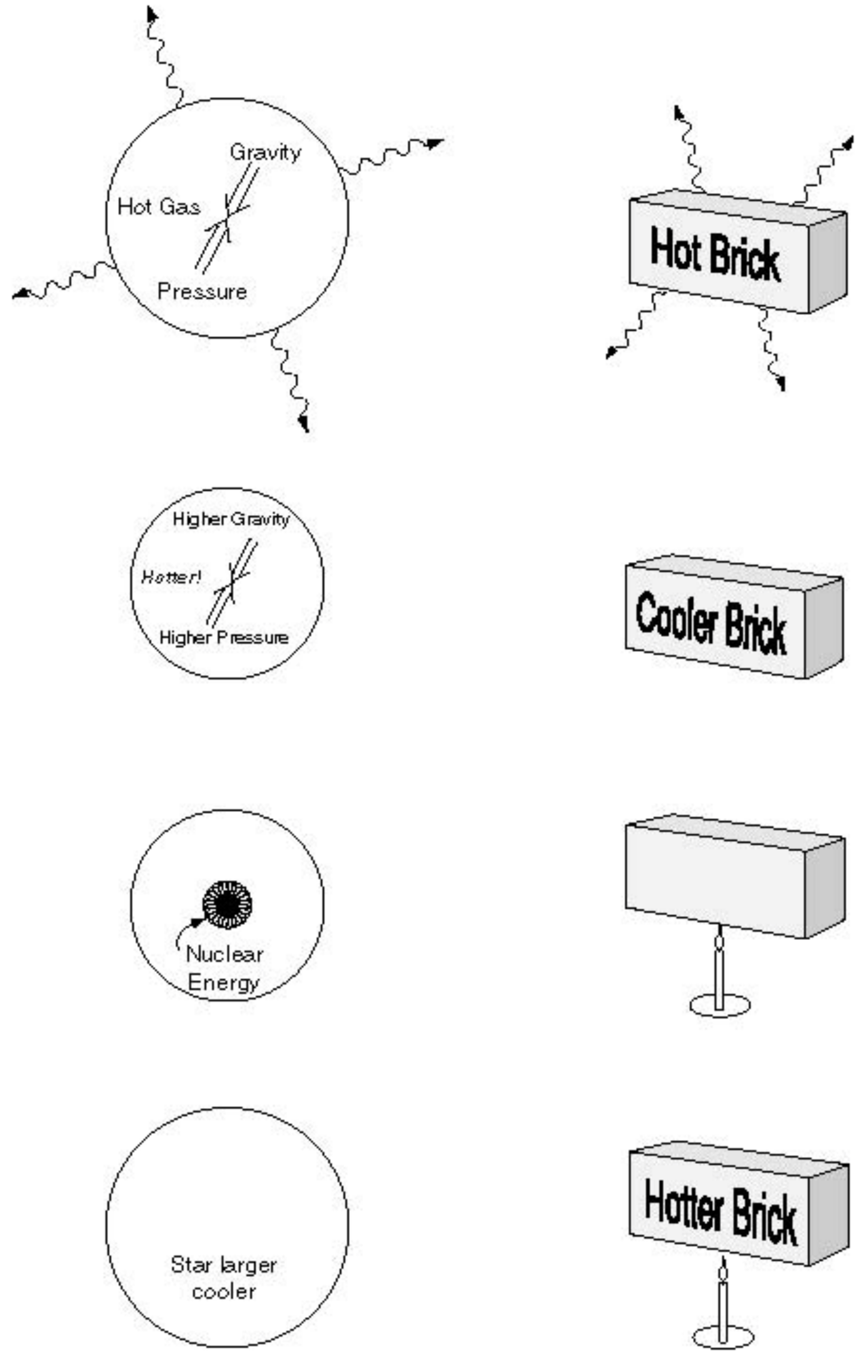
Opposite behavior	Normal Star - *Regulated*	put in energy, star expands, cools
	White Dwarf - *Unregulated*	put in energy, hotter, more nuclear burning -- explosion!

Figure 1.3

A normal star can and will radiate away thermal energy and hence structural energy.

A brick cannot radiate its structural energy,

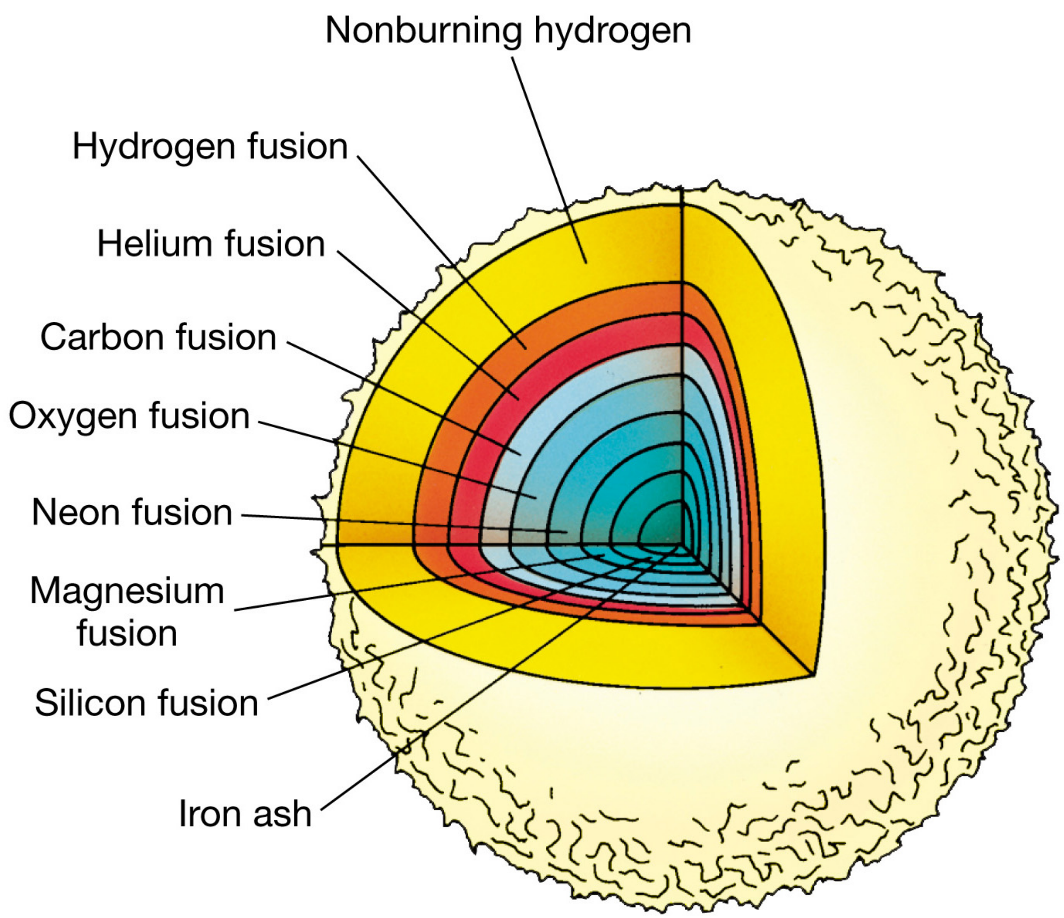
A white dwarf cannot radiate away its quantum energy.



Goal: to understand the origin of Type II, Ib, Ic

How does a massive star get from hydrogen to iron, and why iron, and what then?

Reading: Chapter 2, Section 2.1, 2.4, 2.5, Chapter 6, Sections 6.4 – 6.5



Nuclear physics:

Protons and neutrons attract each other.

The **strong nuclear force** (Section 1.2.1) binds protons and neutrons together in atomic nuclei.

Short range force, acts only when protons and neutrons are nearly touching.

Protons have positive electrical charge. They repel one another at large distances.

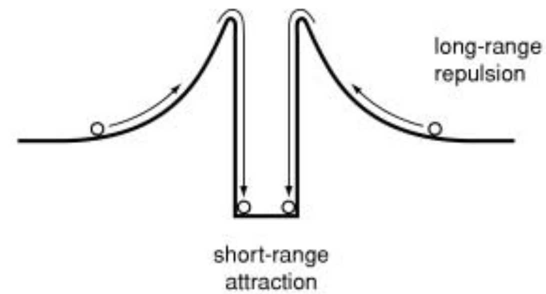
The strong nuclear force can, and does overwhelm the charge repulsion if the protons and neutrons are close enough together.

Evolution of Stars - gravity vs. charge repulsion § 2.1

Discussion point: Why do you have to heat a fuel to burn it?

H → He → C → O
more protons, more charge repulsion, must get ever hotter to burn ever “heavier” fuel

Just what massive stars do!
Support by thermal pressure.
When fuel runs out, **core loses energy**, but gravity squeezes, core contracts and HEATS UP
overcomes higher charge repulsion, burns new, heavier fuel, ***until get to iron***



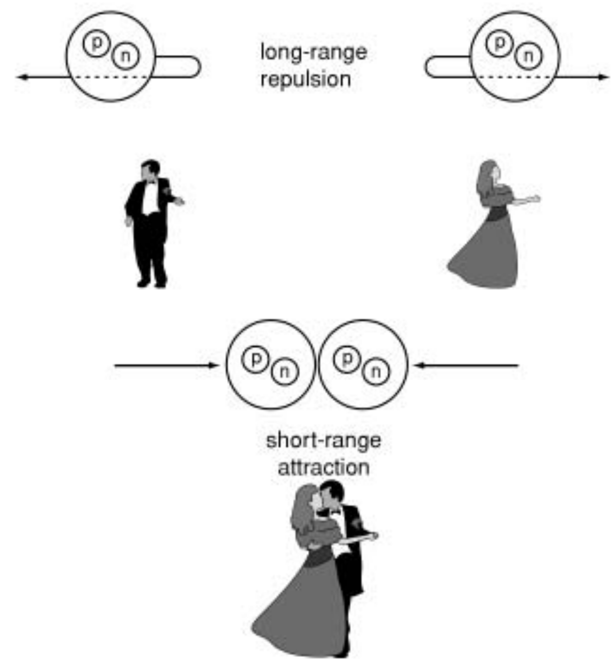


Figure 2.1