Monday, September 23, 2013

See Kevin for exams, skywatch, key posted on class web site.

Fixed grades on Blackboard, sum not done properly.

Reading Chapter 6 (continued) Sections 6.4, 6.5, 6.6, 6.7
(background: Sections 1.2, 2.1, 2.4, 2.5, 3.3, 3.4, 3.5, 3.10, 4.1, 4.2, 4.3, 4.4, 5.2, 5.4)

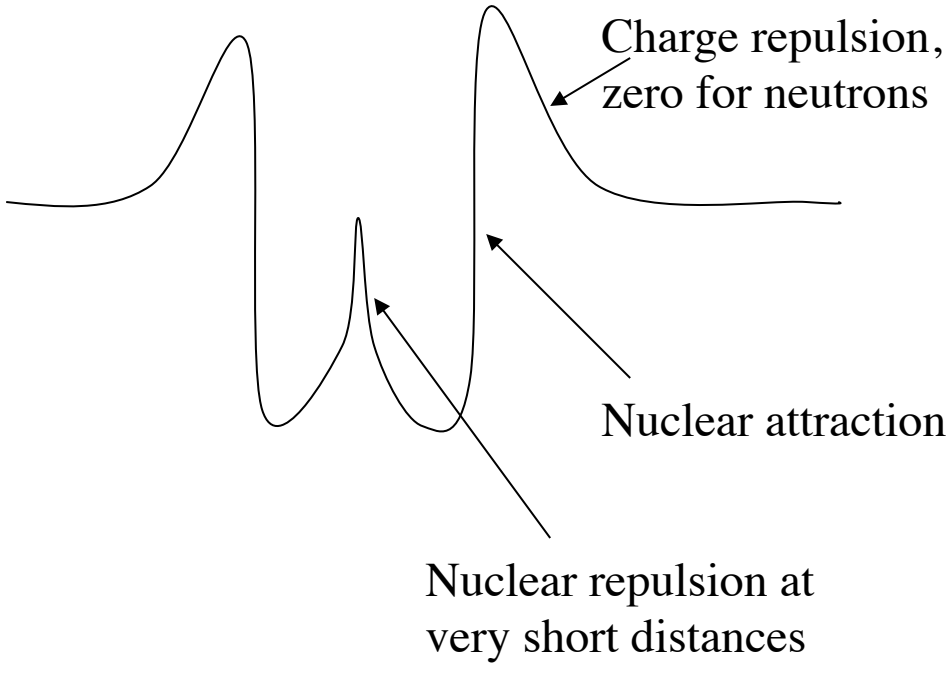
Astronomy in the news?

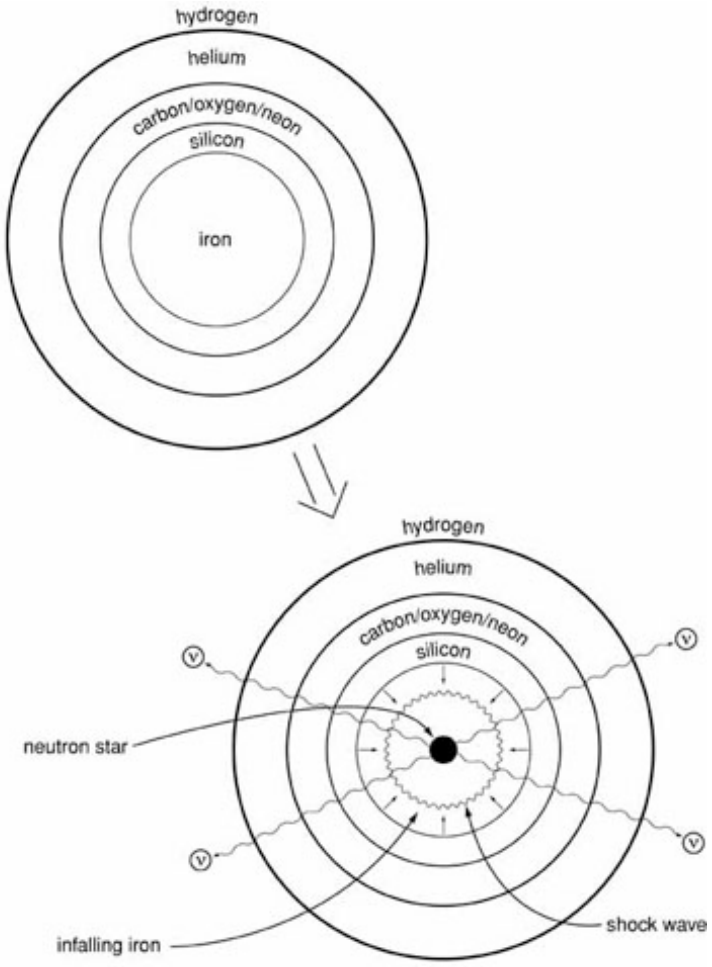
Goal

To understand how the collapse of an iron core can trigger a supernova explosion

Fig 6.1

Collapse is halted by the repulsive nuclear force (somewhat uncertain) + quantum pressure of neutrons

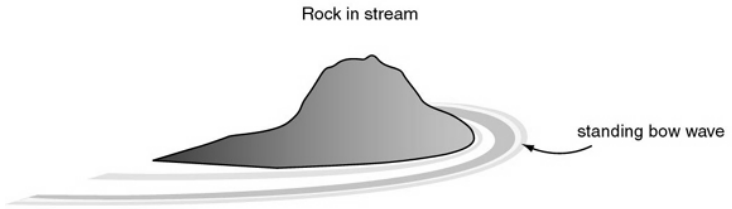




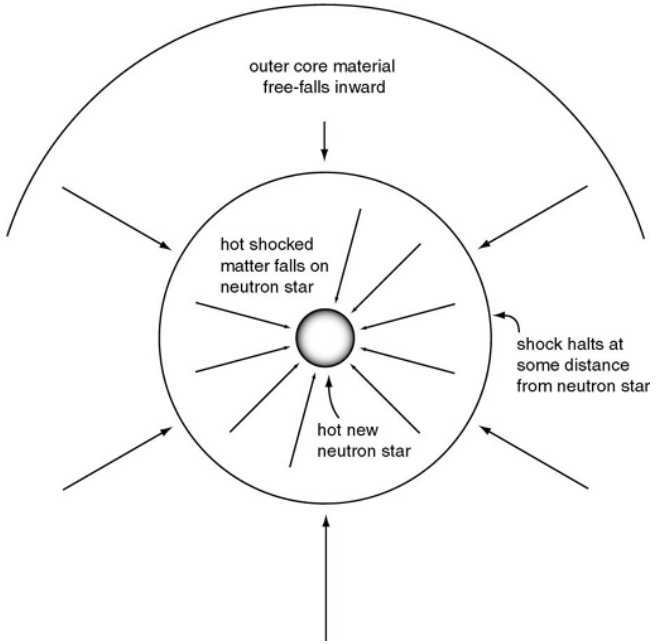
Maximum mass of a neutron star is 1.5 to 2 solar masses

New-born neutron star over compresses and rebounds - potential mechanism for explosion,

DOES NOT WORK!



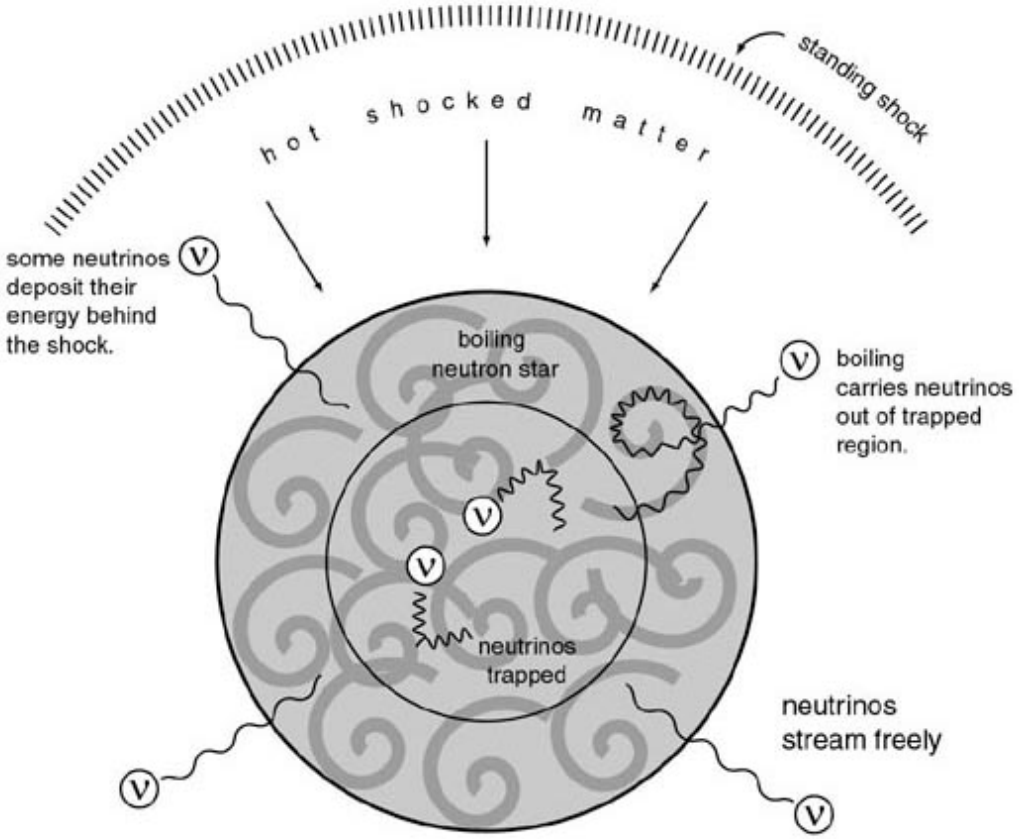
Form ***standing shock***, and outer material just continues to fall in, pass through shock front and settle onto the neutron star.



Perhaps the neutron star can boil out neutrinos at a higher rate…

Possible, but still not proven,

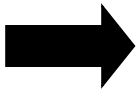
A bit like boiling a pot on the stove, the steam comes out, but lid just rattles, it does not explode to the ceiling.



May need a new idea…

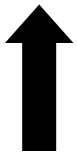
One Minute Exam:

Most of the energy liberated in the formation of a neutron star is emitted in the form of:

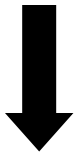


Neutrons

Protons



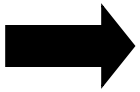
Neutrinos



Photons

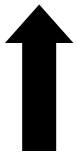
One Minute Exam

What happens to the initial ***shock wave*** produced when an iron core collapses to form a neutron star and bounces?



It fades away

It propagates out through the star and causes an explosion



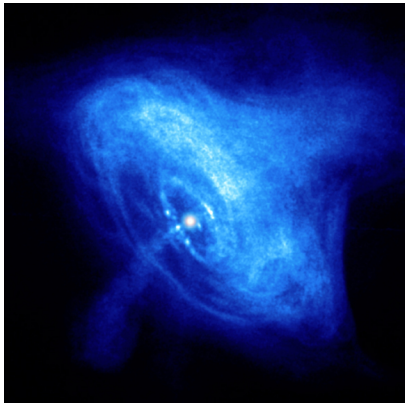
It stalls at some distance from the neutron star

It traps neutrinos

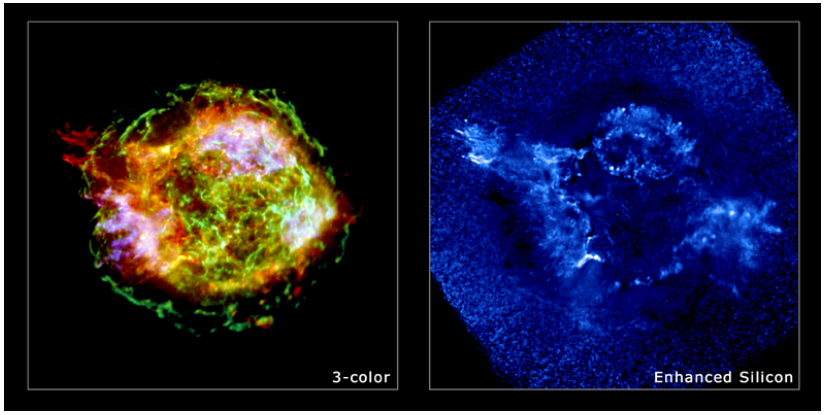
Goal

To understand how jets may trigger a core –collapse supernova explosion

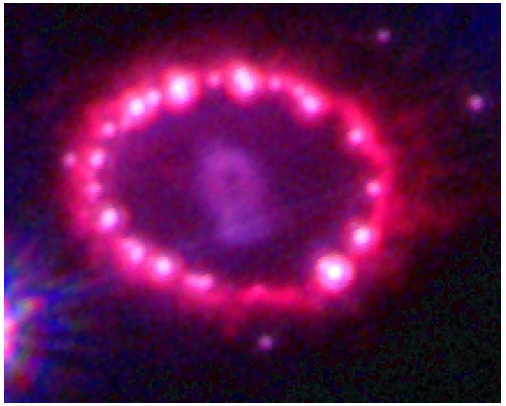
New possibility - Jet-induced supernova (Ch 6, p. 94)



Crab Nebula



Cassiopeiae A



SN 1987A

Are jet-like flows typical? Are they important?

Studies (last 20 years) show that all Core Collapse Supernovae (massive stars: Type II, Ib, Ic) are out-of-round.

Perhaps combination football, frisbee, or something else.
Death Star Explosion (YouTube)

Supernovae show shapes consistent with (but not necessarily proving) jet-like flow.

Computer calculations show that jets emerging from newborn neutron star can explode the star, make it out-of-round.

Predict a jet/torus “bagel and breadstick” shape

What jets do -

Bagel and breadstick, jet/torus shape “natural.”