Thursday, February 26, 2009

Reading Chapter 6 (omit Section 6.7)

Background, Chapter 2, Sections 1, 4, 5

Astronomy in the News?

Stepanie Wilson ‘92 UT Engineering Grad – building the International Space Station, ACES Lecture Hall Today 2 PM

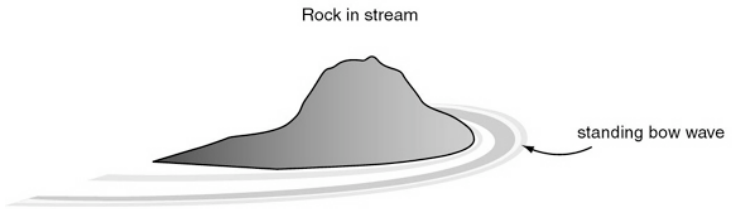
Gene Kranz Union Tonight 7:00 PM

Comet Lulin near Saturn and Regulus in Leo. Need binoculars.

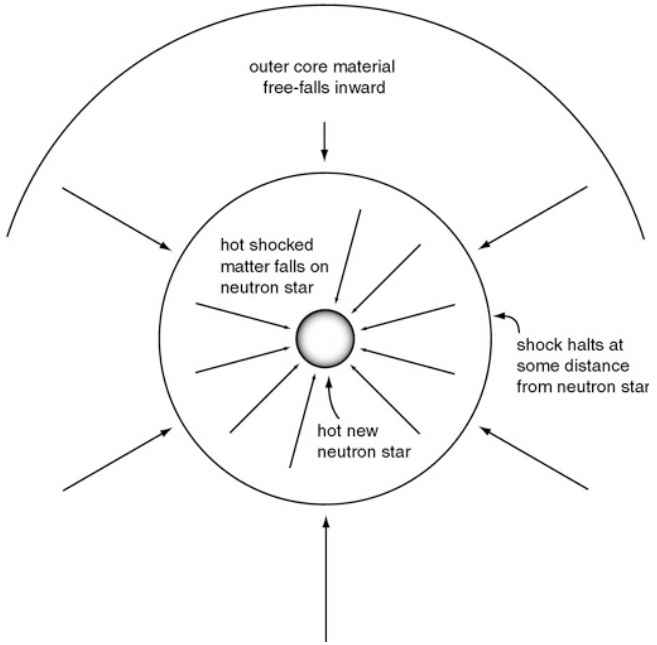
Pic of the Day - Moon, Jupiter, Mars, and Mercury from Australia

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

DOES NOT WORK!



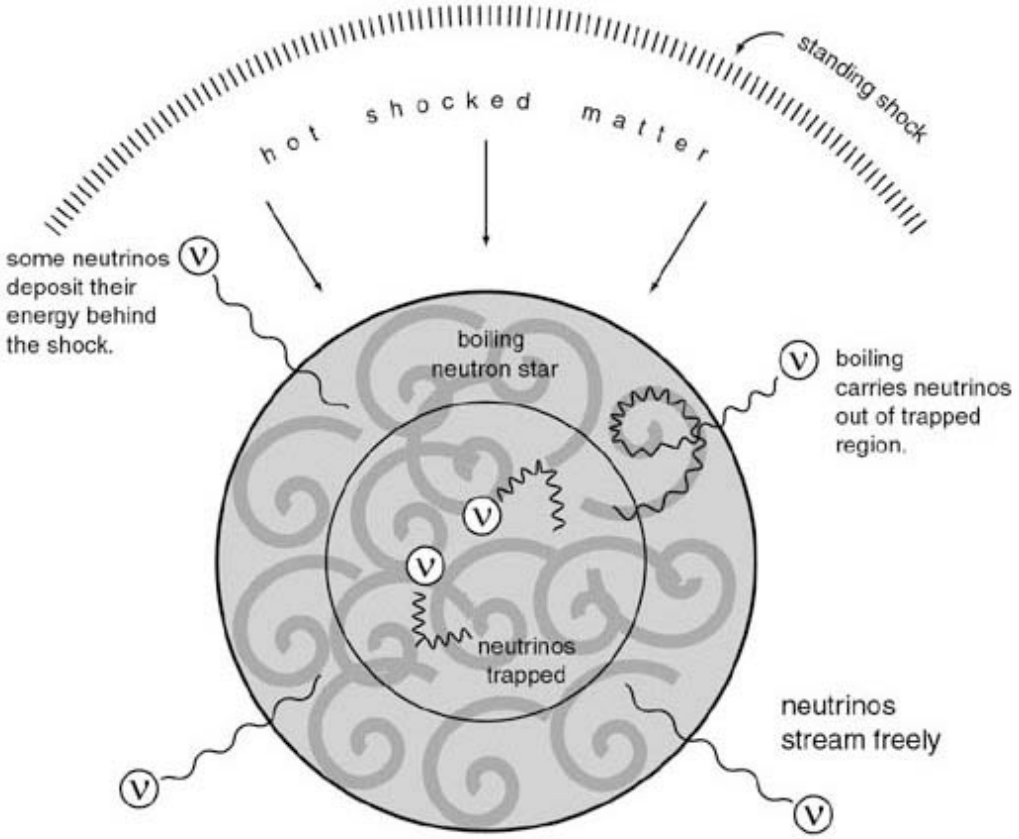
Form ***standing shock***, and outer material just continues to fall in, pass through shock front and settle onto the neutron star.



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:

A) Neutrons

B) Protons

C) Neutrinos

D) Photons

One Minute Exam

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

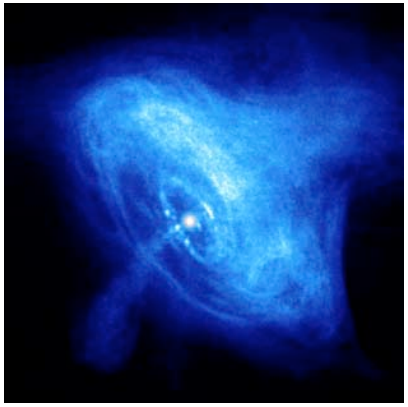
A) It fades away

B) It propagates out through the star and causes an explosion

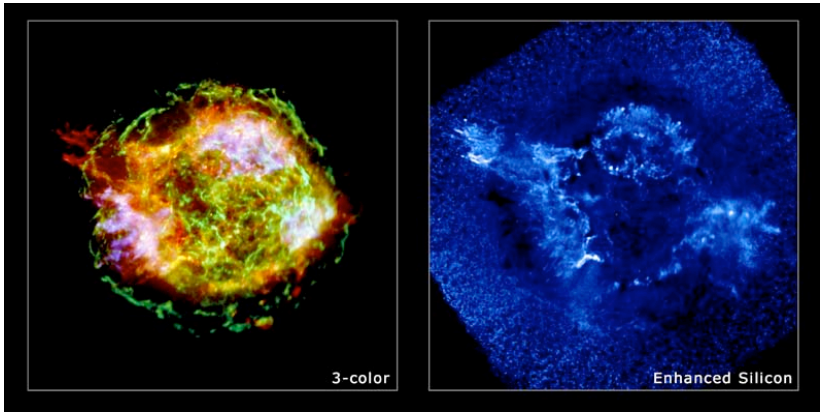
C) It stalls at some distance from the neutron star

D) It traps neutrinos

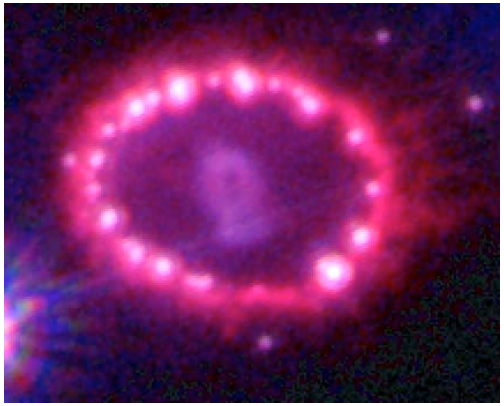
New possibility - Jet-induced supernova (Ch 6, p. 94)



Crab Nebula



Cassiopeiae A



SN 1987A

Are jet-like flows typical? Are they important?

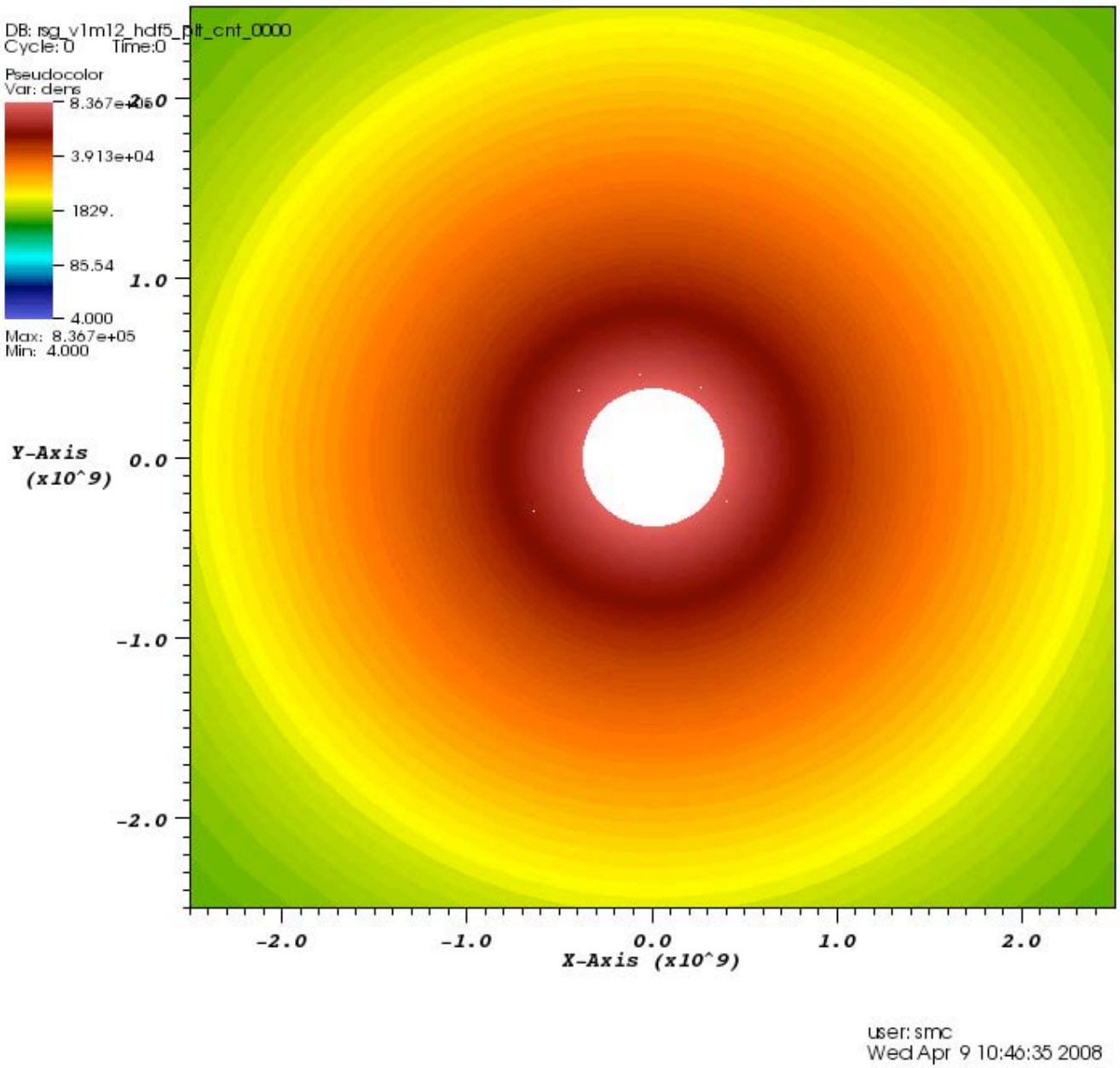
Studies (last 10 years) show that all Core Collapse Supernovae (massive stars: Type II, Ib, Ic) are out-of-round.

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

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

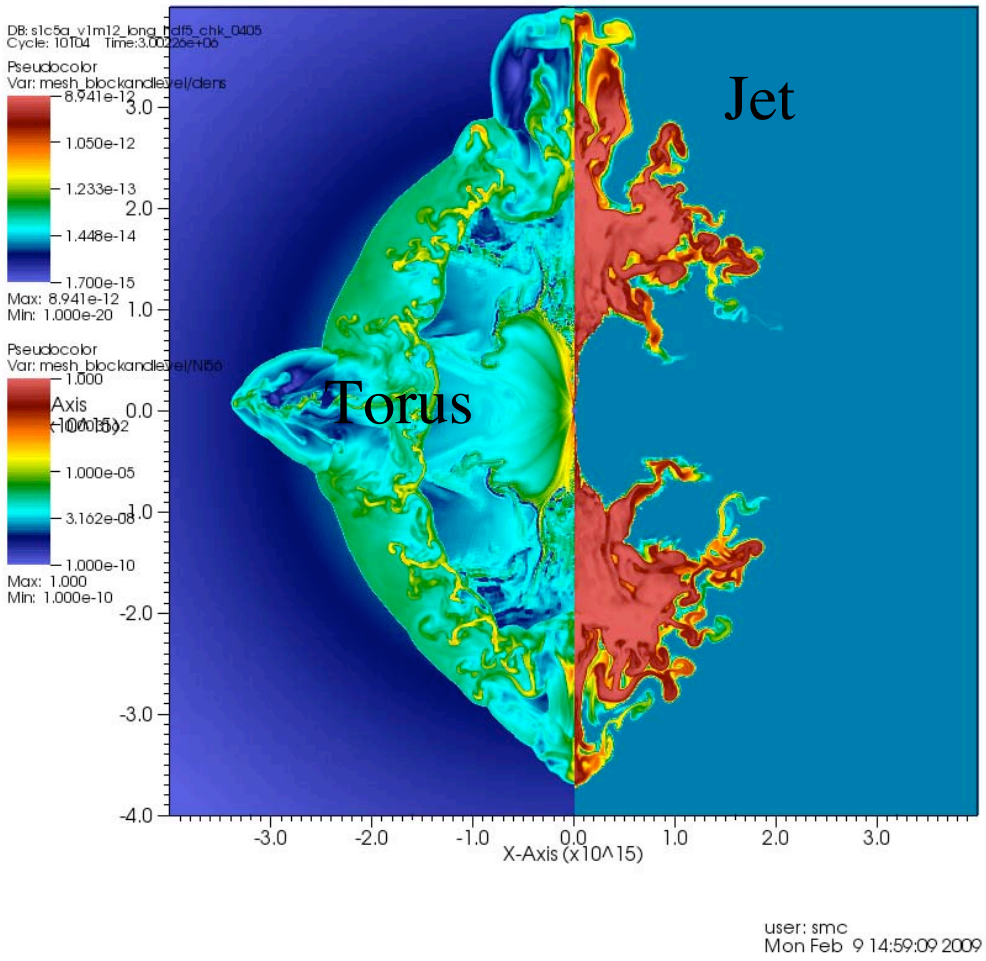
Calculations show jets emerging from newborn neutron star can explode the star, make it out-of-round.

Predict a jet/torus “bagel and breadstick” shape



Explosion of two identical jets in a red giant star like Betelgeuse

Couch et al. 2009



Computer models predict a jet/torus, "bagel and breadstick" structure

Couch et al. 2009

This is the first new idea to understand these supernovae in thirty years.

What jets do -

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

How to define a particular direction in space?

Rotation - rotation axis.

How to make a jet? Some variation on squeeze and squirt (toothpaste mechanism)

Rotate magnetic neutron star, amplify the magnetic field, eject mass if field is strong enough.

Magnetic lines of force, locus of equal field strength, act somewhat like rubber bands, they are elastic and tend to rebound if deformed and can be twisted and coiled.

Twisted magnetic fields have tension along them and exert pressure sideways and along the lines of force.

Rubber band - twist moves along the rubber band.