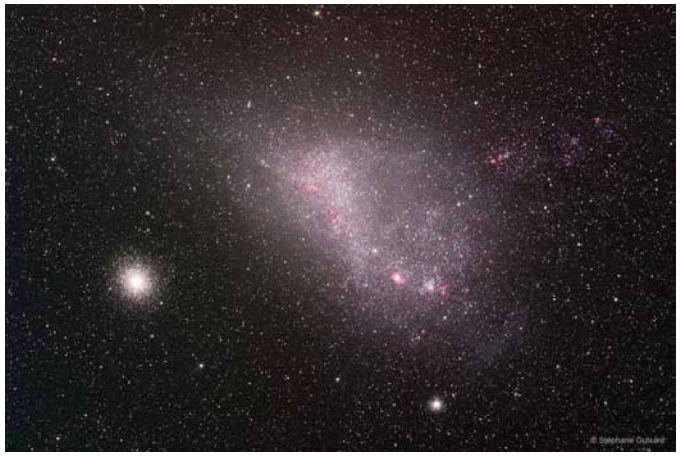
10/1/07

Sky Watch extra credit back

Wheeler on travel Friday - Film

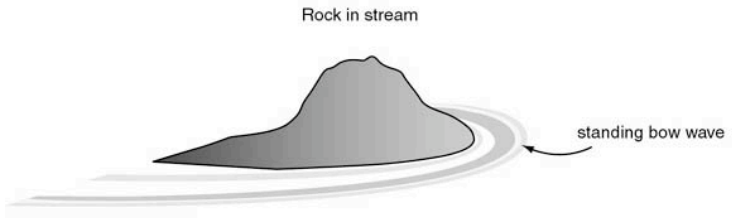
Astronomy in the news?

Pic of the Day - Small Magellanic Cloud, nearby irregular galay

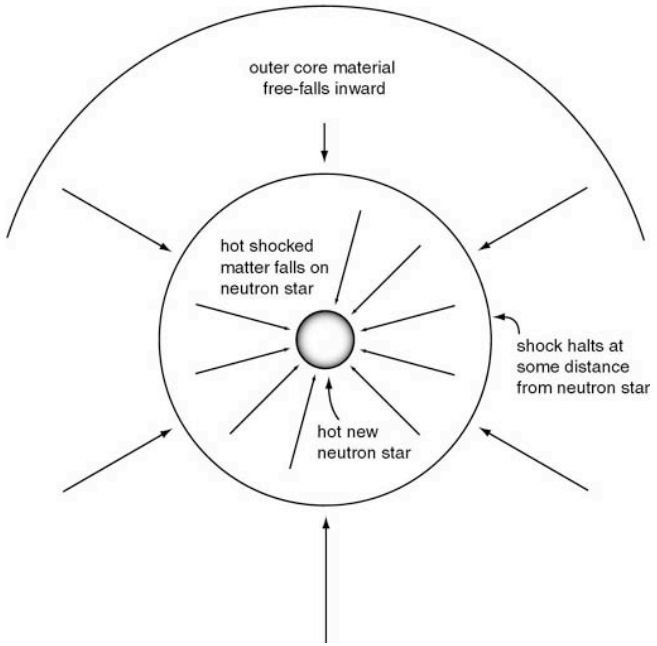


New-born neutron star over compresses and rebounds - potential mechanism for explosion,

DOES NOT WORK!



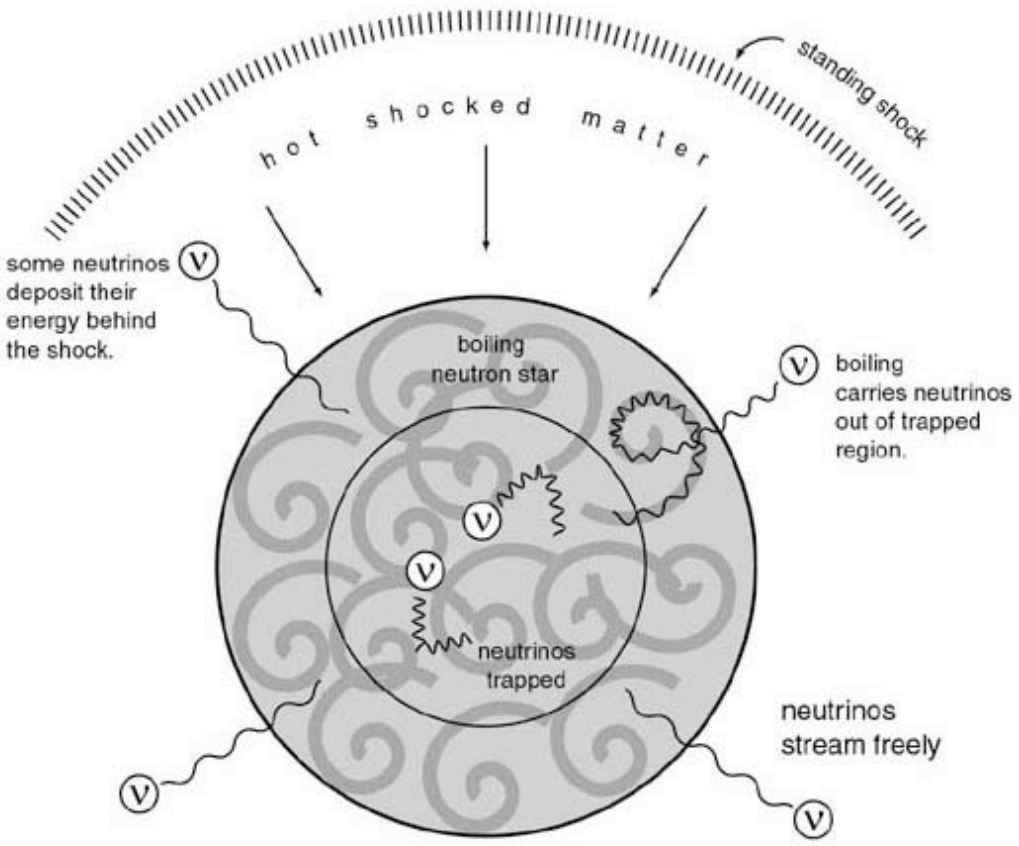
Form ***standing shock***, and outer material just continues to fall in, pass through shock front and settle onto the neutron star.



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:

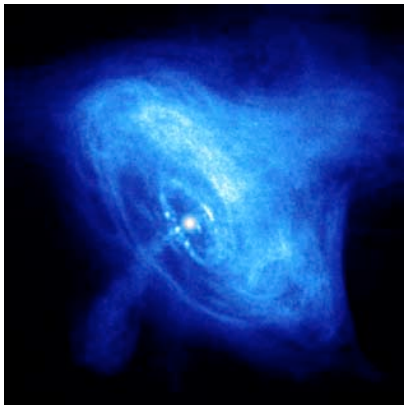
A) Neutrons

B) Protons

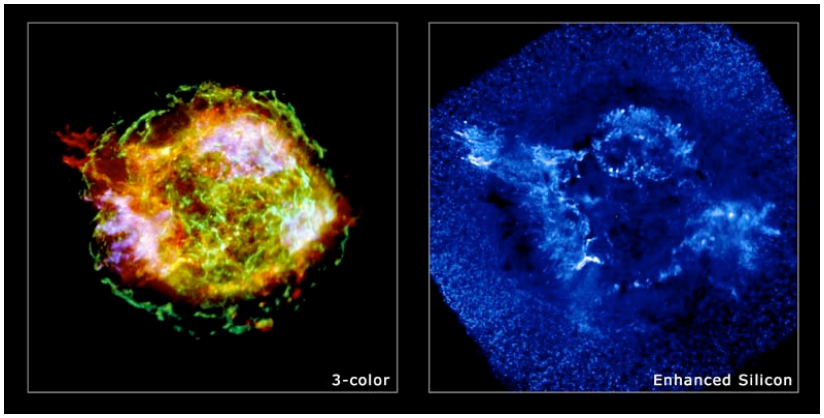
C) Neutrinos

D) Photons

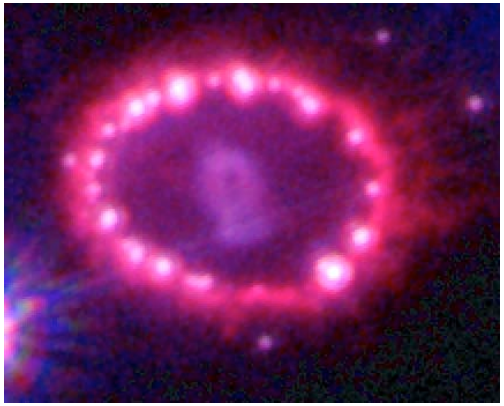
New possibility - Jet-induced supernova (Ch 6, p. 94)



Crab Nebula



Cassiopeiae A



SN 1987A

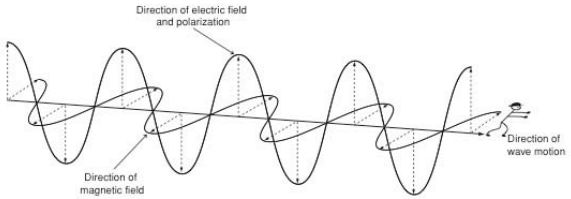
Are jet-like flows typical? Are they important?

What is the shape of a routine, extragalactic, core collapse supernova?

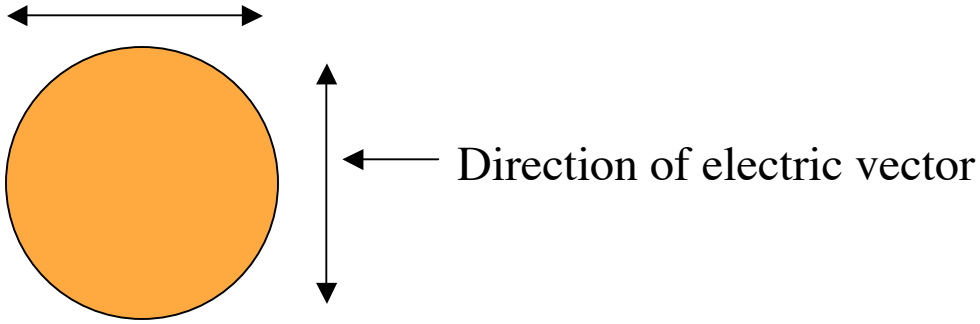
Ball, Football, Frisbee?

How do you measure that for a distant supernova that only appears as a dot of light in even the most powerful telescopes?

Polarization - orientation of the electric component of the electromagnetic waves (light) that comes from the surface of the star.



Polarization = 0: intensity the same in orthogonal directions, photosphere is circularly symmetric, supernova is spherically symmetric (or special viewing angle)



P ≠ 0: intensity different in orthogonal directions, photosphere is not circularly symmetric,
supernova is asymmetric

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

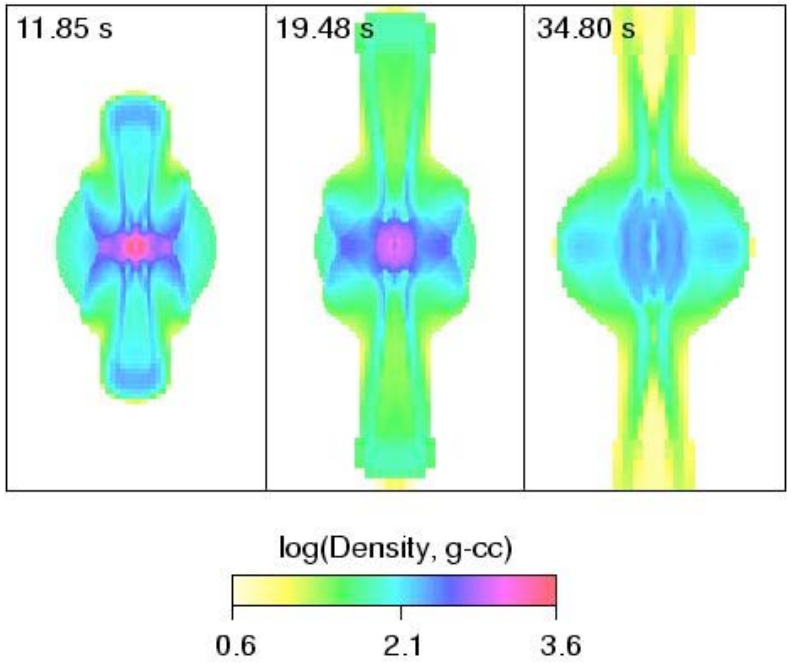
D) It traps neutrinos

Polarization studies (last 10 years) show that all Core Collapse Supernovae are out-of-round.

Perhaps combination football, frisbee, or something else.

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.



computer models predict a jet/torus structure

Khokhlov et al. 1999

These supernovae may be related to ***gamma-ray bursts***.

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

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.