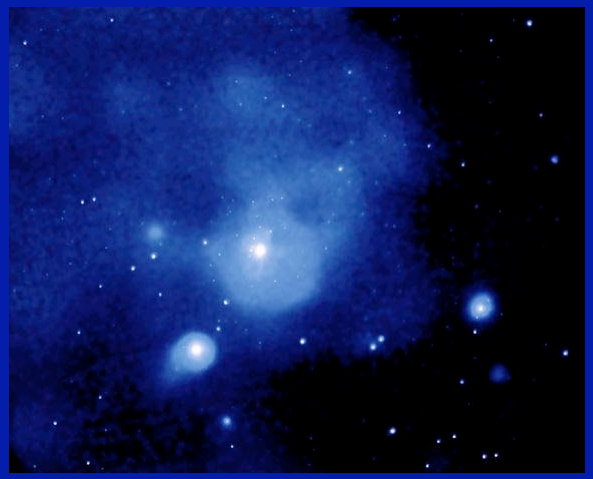
9/27/04

News?

Pic of the day last Friday - not cluster of stars, but cluster of GALAXIES in X-rays!

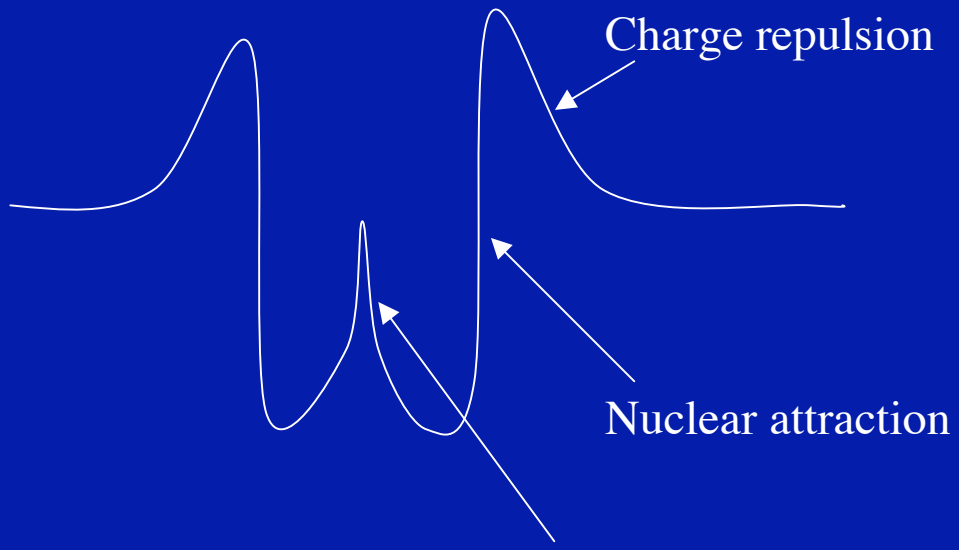


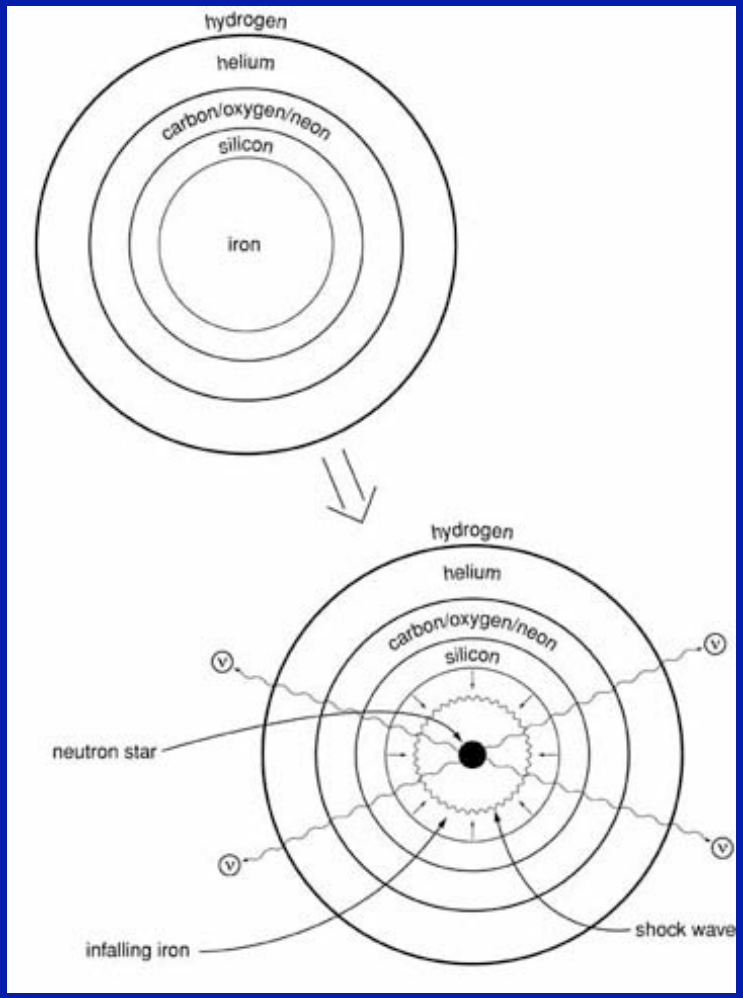
Pic of Today

Orion Nebula

Fig 6.1

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



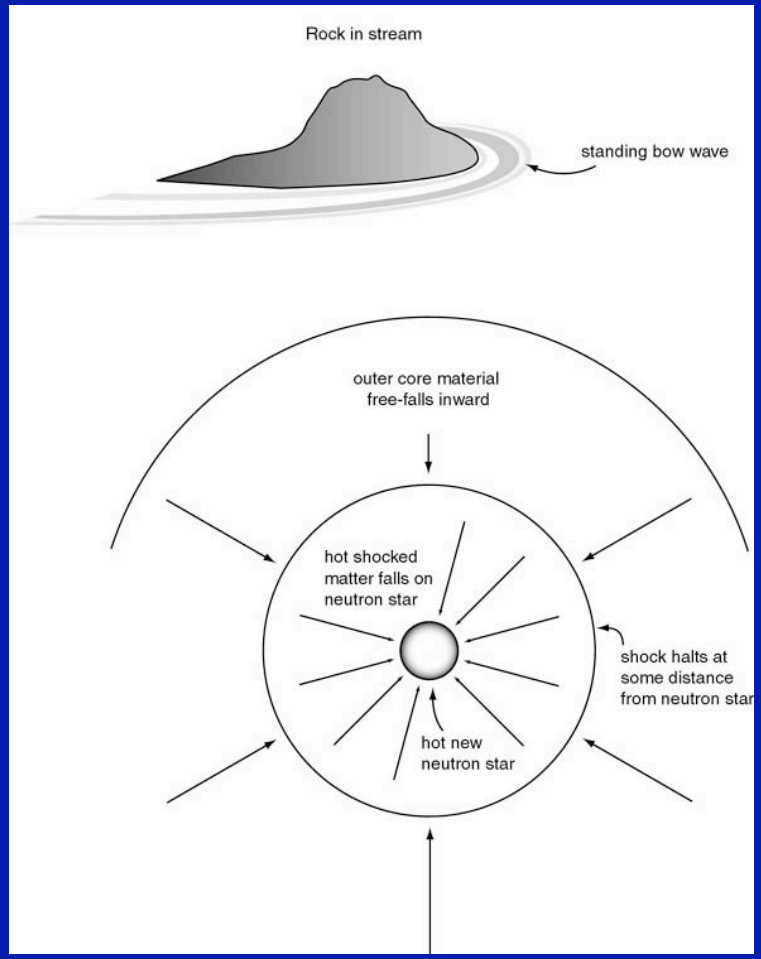


Maximum mass of neutron star is 1.5 to 2 solar masses

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.

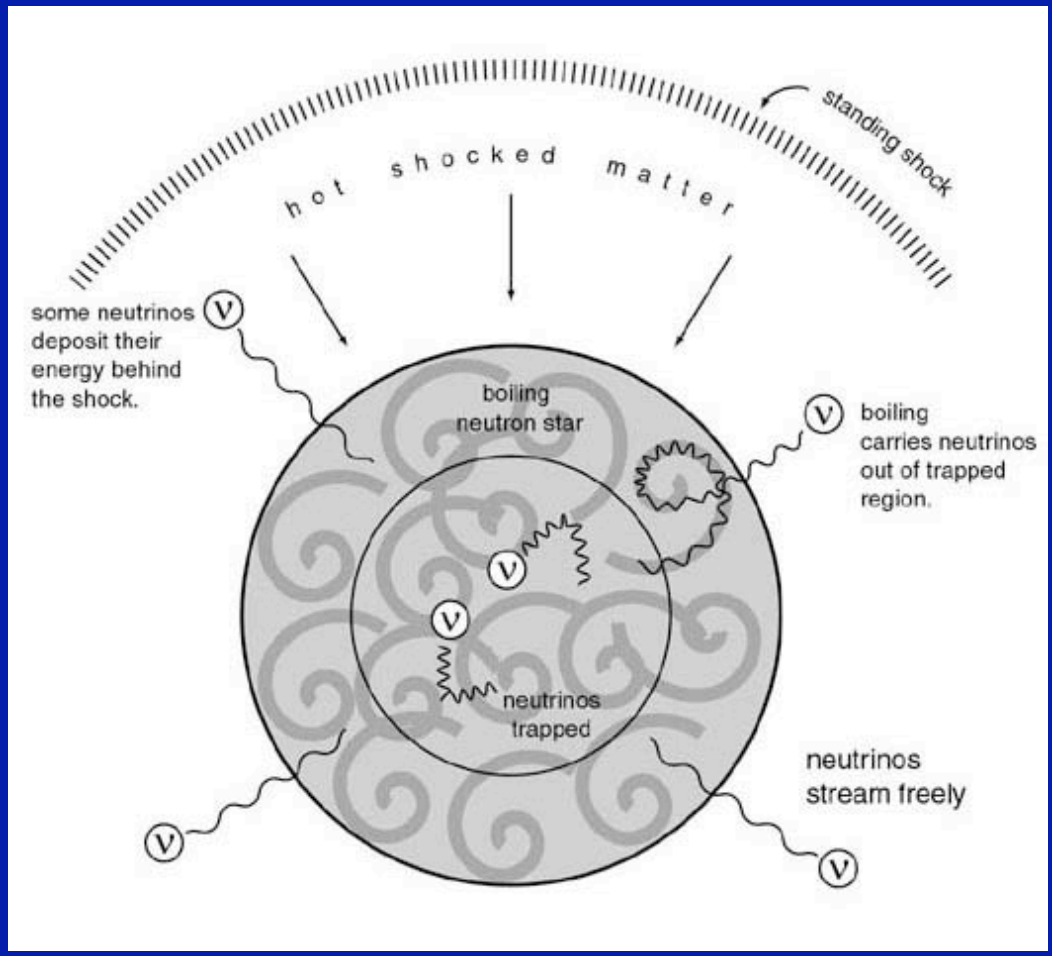


or the neutron star can boil out neutrinos at a higher rate…

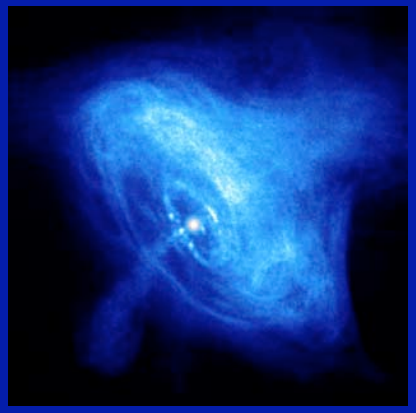
Possible, but still not proven,

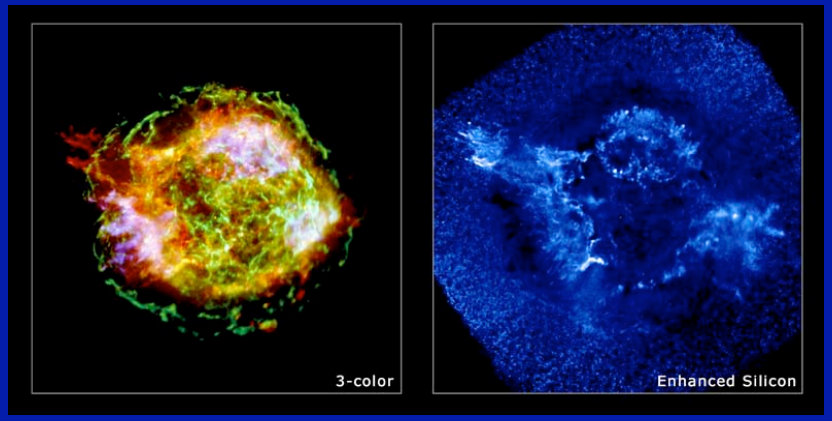
A bit like boiling a pot on the stove, the steam comes out, but lid just rattles, it does not explode to the ceiling

May need a new idea…



New possibility - Jet-induced supernova (p. 94)





Are jet-like flows typical? Are they important?

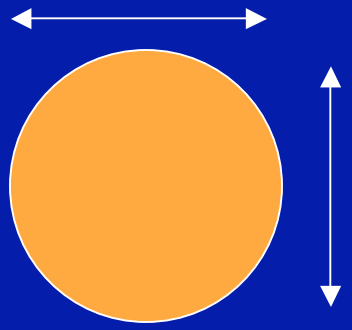
What is the shape of a routine, extragalactic, core collapse supernova?

Ball, Football, Frisbee?

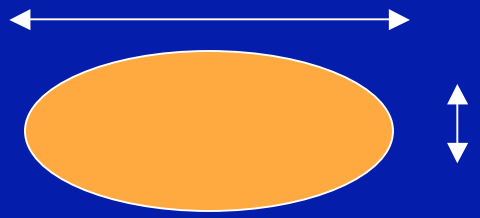
How do you measure that for a distant supernovaß that only appears as a dot of light in even the most powerful telescopes?

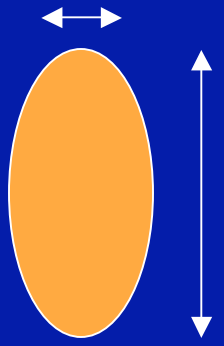
Polarization - orientation of the electric component of the electromagnetic waves (light) that comes from the surface of the star.

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



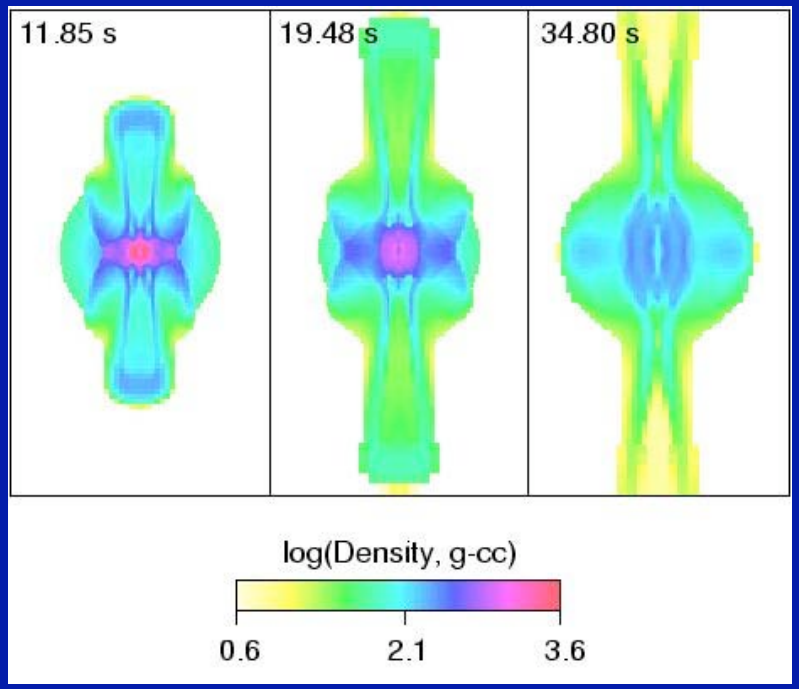


Polarization studies (last 5 years) show that all Core Collapse Supernovae are out-of-round

Perhaps combination football, frisbee, or something else.

They show shapes consistent with routine 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.

Jet Movies

How to make a jet? toothpaste

Rotate, magnetic neutron star, amplify magnetic field, eject mass?