

2/22/06

Book - may be in this week!

Reading - Chapter 6, Sections 4, 5

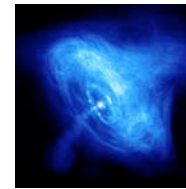
Campus Issue - core curriculum

News? Neutrinos in Ice Cube

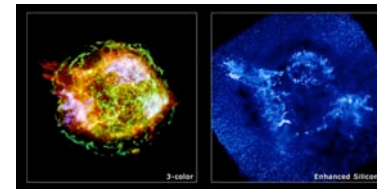
Pic of the day - Saturn's small moon, Telesto



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



Crab Nebula



Cassiopeiae A



SN 1987A

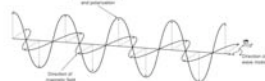
Are jet-like flows typical? Are they important?

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

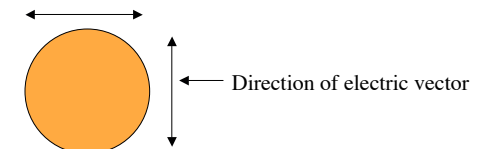
Ball, Football, Frisbee?

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

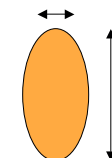
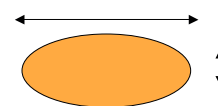
Polarization - orientation of the electric component of the electromagnetic waves (light) that comes from the surface of the star.



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



$P \neq 0$: intensity different in orthogonal directions, photosphere is not circularly symmetric, **supernova is asymmetric**

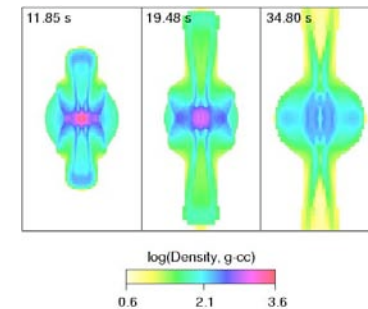


Polarization studies (last 10 years) show that all Core Collapse Supernovae are out-of-round.

Perhaps combination football, frisbee, or something else.

They show shapes consistent with 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 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.

Magnetic jet movies, rubber band.