9/27/04

News?

Background okay? Lighter?

Pic of the day

Hubble Deep Field

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 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.

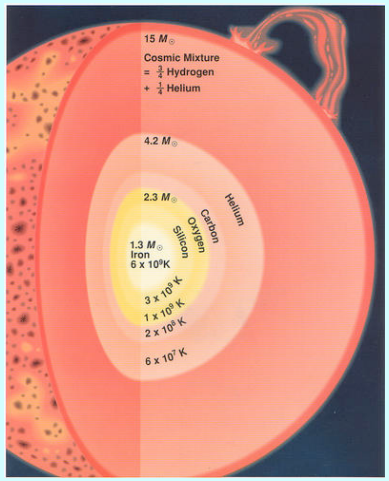
What jets do - bagel and breadstick, jet/torus shape “natural”

Strong enough jet can explode the star, but neutrinos probably also play a role - complicated problem!

Account qualitatively for out-of-round polarization

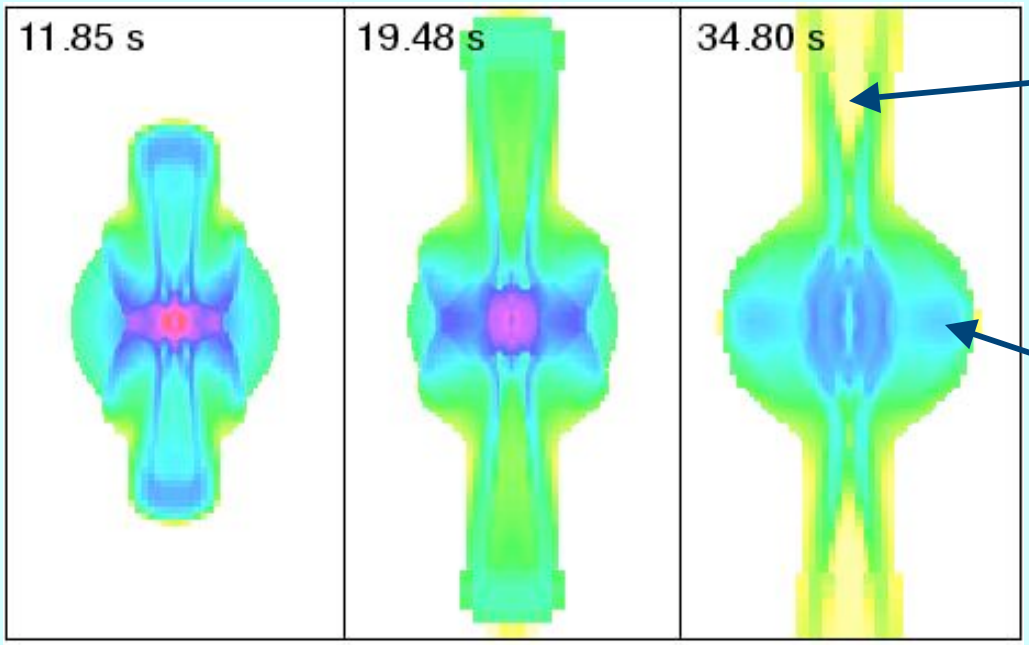
Test for shape (jet/torus), prediction of different elements exploded in different directions

Initially spherical model,



oxygen, silicon, calcium, and iron would be exploded in all directions

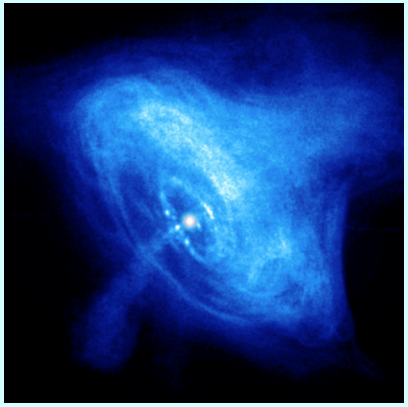
Axis/torus structure

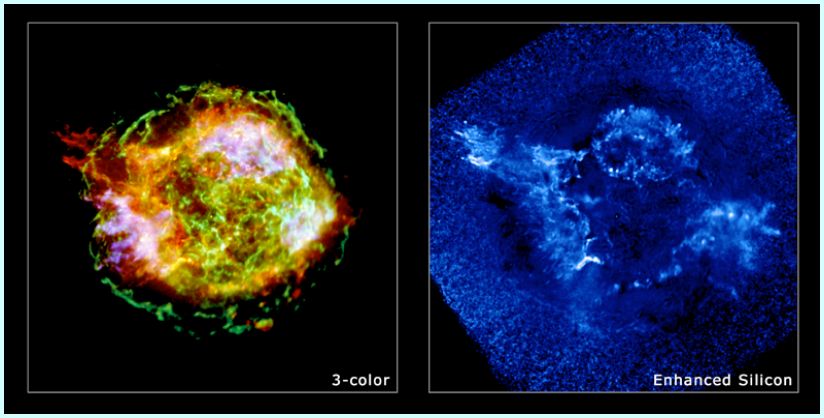


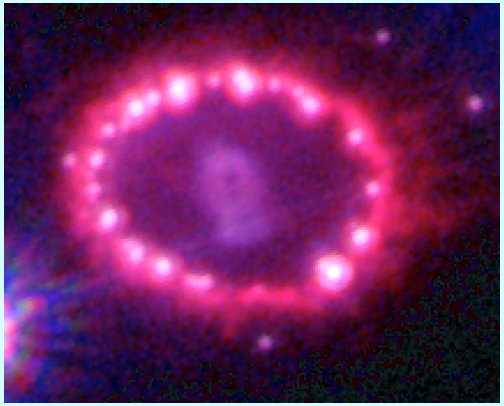
jet "iron" bread stick

torus, O, Ca, bagel

Cautionary notes



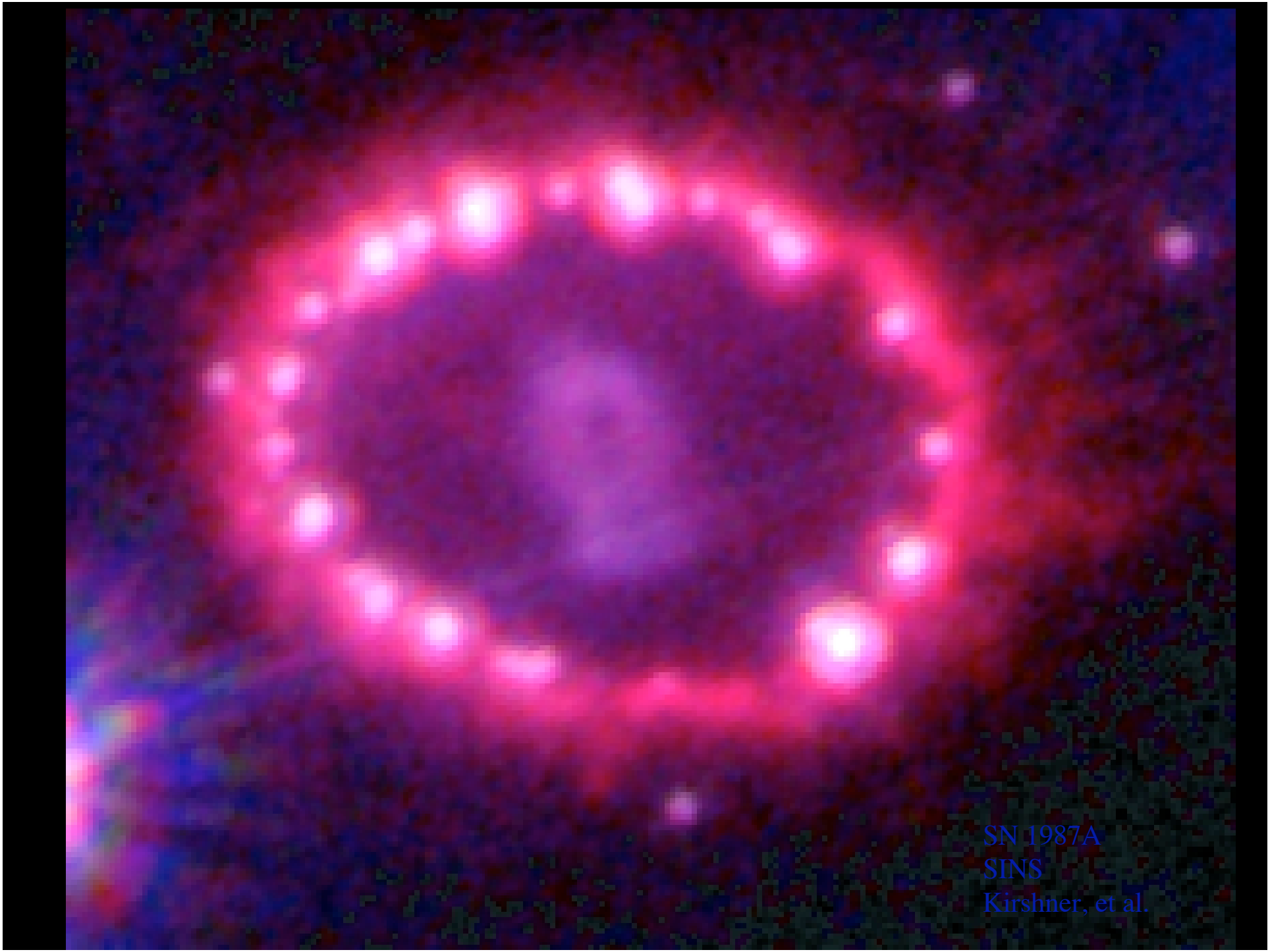




Left over jet/torus, but did jet cause the supernova?

Why is the jet silicon not iron?

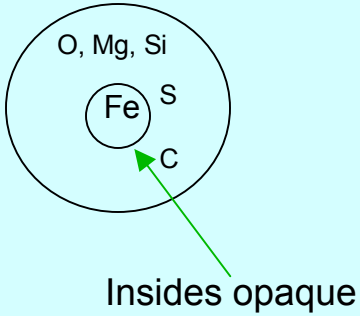
What orientation?


SN 1987A
SINS
Kirshner, et al.

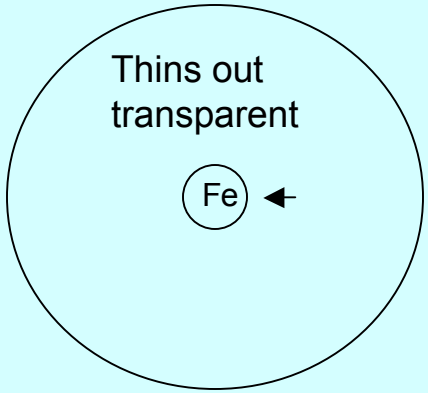
Type Ia - many, if not all, old ⇒ only credible idea is to rejuvenate a white dwarf.

Type II (Ib, Ic) energy from falling, gravity, Type Ia energy from thermonuclear explosion. About the same energy, that required to explode a core with the mass of the Sun, radius of the Earth

Type Ia see O, Mg, Si, S, Ca early on, Iron later => iron inside



near maximum light



Weeks after maximum

Models based on Chandrasekhar mass C/O white dwarfs do just that!

Large quantum pressure -- high density and temperature overcome charge repulsion - very unregulated - ignite Carbon ⇒ runaway ⇒total explosion, no neutron star or black hole.

Models give thorough burning to iron on inside, only partial burning leaving O, Mg, Si, S, Ca in outer layers.

Two stages to explosion:

Deflagration - slower than speed of sound, like a flame

Detonation - supersonic shockwave, faster than the speed of sound - like a stick of dynamite

All data, UV, optical, IR are consistent with this picture