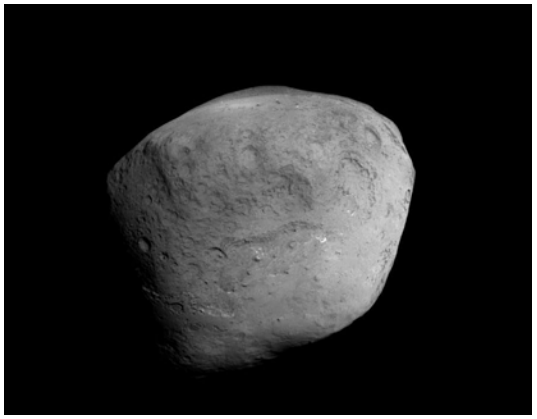
February 16, 2011

Exams returned. Grade distribution.

Astronomy in the news? New planet in our outer solar system, Tyche? Reported on CNN, Huffington post. Proposed for over a decade based on reported perturbations in the orbits of comets in Oort cloud. Not confirmed. Substantial skepticism.

Pic of the day: nucleus of comet Tempel-1 from Stardust flyby on Monday.

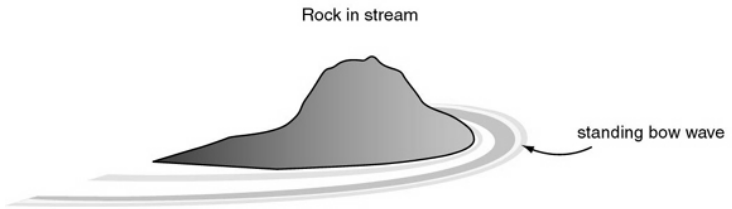


Goal

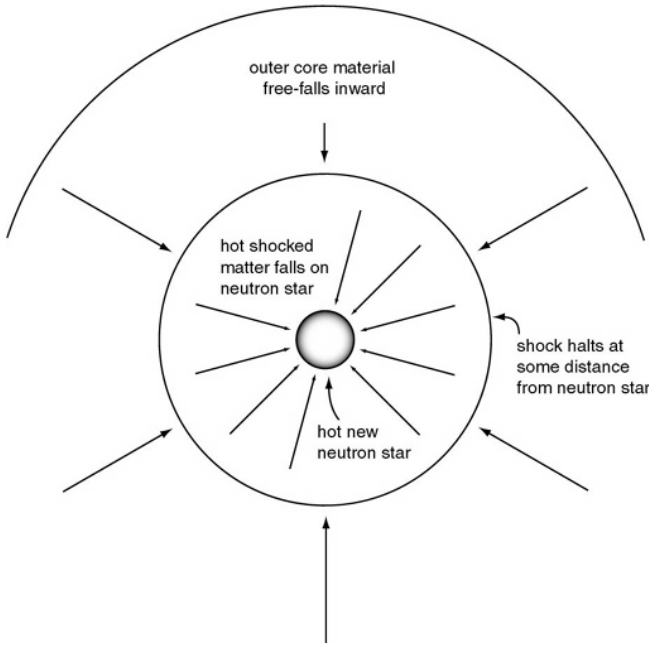
To understand how the collapse of an iron core can trigger a supernova explosion

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

DOES NOT WORK!



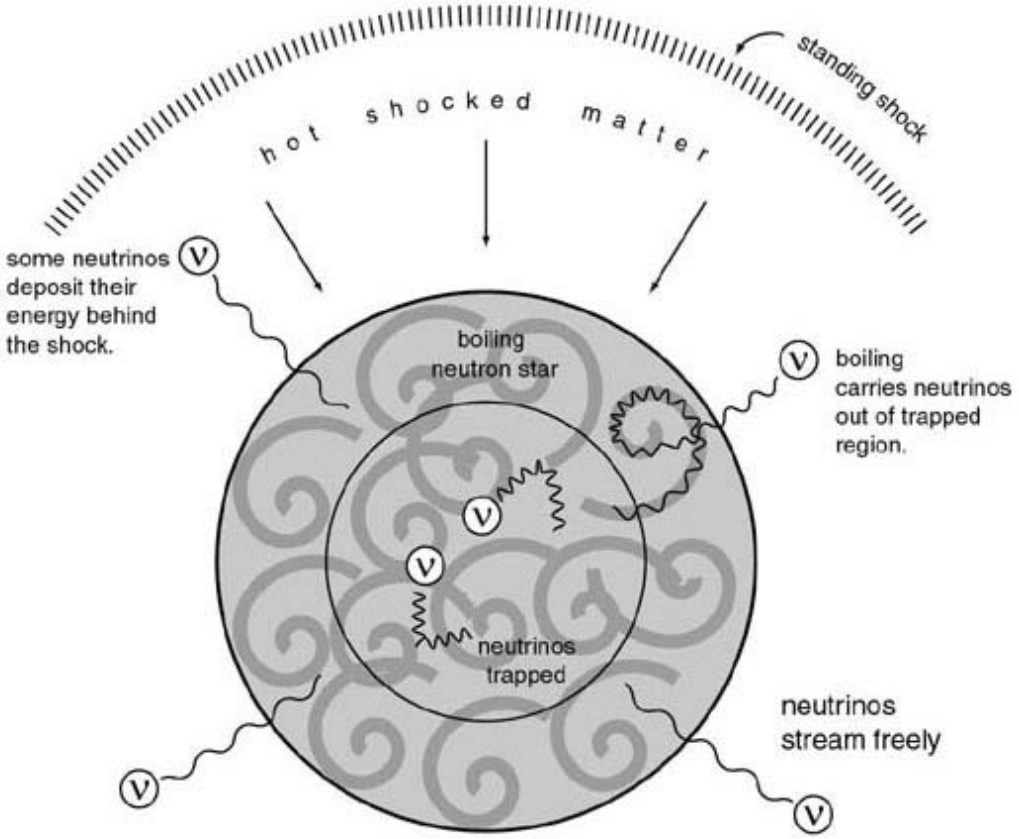
Form ***standing shock***, and outer material just continues to fall in, pass through shock front and settle onto the neutron star.



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:

 Neutrons

 Protons

 Neutrinos

 Photons

One Minute Exam

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

 It fades away

 It propagates out through the star and causes an explosion

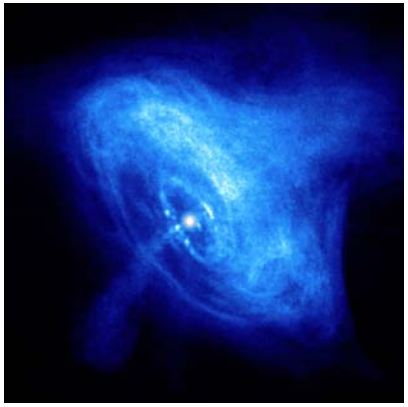
 It stalls at some distance from the neutron star

 It traps neutrinos

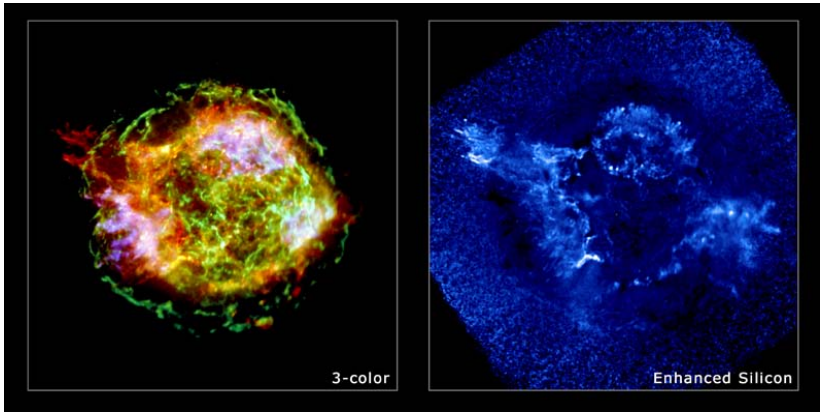
Goal

To understand how jets may trigger a core –collapse supernova explosion

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 (YouTube)

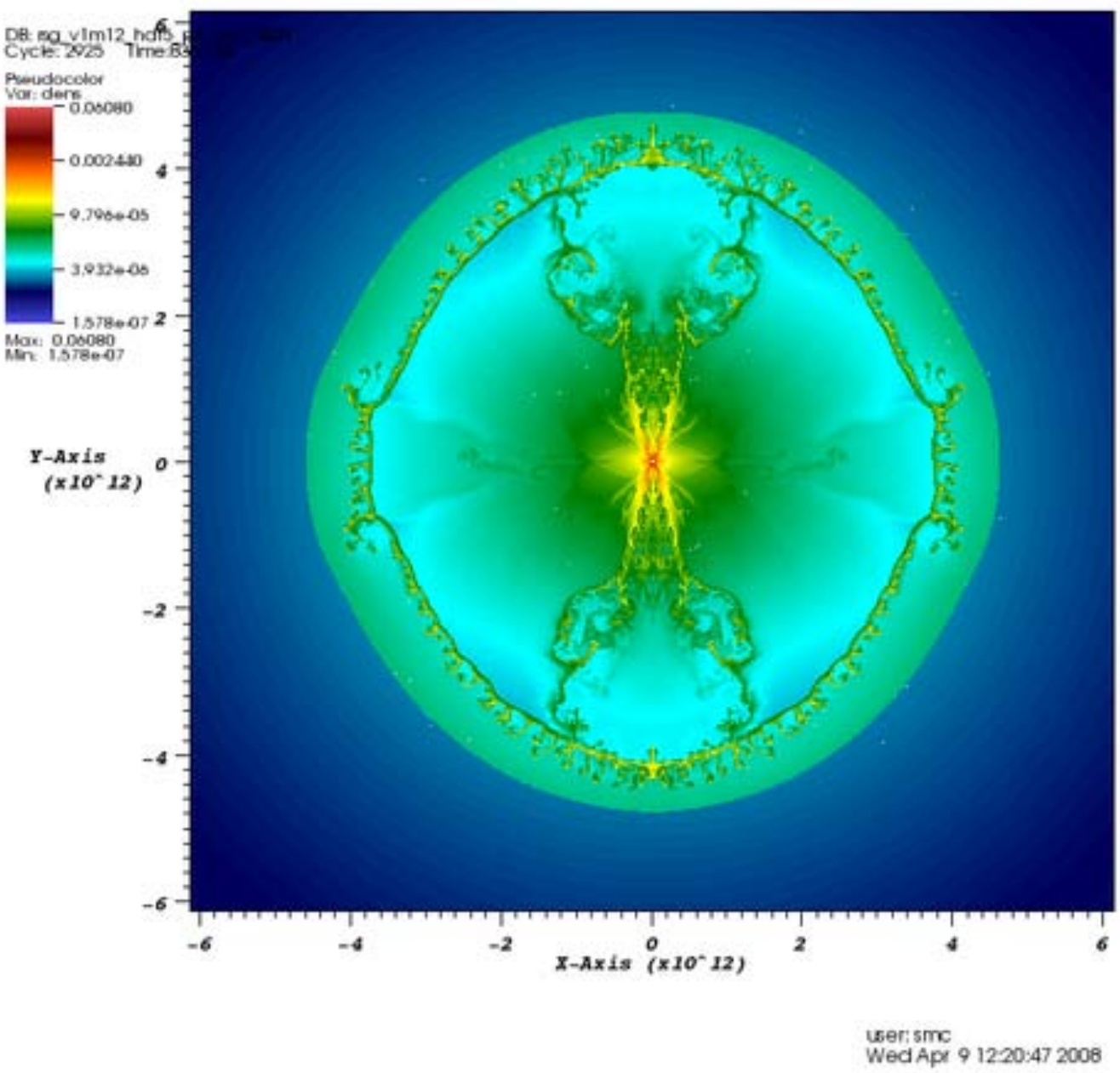
Supernovae show shapes consistent with (but not necessarily proving) jet-like flow.

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

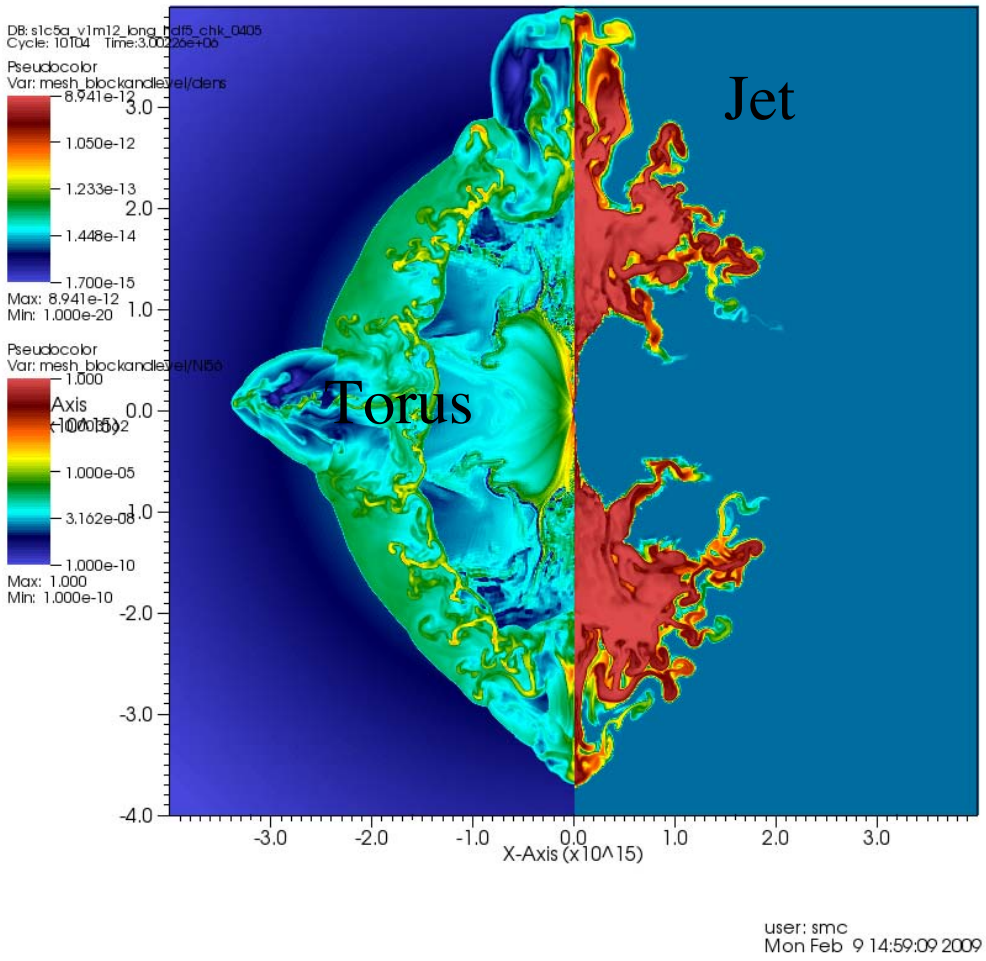
What jets do -

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



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.