

2/6/06

Exam 1: Friday

Chapters 1 - 5, Friday, February 10, 30 multiple-choice questions

Review sheet will be posted on web site today or tomorrow

Review session Thursday 5 PM RLM 4.102 [NOTE different room than help sessions].

BOOKS - quantum uncertainty in the Coop

Astronomy in the news? Continued arguments over whether Pluto or other large Kuiper belt objects are truly “planets.”

Pic of the Day - superbubble, blown by multiple supernovae?



Chapter 6 Supernovae

Historical Supernovae - *in our Milky Way Galaxy* observed with naked eye over 2000 years especially by Chinese (preserved records), but also Japanese, Koreans, Arabs, Native Americans, finally Europeans.

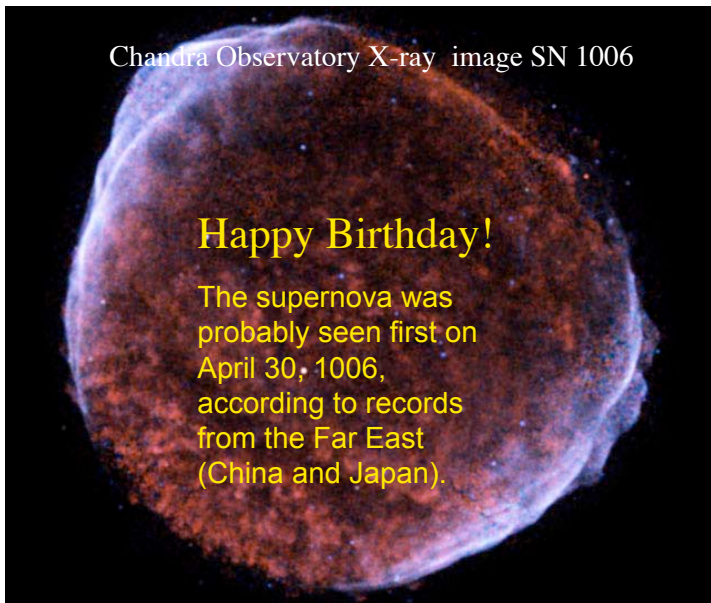
Millennium Celebration!

SN 386	← earliest record	NS, jet?
SN 1006	← brightest	No NS
SN 1054	Crab Nebula	NS, jets
SN 1181	(Radio Source 3C58)	NS, jets
SN 1572	Tycho	No NS
SN 1604	Kepler	No NS
~1680	Cas A	NS? jets
SN 1987A	nearby galaxy	NS? jets
Vela	10,000 years ago	NS, jets

Chandra Observatory X-ray image SN 1006

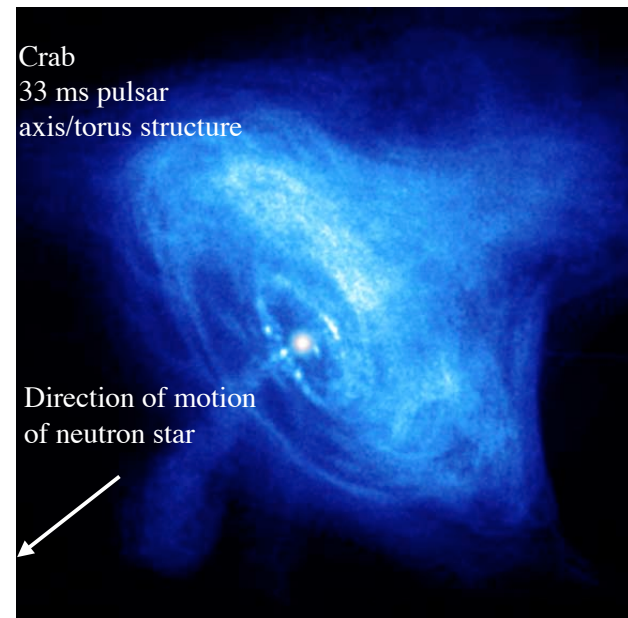
Happy Birthday!

The supernova was probably seen first on April 30, 1006, according to records from the Far East (China and Japan).



Crab
33 ms pulsar
axis/torus structure

Direction of motion
of neutron star

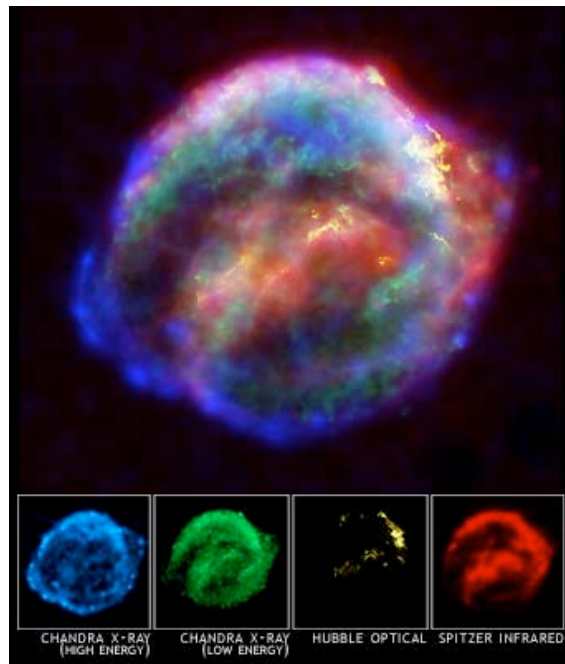
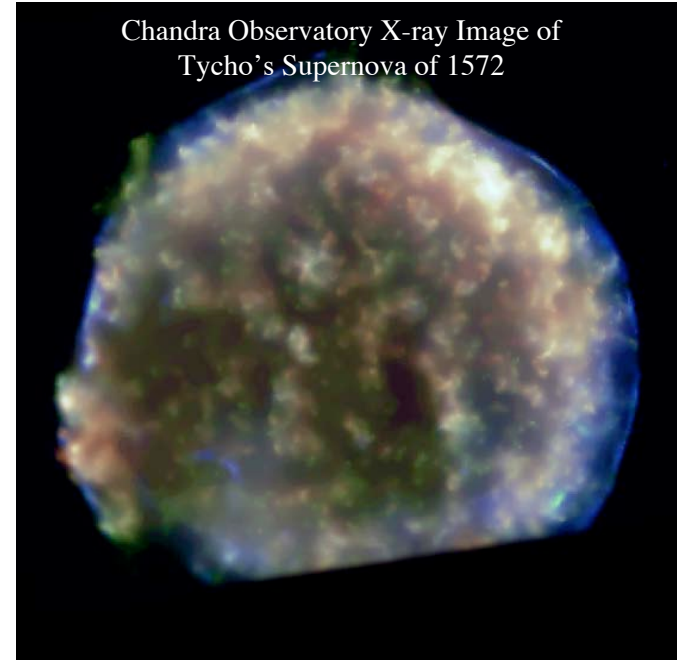


Kepler



Tycho

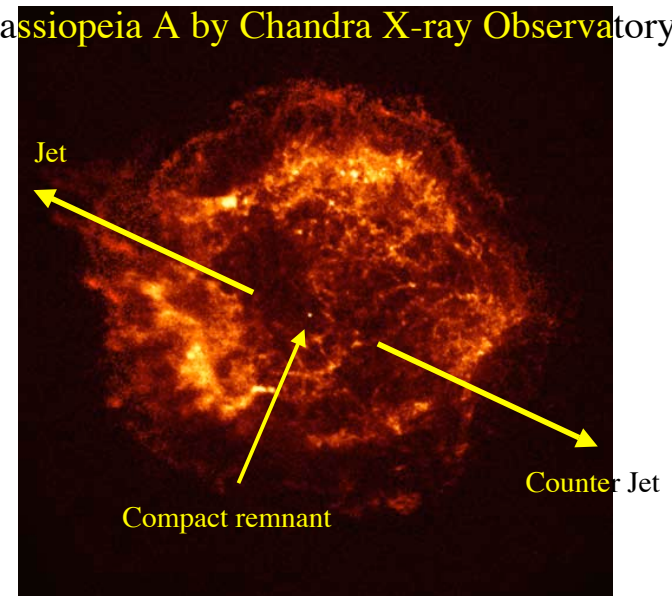
Chandra Observatory X-ray Image of
Tycho's Supernova of 1572



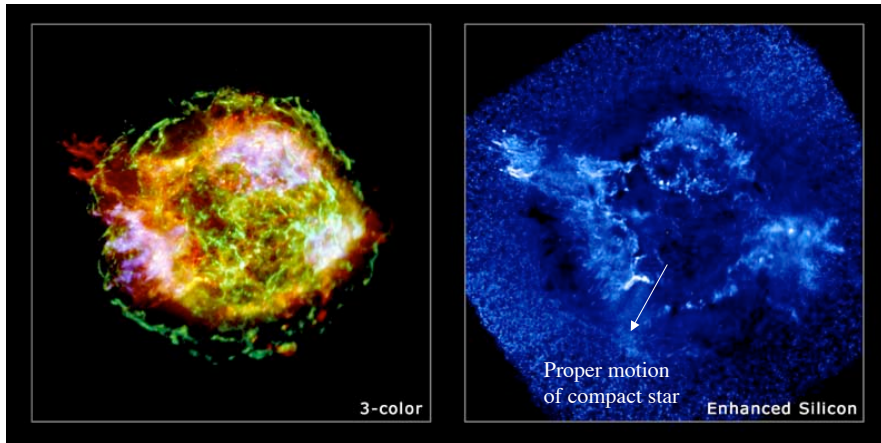
Great
Observatories
composite of
Kepler's
supernova 1604

No sign of neutron
star
“sideways” alignment?

Cassiopeia A by Chandra X-ray Observatory



Recent Chandra Observatory X-ray Image of Cas A

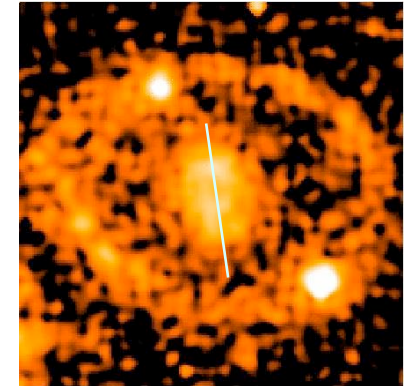


SN 1987A
Exploded in nearby galaxy

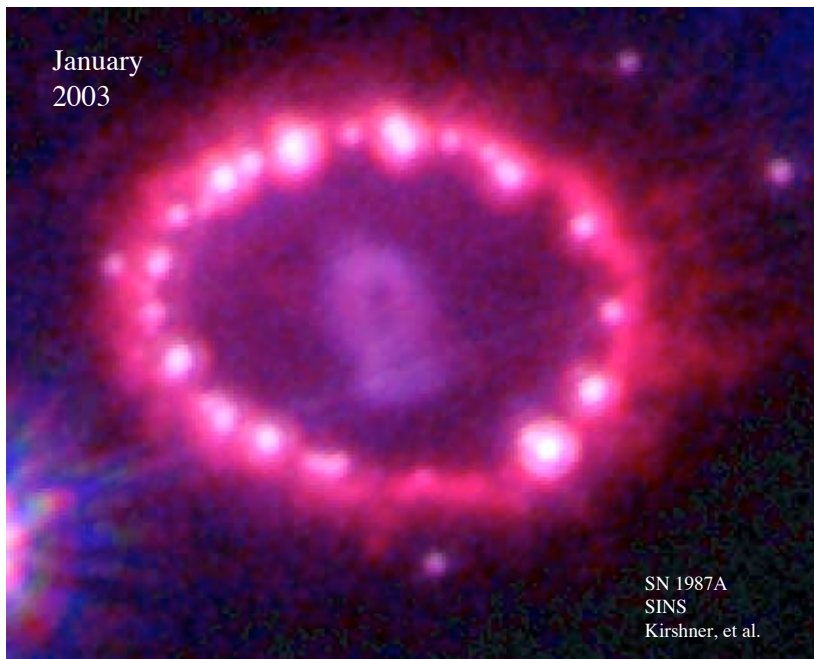
Bi-polar symmetry



Elongated debris

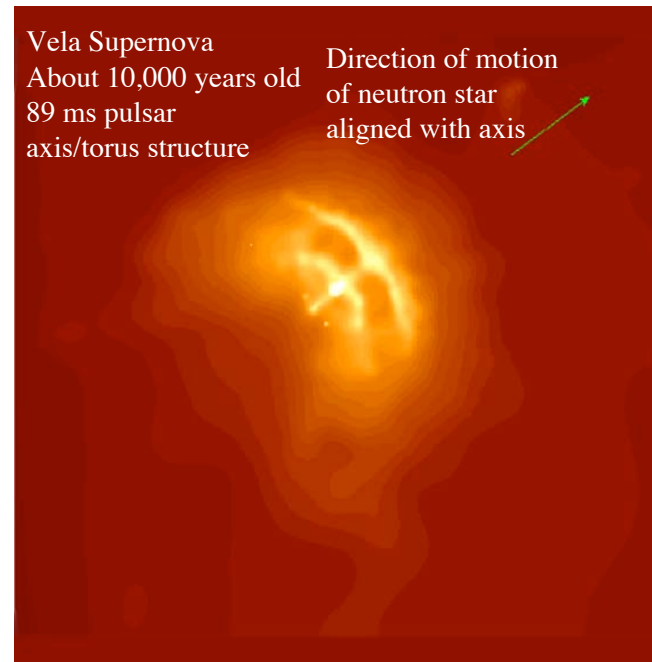


January
2003



Vela Supernova
About 10,000 years old
89 ms pulsar
axis/torus structure

Direction of motion
of neutron star
aligned with axis



All SN since 1680, since invention of telescope, modern astronomy, have been discovered in other galaxies.

Our Galaxy is overdue for another!

It was recognizing (early in the 20th century) that some “novae” were in distant galaxies and hence were 10,000 to 100,000 times brighter than classical novae in the Milky Way.

That led to the recognition and naming of “super” novae.

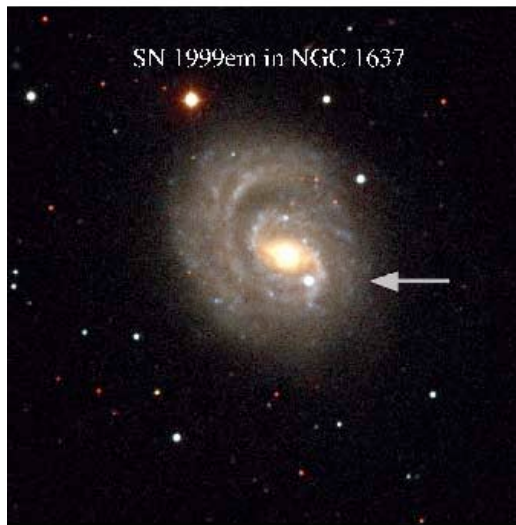
Web site of recent bright supernovae:

<http://www.rochesterastronomy.org/snimages/>

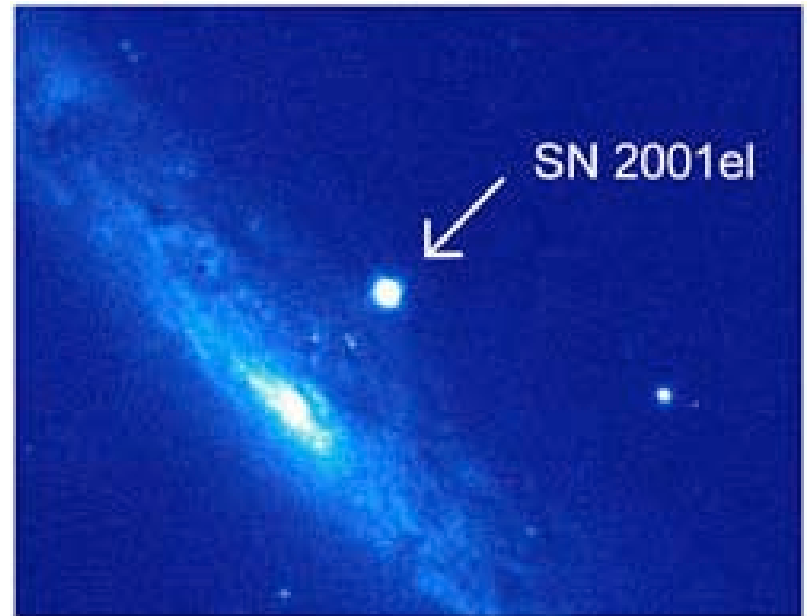
SN 1994D in the Whirlpool Galaxy



SN 1999em in NGC 1637



SN 2001el





Extra Galactic Supernovae: the basis for modern astronomy of supernovae

Cannot predict which galaxies will produce a supernova, so watch lots of galaxies

We found two dozen per year prior to SN 1987A, but with new attention and use in cosmology, now find over 100 per year, most at great distances, more difficult to study.

Nomenclature: A-Z, aa-az, ba-bz, etc.

SN1987A - 1st of '87 (also most important, but that is not what the "A" means).

This year latest, last Friday - SN 2006U 21st of 2006 discovered by professional robotic telescope.

