

9/19/07

Exam 1: Friday [First Sky Watch Reports Monday]

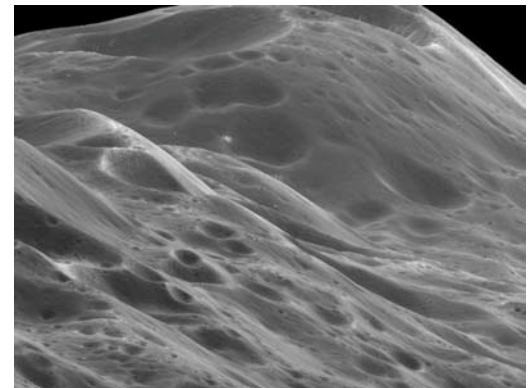
*Chapter 5, portions of chapters 1 - 4, Friday, September 21,
40 multiple-choice questions*

Review sheet posted on web site

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

Astronomy in the news? PBS program “Seeing in the Dark” tonight. Nice associated start chart, now under “links” on web site.

Pic of Day - surface of Saturn moon Iapetus



Sky Watch Extra Credit

Due Monday in Class

Must be typed on 8-1/2x11 paper

See web site for more details, or ask!

See web site for star charts to help guide you where and when to look.

SUPERNOVAE

Catastrophic explosions that end the lives of stars,

Provide the heavy elements on which planets and life as we know it depends,

Energize the interstellar gas to form new stars,

Produce exotic compact objects, neutron stars and black holes,

Provide yardsticks to measure the history and fate of the Universe.

Reading:

Chapter 6 Supernovae

Also § 2.1, 2.2, 2.4 & 2.5 for background

Issues to look for in background:

Why is it necessary for a thermonuclear fuel to get hot to burn - charge repulsion § 2.1 & 2.2

Core Collapse § 2.4 & 2.5

One type of supernova is powered by the *collapse* of the core of a massive star to produce

a *neutron star*,

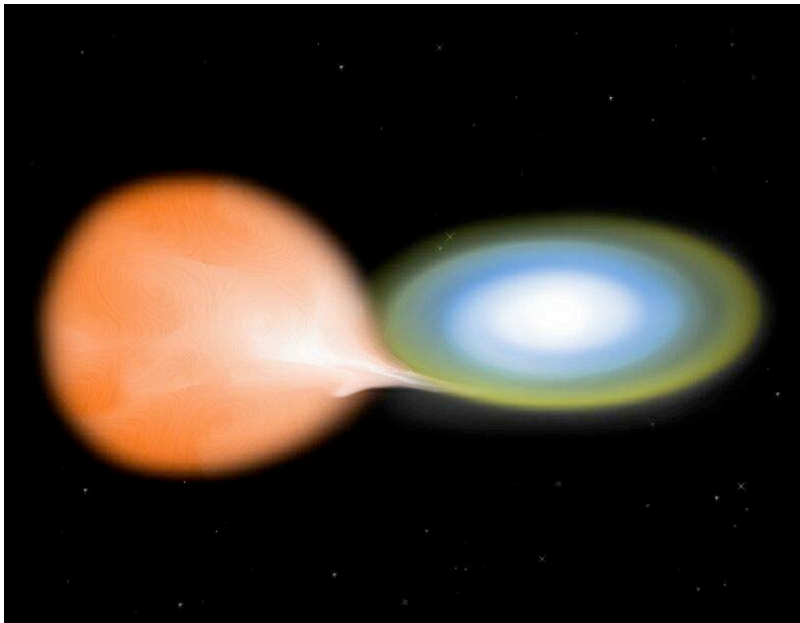
or perhaps

a *black hole*

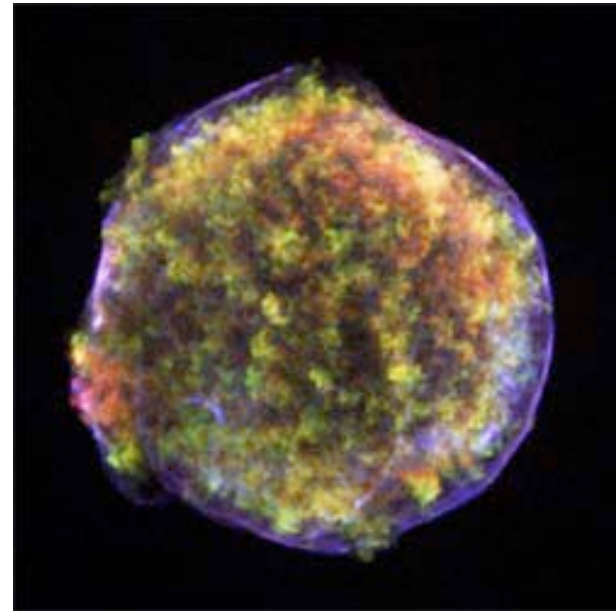


The mechanism of the explosion is still a mystery.

The other type of supernovae (Type Ia) is thought to come from a white dwarf that grows to an explosive condition in a binary system.



Chandra X-ray Observatory image
Of Tycho's supernova of 1572



These explode completely, like a stick of dynamite, and leave no compact object (neutron star or black hole) behind.

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.

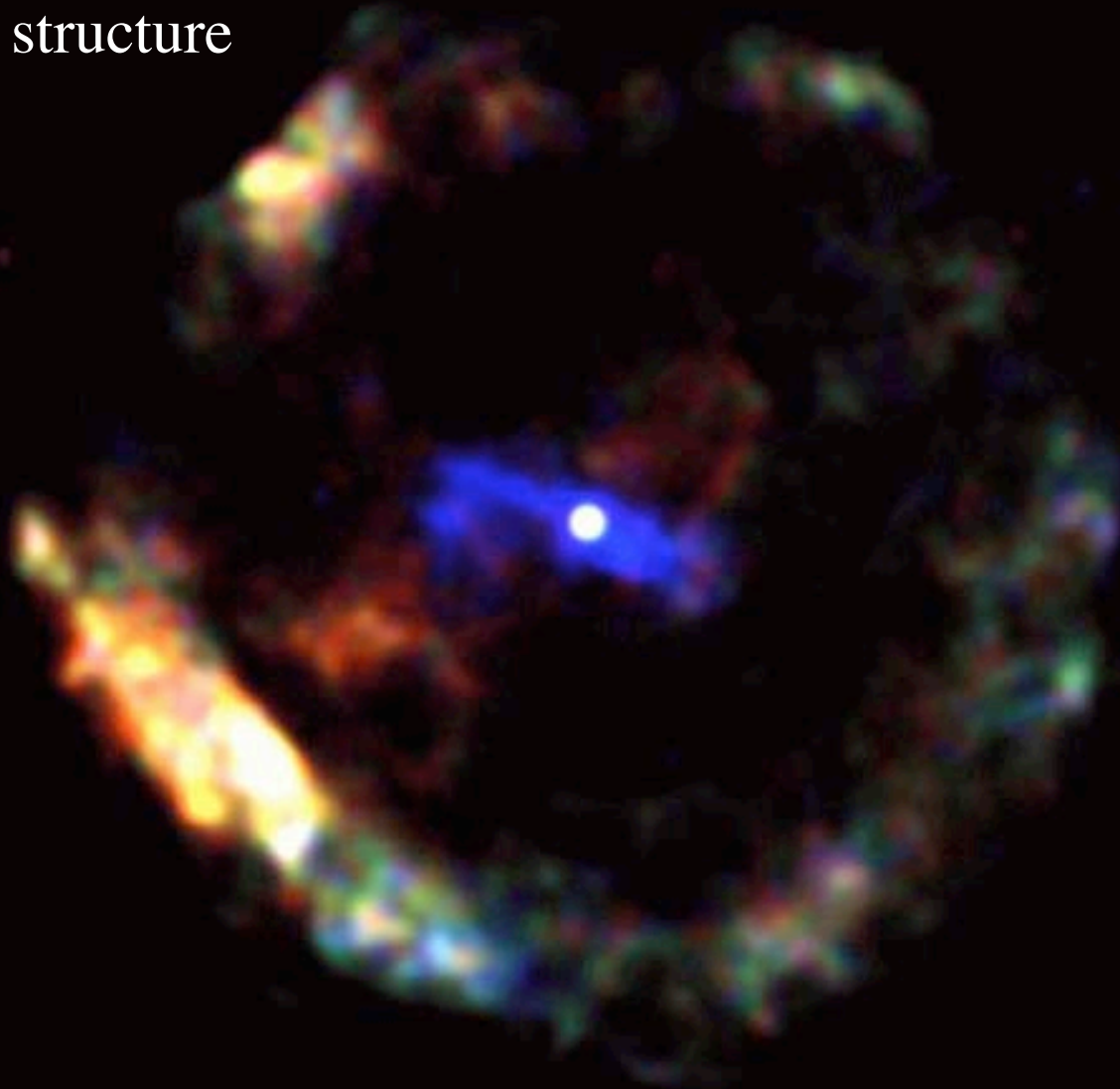
SN 386	earliest record	NS, jet?
SN 1006	brightest	No NS
SN 1054	Crab Nebula	NS, jets
SN 1181	(Radio Source 3C58)	NS, jets
SN 1572	Tycho	No NS
SN 1604	Kepler	No NS
~1680	Cas A	NS? jets
SN 1987A	nearby galaxy	NS? jets
Vela	10,000 years ago	NS, jets

G11.2-0.3 = SN 386

65 ms pulsar

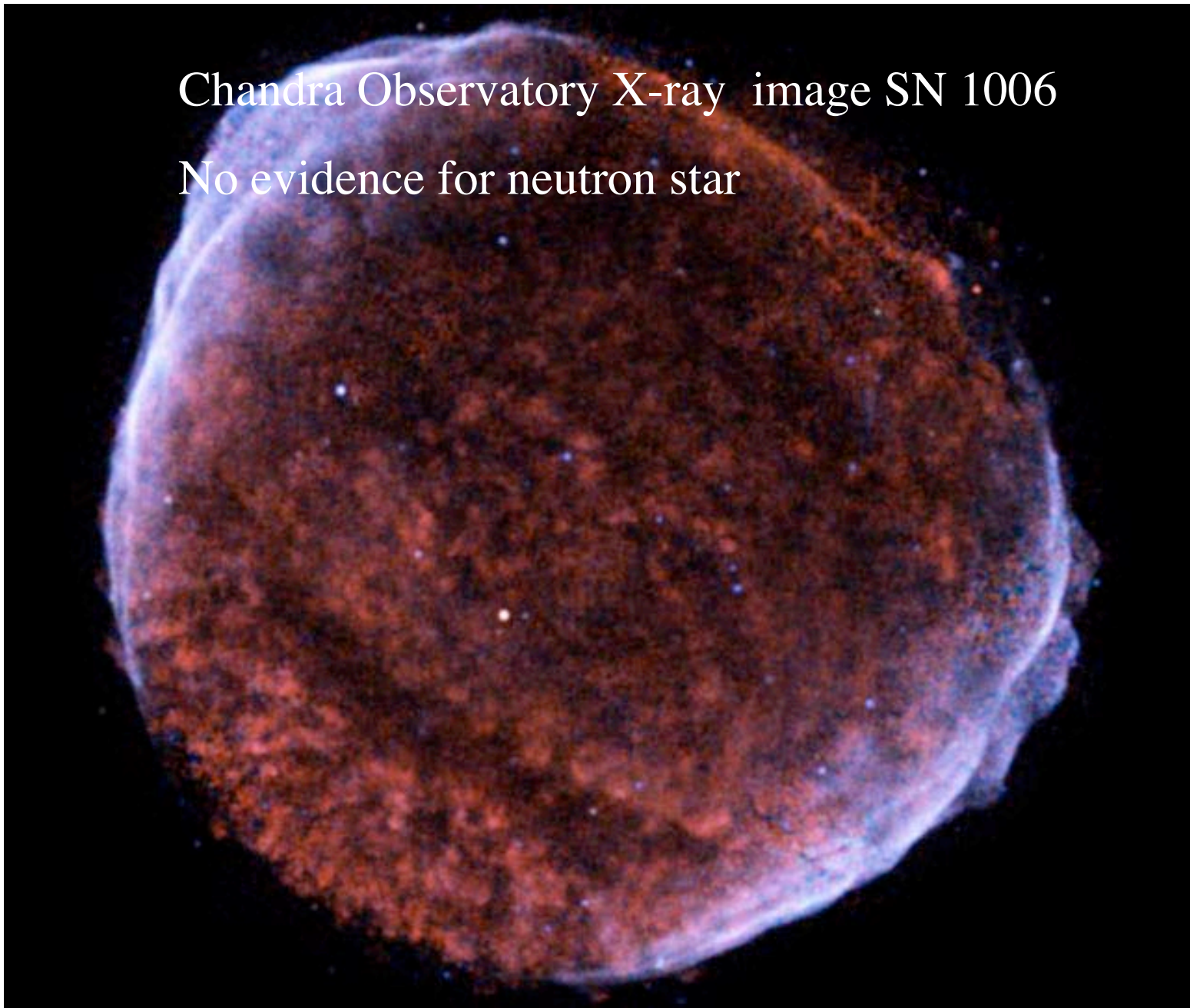
axis structure

X-ray image



Chandra Observatory X-ray image SN 1006

No evidence for neutron star

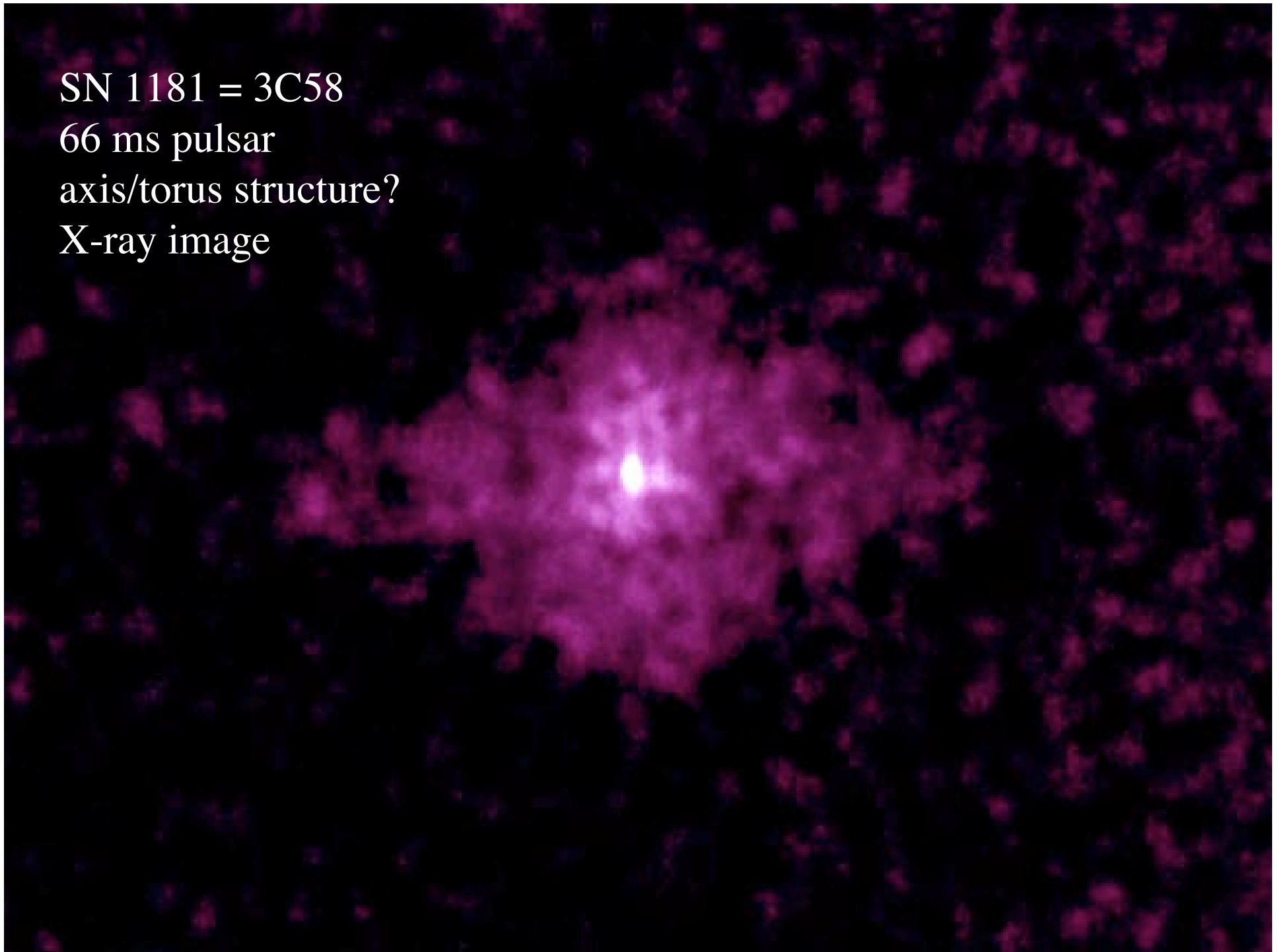


SN 1181 = 3C58

66 ms pulsar

axis/torus structure?

X-ray image



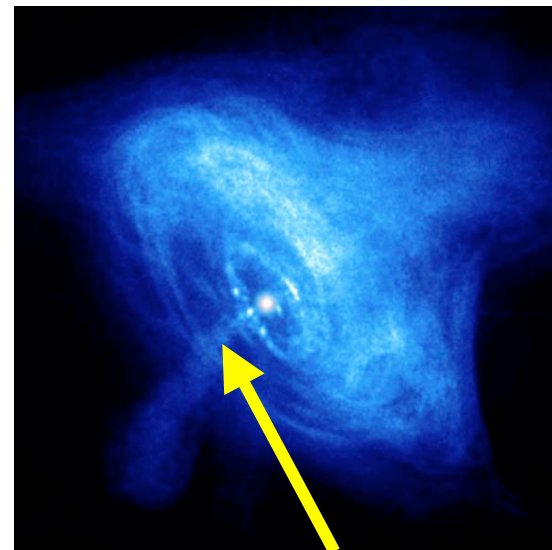
Crab Nebula

Remnant of “Chinese” Guest Star of 1054

Optical Image



Chandra Observatory
X-Ray Image



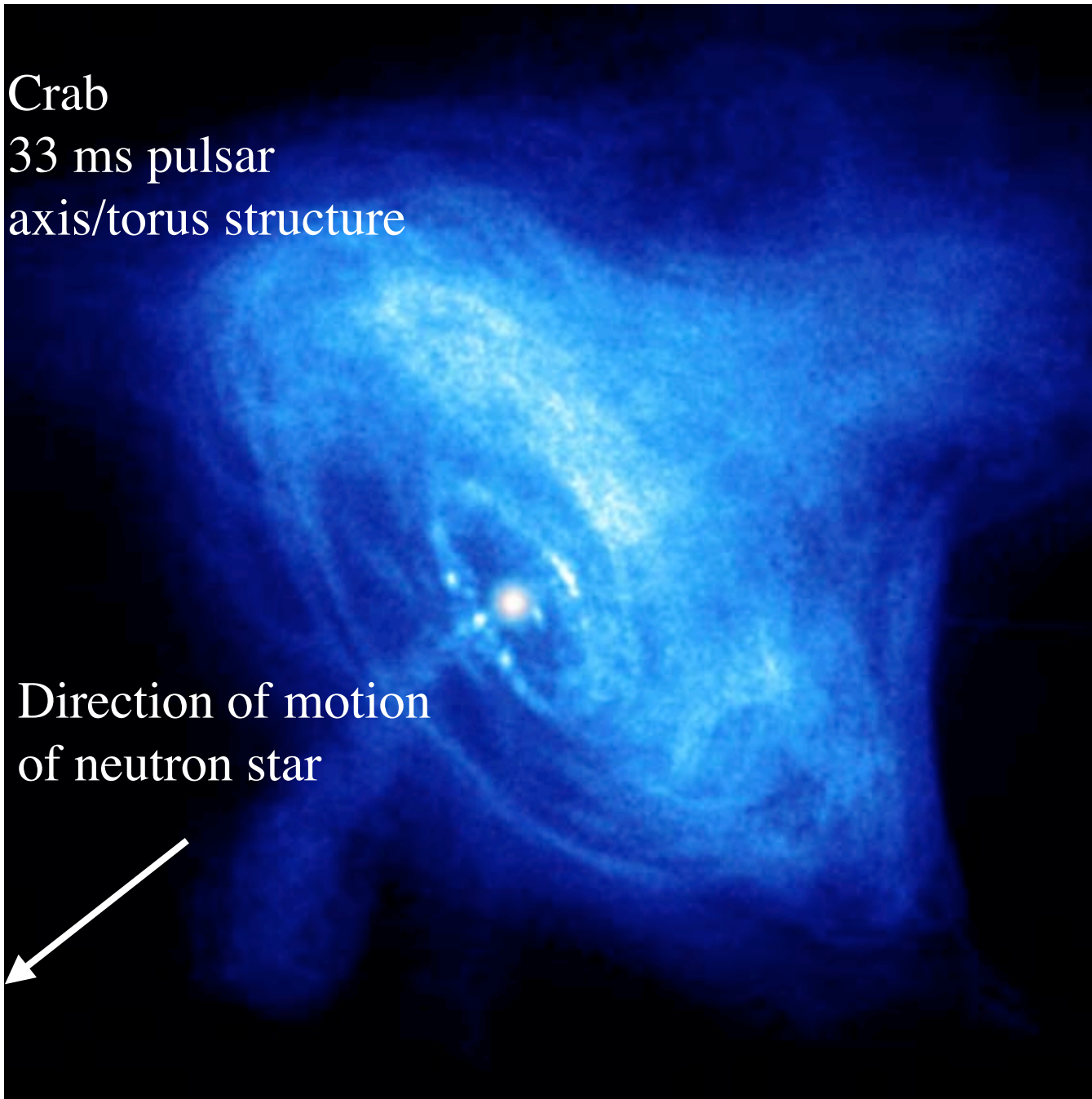
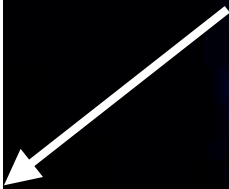
Left-over jet

Crab

33 ms pulsar

axis/torus structure

Direction of motion
of neutron star



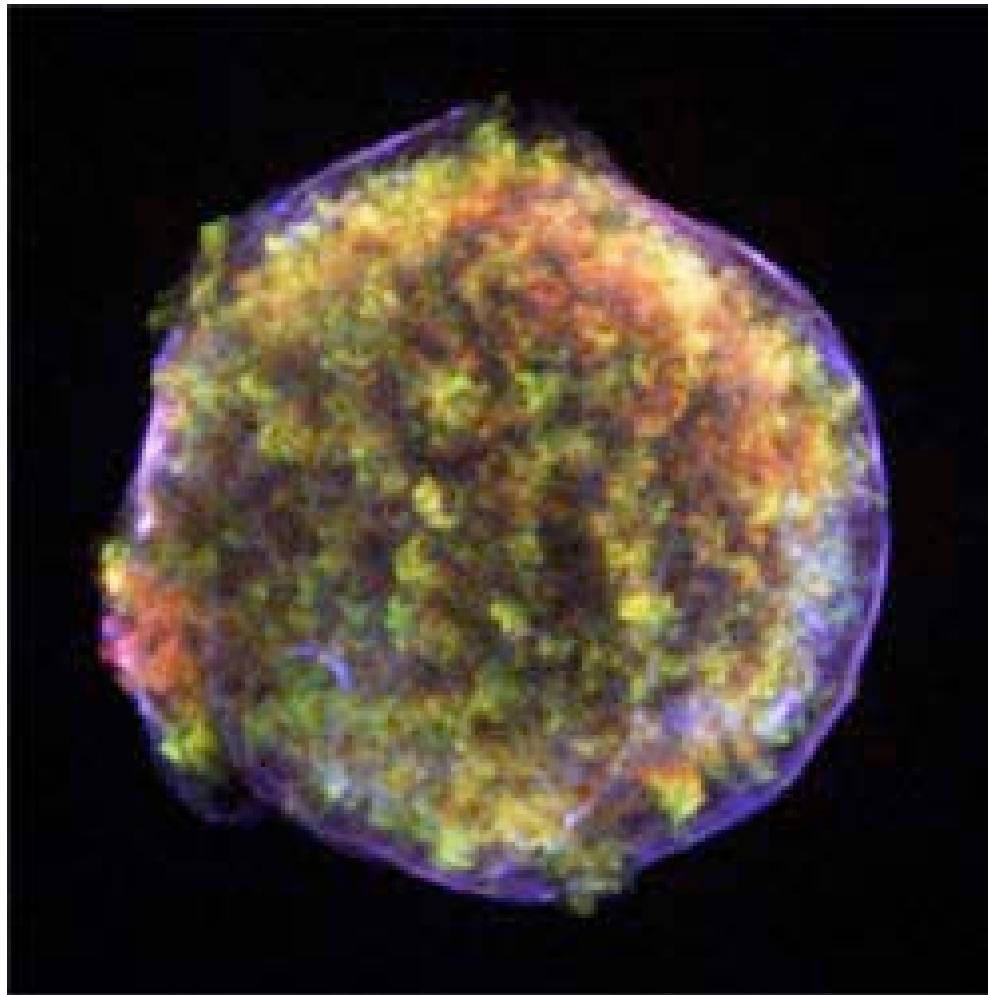
Kepler



Tycho

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

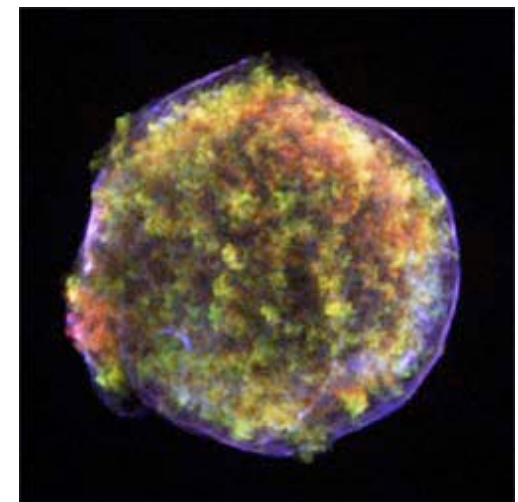
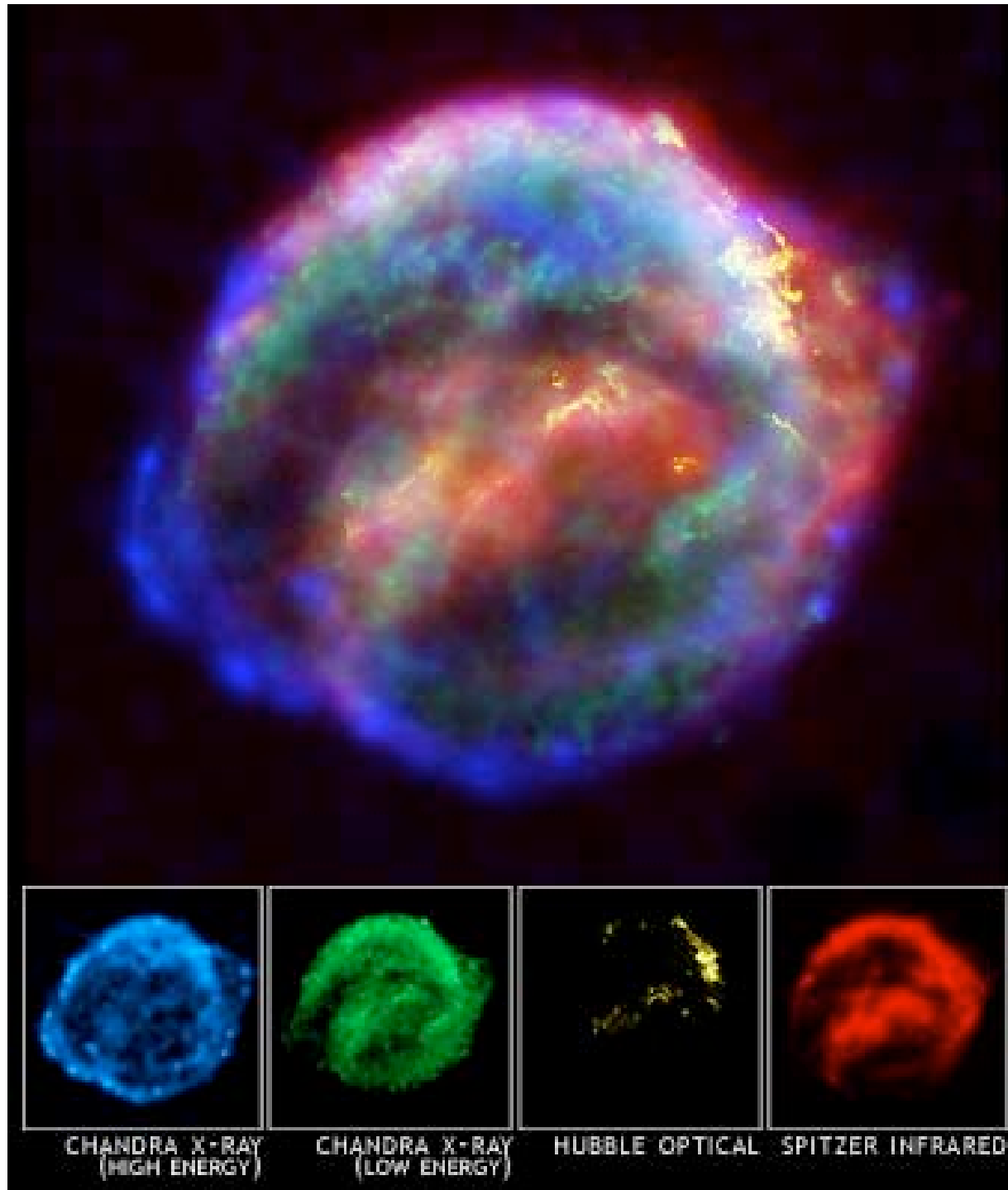
No evidence for neutron star



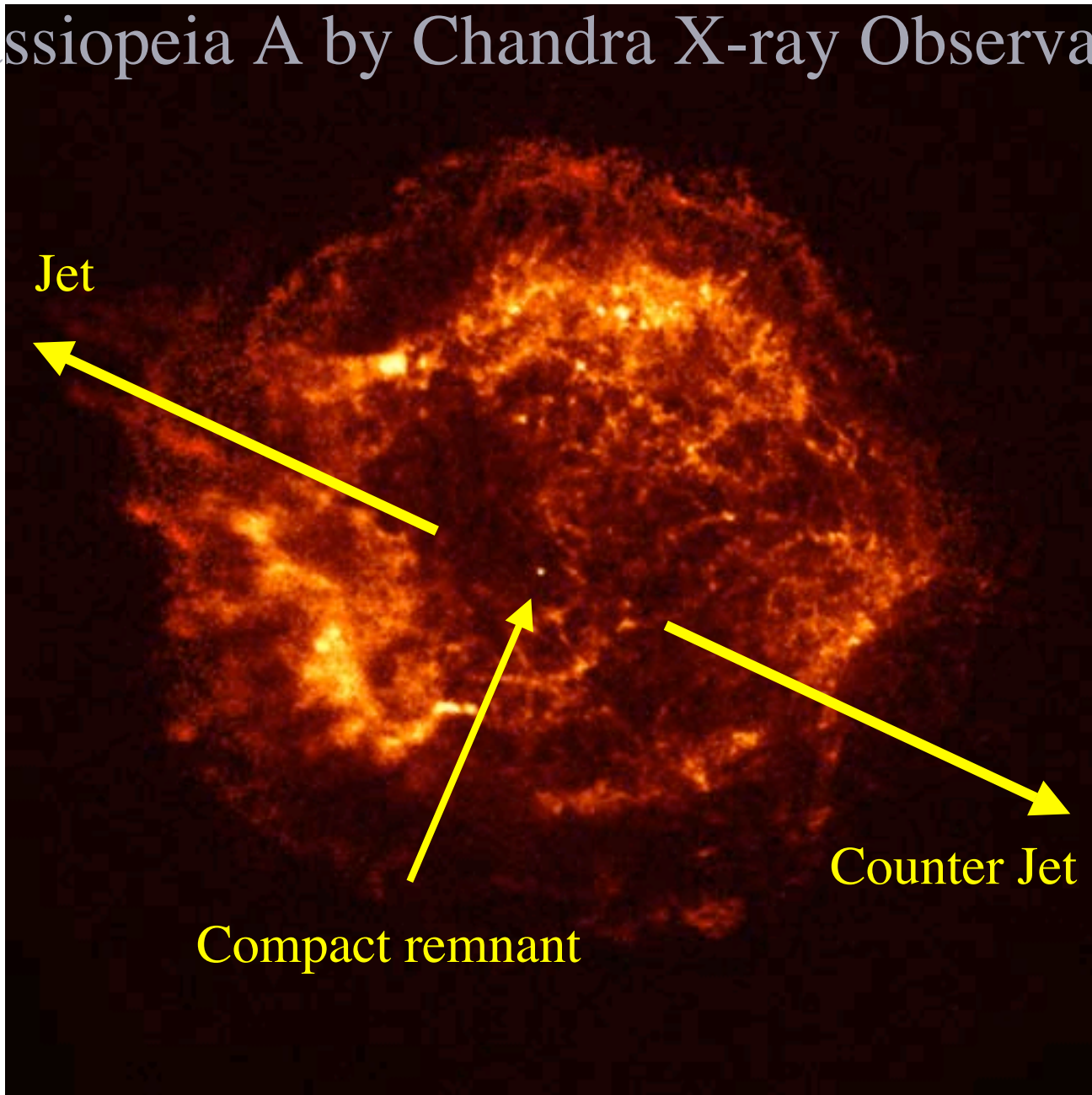
Great
Observatories
composite of
Kepler's
supernova 1604

No sign of neutron
star

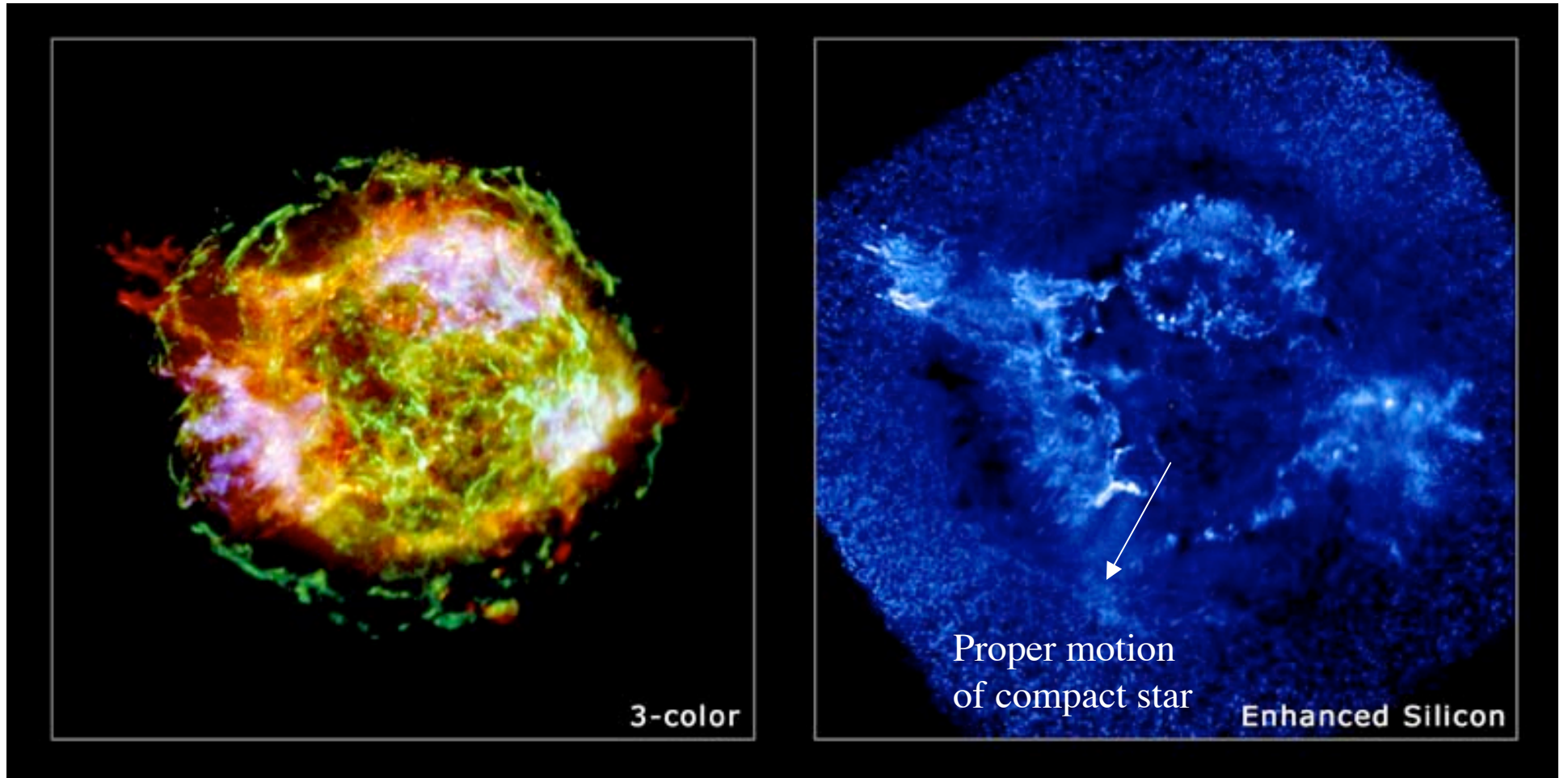
“sideways” alignment?



Cassiopeia A by Chandra X-ray Observatory



Recent Chandra Observatory X-ray Image of Cas A

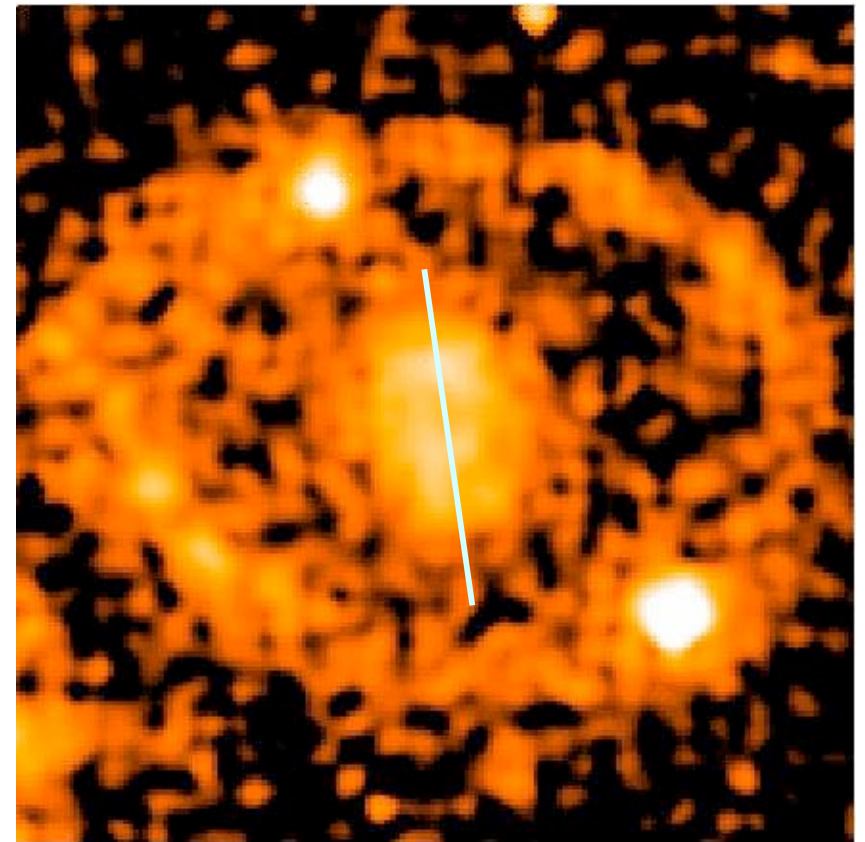


SN 1987A

Exploded in nearby galaxy

Bi-polar symmetry

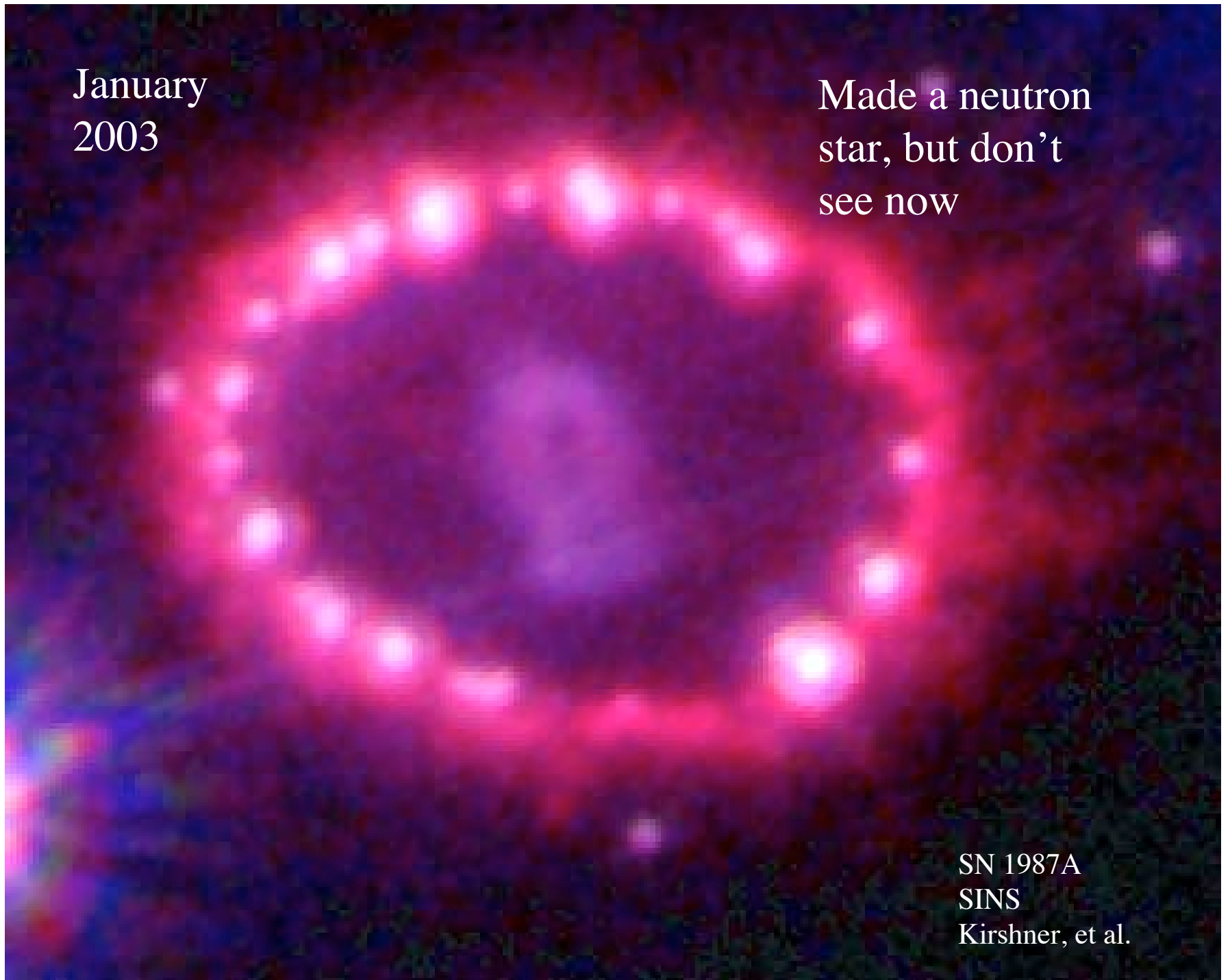
Elongated debris



January
2003

Made a neutron
star, but don't
see now

SN 1987A
SINS
Kirshner, et al.



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

Direction of motion
of neutron star
aligned with axis

