

Exam 1 Friday

Chapters 1 - 5

Review sheet posted on web site

Review session Wednesday: RLM 15.216B 5-6 PM
office hours today, Wednesday 2 PM

News?

Pic of the day - odd image

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

Chapter 6 Supernovae

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

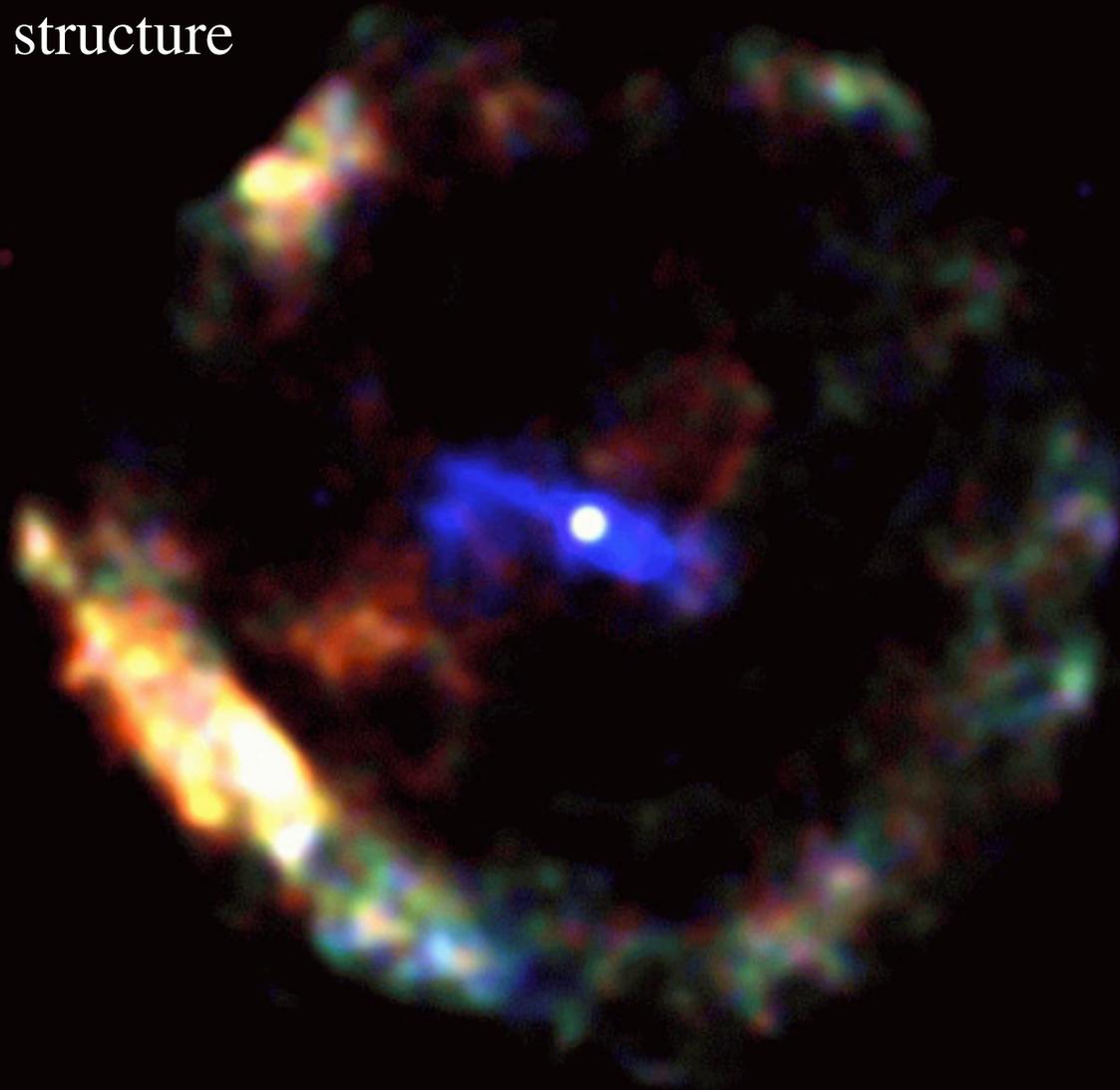
SN 386	earliest record	NS, jet?
SN 1006	brightest	No NS
SN 1054	Crab Nebula	NS, jets
SN 1181	(Radio Source 3C58)	NS, jets
SN 1572	Tycho	No NS
SN 1604	Kepler	No NS
~1680	Cas A	NS? jets
SN 1987A	nearby galaxy	NS? jets
Vela	10,000 years ago	NS, jets

G11.2-0.3 = SN 386

65 ms pulsar

axis structure

X-ray image

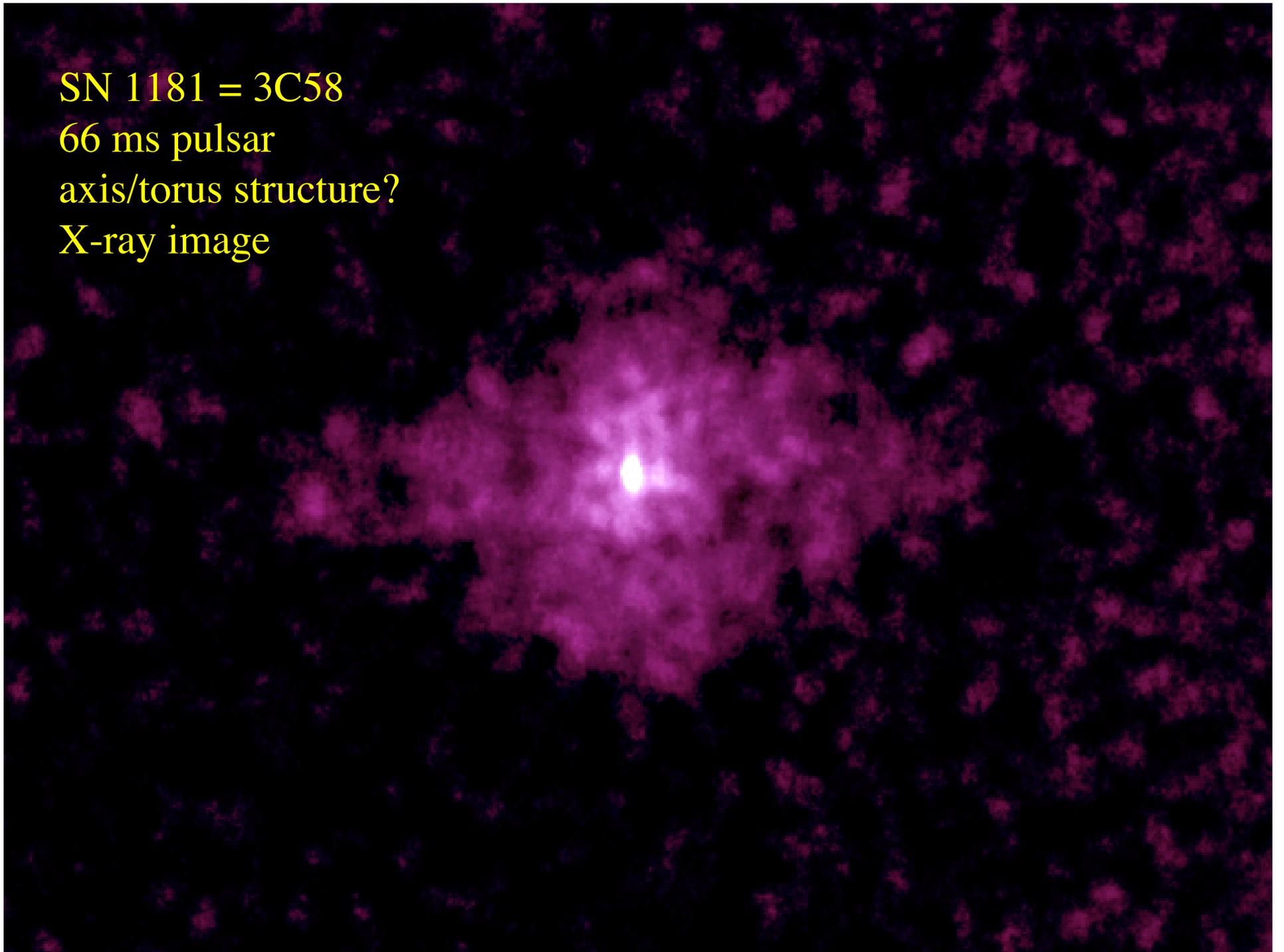


SN 1181 = 3C58

66 ms pulsar

axis/torus structure?

X-ray image



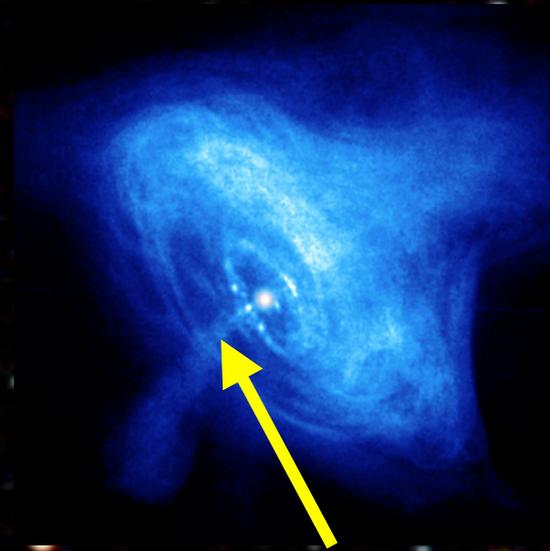
Crab Nebula

Remnant of “Chinese” Guest Star of 1054

Optical Image



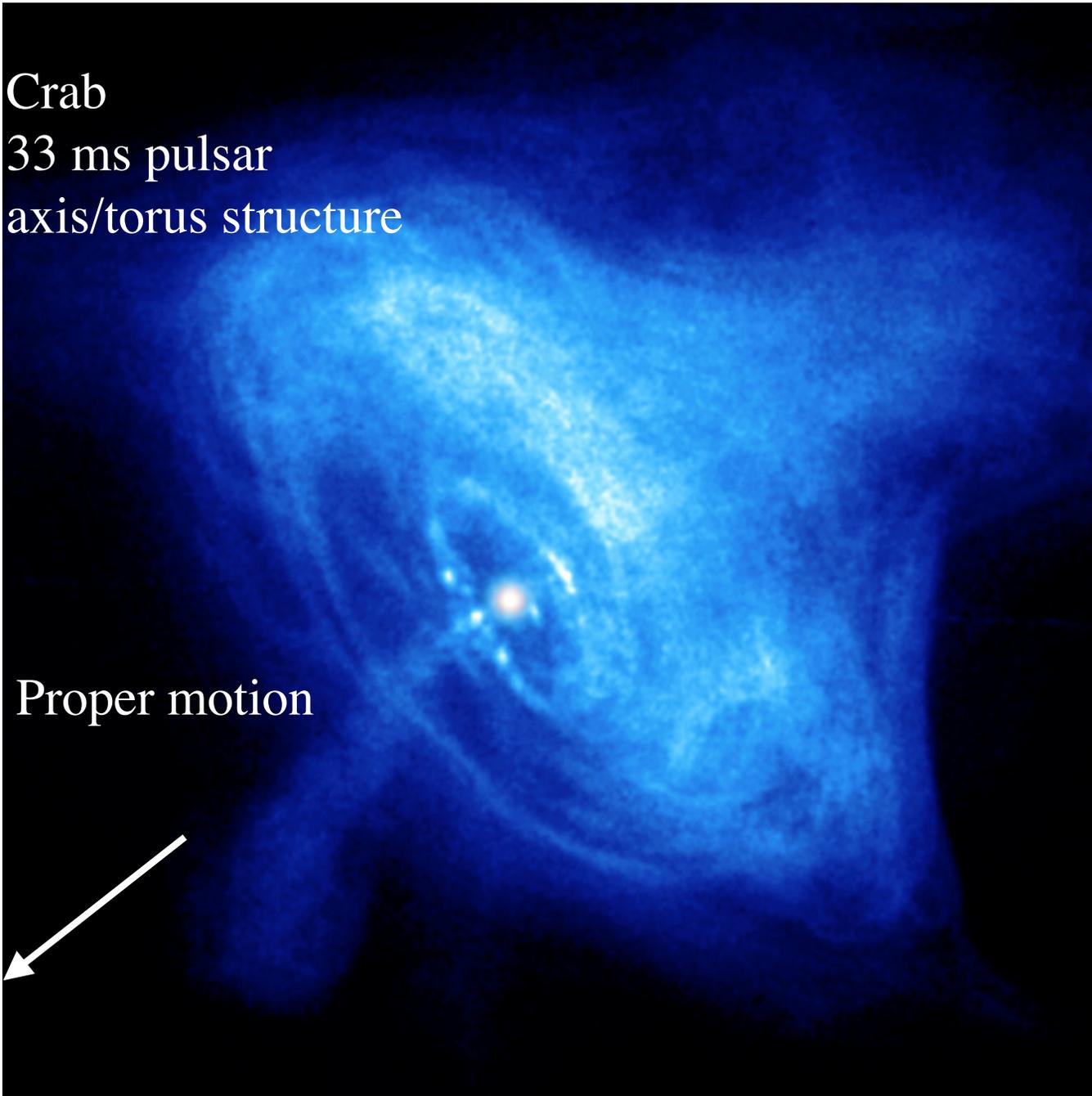
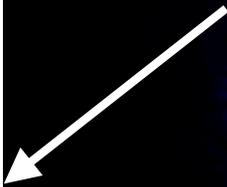
Chandra Observatory
X-Ray Image



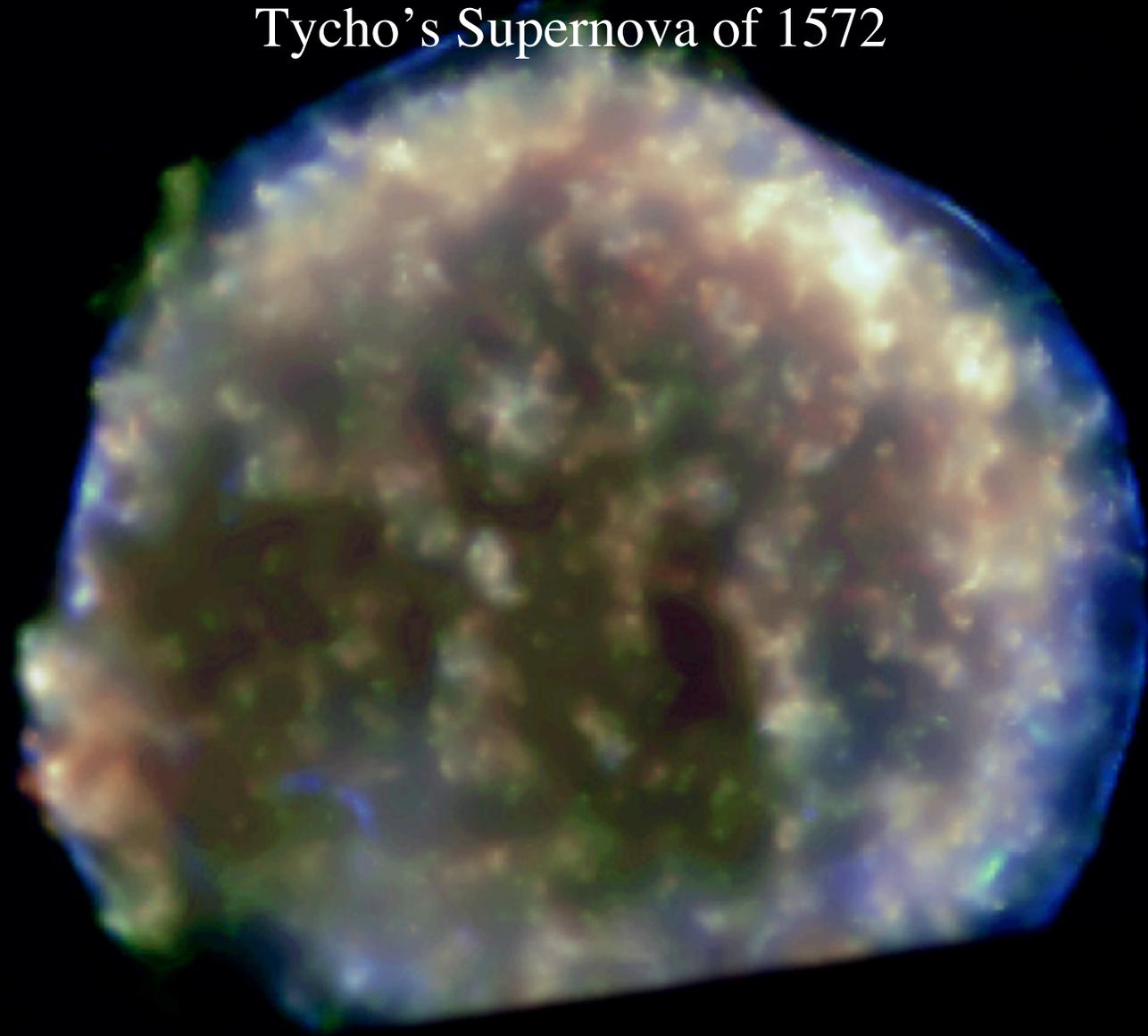
Left-over jet

Crab
33 ms pulsar
axis/torus structure

Proper motion

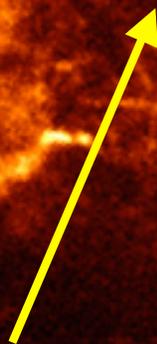
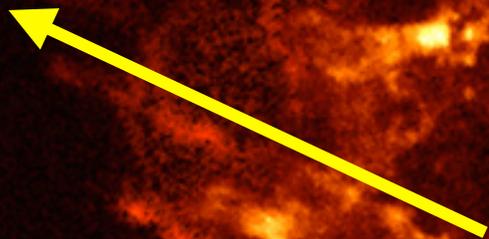


Chandra Observatory X-ray Image of
Tycho's Supernova of 1572

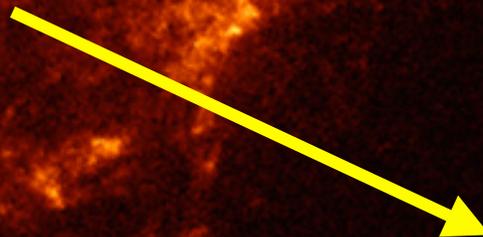


Cassiopeia A by Chandra X-ray Observatory

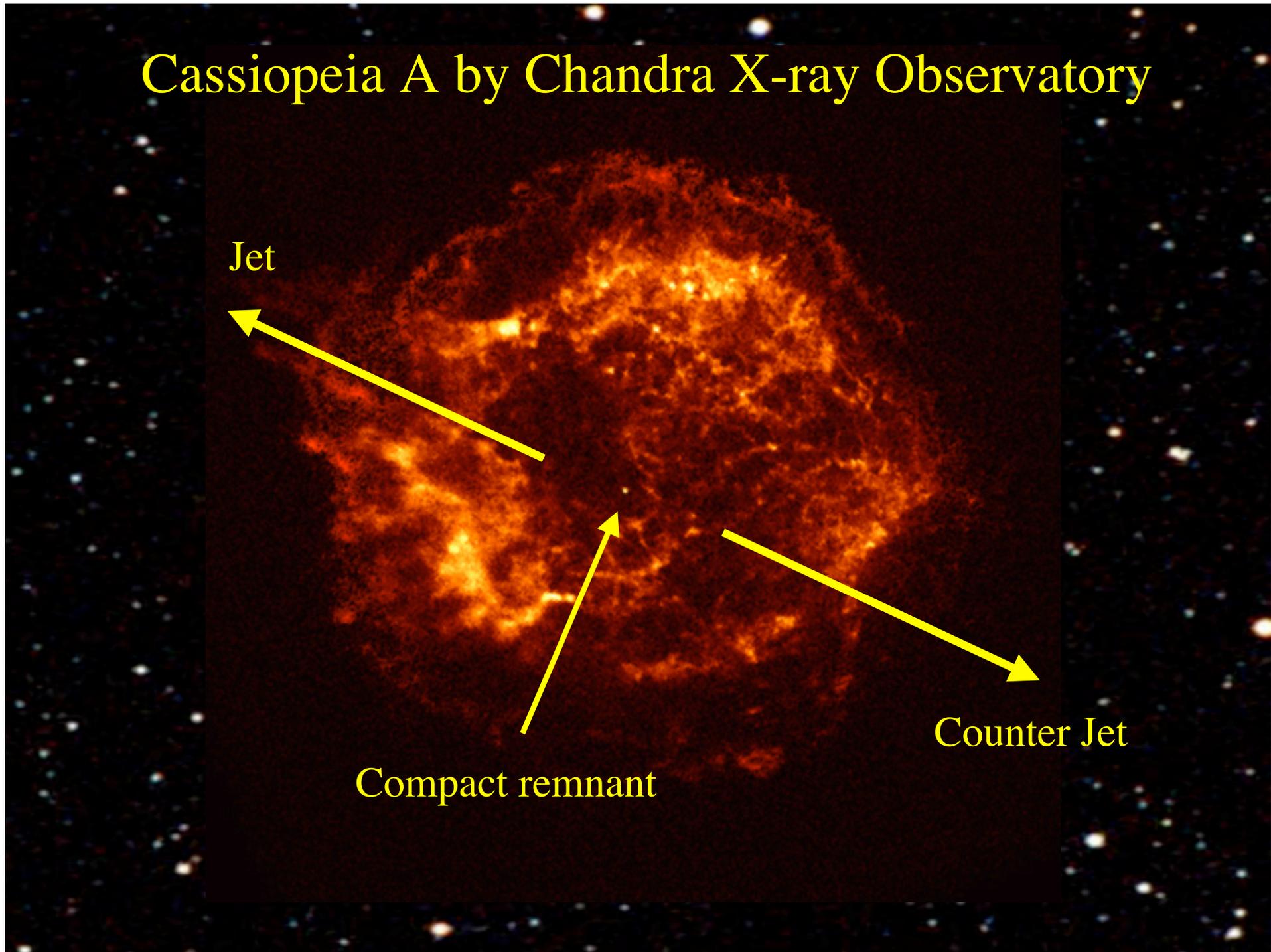
Jet



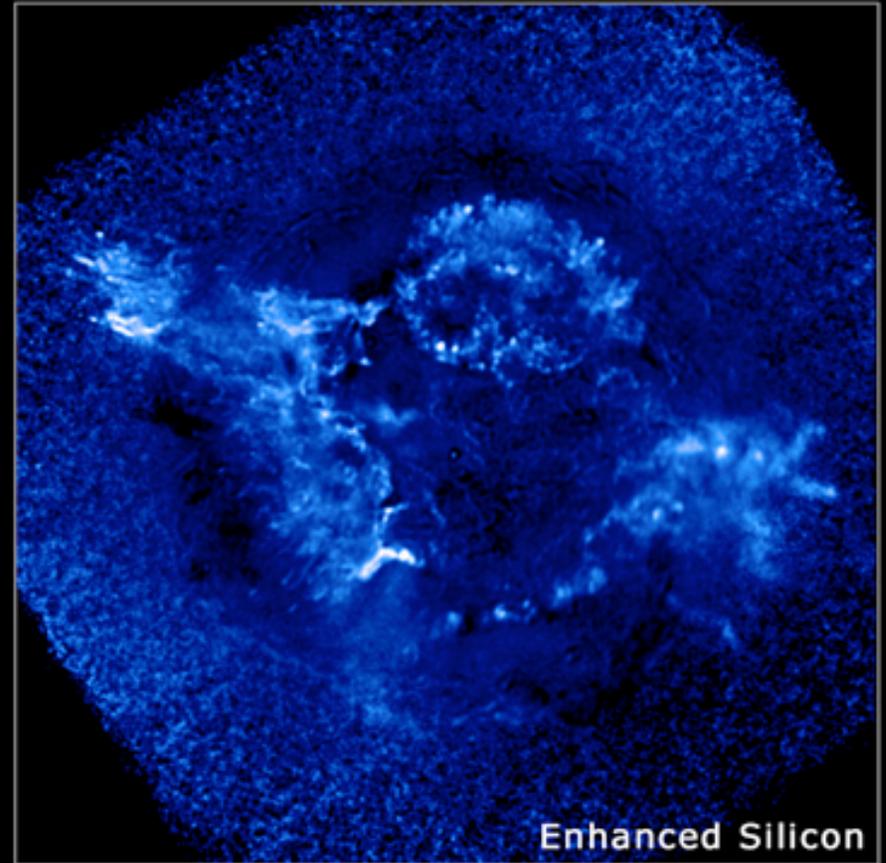
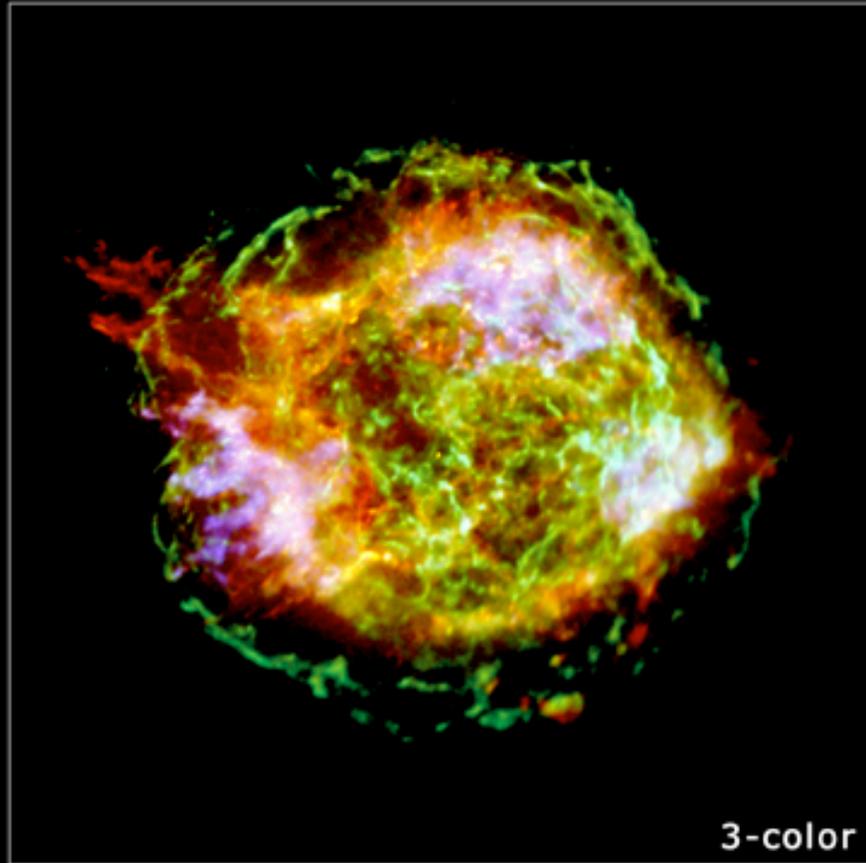
Compact remnant



Counter Jet



Recent Chandra Observatory X-ray Image of Cas A



SN 1987A

Exploded in nearby galaxy

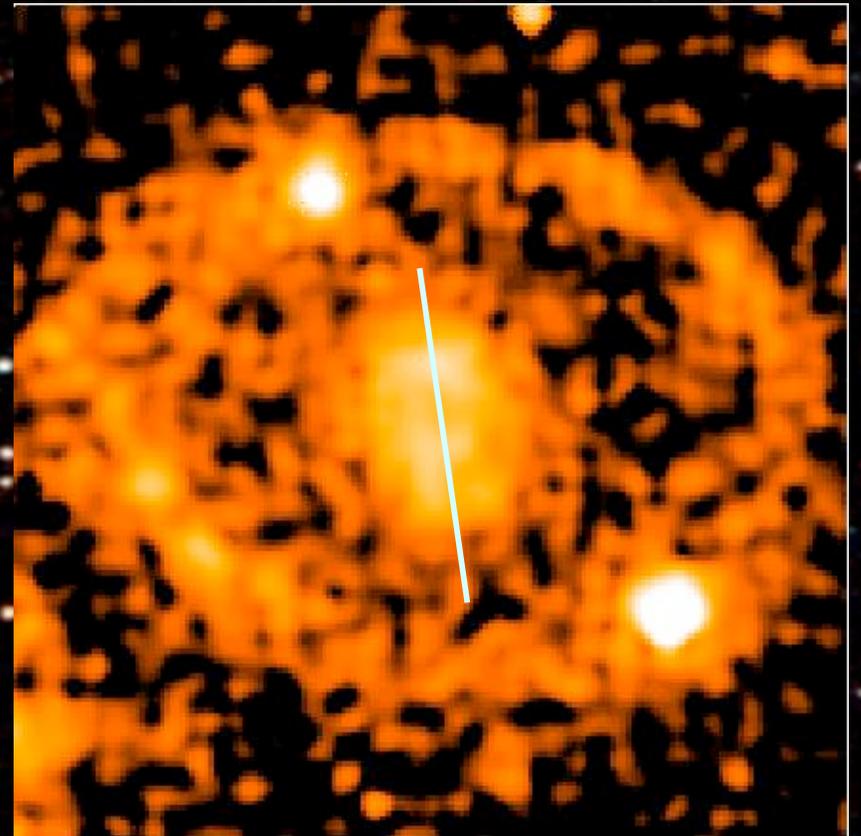
Bi-polar symmetry

Elongated debris

Supernova 1987A Rings



Hubble Space Telescope
Wide Field Planetary Camera 2

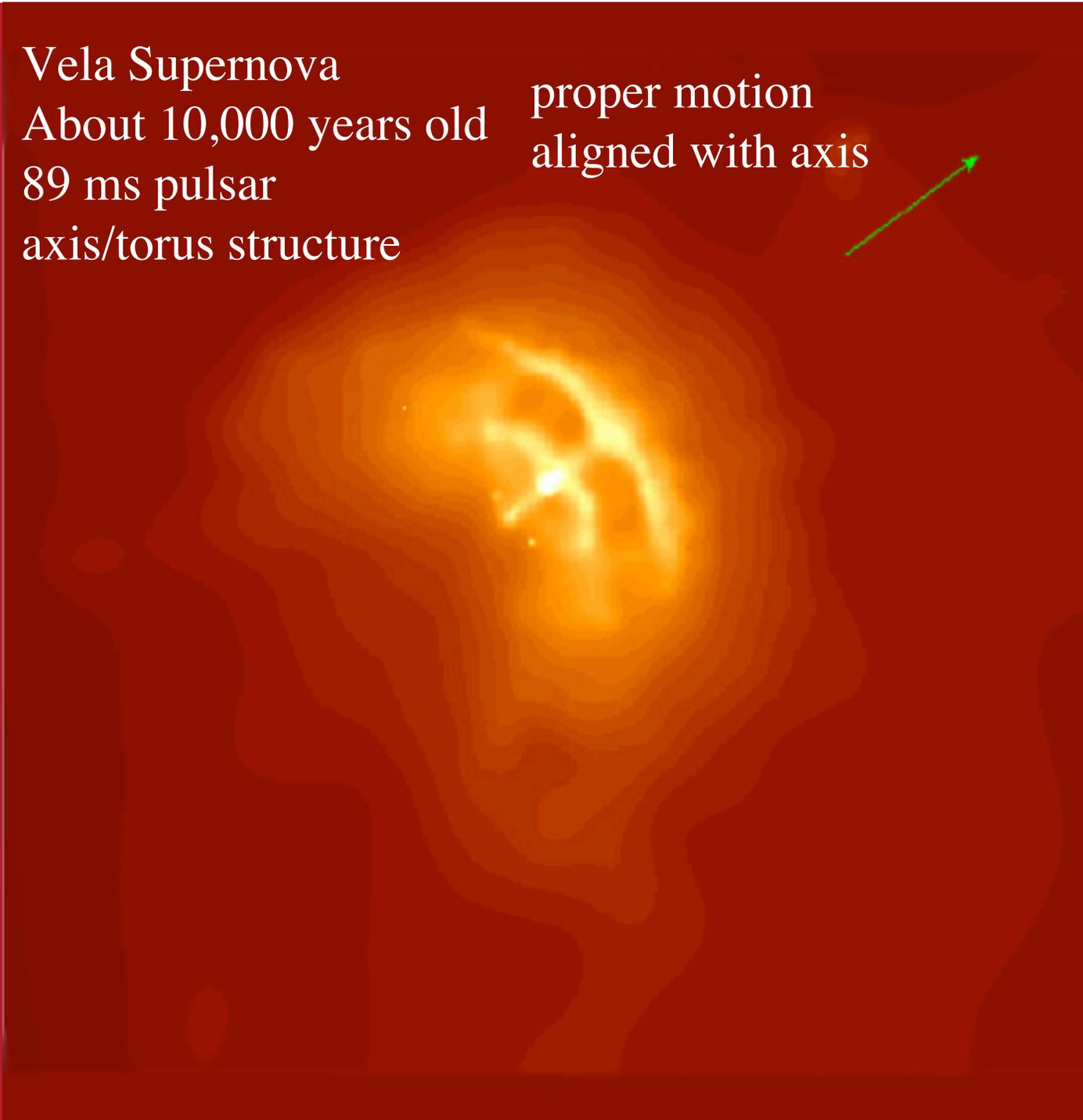




SN 1987A
SINS
Kirshner, et al.

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

proper motion
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.