

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.

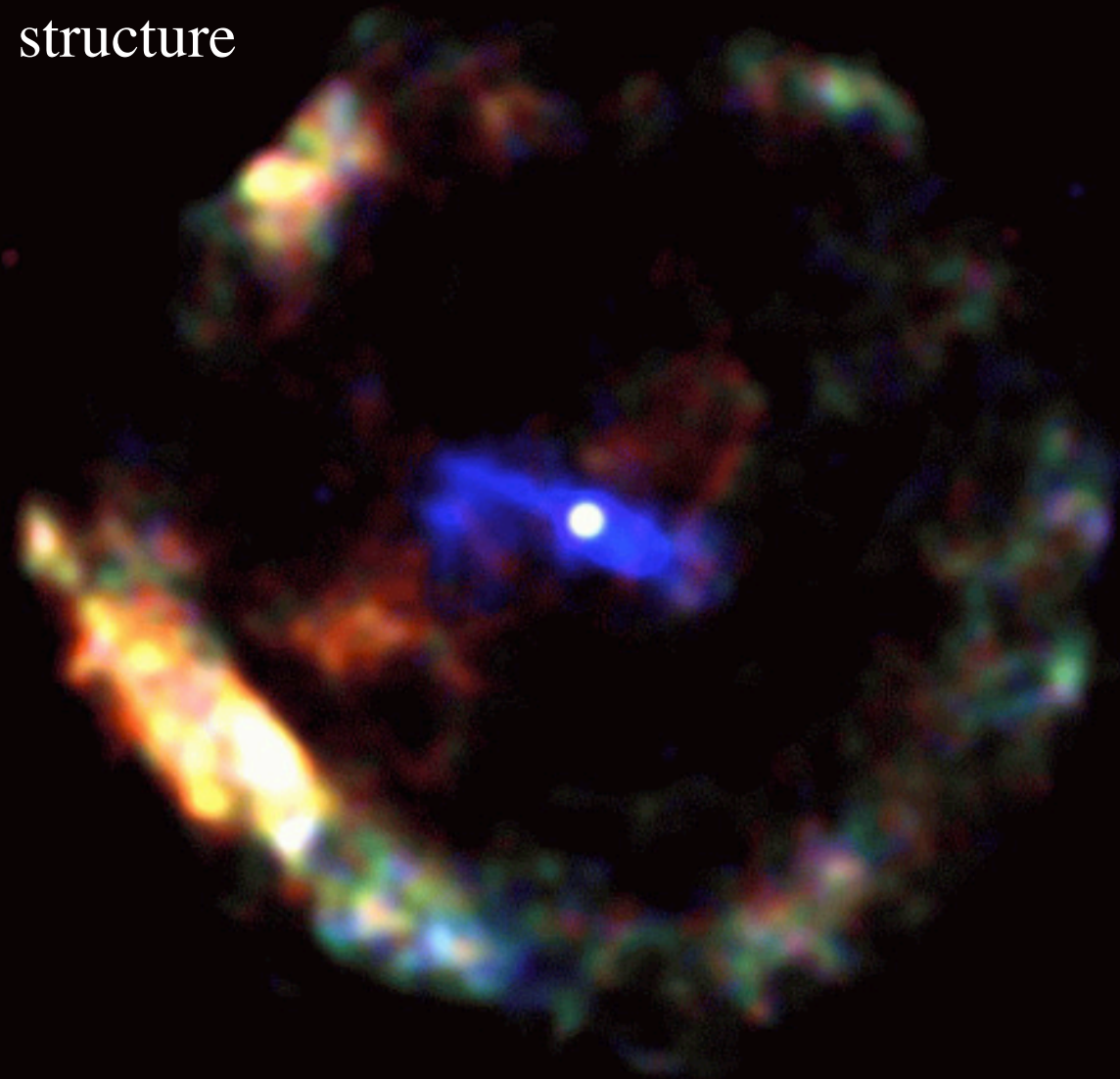
| | | |
|----------|---------------------|----------|
| SN 386 | earliest record | NS, jet? |
| SN 1006 | brightest | No NS |
| SN 1054 | Crab Nebula | NS, jets |
| SN 1181 | (Radio Source 3C58) | NS, jets |
| SN 1572 | Tycho | No NS |
| SN 1604 | Kepler | No NS |
| ~1680 | Cas A | NS? jets |
| SN 1987A | 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

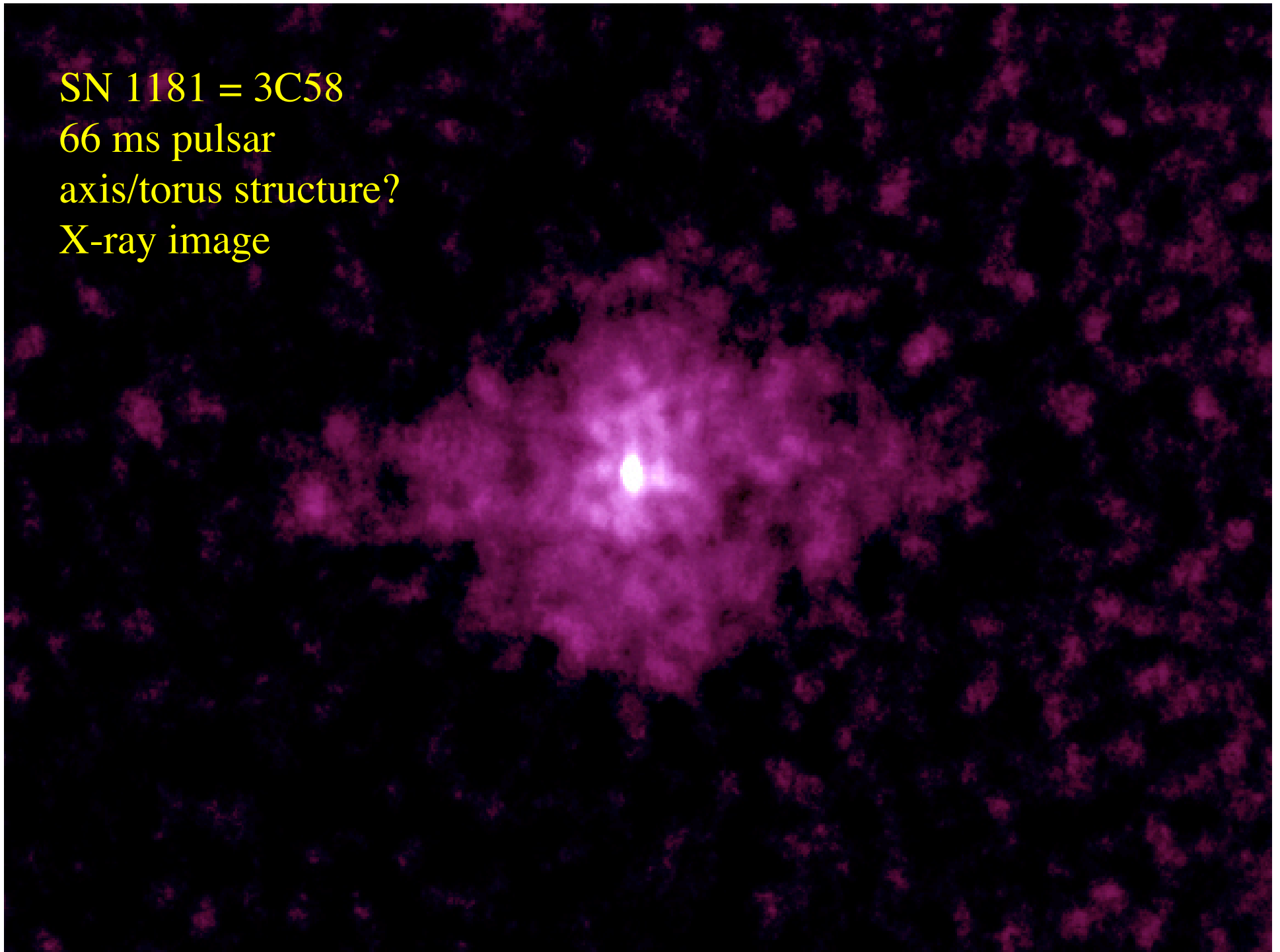


SN 1181 = 3C58

66 ms pulsar

axis/torus structure?

X-ray image



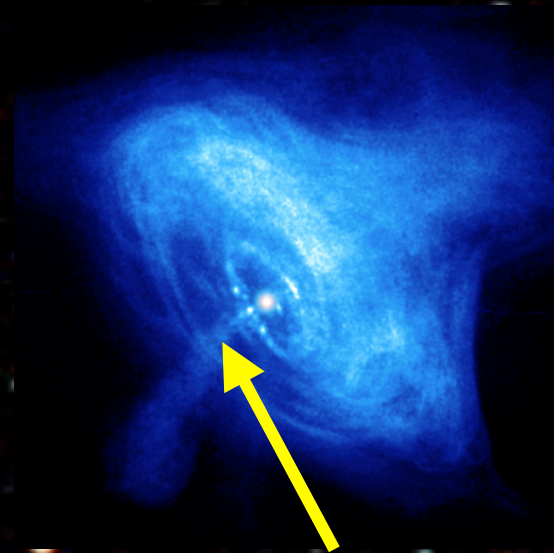
Crab Nebula

Remnant of “Chinese” Guest Star of 1054

Optical Image



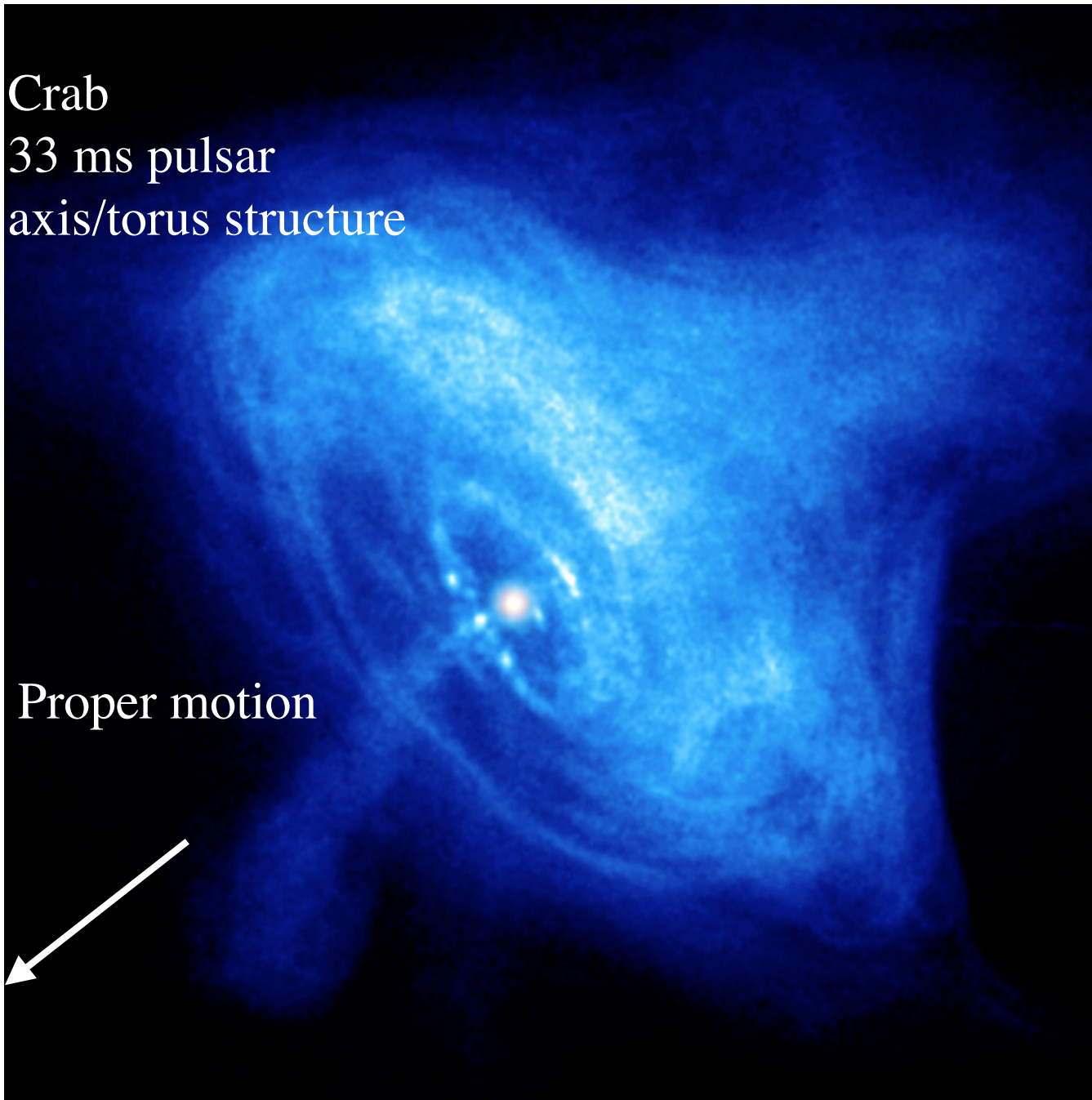
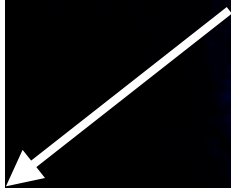
Chandra Observatory
X-Ray Image



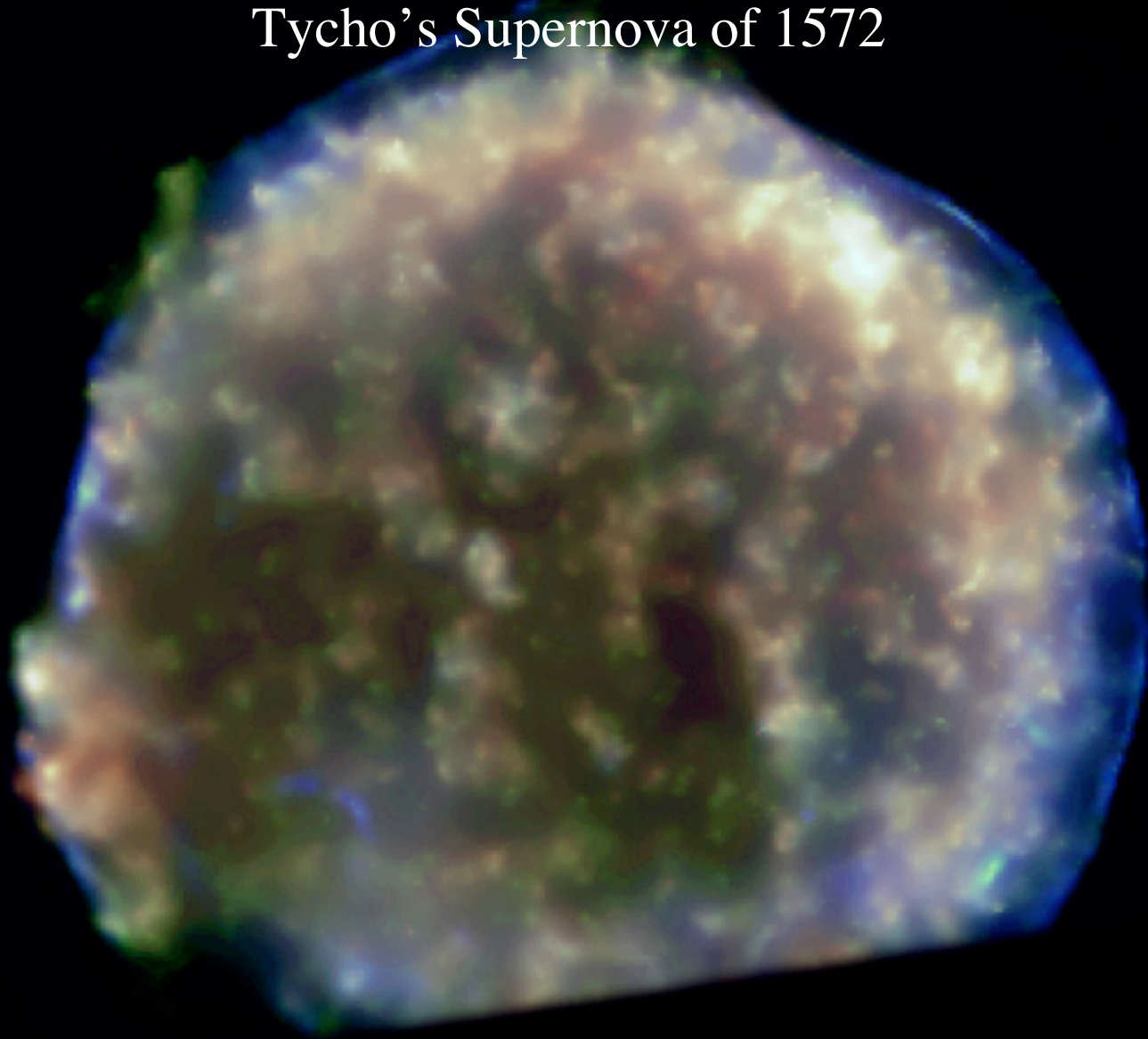
Left-over jet

Crab
33 ms pulsar
axis/torus structure

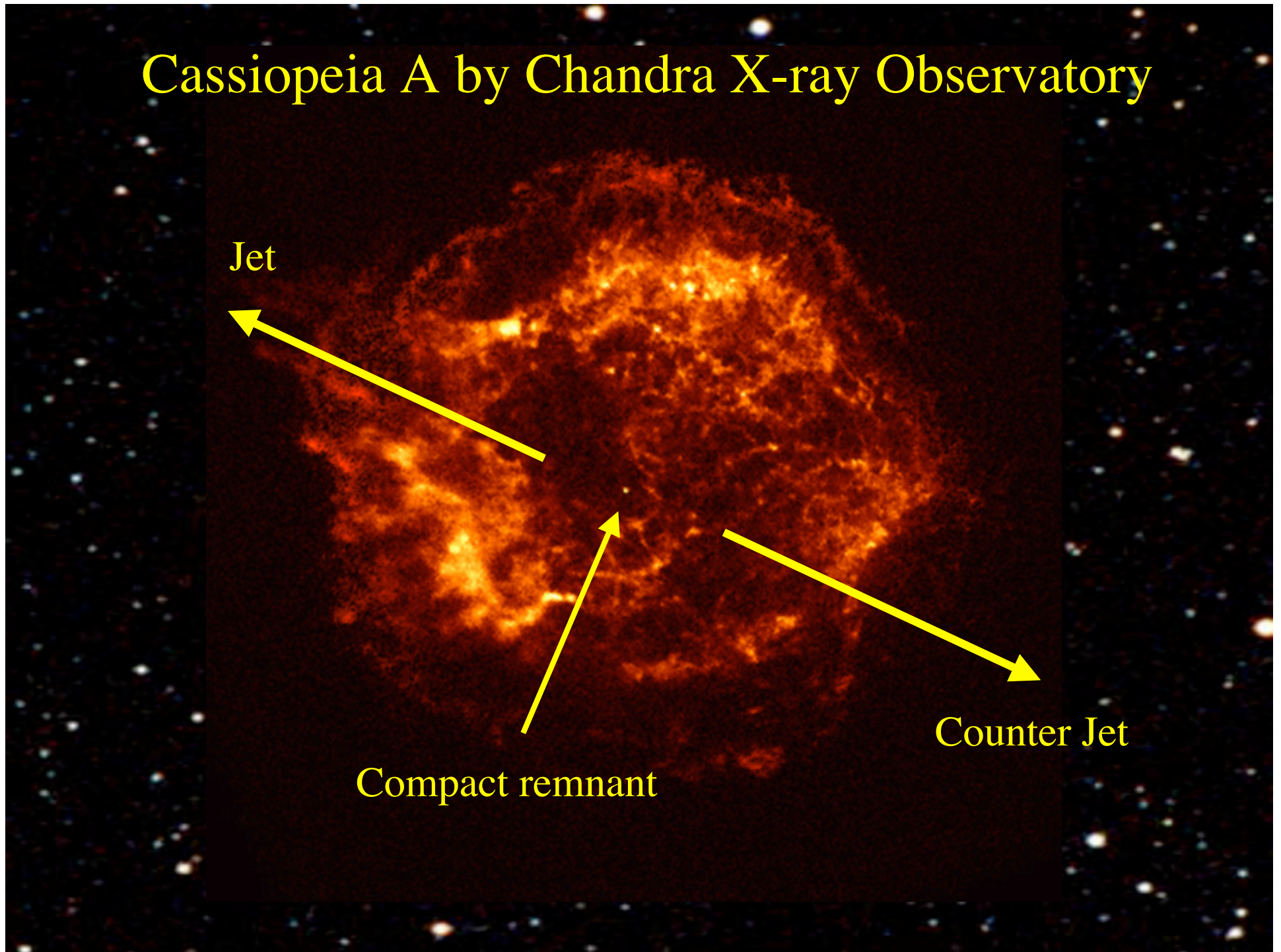
Proper motion



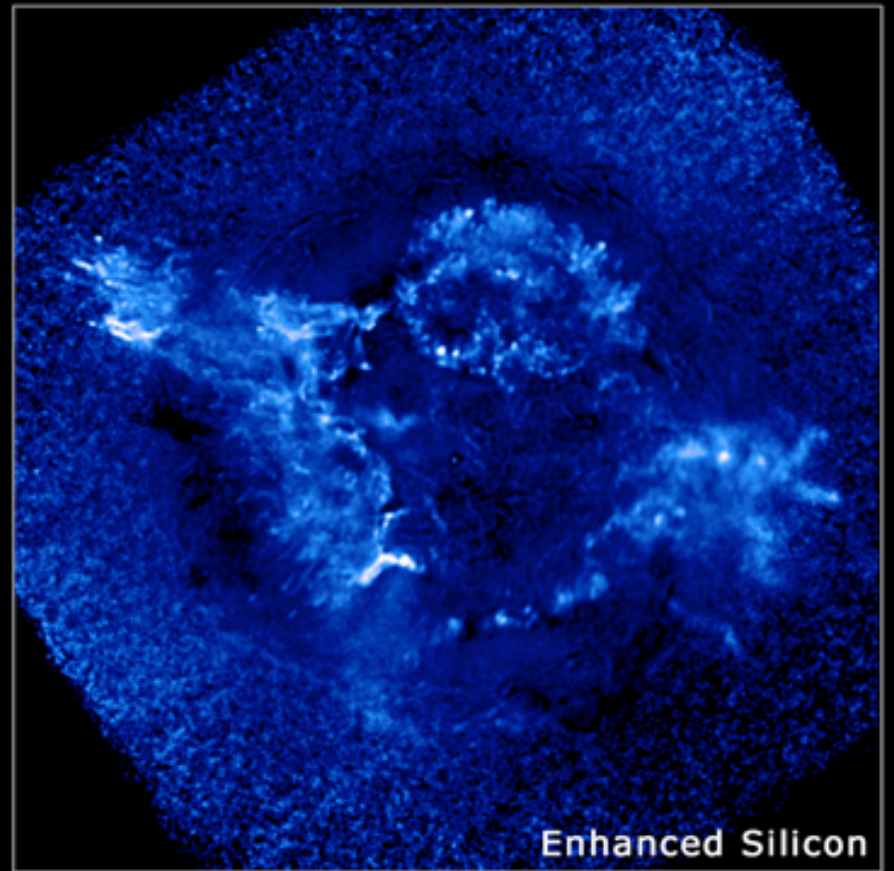
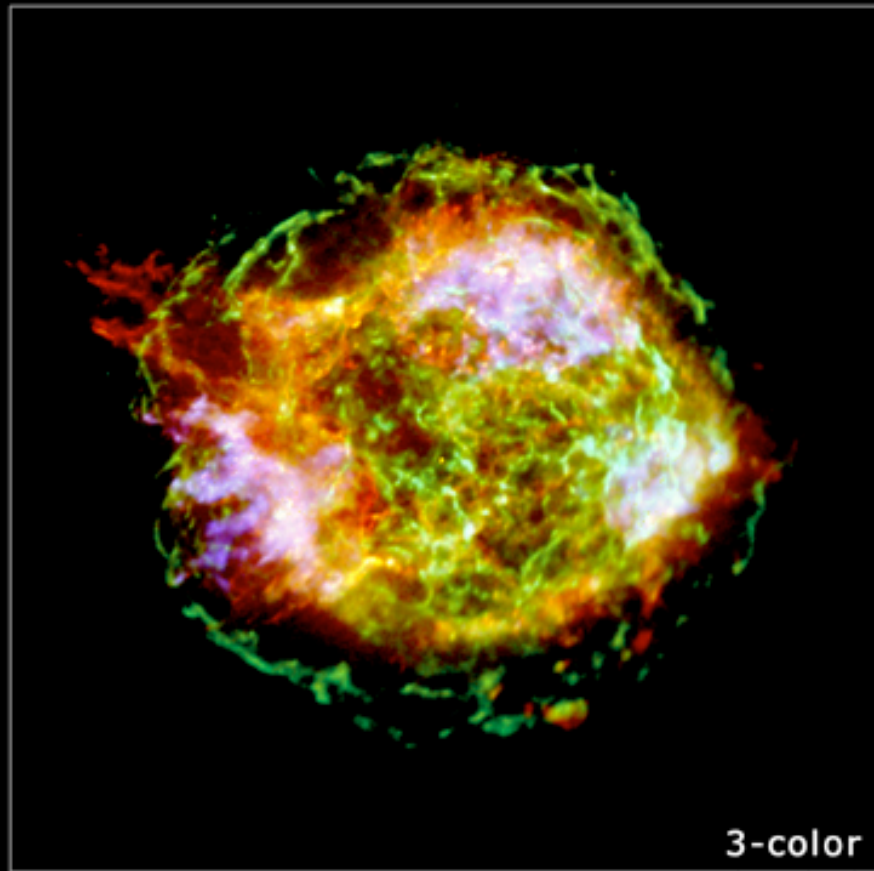
Chandra Observatory X-ray Image of
Tycho's Supernova of 1572



Cassiopeia A by Chandra X-ray Observatory



Recent Chandra Observatory X-ray Image of Cas A



SN 19897A

Exploded in nearby galaxy

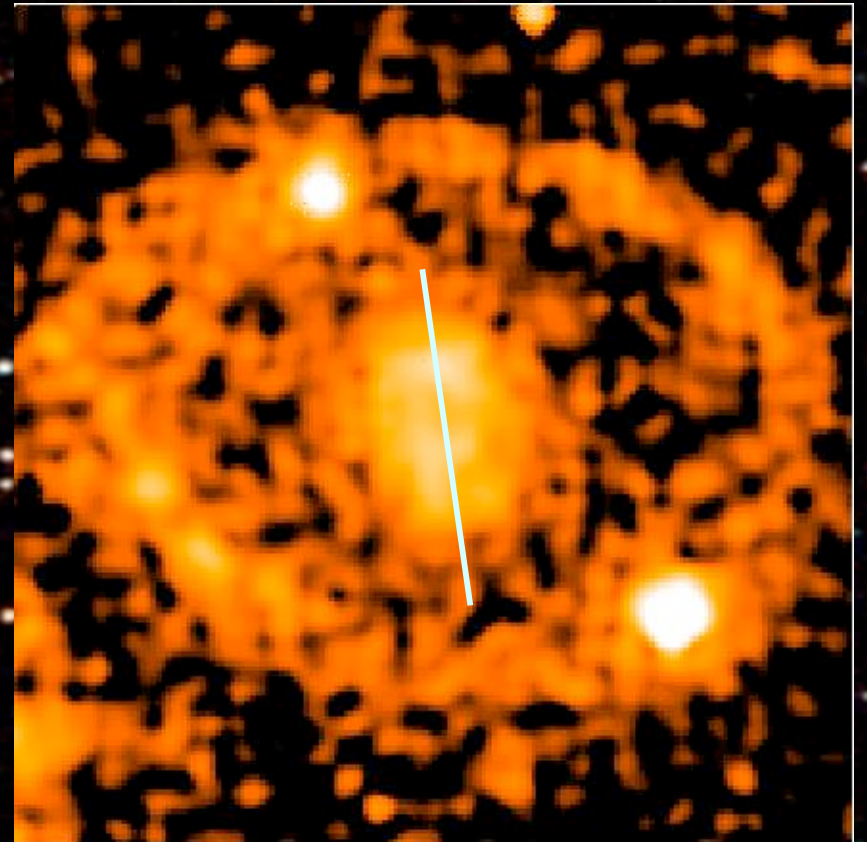
Bi-polar symmetry

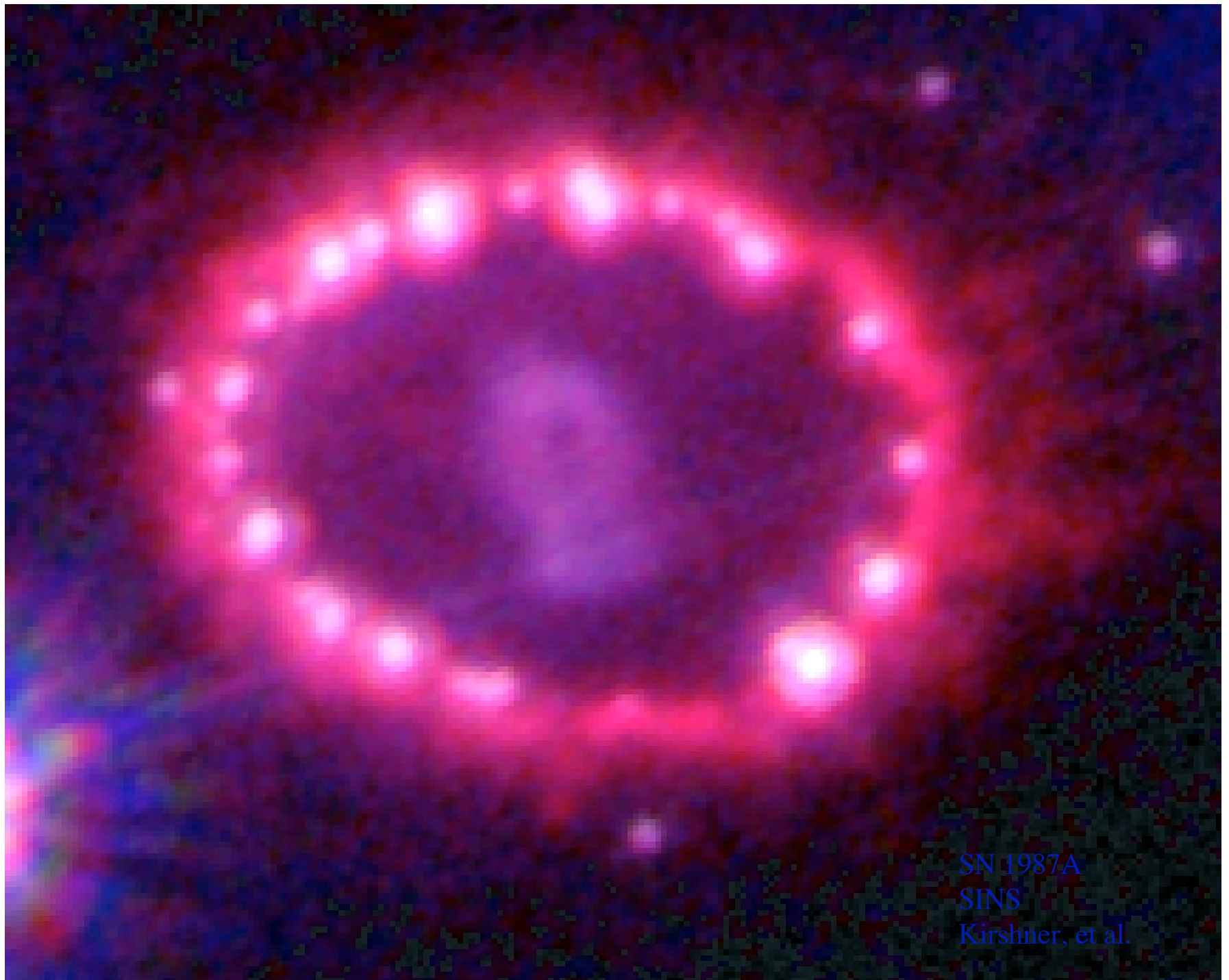
Elongated debris

Supernova 1987A Rings



Hubble Space Telescope
Wide Field Planetary Camera 2





SN 1987A
SINS
Kirshner, et al.

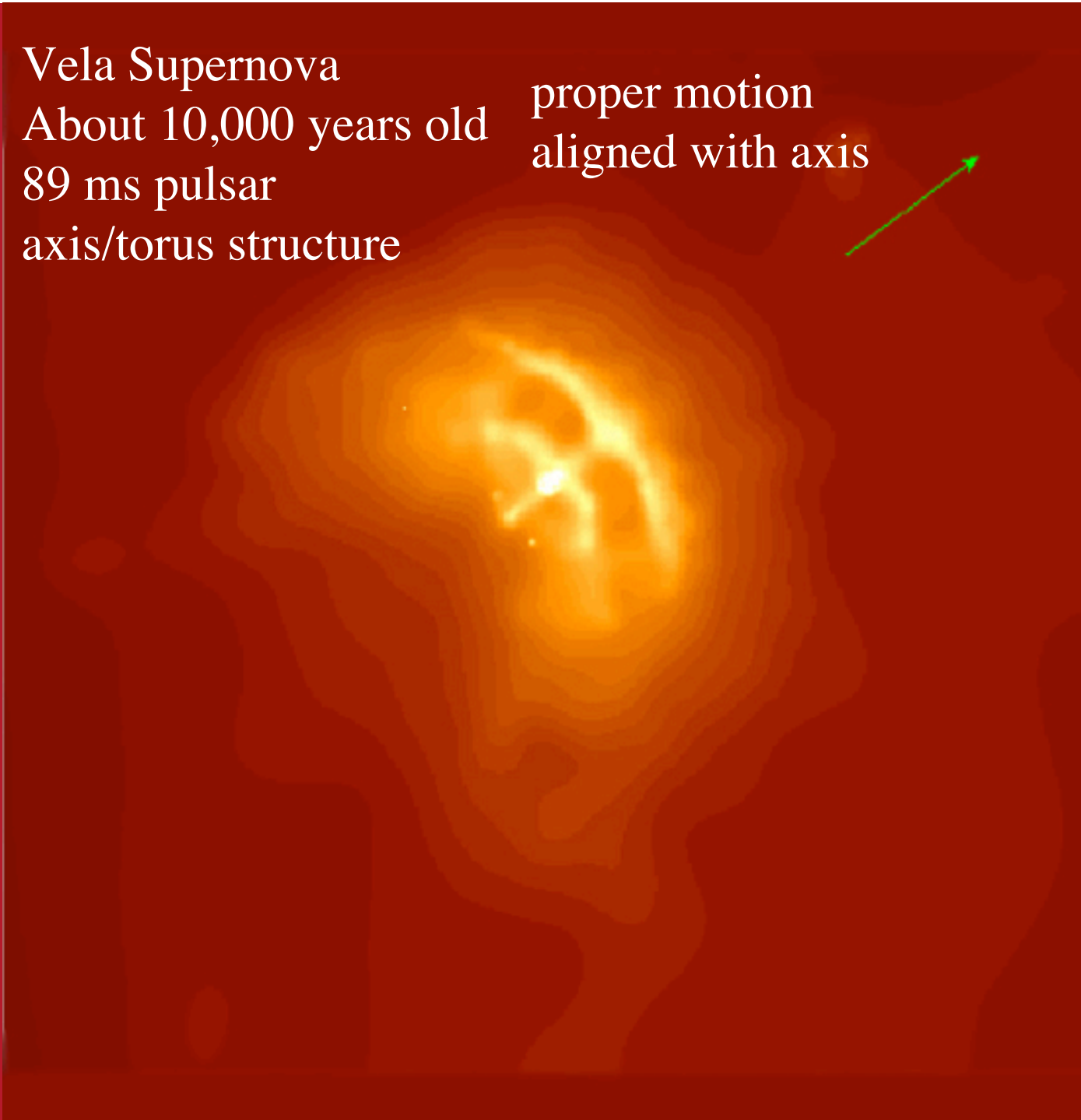
Vela Supernova

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.