

January 29, 2010

*First Exam a week from today*

Reading assignment, Chapter 6 Sections 6.1 - 6.3, plus Section 1.2.4, Sections 2.1 - 2.5, Section 5.1

Review Sheet Monday, Review Session Thursday 5 PM.

Astronomy in the News? “Research” and “Science” in the State of the Union Address.

Flare up of U Sco - eruption on the surface of a white dwarf, possible precursor to a supernova explosion.

Pic of the Day - Mars in “opposition”  
opposite the Sun, near Full Moon



# 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.

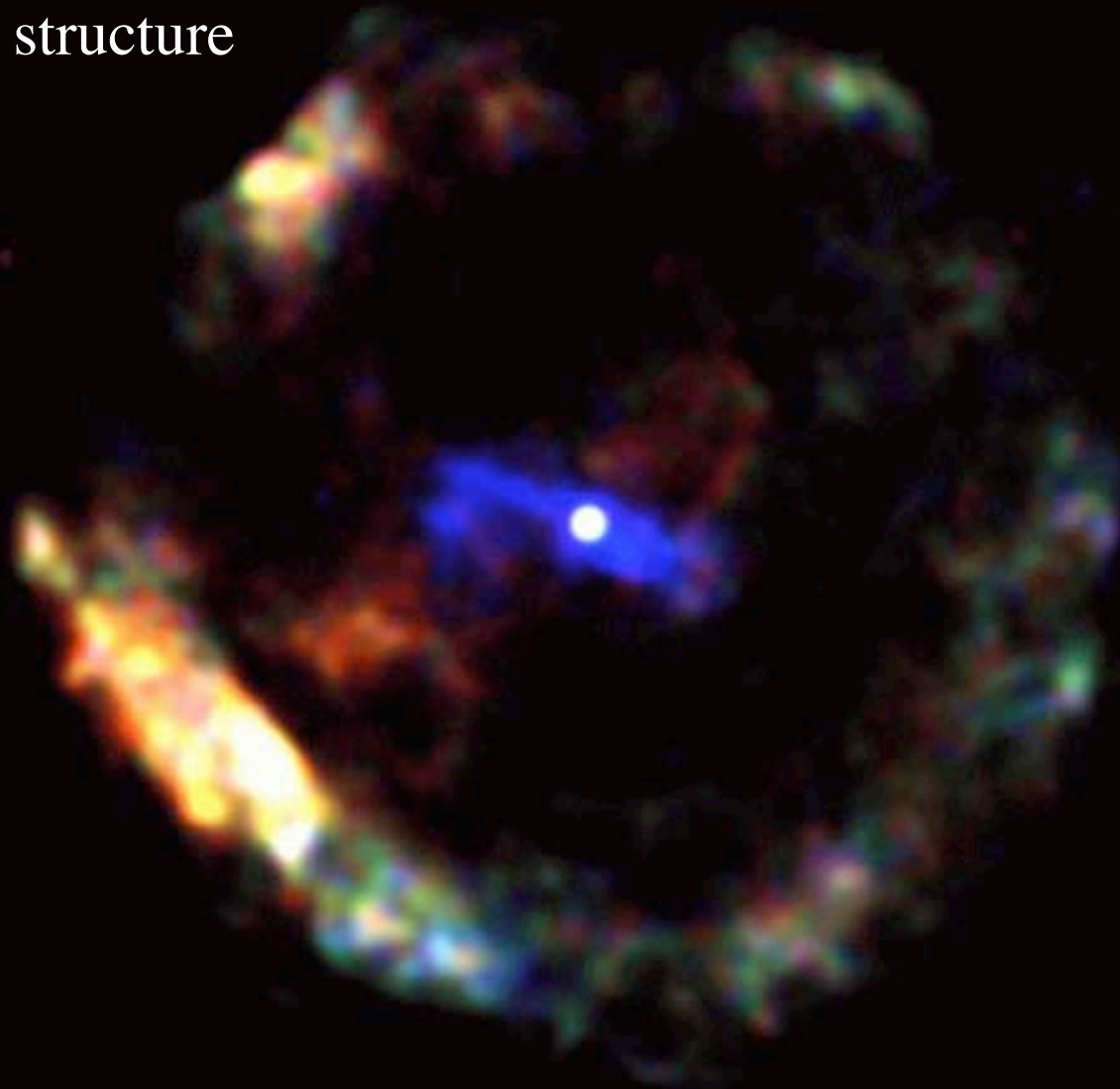
SN 386	earliest record	NS, jet?
SN 1006	brightest	No NS
SN 1054	Crab Nebula	NS, jets
SN 1181	(Radio Source 3C58)	NS, jets
SN 1572	Tycho	No NS
SN 1604	Kepler	No NS
~1680	Cas A	NS? jets
SN 1987A	nearby galaxy	NS? jets

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

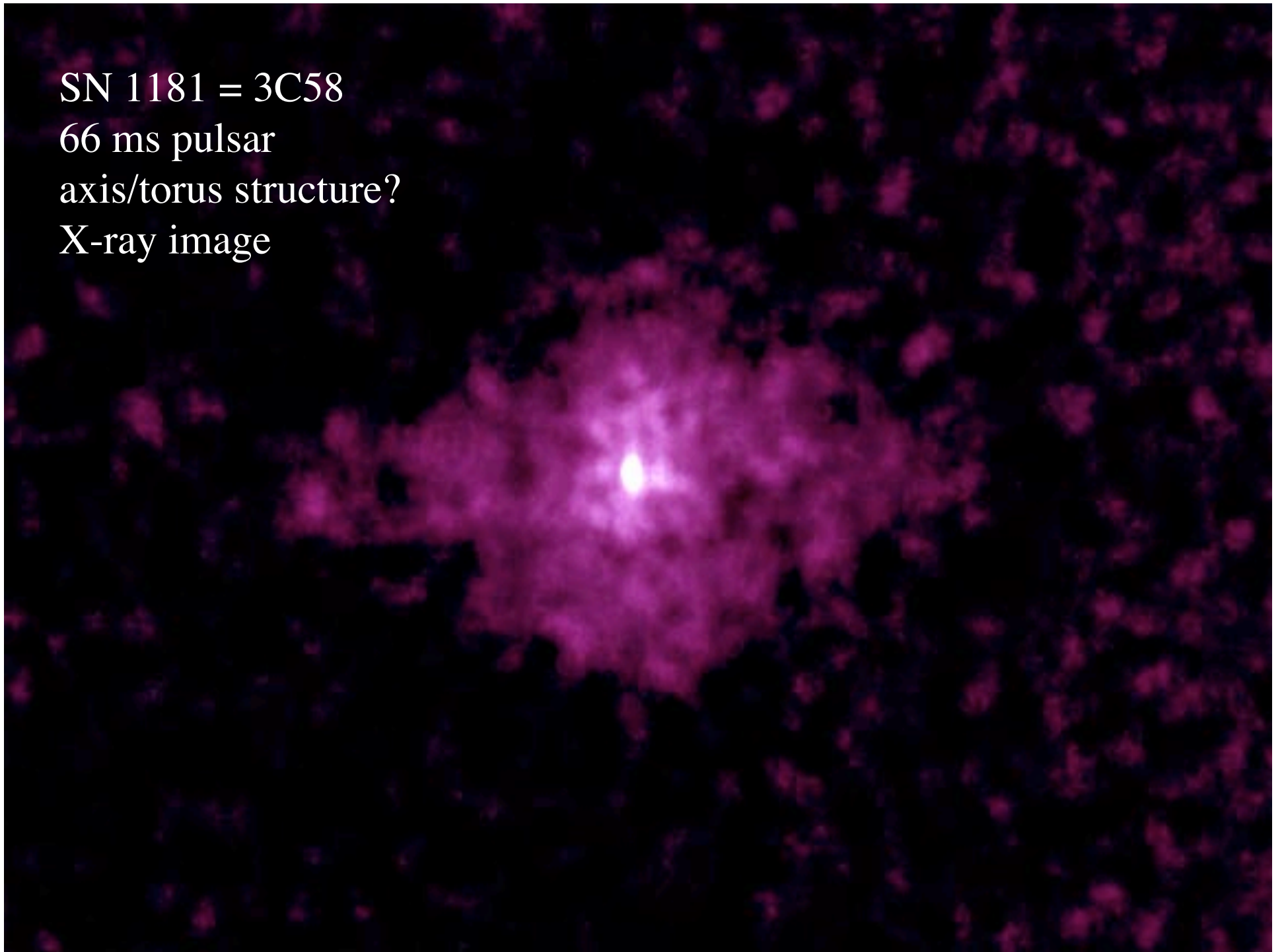


SN 1181 = 3C58

66 ms pulsar

axis/torus structure?

X-ray image



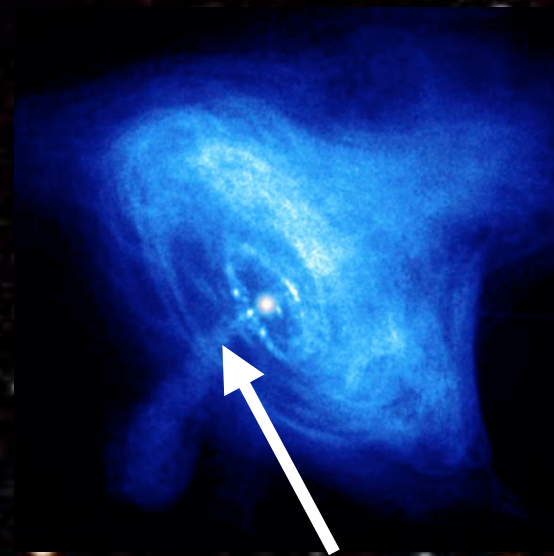
# Crab Nebula

Remnant of “Chinese” Guest Star of 1054

Optical Image

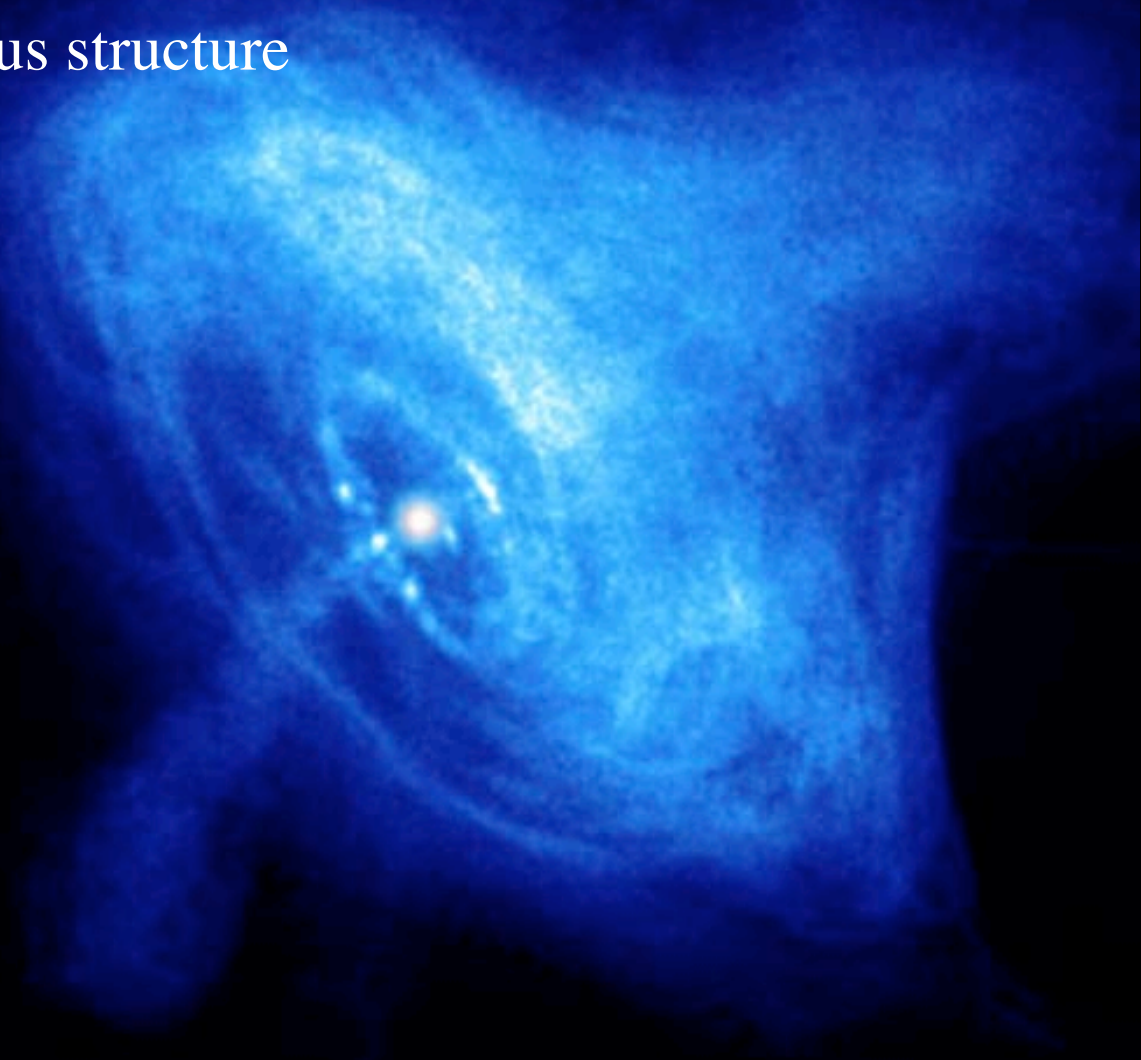


Chandra Observatory  
X-Ray Image



Left-over jet

Crab  
33 ms pulsar  
axis/torus structure



Kepler

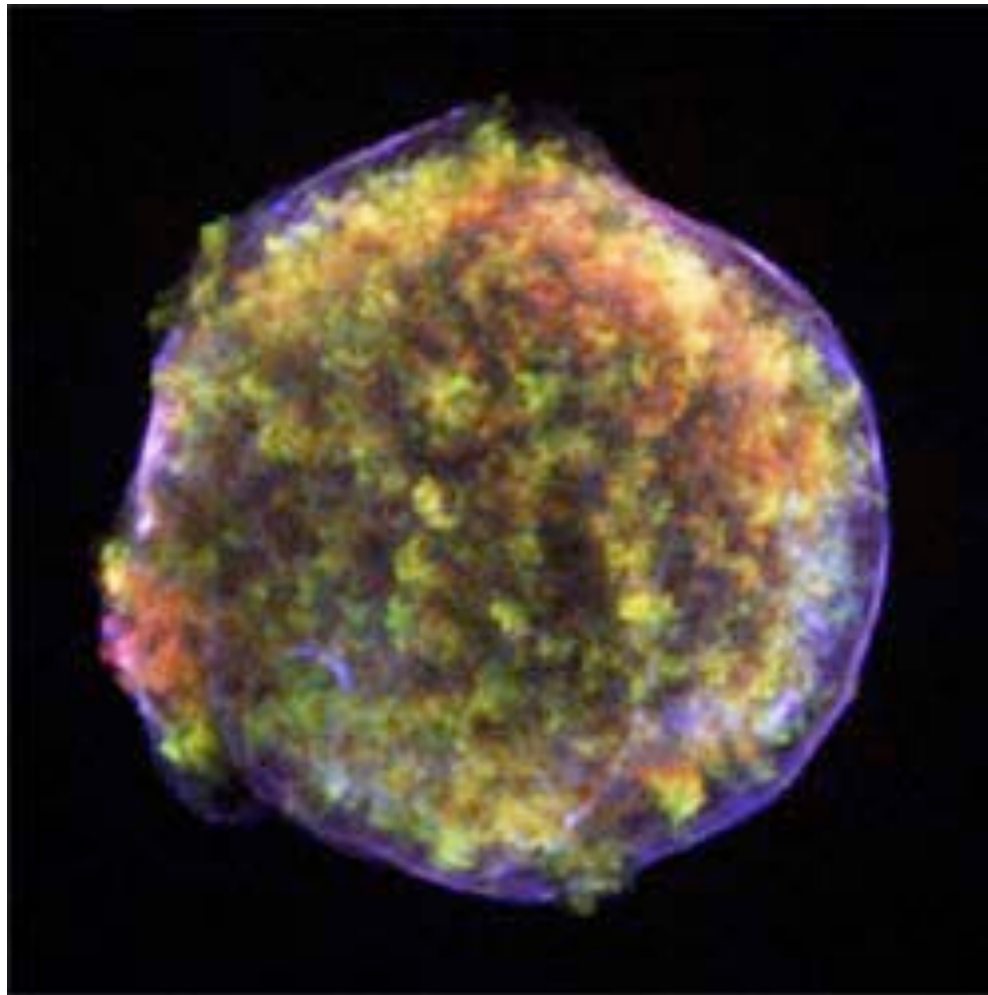


Tycho



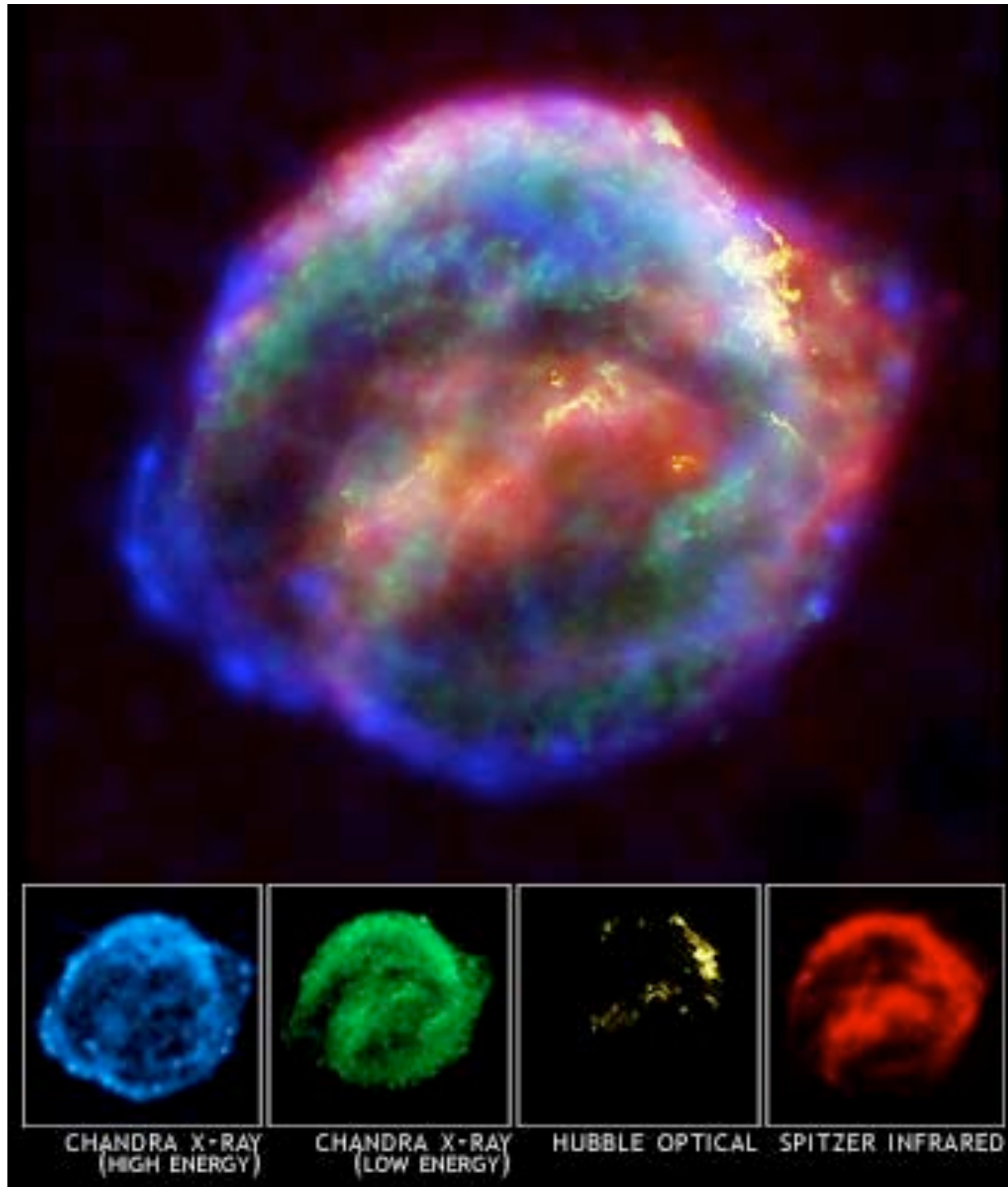
# Chandra Observatory X-ray Image of Tycho's Supernova of 1572

No evidence for neutron star



SN 1006



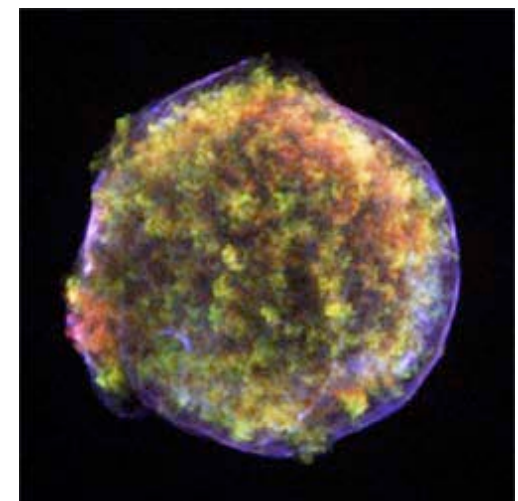


Great  
Observatories  
composite of  
Kepler's  
supernova 1604

No sign of neutron  
star

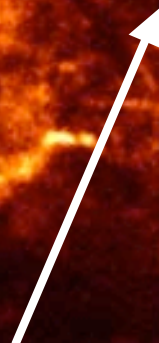
“sideways” alignment?

SN 1572 Tycho

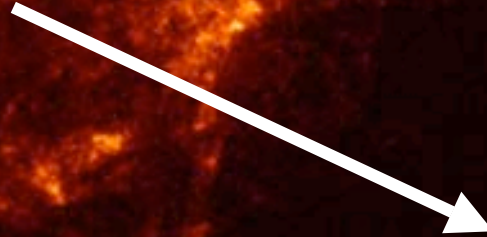


# Cassiopeia A by Chandra X-ray Observatory

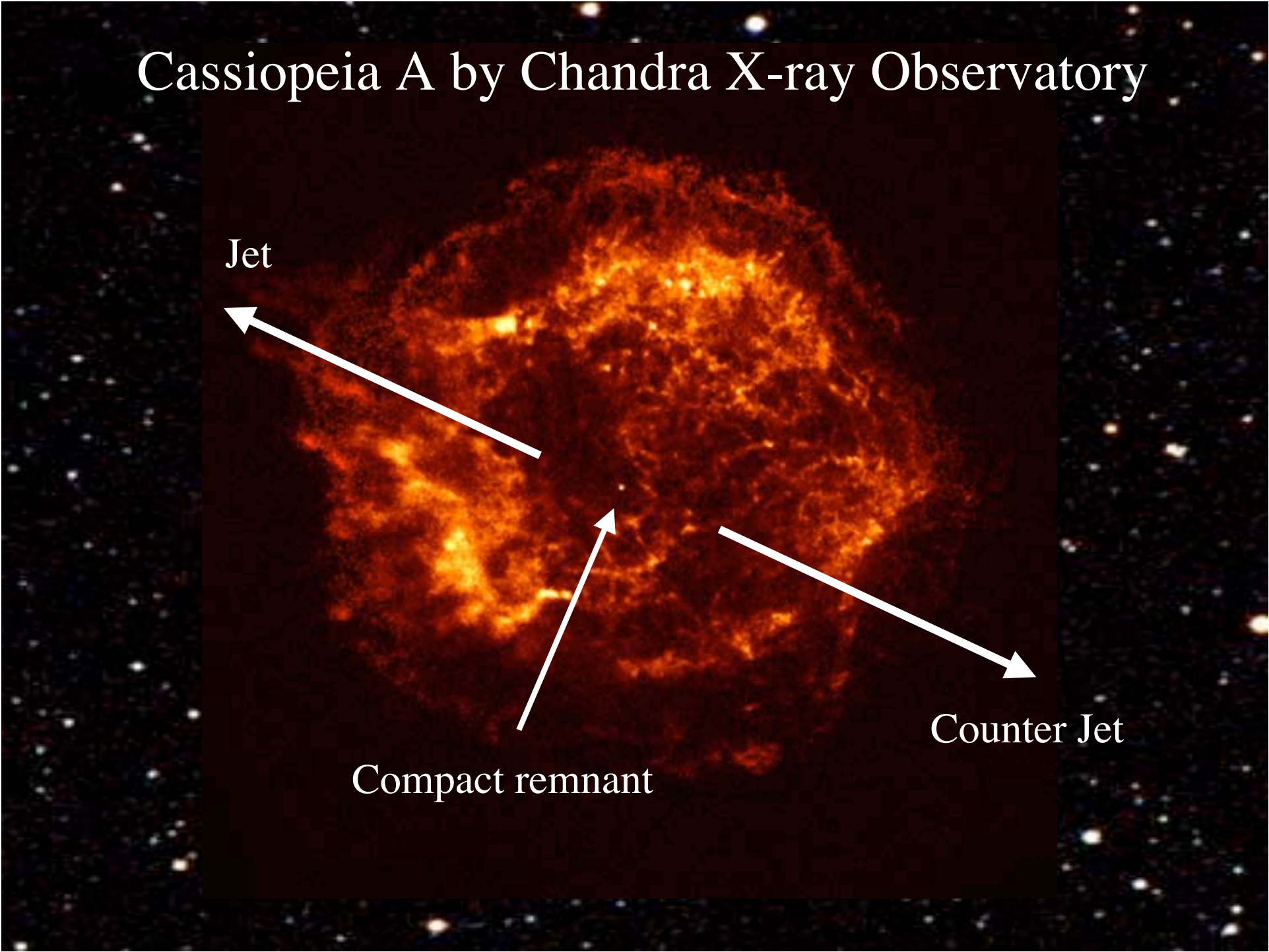
Jet



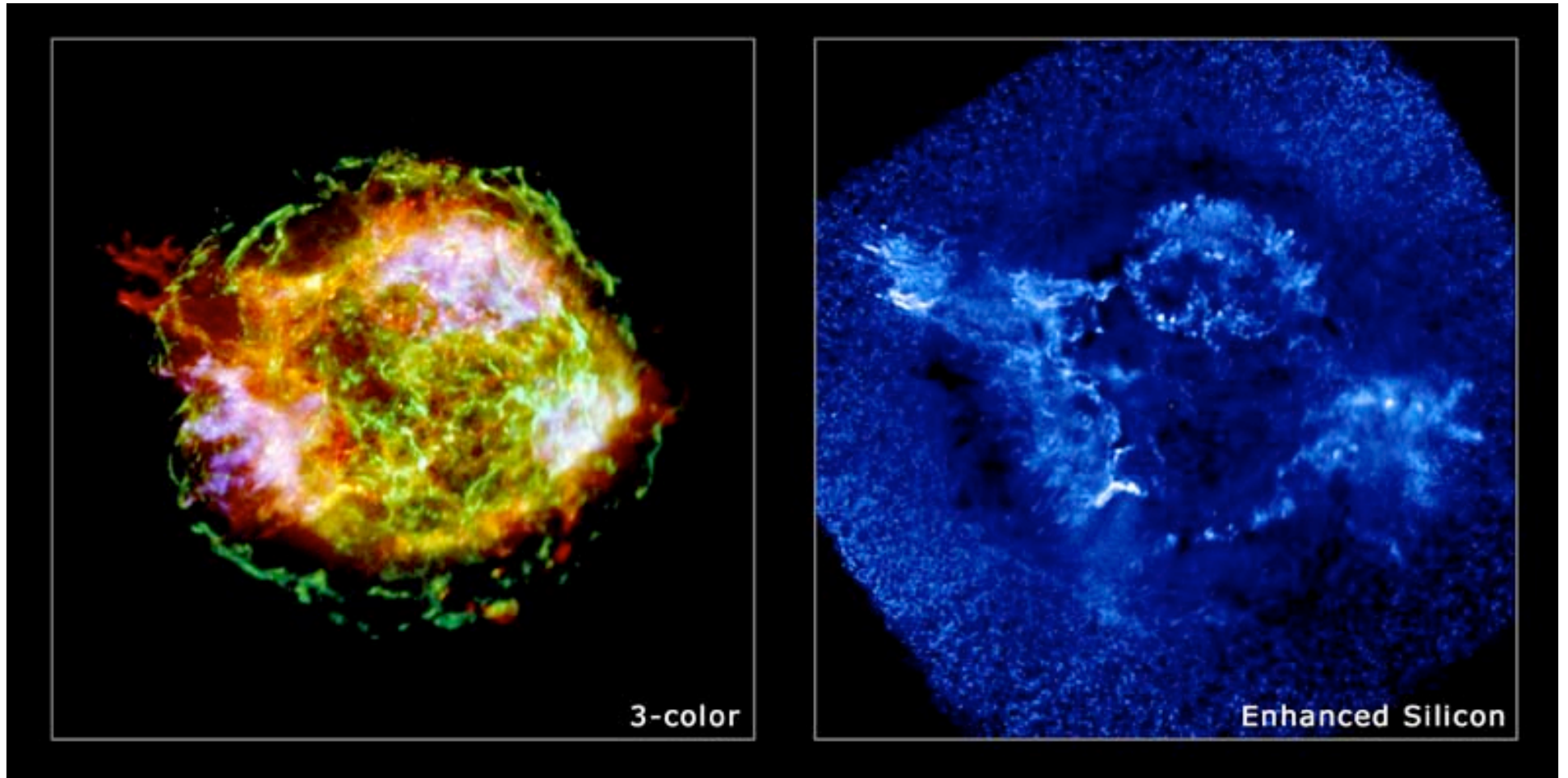
Compact remnant



Counter Jet



# Recent Chandra Observatory X-ray Image of Cas A



# SN 1987A

Exploded in nearby galaxy

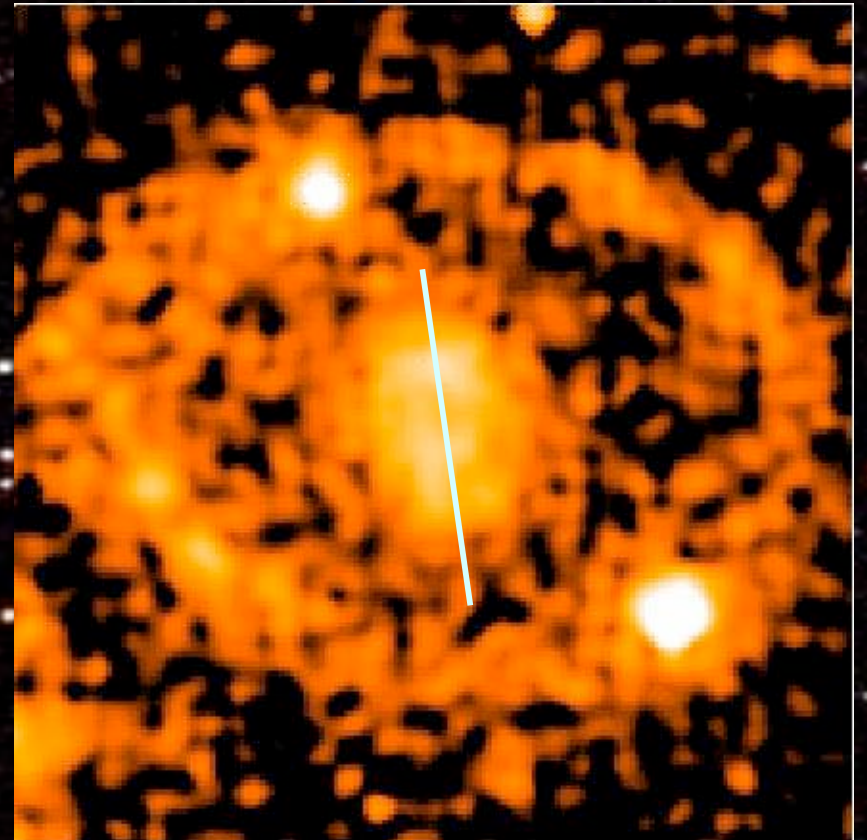
Bi-polar symmetry

Elongated debris

Supernova 1987A Rings



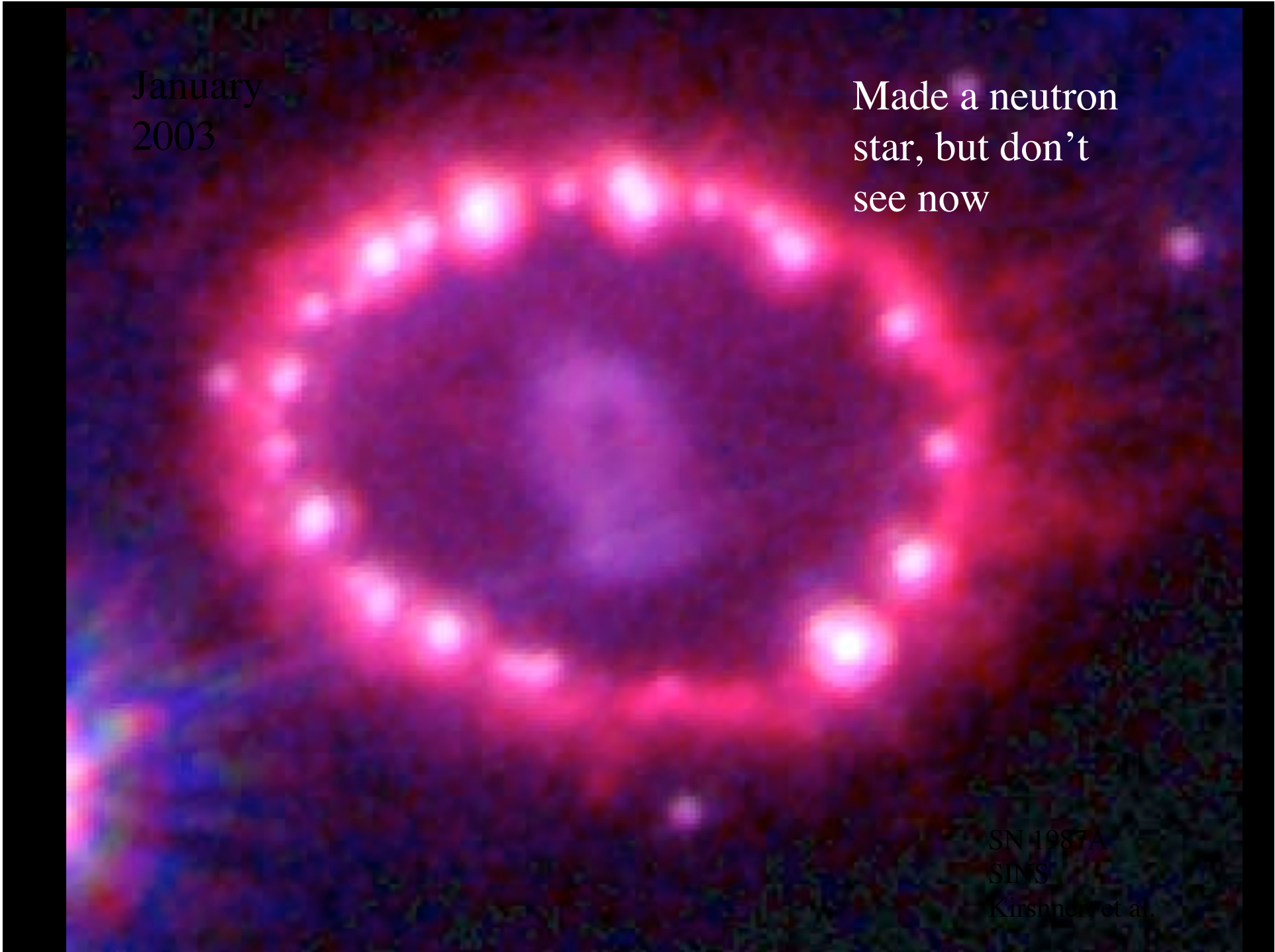
Hubble Space Telescope  
Wide Field Planetary Camera 2



January  
2003

Made a neutron  
star, but don't  
see now

SN 1987A  
SINS  
Kirshner, et al.



*Sky Watch Extra Credit - location of supernovae*

*SN 1006 - Lupus/Centaurus*

*SN 1054 Crab Nebula - Taurus*

*SN 1572 Tycho - Cassiopeia*

*SN 1604 Kepler - Ophiuchus*

*Cassiopeia A - Cassiopeia*

*Betelgeuse - Orion, Red Supergiant due to explode “soon” 15 solar masses*

*Antares - Bright Red Supergiant in Scorpius, 15 to 18 solar masses  
(+companion)*

*Rigel - Orion, Blue Supergiant due to explode later, 17 solar masses*

*U Sco - Scorpius, possible white dwarf supernova progenitor.*