Friday, January 27, 2012

First exam a week from today, Friday, February 3. Skywatch due

Review sheet posted Monday.

Moon?

Astronomy in the news?

Quantum device.

Goal:

To understand what we have learned from the study of old supernova explosions in our Milky Way Galaxy.

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 185	earliest record	No NS
SN 386		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
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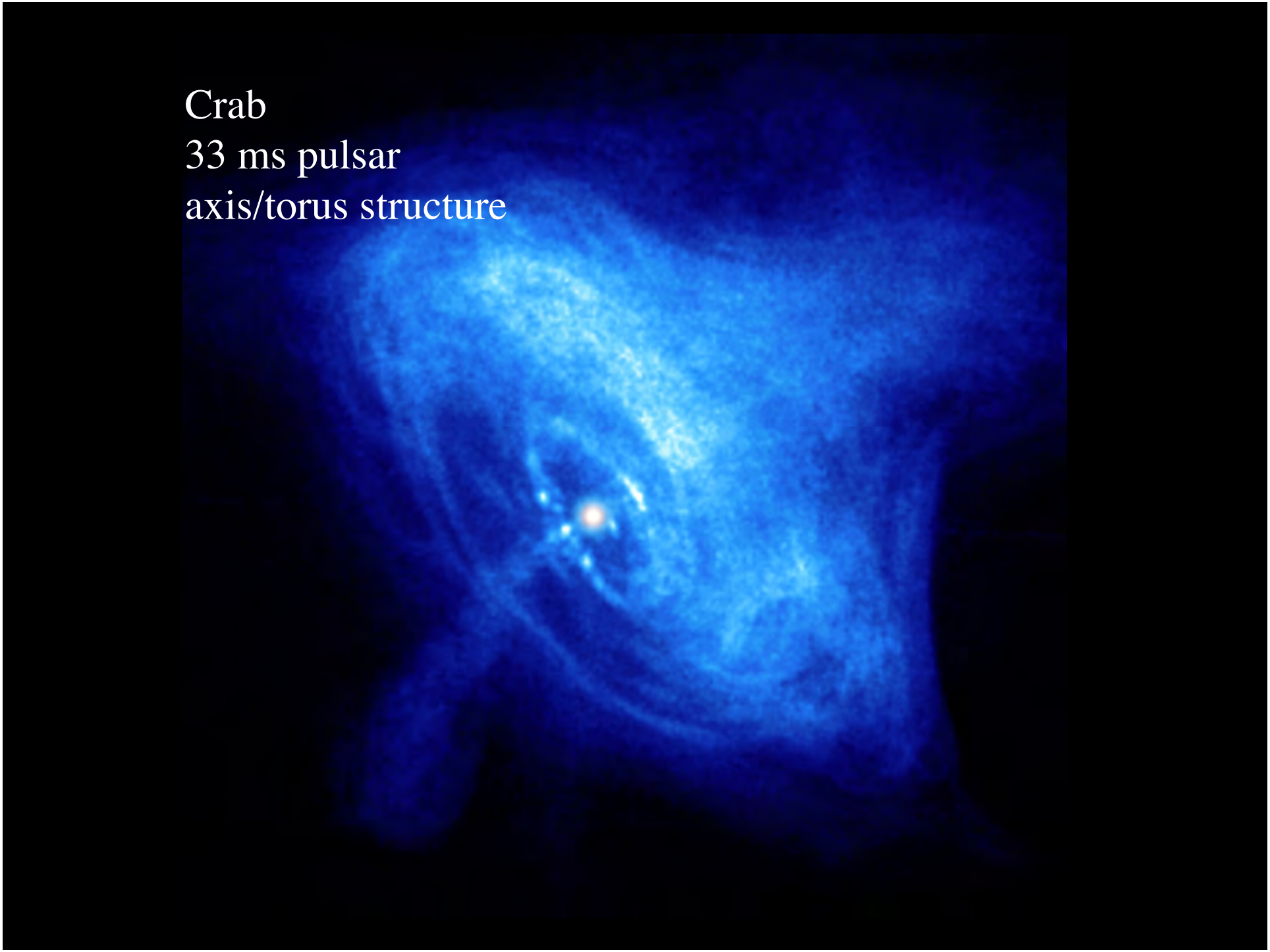
SN 1987A	nearby galaxy	NS? jets

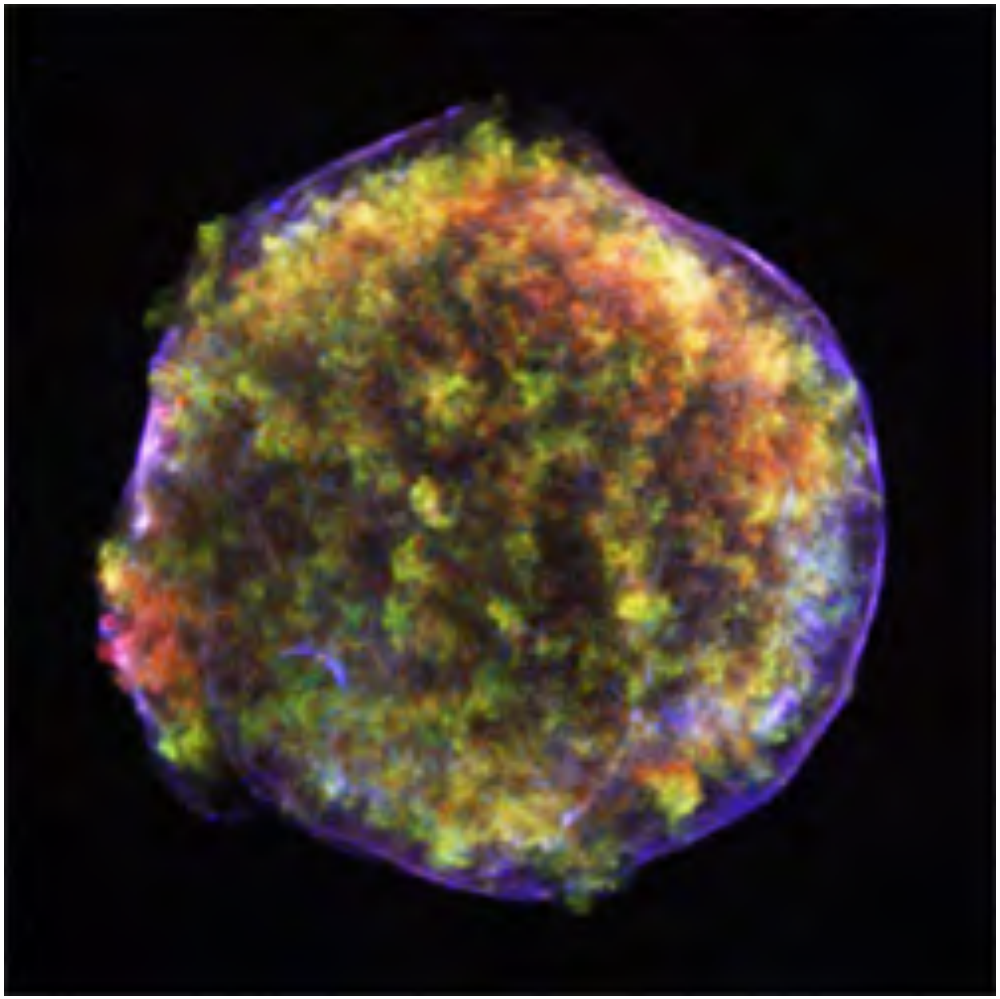

Crab
33 ms pulsar
axis/torus structure

Kepler

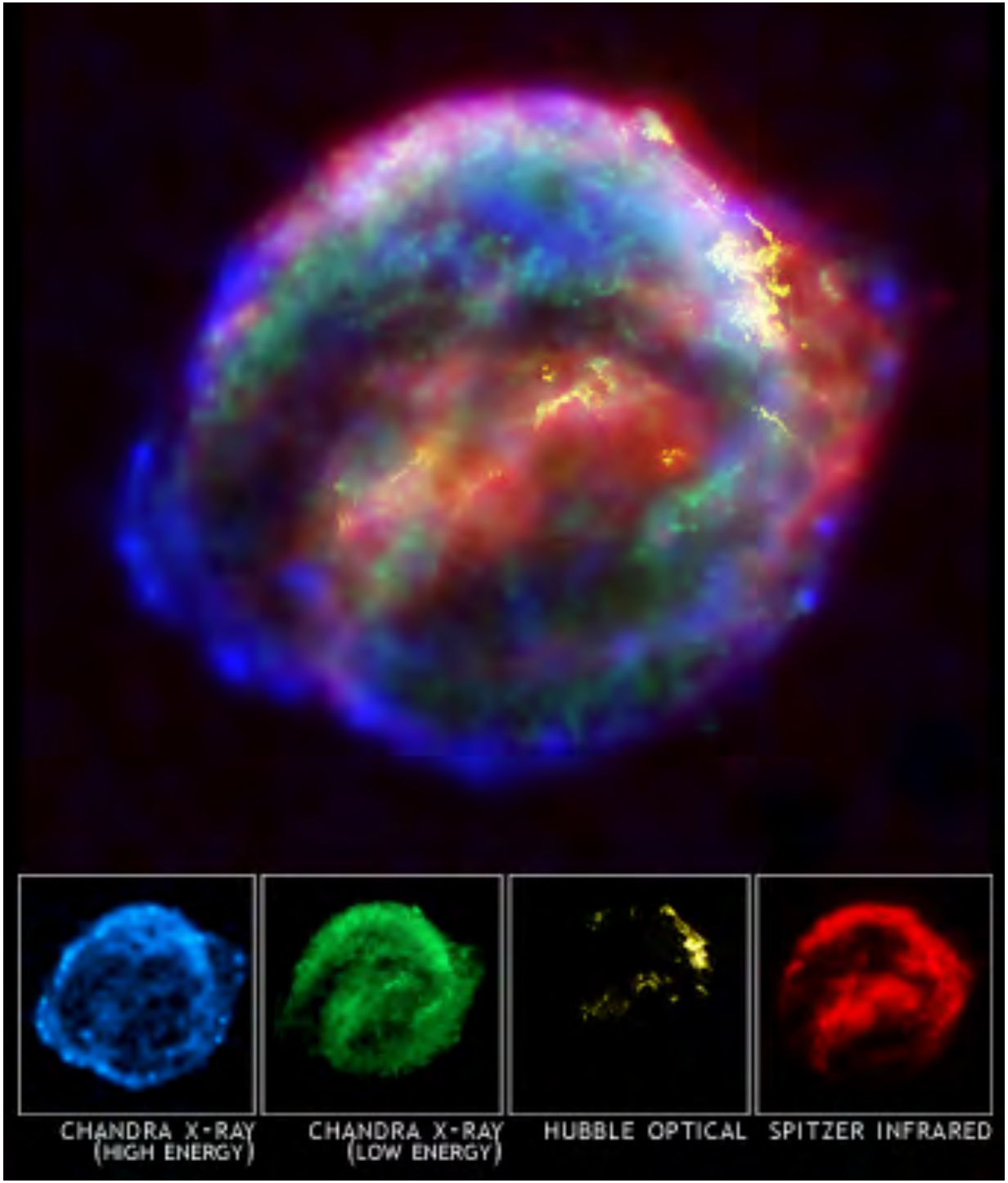
Tycho

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

No evidence for neutron star



SN 1006

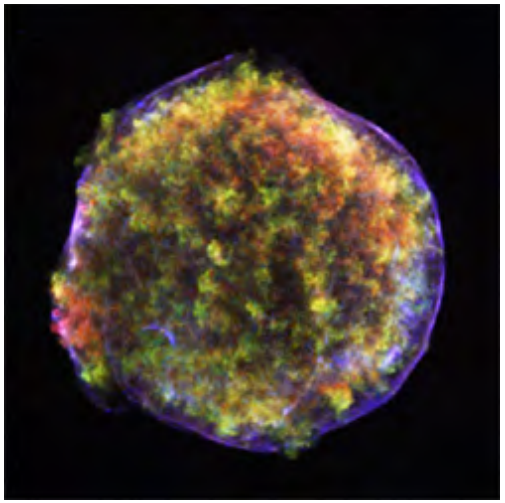


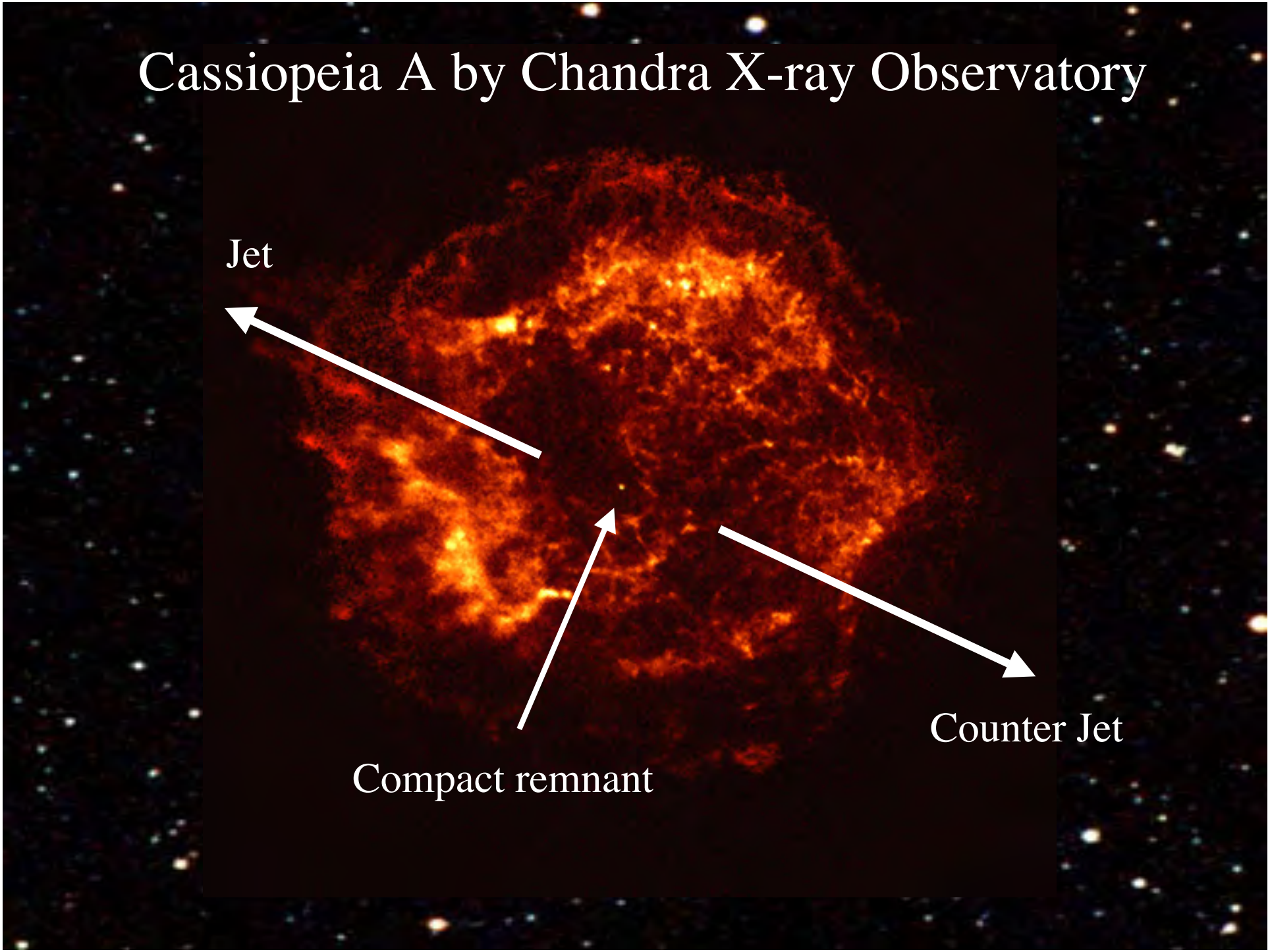
Great Observatories composite of Kepler's supernova 1604

No sign of neutron star

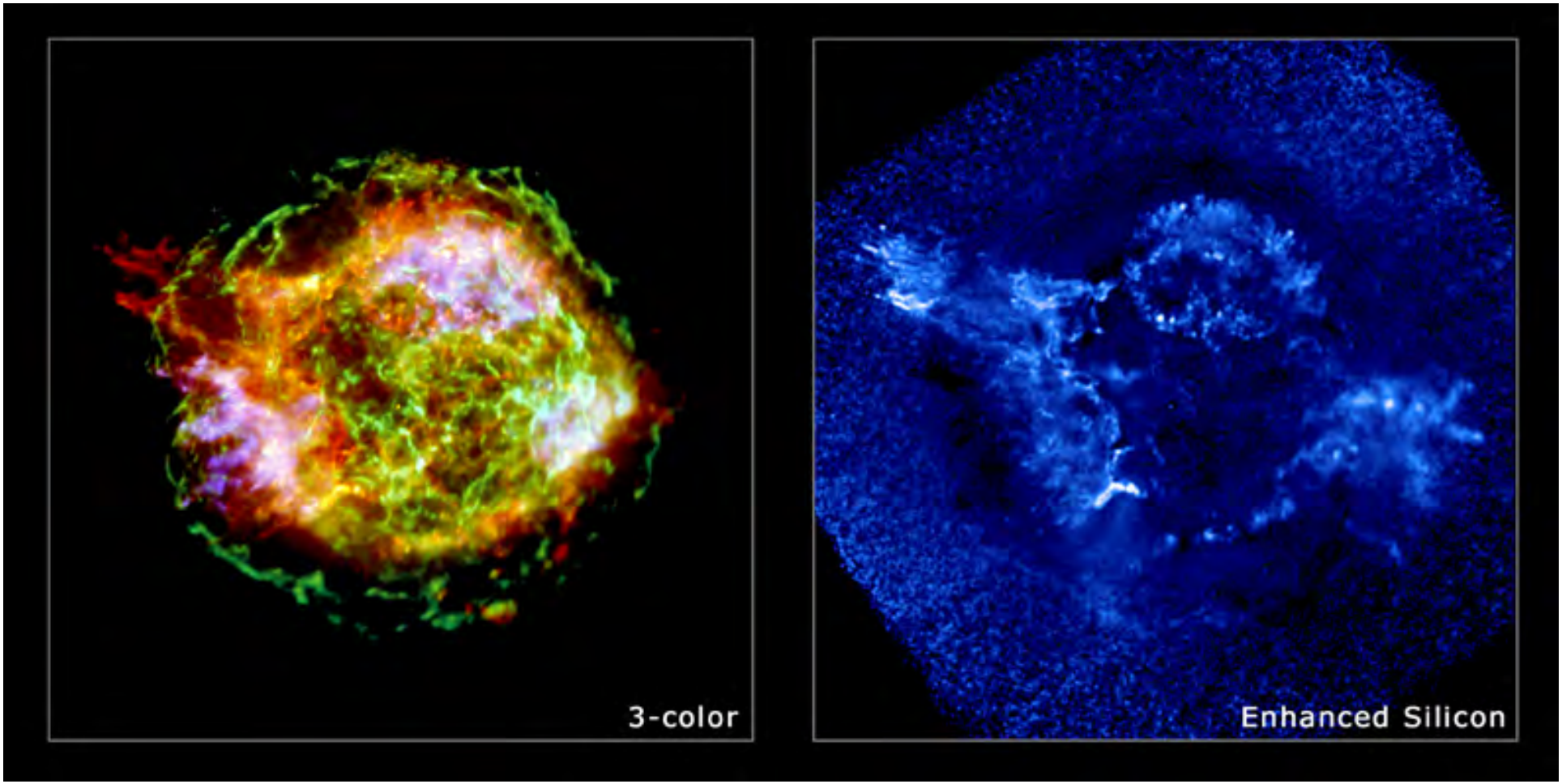
"sideways" alignment?

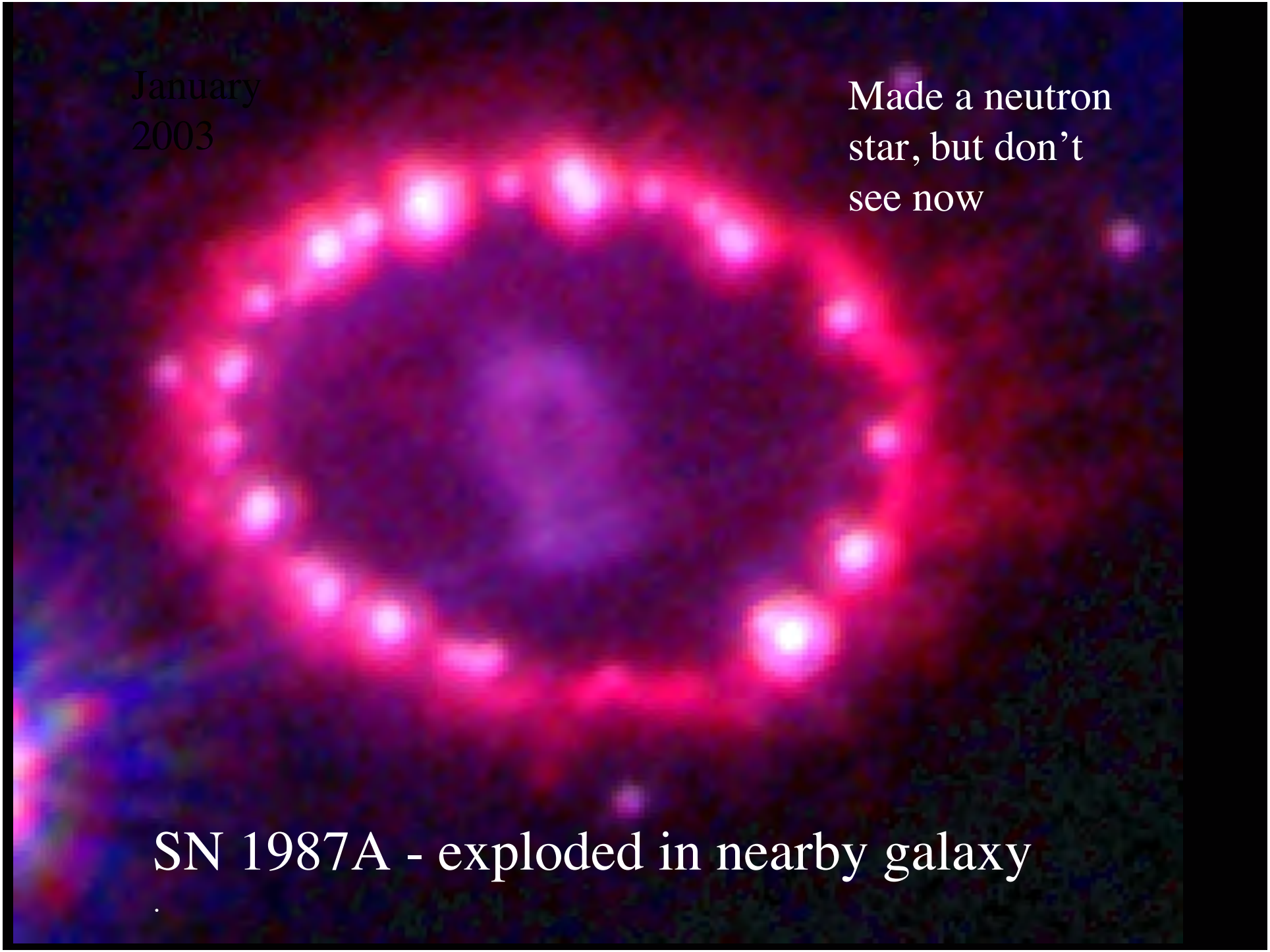
SN 1572 Tycho




Cassiopeia A by Chandra X-ray Observatory
Jet
Counter Jet
Compact remnant

Recent Chandra Observatory X-ray Image of Cas A




January
2003
Made a neutron
star, but don't
see now
SN 1987A - exploded in nearby galaxy

Sky Watch Extra Credit - location of supernovae

SN 185 – Circinus/Centaurus (direction of Alpha Centaurus)

SN 386 - Sagittarius

SN 1006 - Lupus/Centaurus (difficult this time of year)

SN 1054 Crab Nebula - Taurus

SN 1181 – Cassiopeia

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.

One Minute Exam

Tycho's supernova of 1572 shows no sign of a compact object left over in its center. This suggests that:

It made a jet

It was formed by the collapse of a massive star

It was formed by an exploding white dwarf

It actually exploded much earlier than 1572

Discussion point: What's going on here?

Goal:

To understand what we have learned from the study of “live” supernova explosions in other galaxies.

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

Galaxies like our Milky Way produce supernovae about once per century.

None since Cas A in about 1680. Our Galaxy is overdue for another!

Recognition (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.

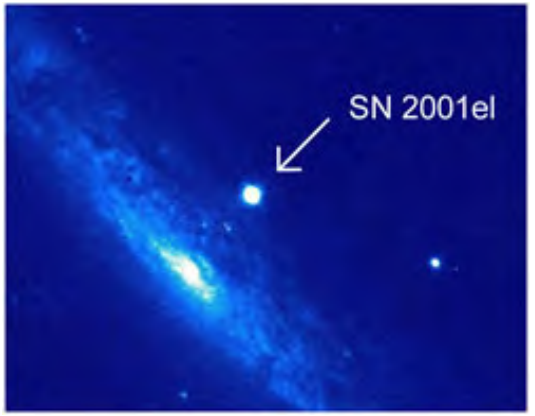
Led to the recognition and naming of “super” novae.

Web site of recent bright supernovae:

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

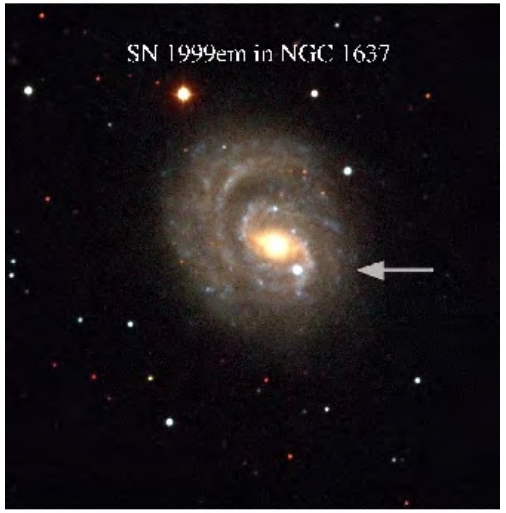
Sample of extragalactic supernovae

SN1994D



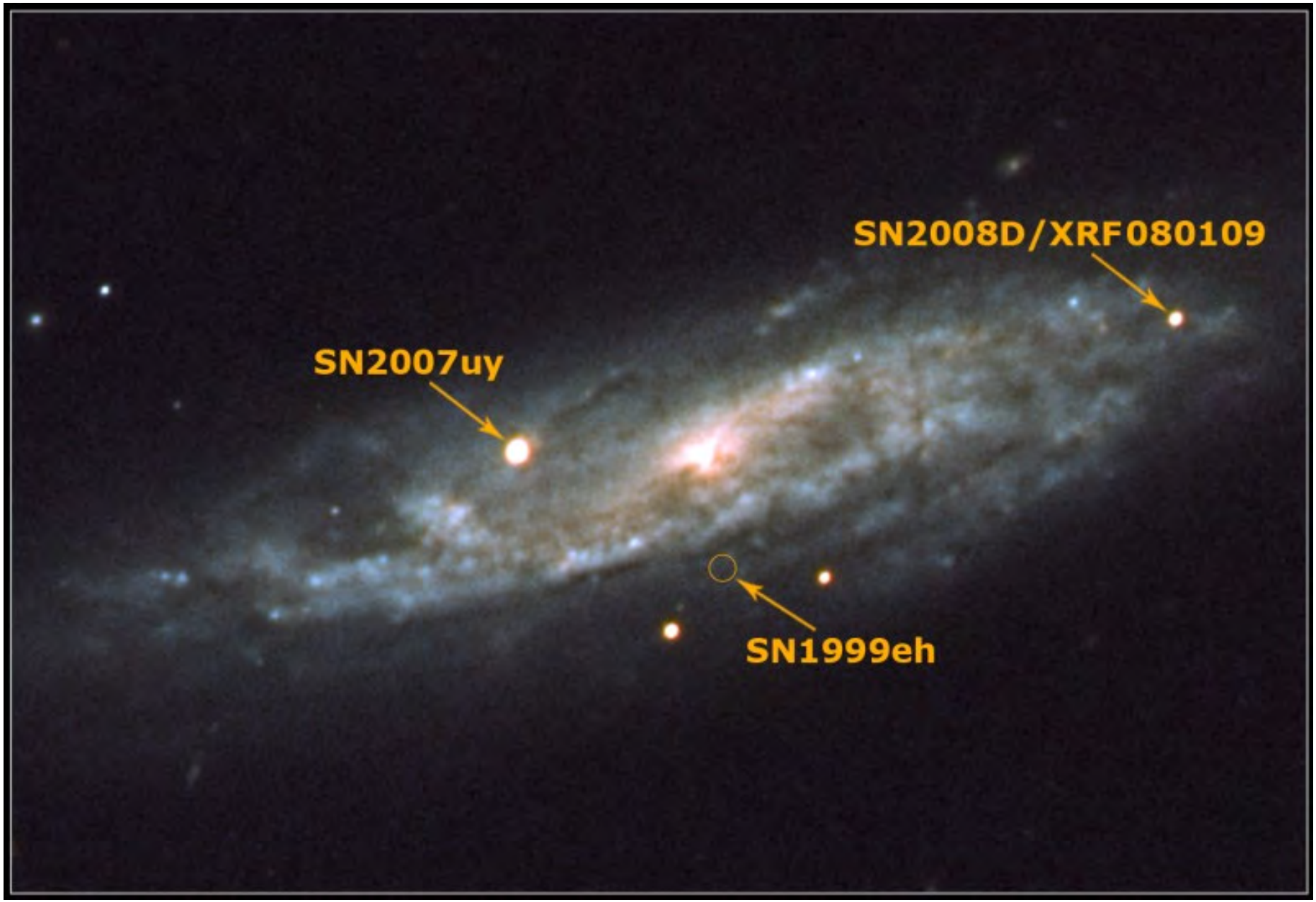
SN2001el

SN1999em



SN 2011fe

Some galaxies are rapid producers of supernovae.



Extra Galactic Supernovae: the basis for modern astronomy of supernovae.

Supernovae explode about once per second somewhere in the Universe, most unseen.

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 several hundred per year, about one per day, most at great distances, more difficult to study.