Tuesday, February 17, 2009

Answer key posted

Astronomy in the News? The sky falls on Texas!

Iridium satellite (1/2 ton) and out-of-commission Russian communication satellite (1 ton) collide last Tuesday. Something rains down, daylight fireball, on Central Texas 11 AM Sunday morning. Maybe meteor, unrelated to satellite collision? Try J-Track 3D for satellite orbits.

http://science.nasa.gov/Realtime/jtrack/3d/JTrack3d.html

Pic of the Day - red glow over Minnesota???

Sky Watch Extra Credit - location of supernovae

SN 1006 - Lupus/Centaurus (difficult)

SN 1054 Crab Nebula - Taurus

SN 1572 Tycho - Cassiopeia

SN 1604 Kepler - Ophiuchus (near Venus, Jupiter)

Cassiopeia A - Cassiopeia

Vela supernova - Vela (not this time of year)

Betelgeuse - Orion, Red Supergiant due to explode "soon" 15 solar masses

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

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

Aldebaran - Bright Red Supergiant in Taurus, 2.5 solar masses (WD not SN)

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.

Our Galaxy is overdue for another!

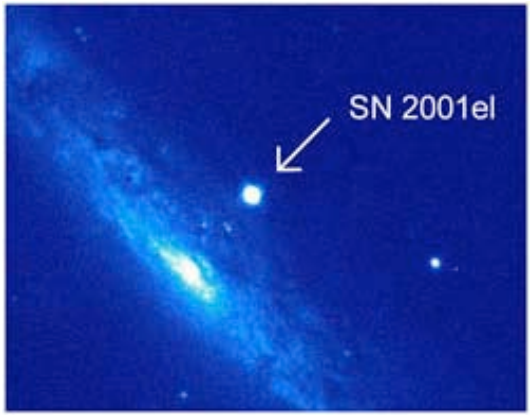
Recognition (early in the 20th century) that some “novae” were in distant galaxies and hence were 10,000 to 100,000 times brighter than classical novae in the Milky Way.

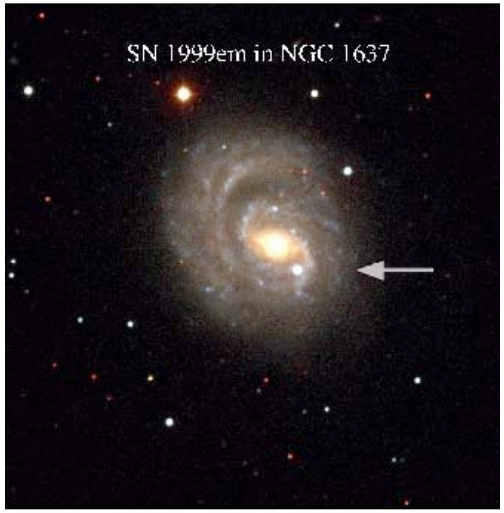
Led to the recognition and naming of “super” novae.

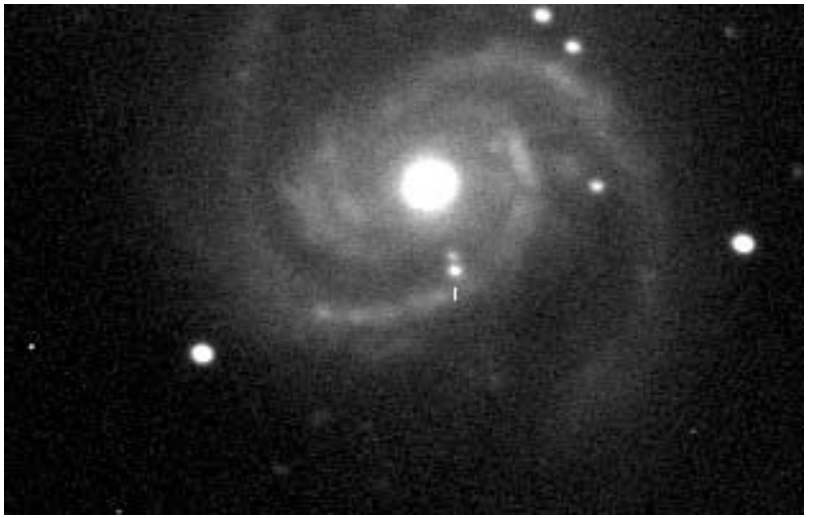
Web site of recent bright supernovae:

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

Sample of extragalactic supernovae

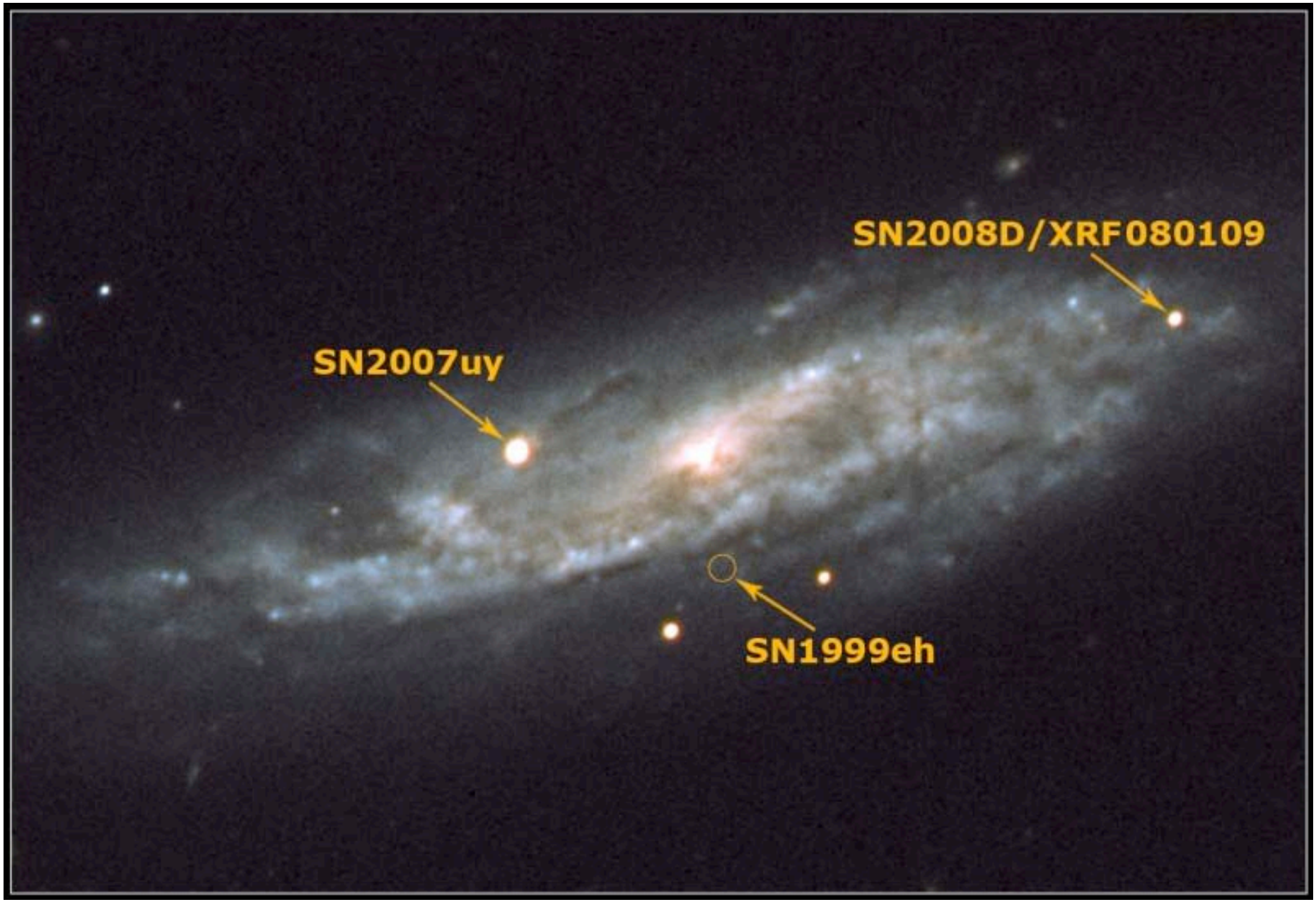






SN 2006X

Some galaxies are rapid producers of supernovae.



Extra Galactic Supernovae: the basis for modern astronomy of supernovae

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 over 100 per year, most at great distances, more difficult to study.

Nomenclature: A-Z, aa-az, ba-bz, etc.

SN1987A - 1st of ‘87 (also most important, but that is not what the “A” means).

This year’s latest, SN 2009ad, discovered February 13 - #30 so far

One Minute Exam

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

A) It made a jet

B) It was formed by the collapse of a massive star

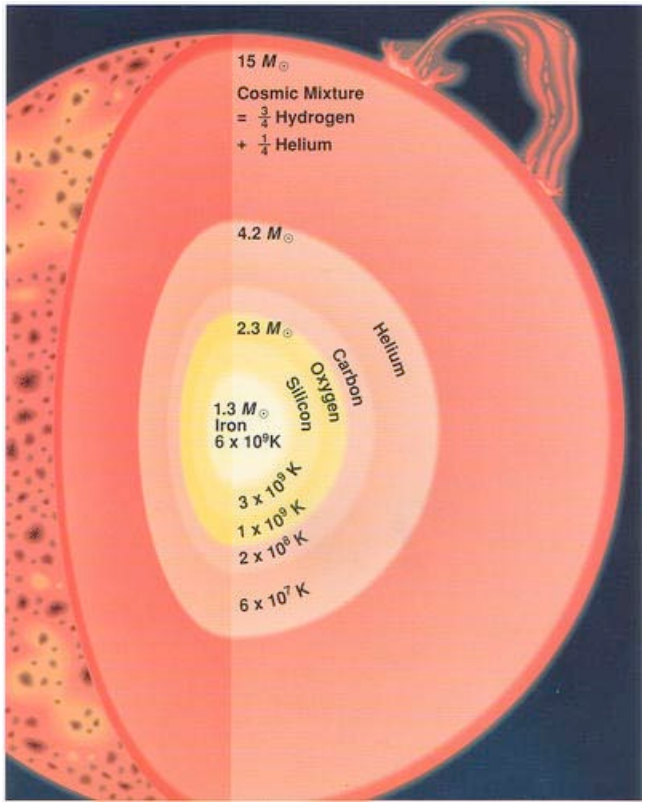
C) It was formed by an exploding white dwarf

D) It actually exploded much earlier than 1572

Physics: in massive stars (more than about 12 - 15 times the Sun) the core is composed of Helium or heavier elements, Carbon, Oxygen, Magnesium, Silicon, Calcium, finally Iron. The core continues to be hot even as it gets dense,

⇒ always supported by thermal pressure

⇒ continues to evolve, whether the Hydrogen envelope is there or not.



H -> He (2 protons, 2 neutrons - Chapter 1, figure 1.6)

2 Helium -> unstable, no such element

3 Helium -> Carbon (6 protons, 6 neutrons)

4 Helium -> Oxygen (8 protons, 8 neutrons)

6 Helium -> Magnesium (12 protons, 12 neutrons)

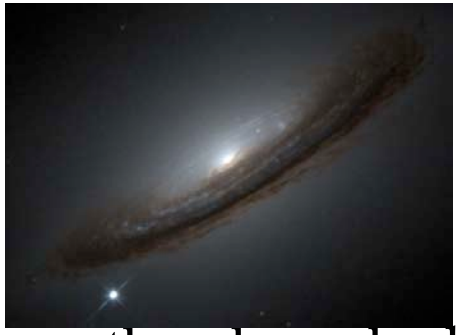
7 Helium -> Silicon (14 protons, 14 neutrons)

Common elements forged in stars are built on building blocks of helium nuclei

Categories of Supernovae

1st category discovered

Type Ia - no detectable Hydrogen in the spectrum, rather "intermediate mass elements" like oxygen, magnesium, silicon, sulfur, calcium. Iron appears later as the light fades.



These occur in all galaxy types:

In **spiral galaxies** they tend to avoid the spiral arms, they have had time to drift away from the birth site → ***the star that explodes is old***

In **irregular galaxies**

In **elliptical galaxies** where star formation is thought to have ceased long ago → ***the star that explodes is old***

⇨***the progenitor that explodes must be long-lived, not very massive, suggesting a white dwarf.*** Sun is long-lived, but won't explode