

2/16/05

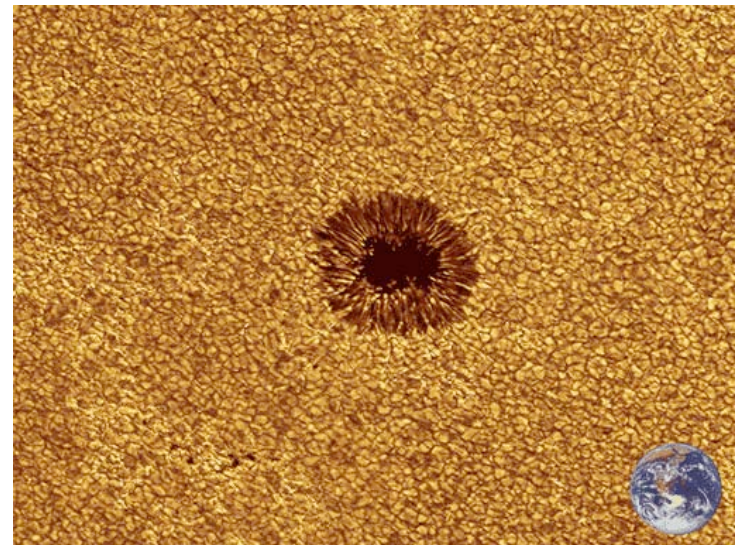
Exam back. Histogram.

Discussion - DN instability

Exam 2, Wednesday March 9 or March 11

News? May be big story
relevant to class on Saturday.
Check papers, CNN etc.

Pic of the day - Sunspot



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

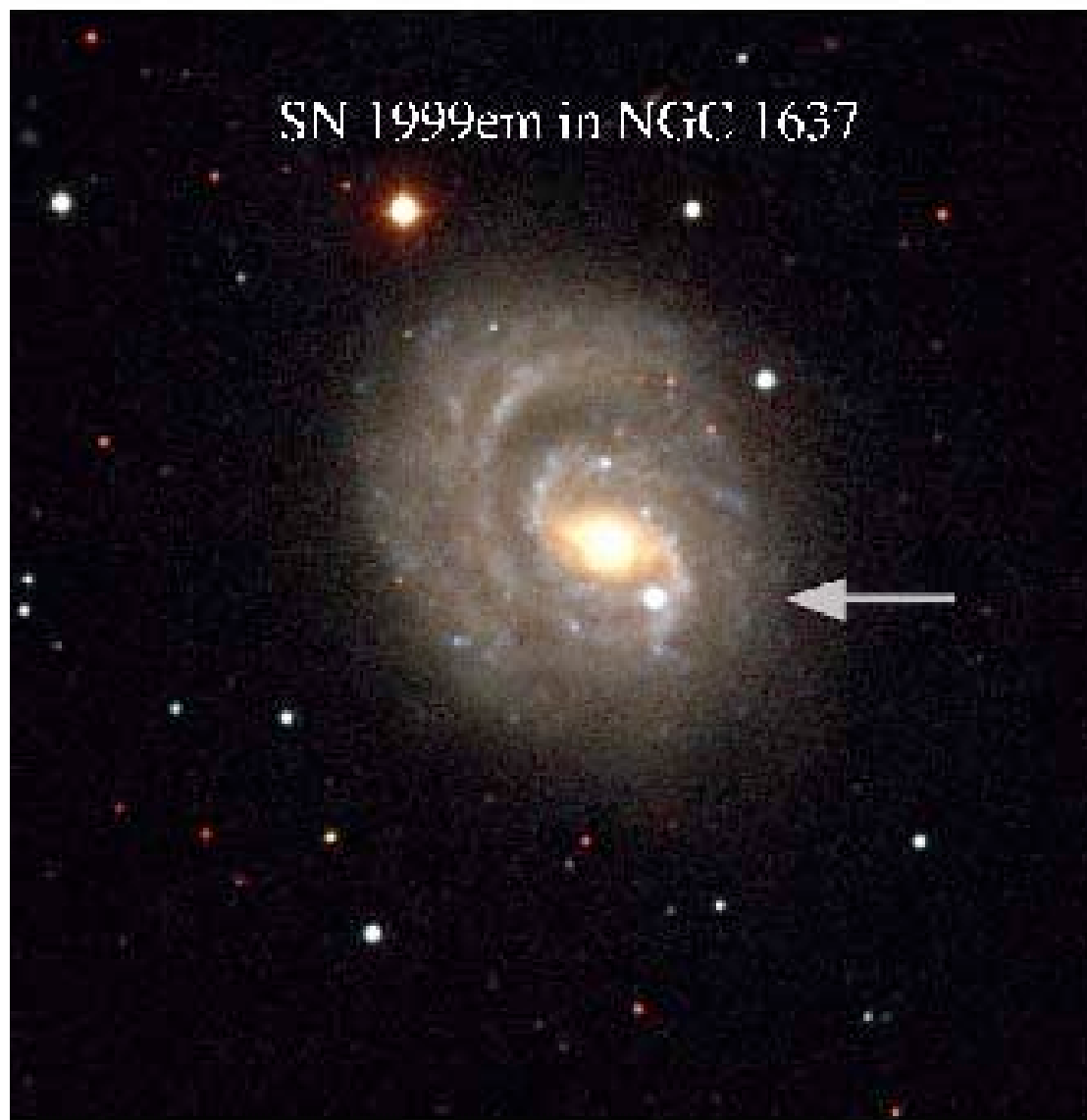
Web site of recent bright supernovae:

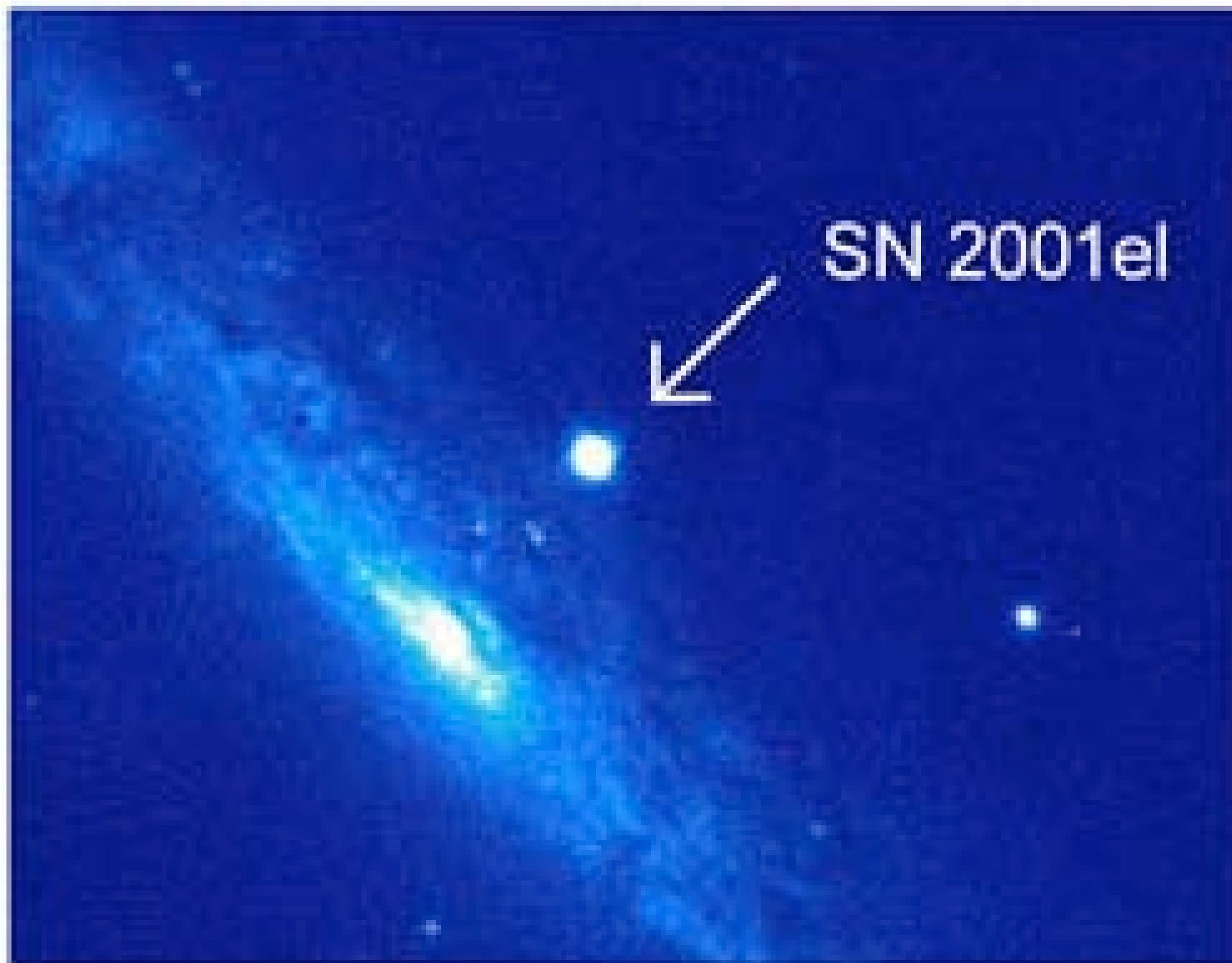
<http://www.rochesterastronomy.org/snimages/>

SN 1994D in the Whirlpool Galaxy



SN 1999em in NGC 1637







Extra Galactic Supernovae: the basis for modern astronomy of supernovae

Cannot predict which galaxies will produce a supernova, so watch lots of galaxies

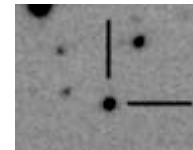
We found two dozen per year prior to SN 1987A, but with new attention and use in cosmology, now find over 100 per year, most at great distances, more difficult to study.

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 latest, last Saturday - SN 2005ai

26 + 9 = 35th of 2005 discovered by amateur SN hunter.



Categories of Supernovae

1st 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

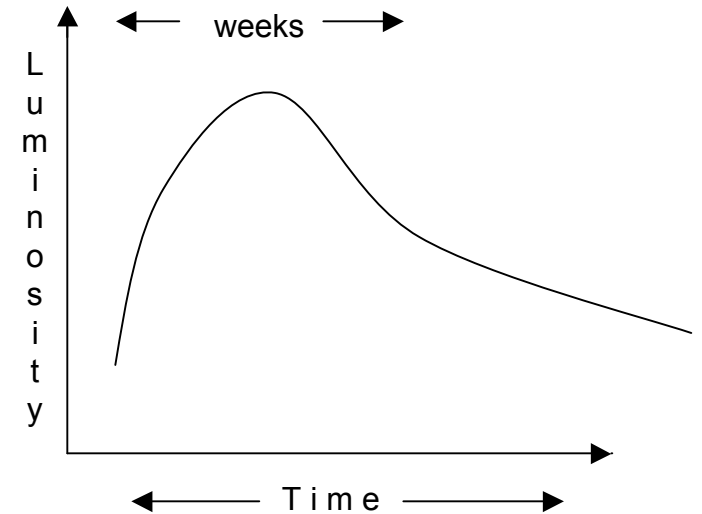
Type Ia Light Curve

brightness vs. time

consistent with an

exploding C/O white dwarf

no neutron star



If U Sco becomes a supernova it will probably be a Type Ia

SN 1006, almost definitely

Tycho, SN 1572 almost definitely

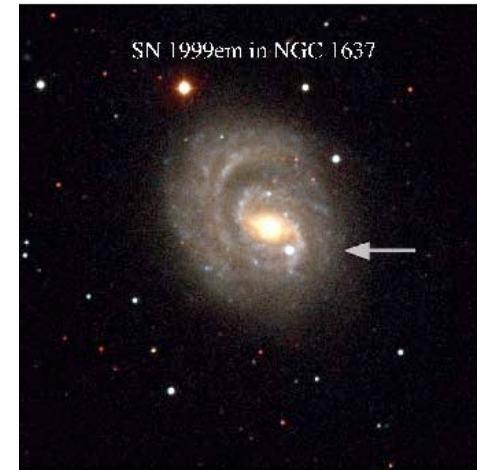
Kepler, 1604, some argue yes (no sign of neutron star), but
some ambiguities suggesting a massive star progenitor

Type II Supernovae - “other” type discovered early, show Hydrogen in the spectrum early, Oxygen, Magnesium, Calcium, later

Most occur in spiral galaxies, *in the spiral arms, they have no time to drift from the birth site*
sometimes in irregular galaxies
never in elliptical galaxies

→ *The progenitor stars are young, short-lived massive stars*

We expect such stars to evolve to form iron cores and collapse to a neutron star or black hole
(physics to come)



SN 1999em