2/8/06

Exam 1: Friday

Chapters 1 - 5, Friday, February 10, 30 multiple-choice questions

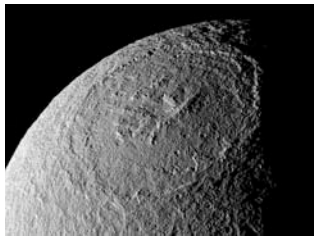
Review sheet is posted on class web site
http://www.as.utexas.edu/astronomy/education/spring06/wheeler/309n.html

Review session TOMORROW Thursday 5 PM RLM 4.102 [NOTE different room than help sessions].

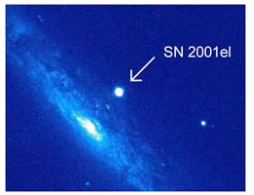
BOOKS - two more weeks???

Astronomy in the news?

Pic of the Day - The Great Basin on Tethys, moon of Saturn



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



One Minute Exam

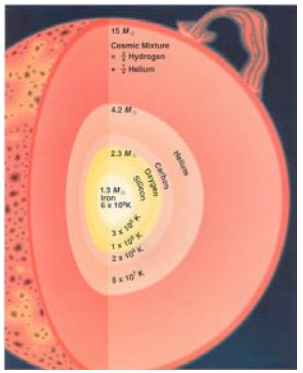
Tycho's supernova of 1572 shows no sign of a compact object left over in its center. This suggests that:

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

Physics: in massive stars (more than about 12 - 15 times the Sun) the core of Helium or heavier elements, Carbon, Oxygen, Magnesium, Silicon, Calcium, finally Iron, 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

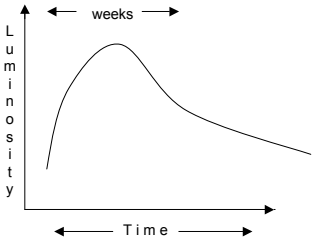
1st category discovered

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

Type Ia - no hydrogen, intermediate mass elements early, iron later



Light Curve - brightness vs. time consistent with an exploding C/O white dwarf
expect total disruption, ***no neutron star***

Type Ia occur in elliptical galaxies, tend to avoid spiral arms in spiral galaxies - old when explode, probably a white dwarf.

SN 1006, almost definitely Type Ia

Tycho, SN 1572 almost definitely Type Ia

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

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

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***

SN 1999em

→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)

Light curves of Type II supernovae are consistent with explosion in a Red Giant

Betelgeuse is a massive red giant, 15 solar masses: we expect it to become a Type II supernova. ***Maybe tonight!***

SN 386, 1181 records are sparse, might have been Type II
Crab was a "peculiar" Type II (high helium abundance, slow explosion)
Cas A was probably something else (next topic),
SN1987A was a "peculiar" Type II.

Not obvious that any of the historical supernovae were a "normal" Type II, although Type II are common in other galaxies