



**Astro 301/ Spring 2005
(46690)**



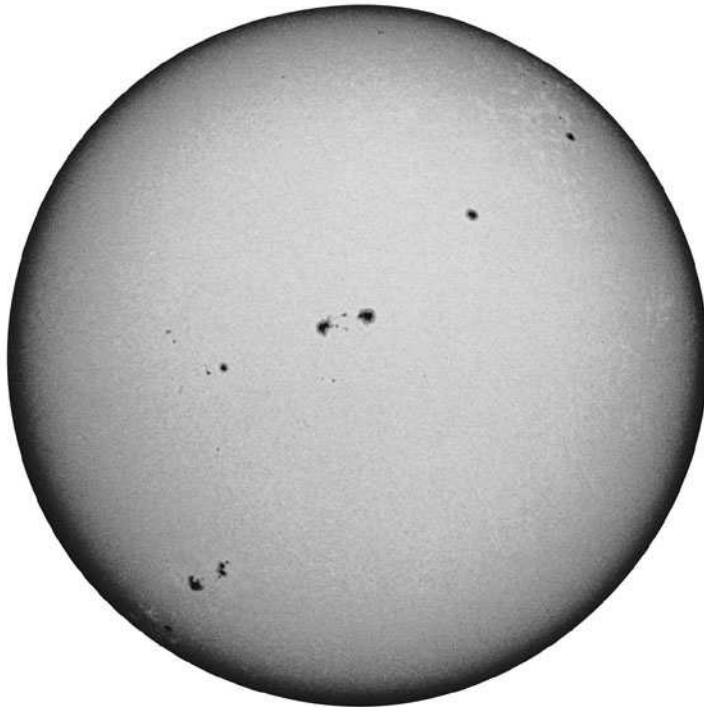
Introduction to Astronomy

Instructor: Professor Shardha Jogee

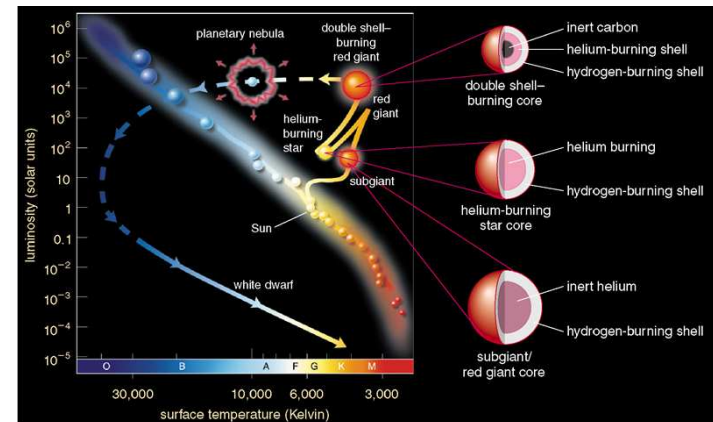
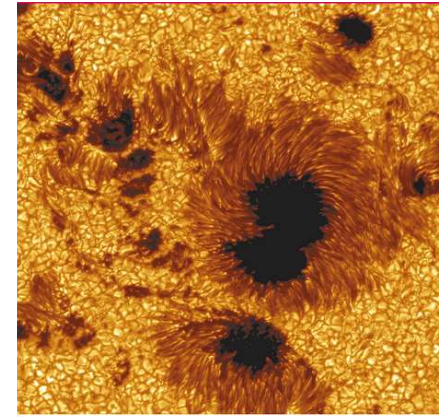
TAs: Nick Sterling & Nairn Baliber

MWF 12-1 W-3.502

Star: A glowing ball of gas that generates heat and light through nuclear fusion

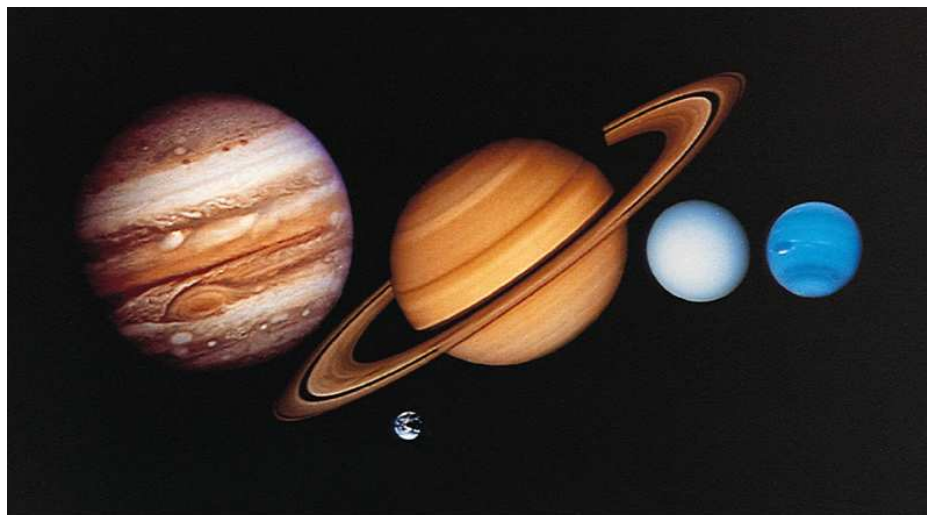
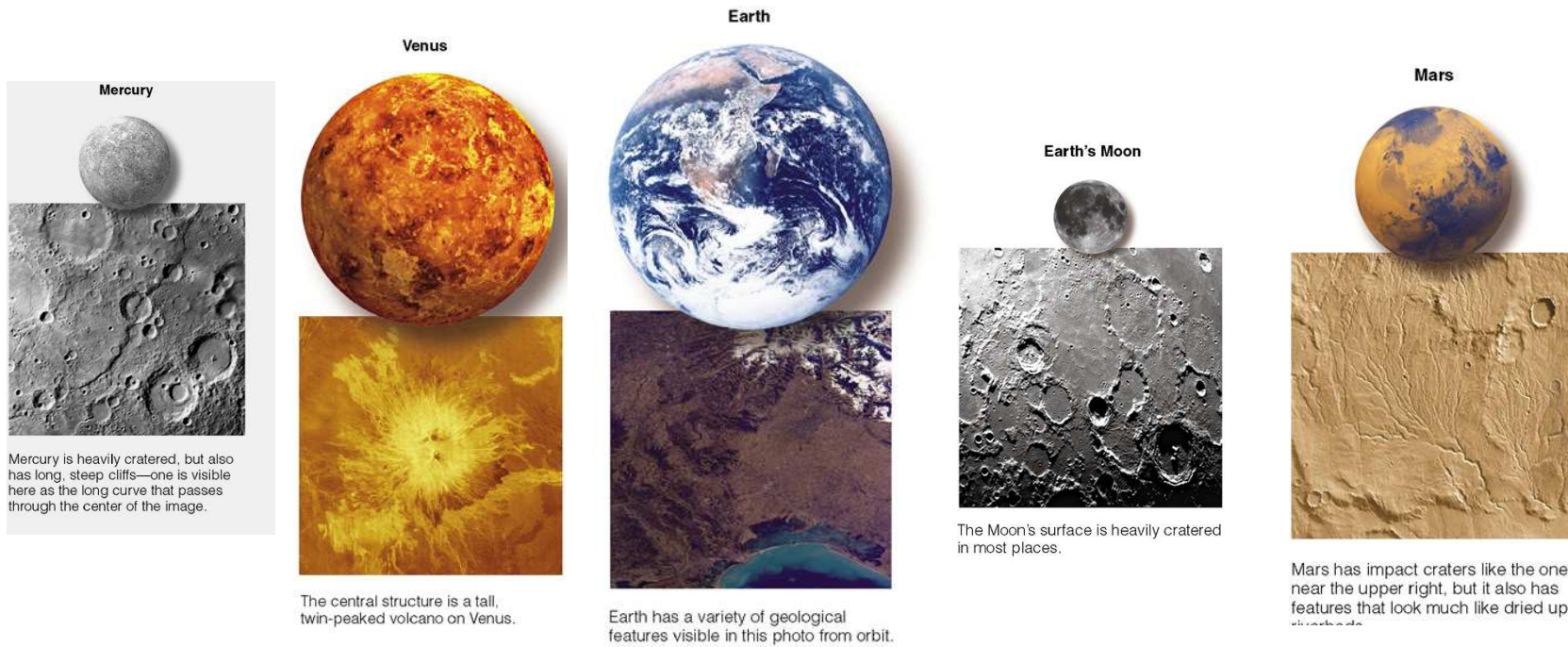


Nearest star= Our Sun



Evolution of a star on H-R diagram

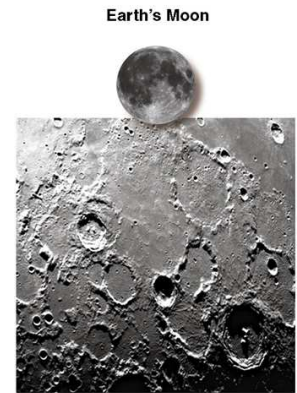
Planet : A moderately large object which orbits a star; it shines by reflected light.
 Planets may be rocky, icy, or gaseous in composition.



Mercury, Venus, Earth, E's Moon, Mars

Jupiter, Saturn, Uranus, Neptune

Moon: An object which orbits a planet.



The Moon's surface is heavily cratered in most places.

Star-forming nebulae: Clouds where young stars are forming from dense cold gas and where hot massive young stars are heating and ionizing the gas

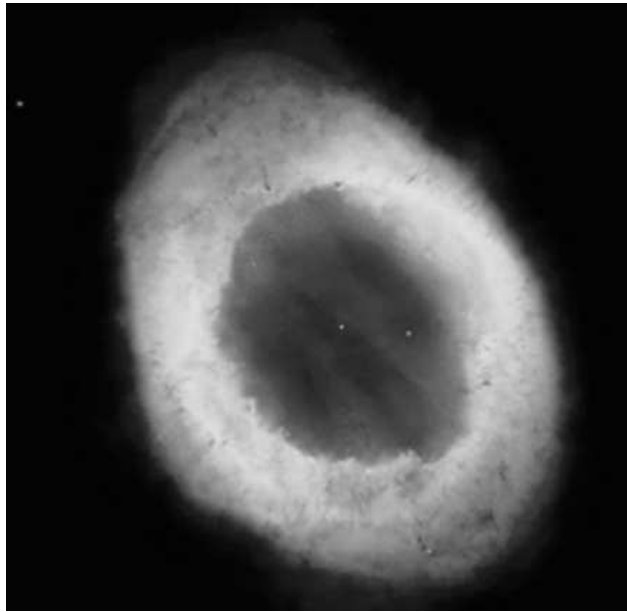


Part of Eagle Nebula
(5 ly across)

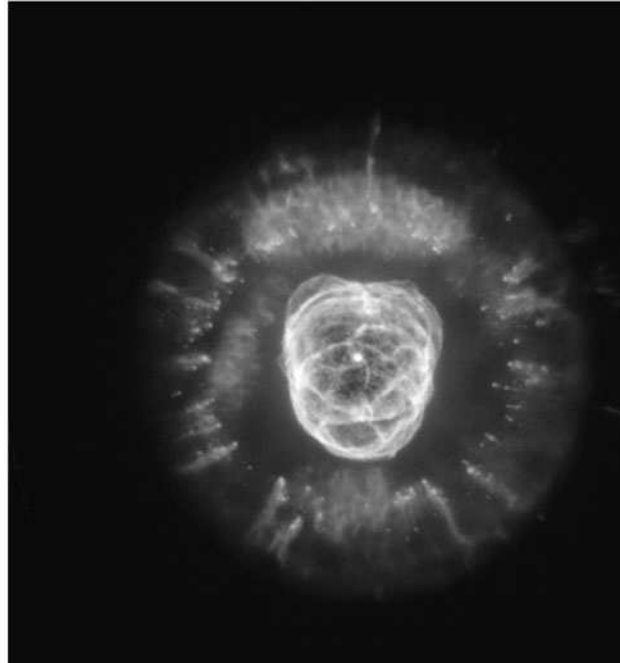


Orion Nebula

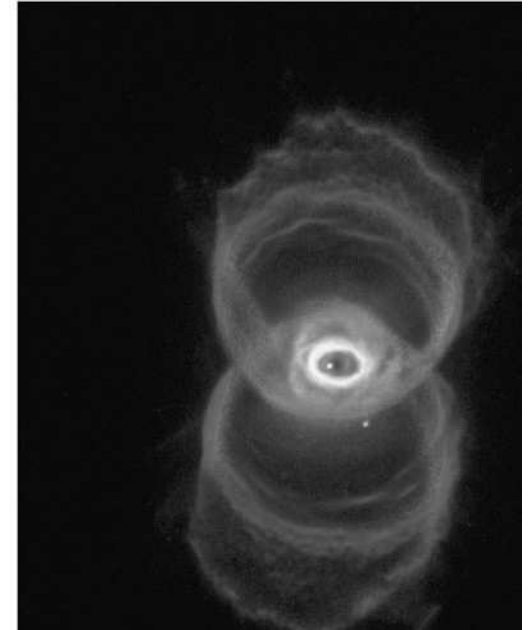
Planetary nebulae: Brightly glowing gas produced when low-mass stars die, cast off their outer layers of gas, and the remaining hot core ionizes and heats the gas surrounding it.



Ring Nebula



Eskimo Nebula



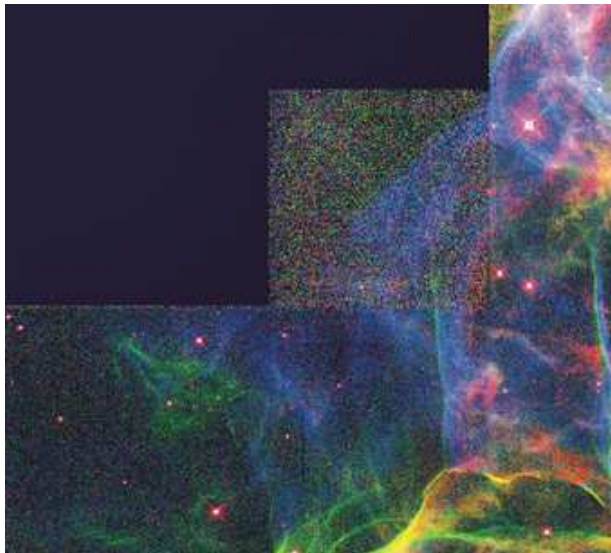
Hourglass Nebula

Connection to white dwarf?

Supernova remnant: Expanding hot clouds of gas produced when a high-mass star undergoes a supernova explosion at the end of its life. The gas is enriched with heavy elements like C , O, S.

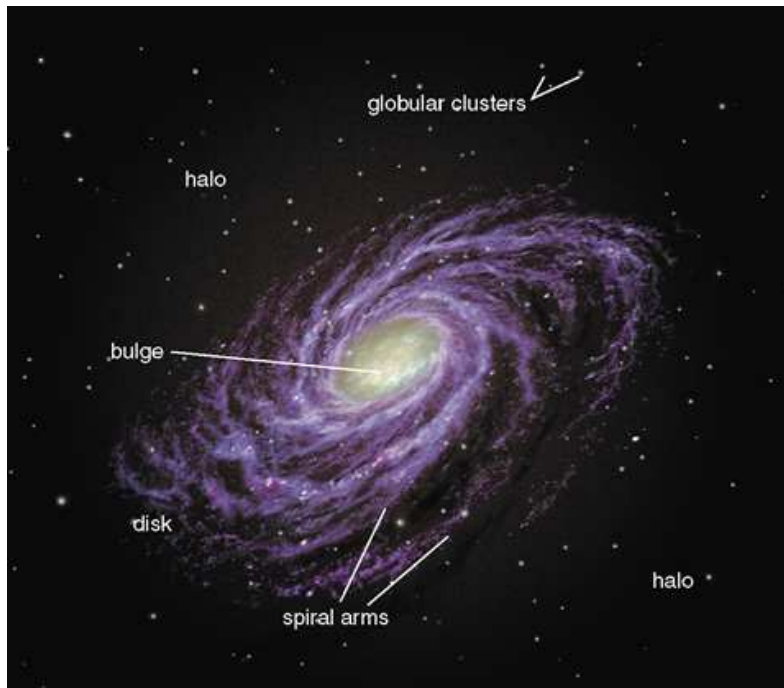


- Cygnus loop SN remnant; 130 ly; optical
- HST/optical : Visible Ionized O, Atomic H, ionized S



Crab Nebula; VLT/ Optical
First observed in 1054

Galaxy: Collection of few times (10^8 to 10^{12}) stars orbiting a common center and bound by gravity. Made of gas, stars, dust, dark matter.



Unbarred spiral



NGC1300; Barred spiral
150,000 ly across

Many types of galaxies with different structure, and amounts of gas, stars, SF.

à Spirals (barred and unbarred), Ellipticals, Dwarfs, Irregular, Peculiar/Interacting, etc

A spiral galaxy can appear different due to different inclinations

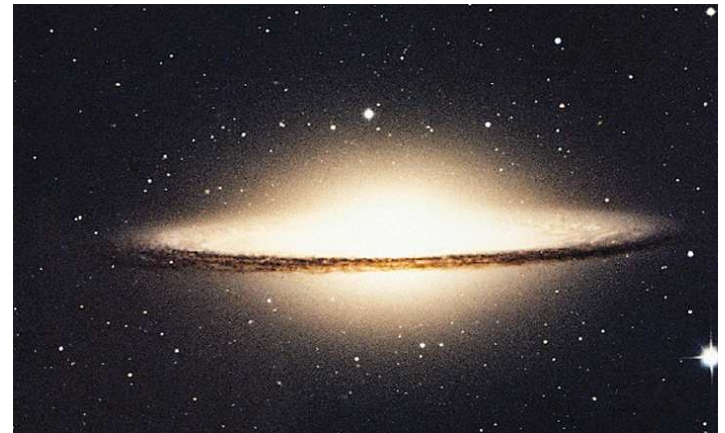


NGC 6744
Spiral, Face on



NGC 4414
Spiral
Moderately inclined

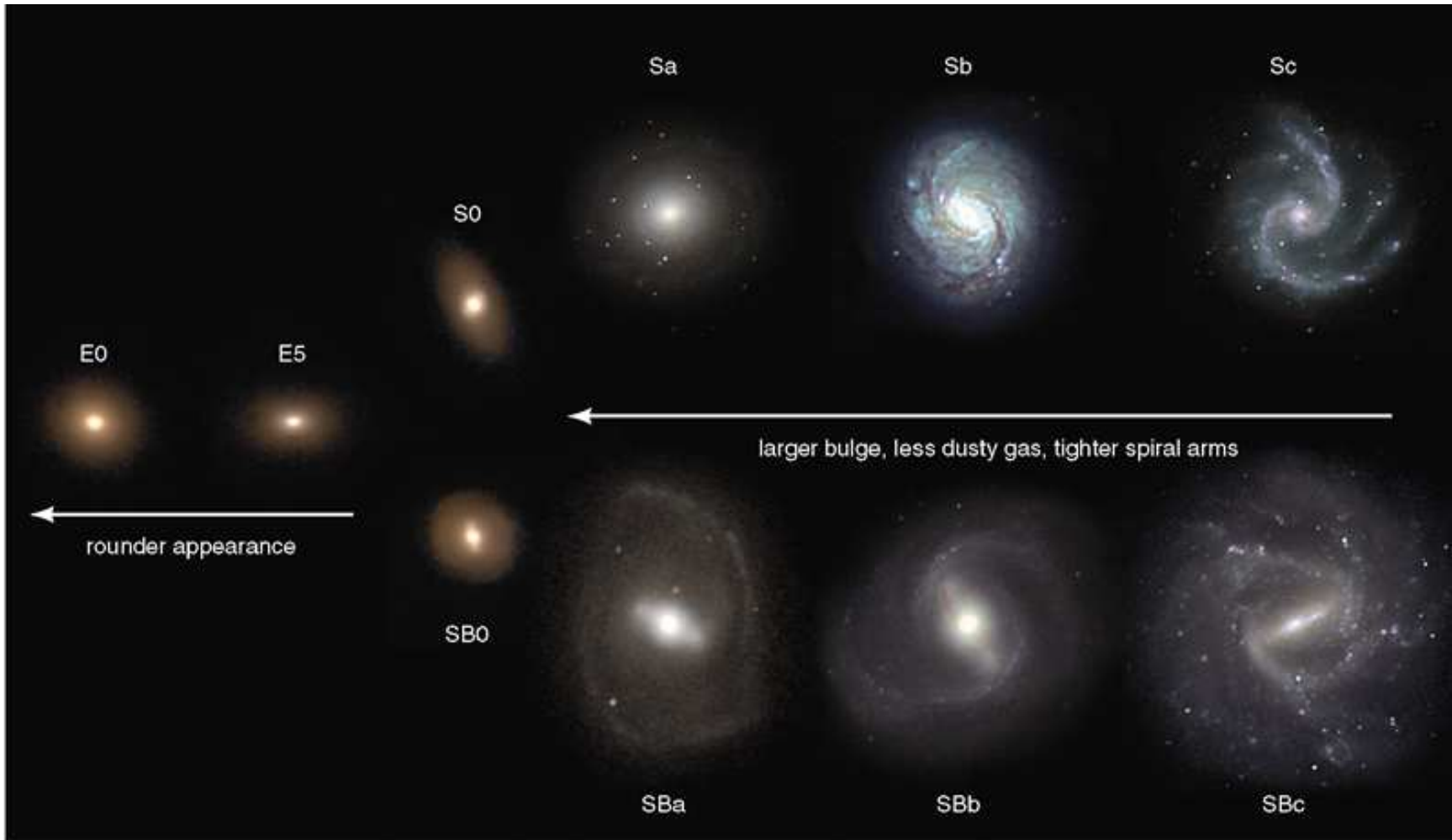
Sombrero NGC 4594
Spiral, large bulge, dusty disk
Edge on



Spirals: Disk galaxies with significant amounts of gas, dust, ongoing star formation .

They can be unbarred or barred. Bars play key role in galaxy evolution.

Ellipticals: Spheroidal systems, smooth appearance. Have little gas, dust, and recent SF



Irregular galaxies: Galaxies which have irregular, peculiar morphologies in terms of gas dust and SF. Often dusty and patchy.



LMC; Irr; 30,000 ly across



NGC 1313 ; Irr; 50,000 ly across



SMC; Irr ;18,000 ly across

Interacting galaxies: Galaxies which are interacting with others. Interactions can induce dramatic changes in morphology



Polar ring galaxy
NGC 4650



Cartwheel galaxy
Head-on collision

Ring galaxy AM 0644-741 50,000 ly across

