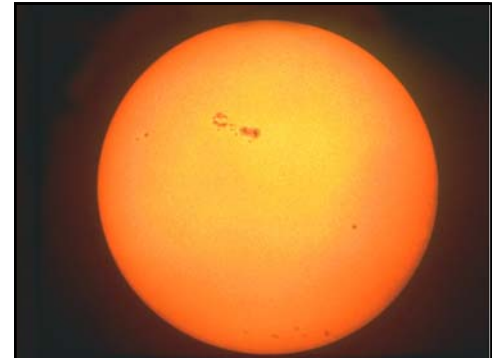
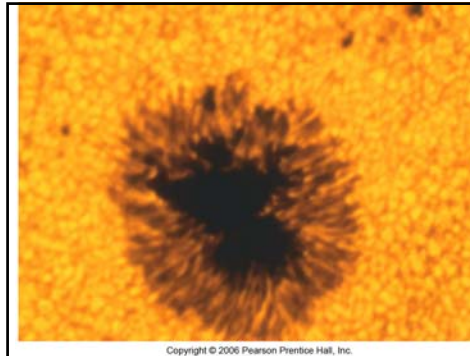
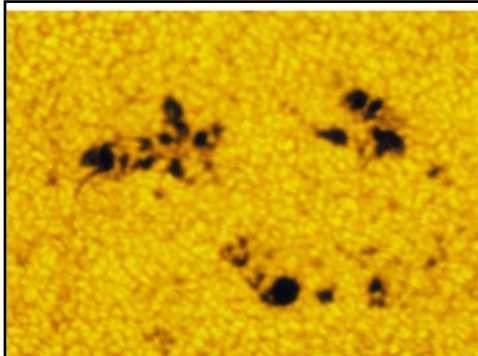


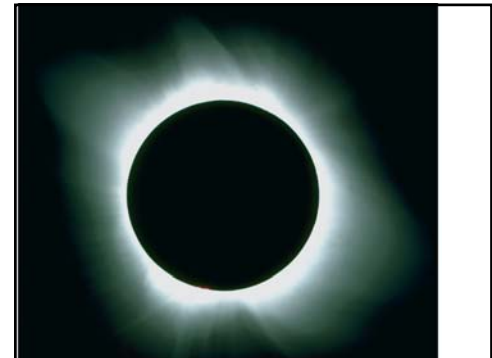
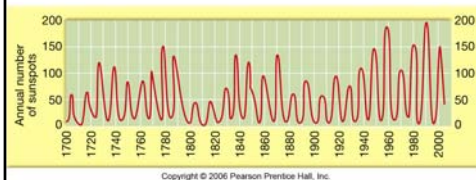
Sun Stars Galaxies

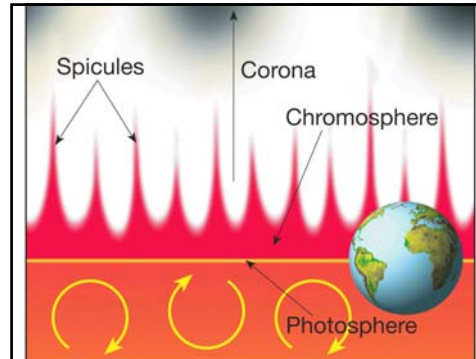
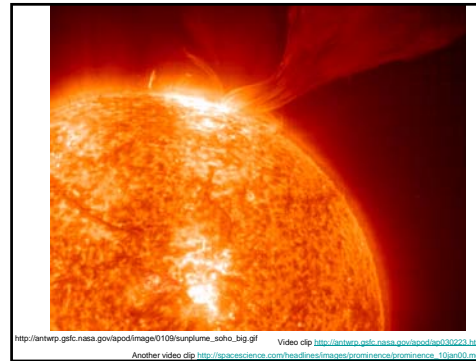
Midterm Exam

- The in-class activities are posted on webpage and online.wou.edu—study them for the exam.
- A study guide, answers to review questions, and last year's exam are posted on line also
- Bring a scantron and a pencil



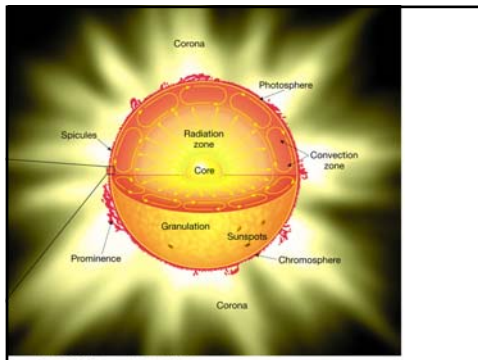
Sunspot Variation over time





Solar Interior

- Nuclear Fusion of 4 Hydrogen to 1 Helium
- Difference in atomic mass is released as energy
- Released as photons—light particles
- Convection brings photons to photosphere
- Sun will last about another 5 billion years



This page was copied from [Jack Stebbins's Astronomy Notes](http://www.astro.com/astro/notes). Go to his site at www.astro.com/astro/notes for the updated and corrected version

Earth

Now: hot core + warm surface; small size.

Earth

Future: very hot core + cool surface. Large size but less mass; very bright.

This page was copied from [Jack Stebbins's Astronomy Notes](http://www.astro.com/astro/notes). Go to his site at www.astro.com/astro/notes for the updated and corrected version

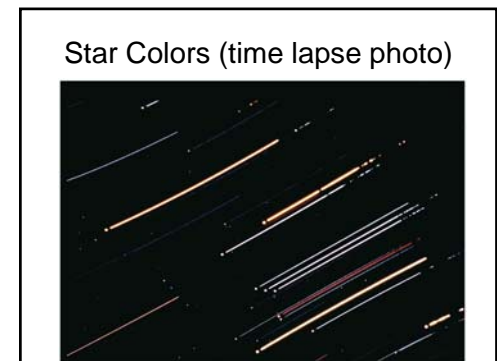
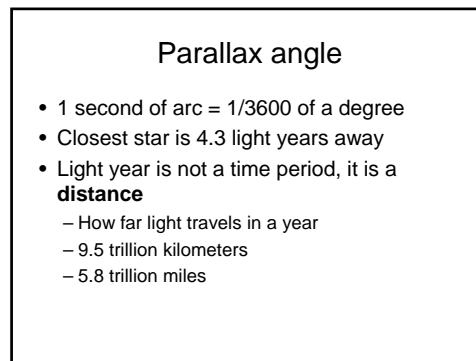
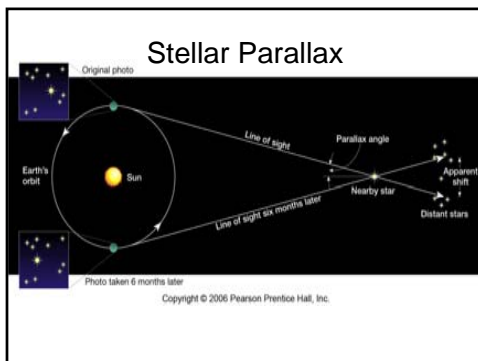
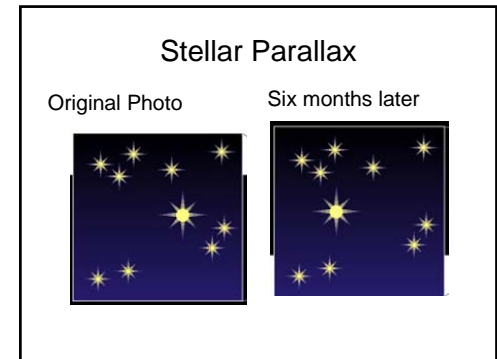
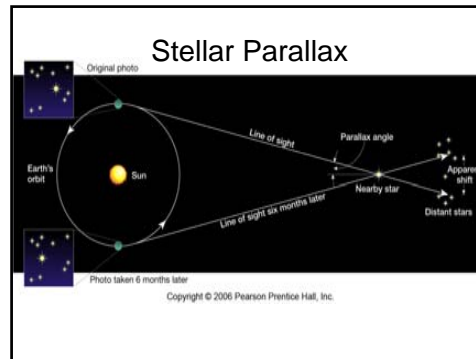
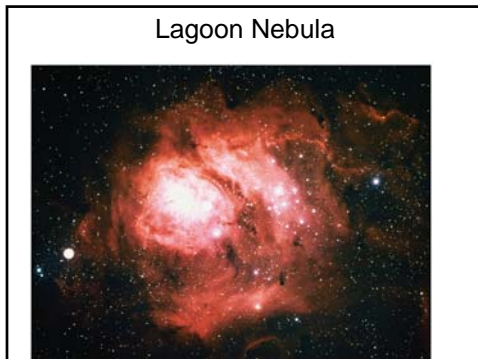
Red Giant Betelgeuse

Size of Star

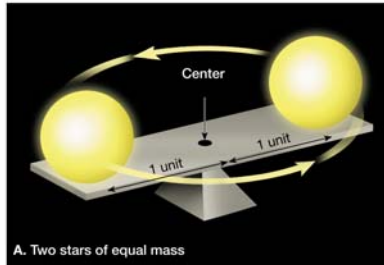
Size of Earth's Orbit

Size of Jupiter's Orbit

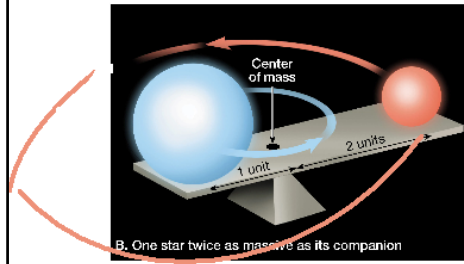
BET now of Betelgeuse is the size of our Sun. Even though Betelgeuse is very large, its distance is too great to resolve details smaller than about 1/10th of its diameter (small grey circle).



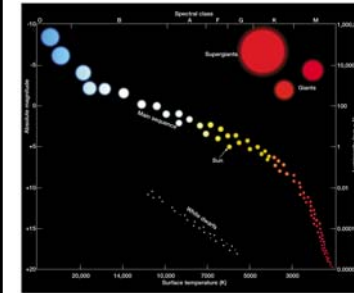
Equal Mass Stars



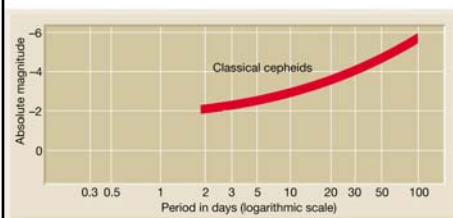
One is twice mass of other



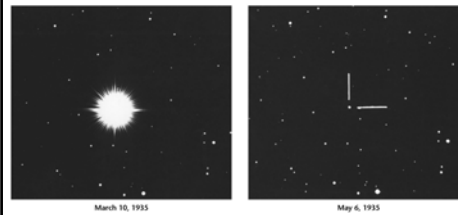
Star temperature vs. magnitude



Pulsating magnitude



Nova Herculis



Nova Persei



Orion Nebula



Pleiades
star
cluster
has
reflection
nebula



Horsehead Nebula Dark nebula in Orion

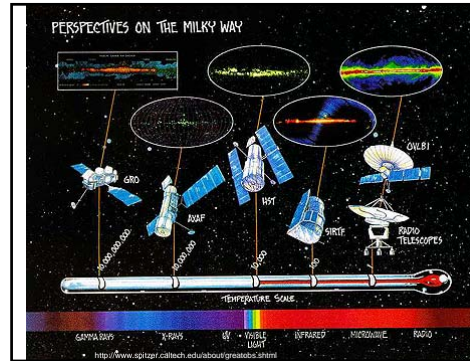


Closeup

Protostars at
base of head

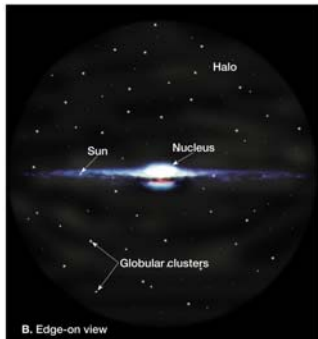
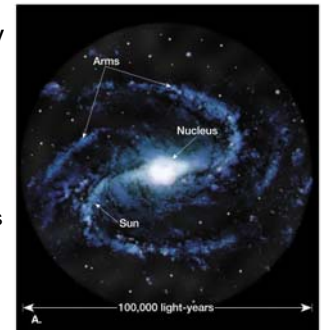


http://www.nasa.edu/image_gallery/itm0007.html



Milky Way

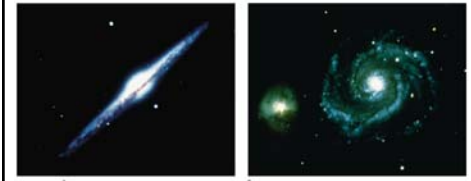
- Spiral
- 200 billion stars
- Black hole in center
- Older stars in center, younger at edges



Great Galaxy in Andromeda



Typical spiral galaxies

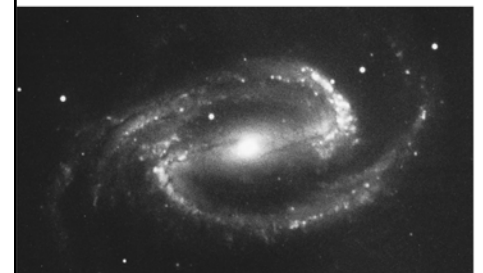


A.



B.

Barred spiral galaxy



Cluster of galaxies



Raisin bread analogy of the expanding universe

