Astro 301/ Fall 2006

(50405)

Introduction to Astronomy

http://www.as.utexas.edu/~sj/a301-fa06

Instructor: Professor Shardha Jogee

TAs: Biqing For, Candace Gray, Irina Marinova

Lecture 4: Tu Sep 12

Recent and Upcoming Topics in class

-- Recap: Course Overview and Basic Math Skills

-- Natural units in Astronomy

-- Overview of Astronomical Objects
- Building blocks of matter: protons, electron, neutrons, and atoms
- Stars
- Brown Dwarfs, Planets, and Moons
- Death of Stars: Planetary Nebulae, White Dwarfs, Supernovae remnants
- Why is human life `star stuff'?'
- Different Type of Nebulae: Star-forming nebulae vs Planetary nebulae
- Galaxies and the Milky Way

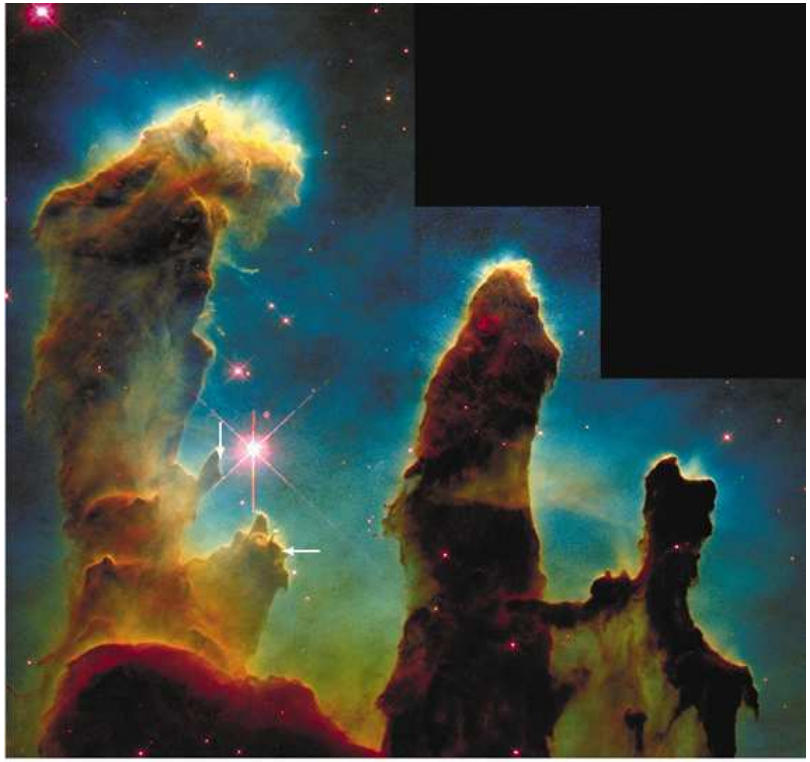
-- Scales and Distances: From the infinitesimal to the grandest

-- Timescales : From the earliest epochs to the present day

Different Type of Nebulae:
Star-forming nebulae vs Planetary nebulae

What is the difference between nebulae like Orion and a planetary nebula?

See in-class note



Part of Eagle Nebula
(5 ly across)

Orion Nebula

Astronomy Picture of the Day

The Rosette Nebula:

Cluster of bright young stars in center. Winds from young massive stars clearing out a hole in center. UV light from stars heat surrounding gas causing it to glow

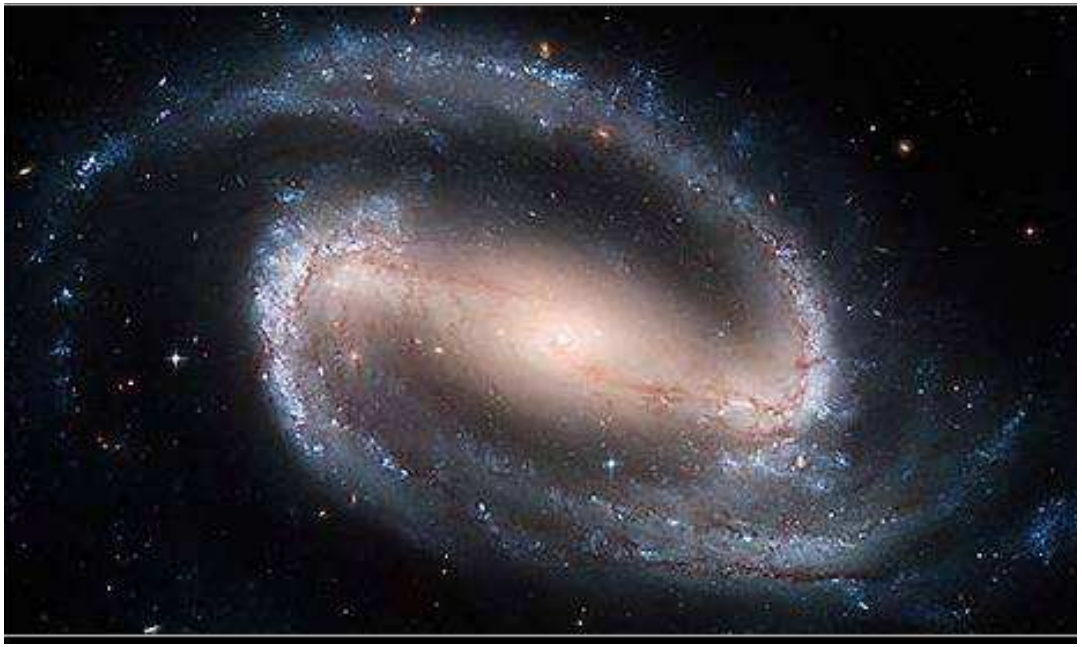
Galaxies and our Milky Way

Galaxies

See in-class notes

Elliptical galaxy M87

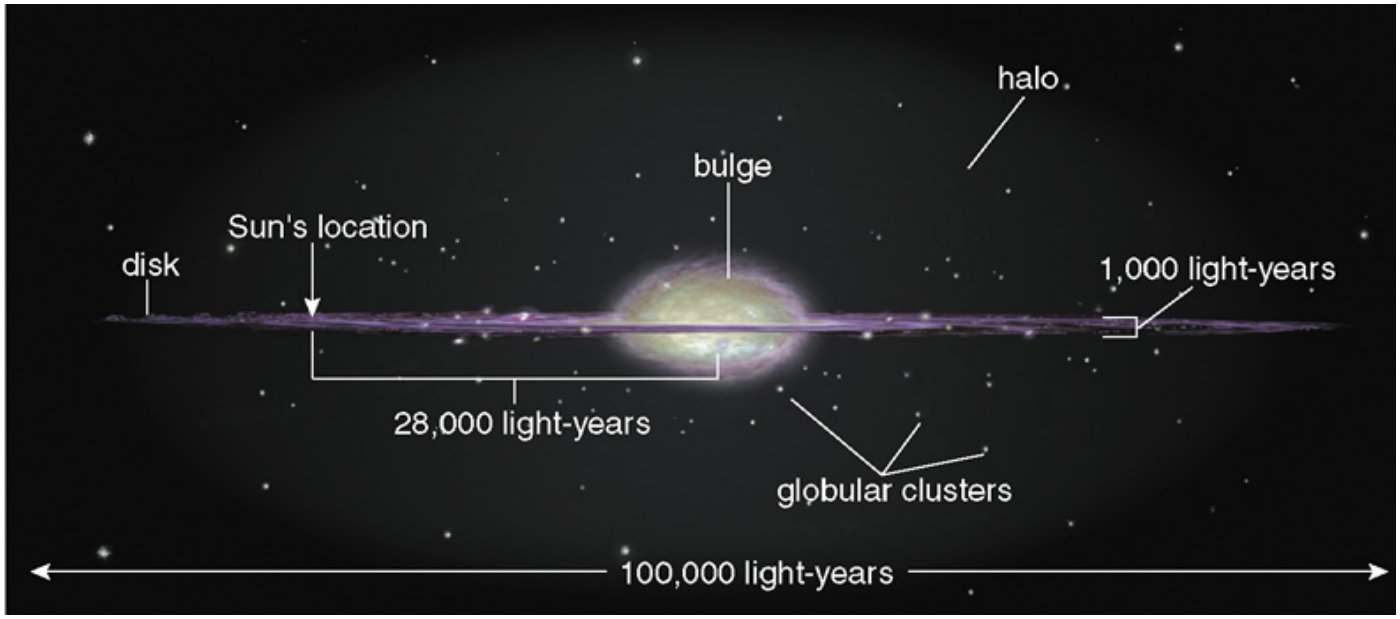
Spiral galaxy NGC 674, seen face on. Note the disk of stars, dust, gas and the bulge of stars in the middle.



See in-class notes

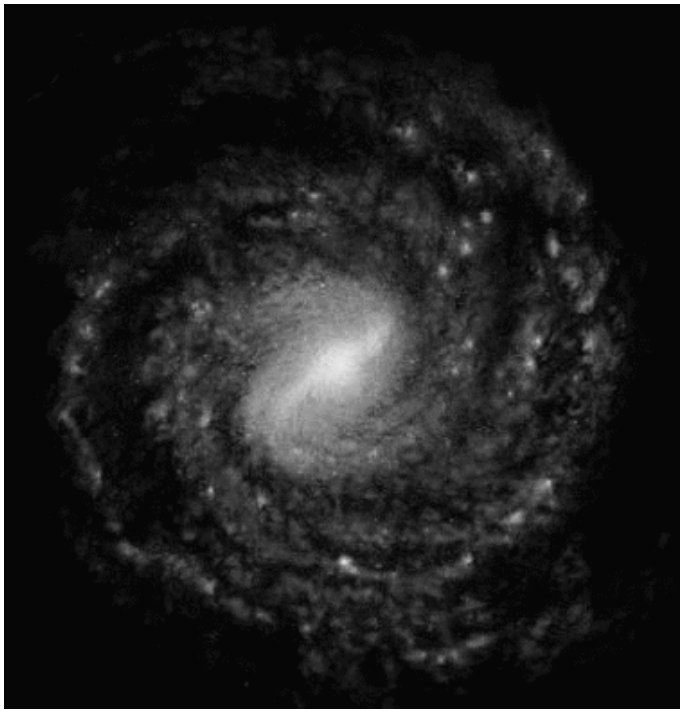
Barred spiral galaxy NGC 1300

Unbarred spiral NGC 4622



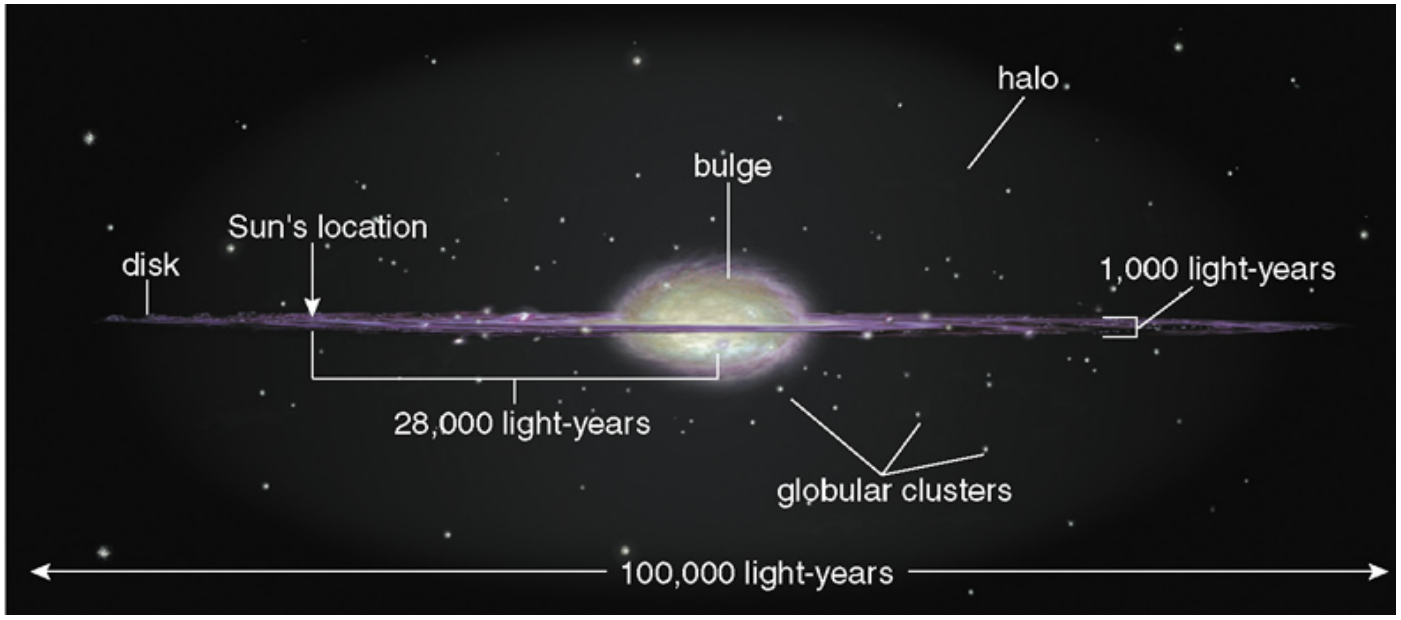
Edge on view

Face on view



Our Galaxy, the Milky Way is a barred spiral galaxy, 100,000 light years across. It contains over 100 billion stars. The Sun and its Solar system lie at a 28,000 ly from the center of the Milky Way

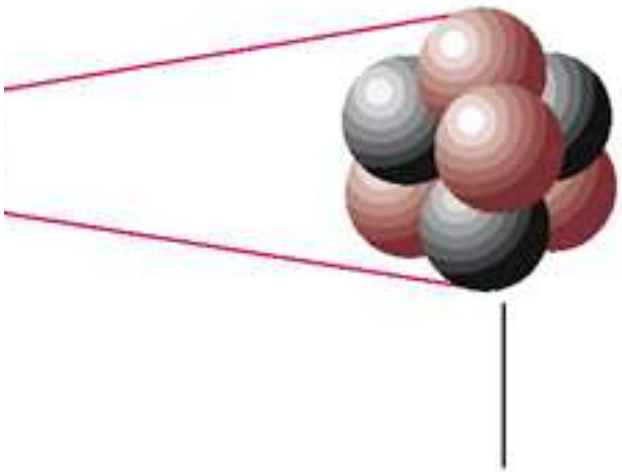
Edge-on view :
Actual infrared image from COBE satellite



Edge-on view (Artist's conception)

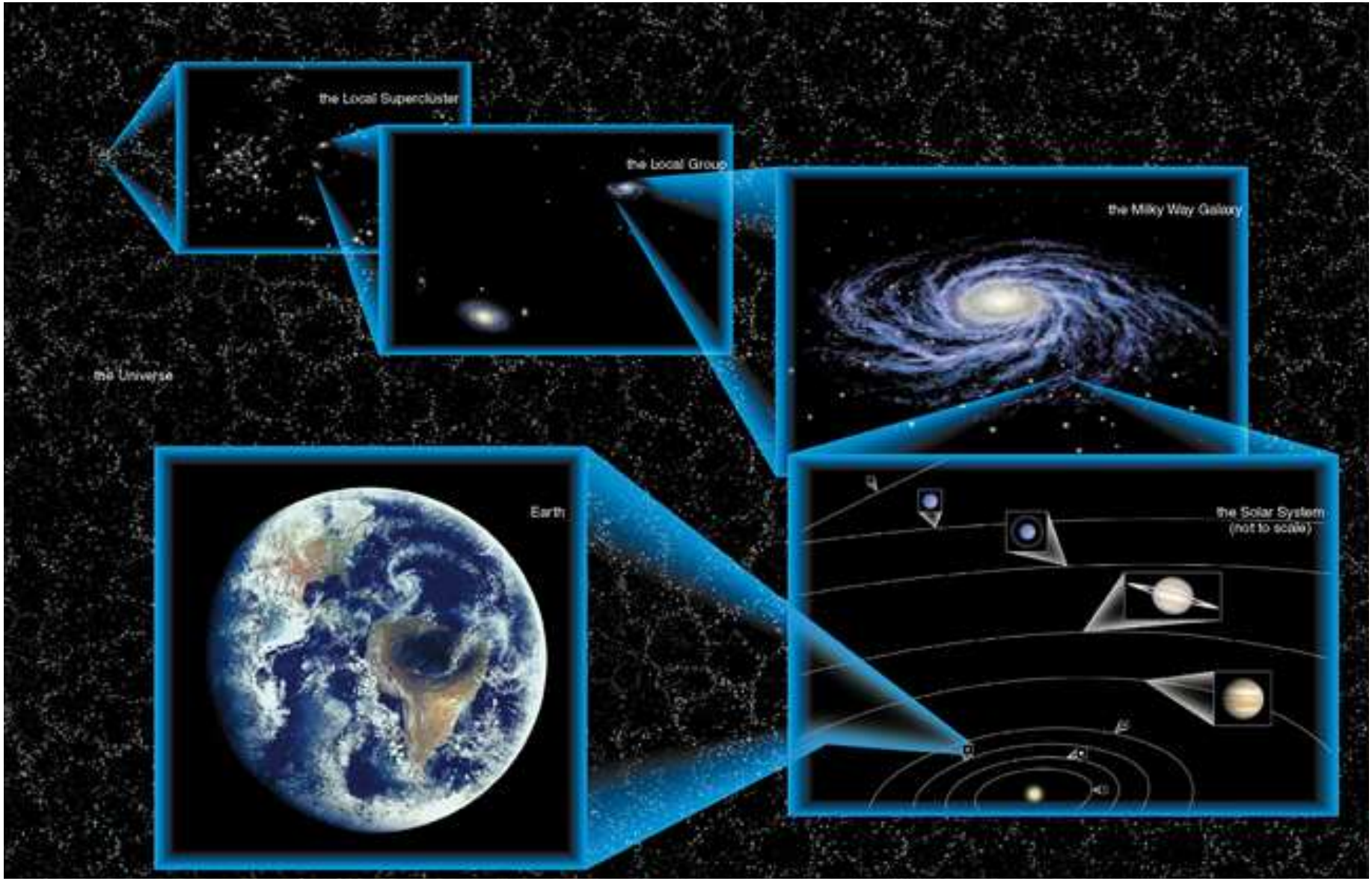
Scales and Distances: From the infinitesimal to the grandest

- See in-class summary table From the size of hydrogen nuclei to the edge of the visible Universe : 10^{-15} m to 10^{26} m
- In-class demo: Zooming 26 orders of magnitude



Nucleus: Contains positively charged pr otons (red) and neutral neutrons (gray).

Nucleus: 10^{-15} m
Atom : 10^{-10} m

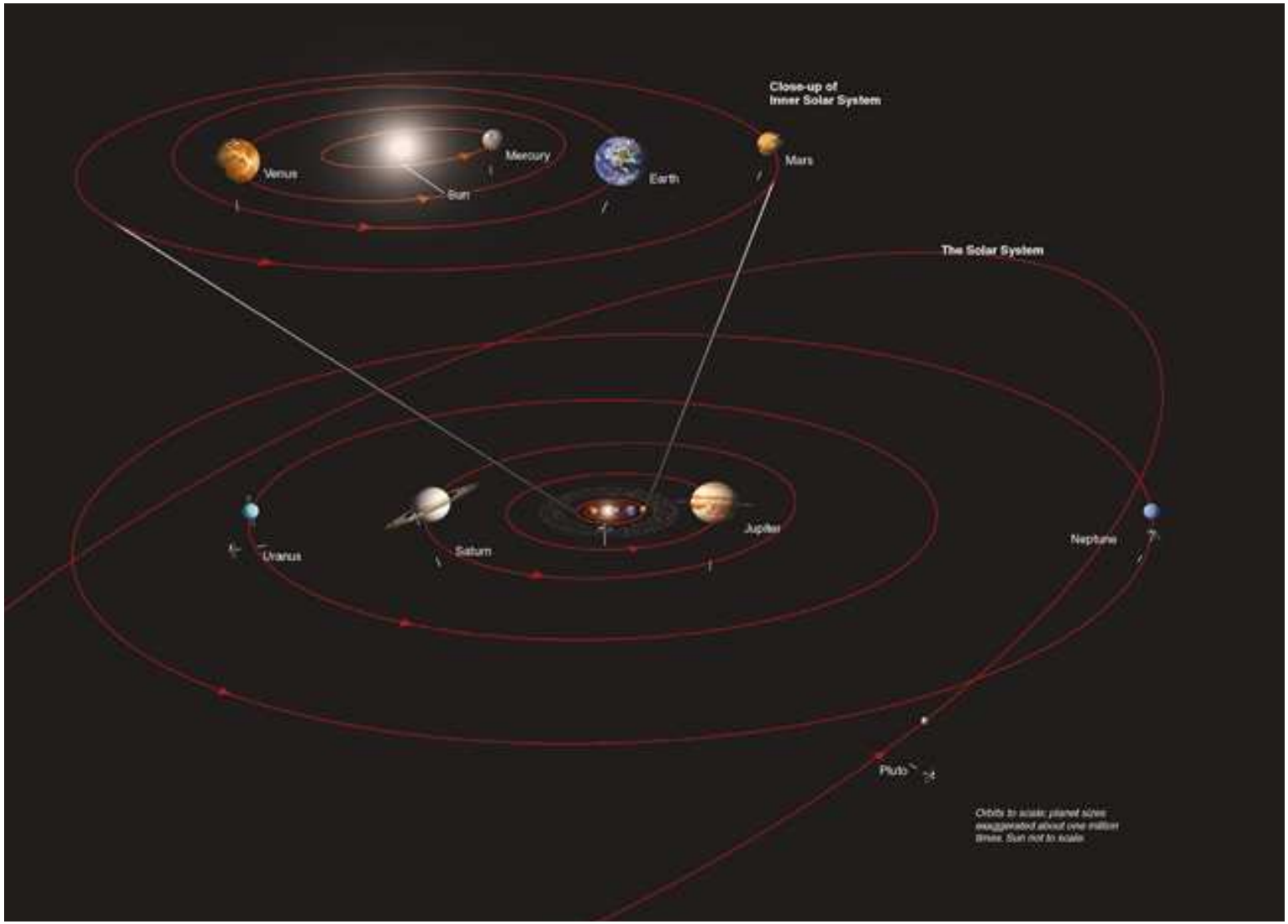


Nucleus: 10^{-15} m Atom : 10^{-10} m Earth's radius= 6.4 x10^{6} m

Our Solar System

Sun (star) + 9 planets M, V, E, Mars, J S N U (P=dwarf planet)

Distance between Earth and Sun = 1.5×10^{11} m = 1AU ; Pluto-Sun= 39.5 AU



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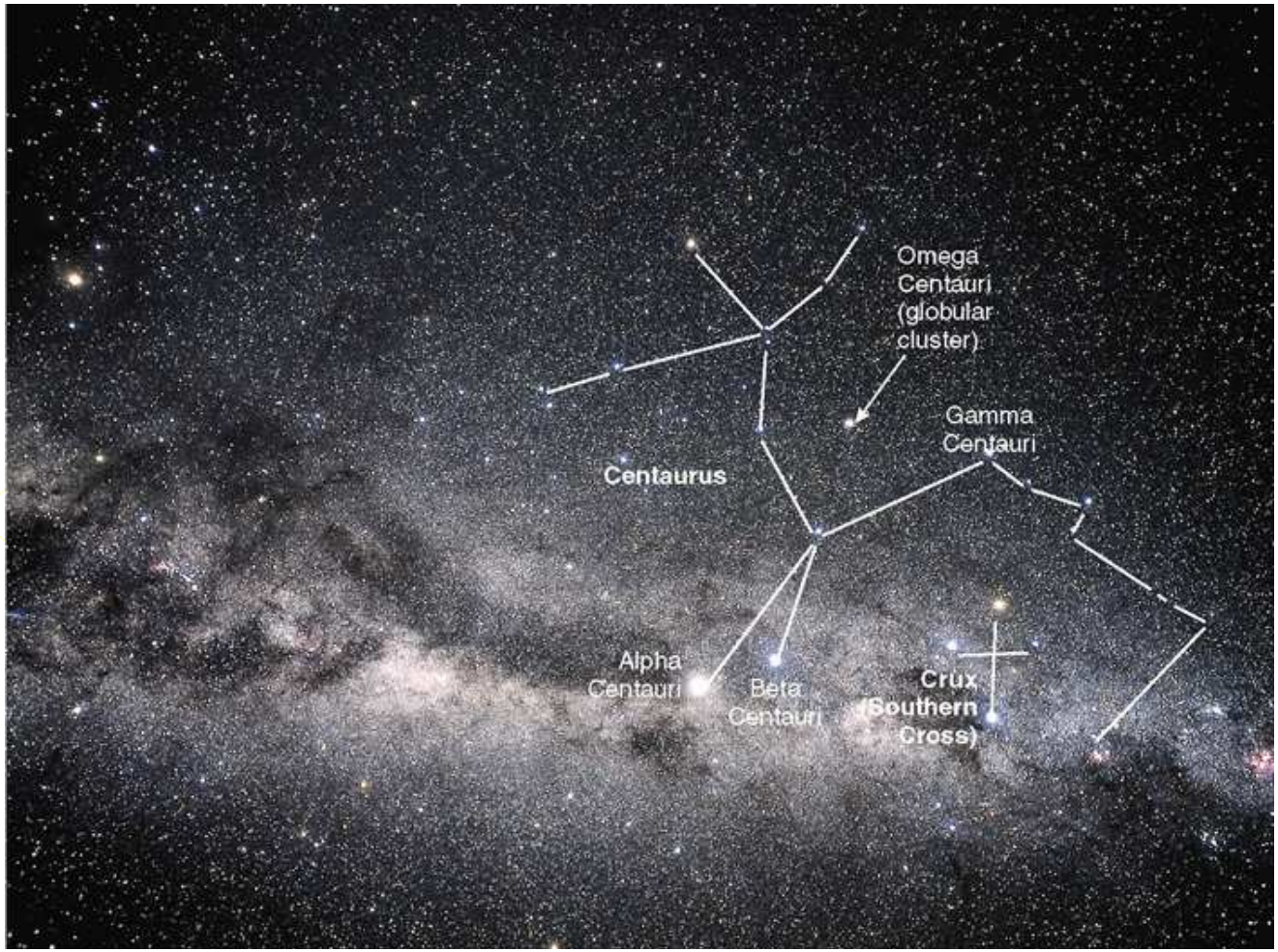
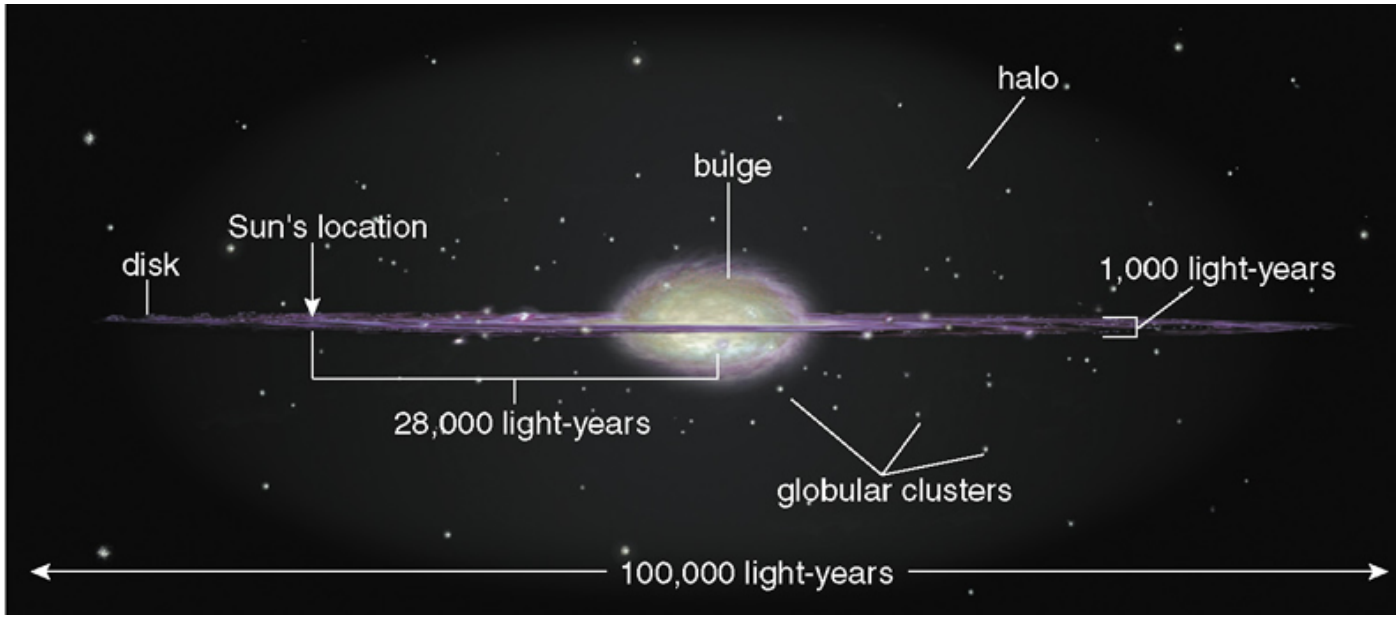
Lecture 5: Th Sep 14

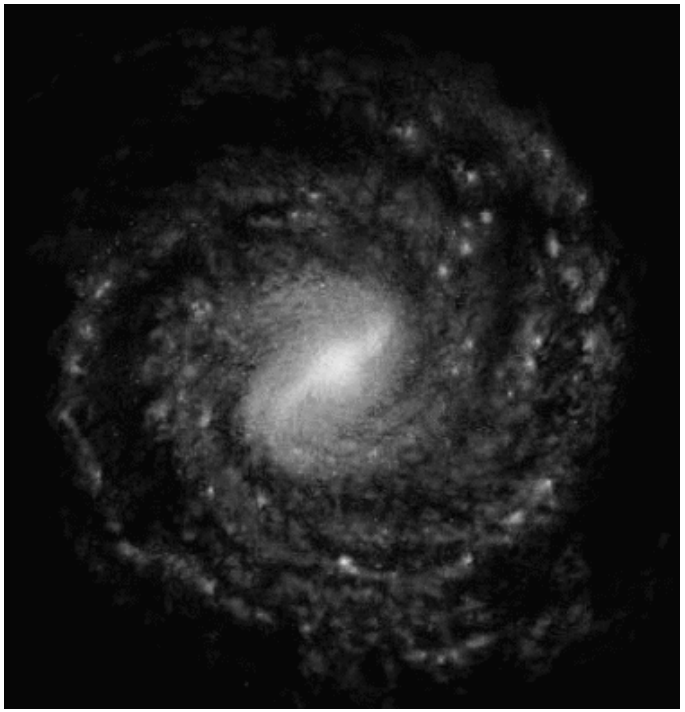


Stars closest to our Sun = Proxima Centauri 4.2 ly away, Alpha Centauri A and B at 4.4 ly



Edge on view

Face on view



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The Local Group

See In-class notes

Brightest members of Local Group?

Closest galaxy neighbors of Milky Way? Interactions of Milky Way?

LMC; Irr;

Size = 30,000 ly Dist = 0.16×10^{6} ly

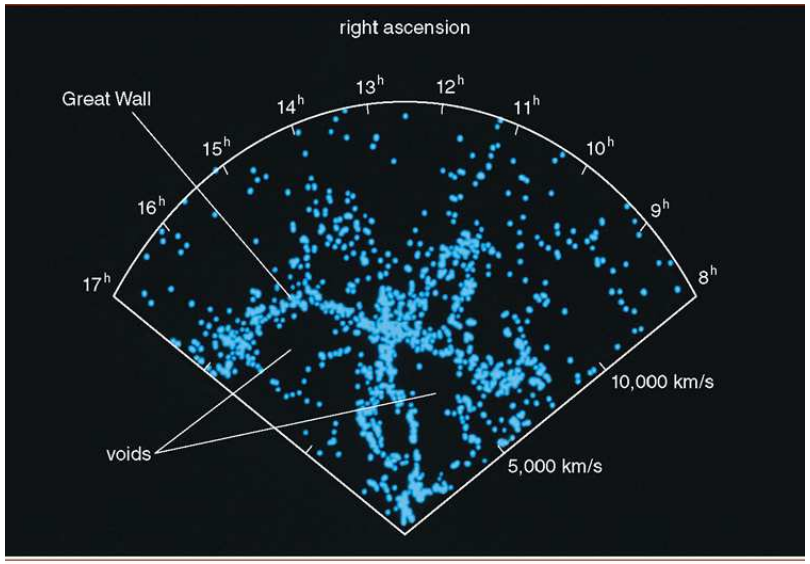
Clusters of galaxies (see in class notes)

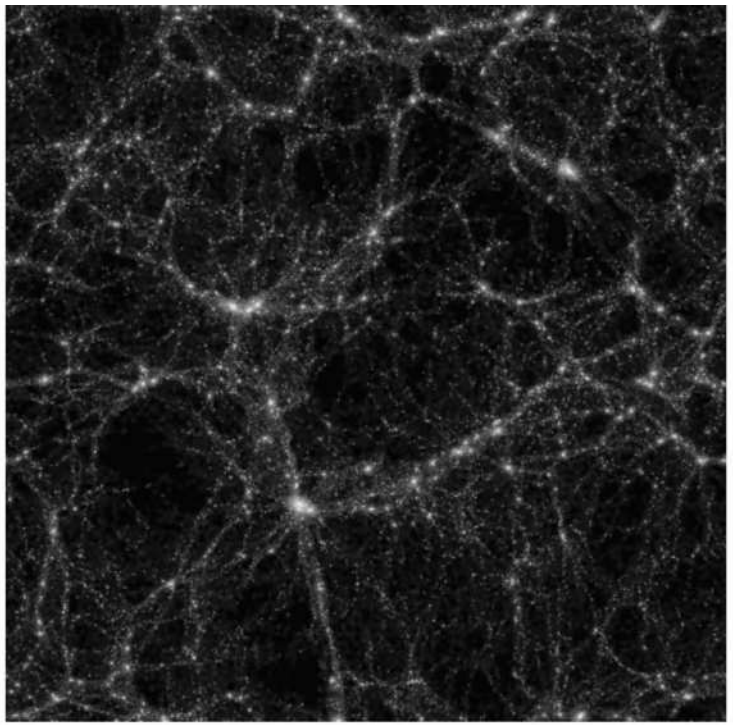
Virgo = closest cluster of galaxies at 60 million ly away ; contains> 100 galaxies

Abell 2218 cluster of galaxies

Region shown = 1.4 x 10^6 lyr

Superclusters, Filaments, and Voids in the Cosmic Web





Large-scale structure: sheets, voids, filaments/walls

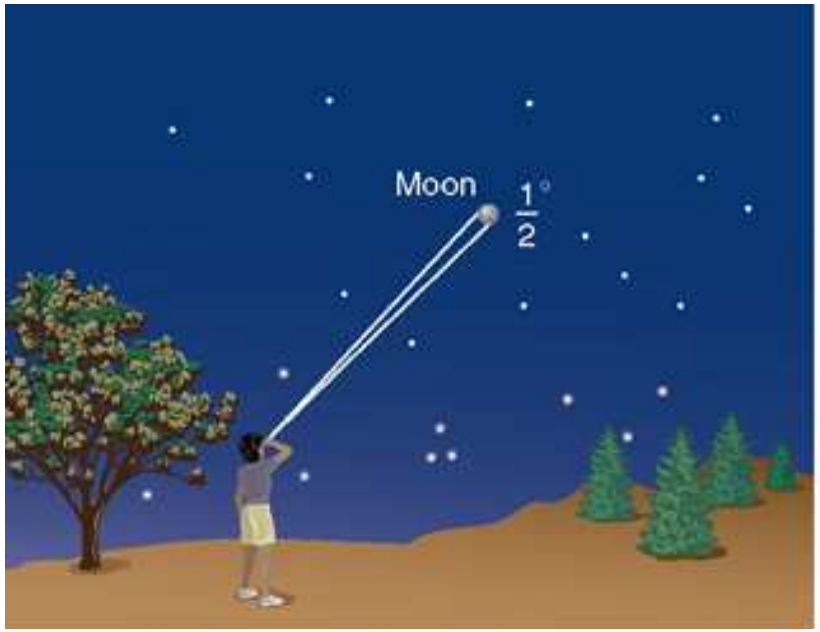
Superclusters = 10 million lyr = 10^{23} m or 10^{7} lyr
Fliaments = 10 x larger even….

Summary table -à see in class notes

From the infinitesimal to the grandest ….from the size of the hydrogen nucleus (10^{-15} m) to the “edge” of the visible Universe (10^{26} m)

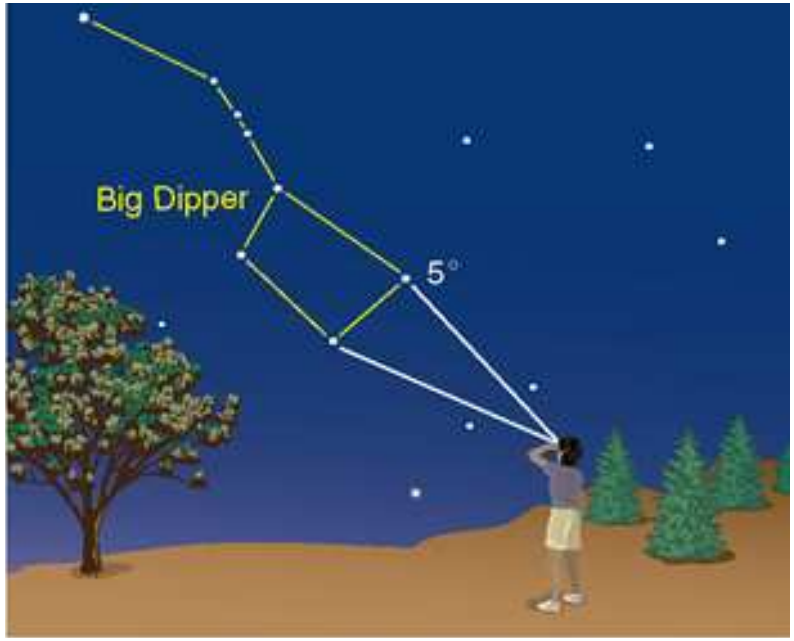
See in-class movie: Powers of 10

Angular sizes and Angular distances



Angular diameter of Moon
= 0.5 degree = 30 arcmin

Use your hand to get angular sizes!



Angular separation of two stars on
the Big Dipper = 5 degrees.