

Angstrom Astronomical Unit, Light-Years, and Parsecs

Convenient 'natural' units for different quantities

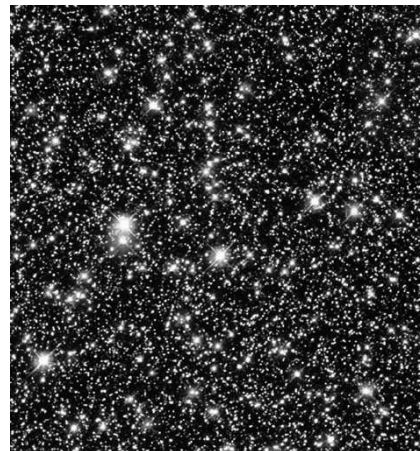
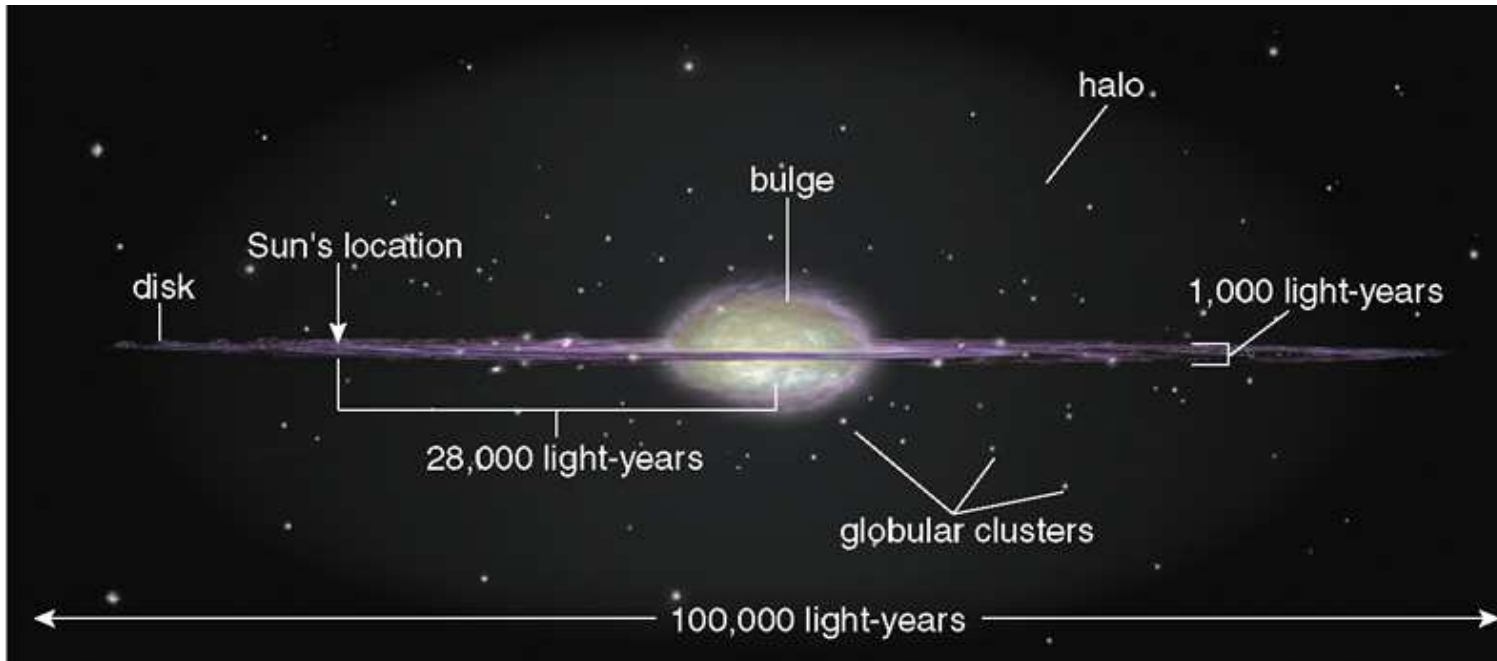
1 Angstrom (A) = Diameter of a Hydrogen atom = 1.0×10^{-10} m

1 Astronomical Unit (AU) = Distance between Earth and Sun = 1.5×10^{11} m

1 light-year (ly) = Distance travelled by light in 1 year
= Speed of light \times Travel time
= $c \times t = (3 \times 10^8 \text{ m/s}) \times (3.15 \times 10^7 \text{ s})$
= 9.46×10^{15} m = nearly 10^{16} m (ten thousand trillion meters)

1 parsec (pc) = 3.2×1 ly = approximately distance between stars

Milky Way = a barred spiral galaxy, hosting our Sun and Solar system



Edge on view

HST image of the center of M Way

Local Group = a set of ~40 galaxies, including the Milky Way, bound by gravity. Includes 3 massive spirals, 4E/dEs, 17 dwarfs dSph, 12 dlrr/lrr.

Extends at least 5 million ly from MW

Brightest members of LG

M31 (Andromeda SAb), Milky Way (SBbc), M33(SAcd) =90%
LMC (lrr), NGC 55 (lrr), M32 (E), SMC (lrr)

Closest galaxy neighbors of MW

Sagittarius (dE) = 0.08×10^6 ly
LMC (lrr) = 0.16×10^6 ly
SMC (lrr) = 0.19×10^6 ly

Interactions of MW

- Cannibalism: MW is 'digesting' Sagittarius dE
(has 8 other dE satellites)
- MW interacting with SMC & LMC → Magellanic stream
- MW has a warp seen in atomic gas ..
- Moving towards M31.... 10 Gyr ...



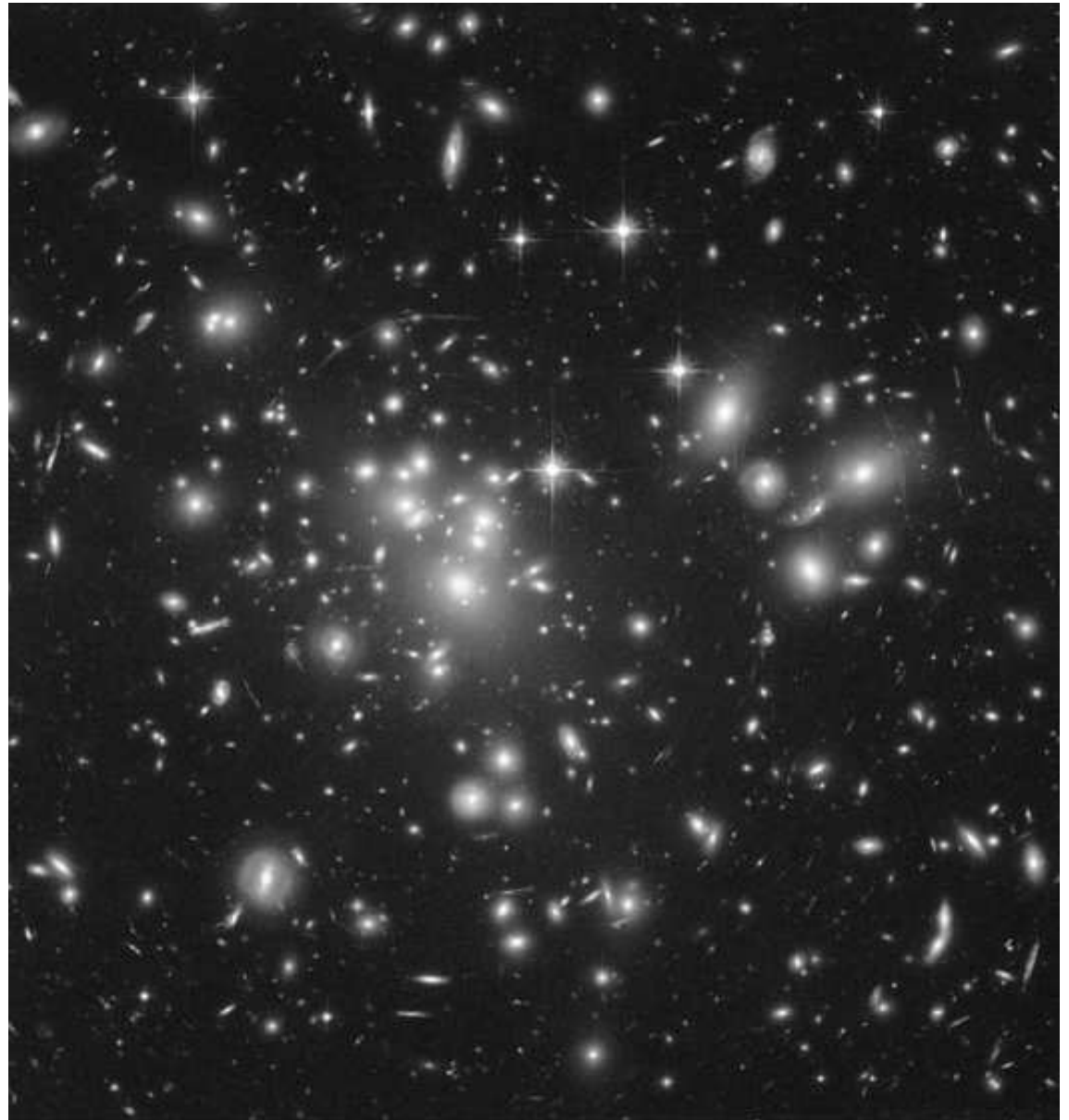
LMC; lrr;
Size = 30,000 ly Dist = 0.16×10^6 ly

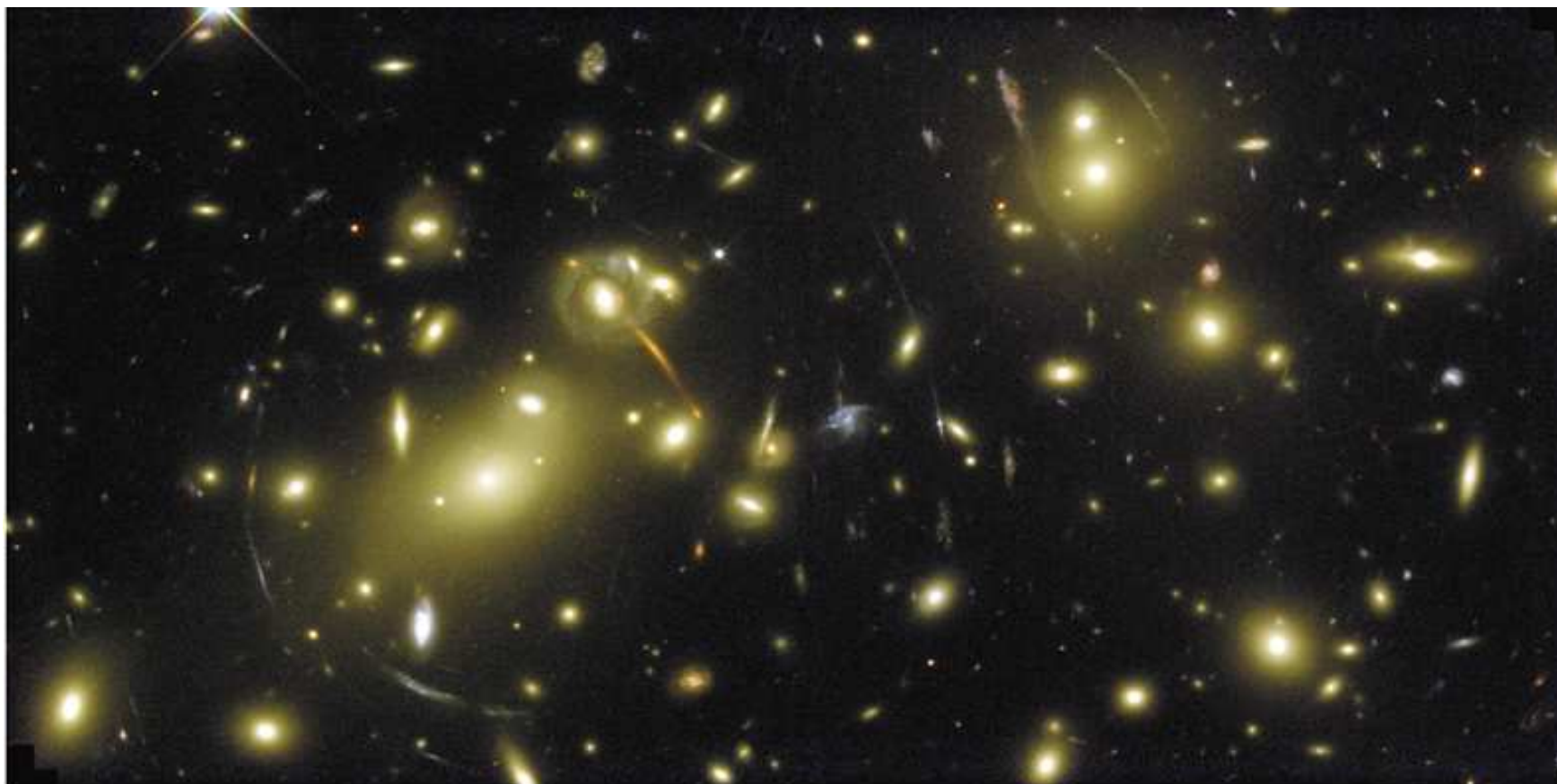
Groups/Clusters of galaxies = a set of galaxies bound by gravity.

Virgo cluster = 64×10^6 lyr
Coma cluster = 3400×10^6 lyr
 = 3.4×10^9 lyr
Abell clusters = several $\times 10^9$ ly

Central Part of Abell
1689 Cluster of Galaxies

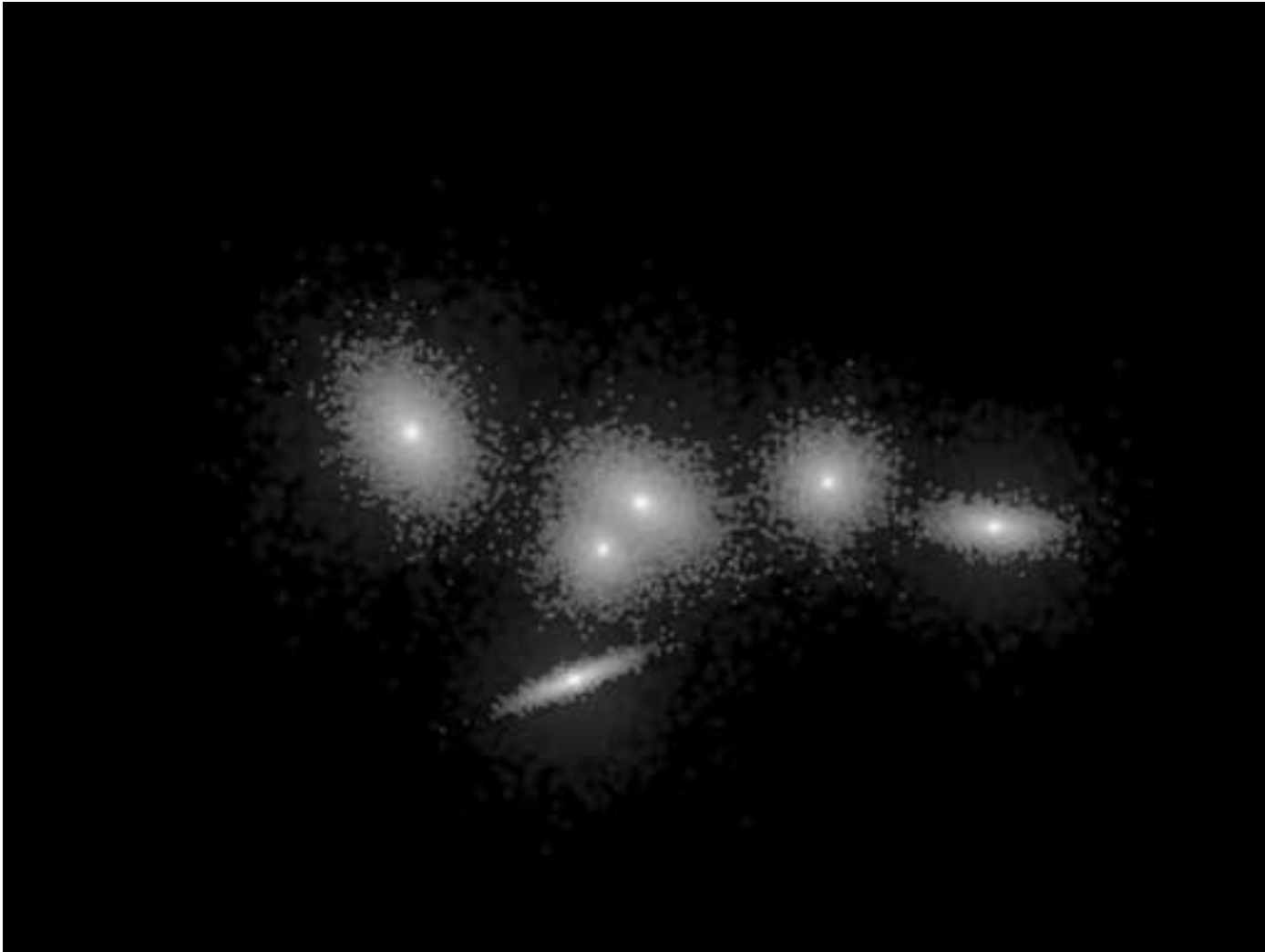
Region shown = 2×10^6 lyr





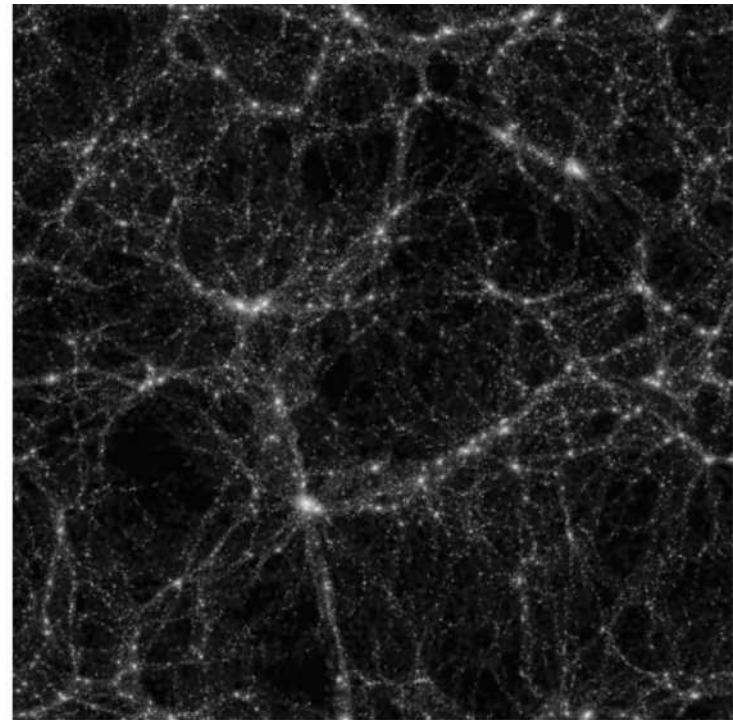
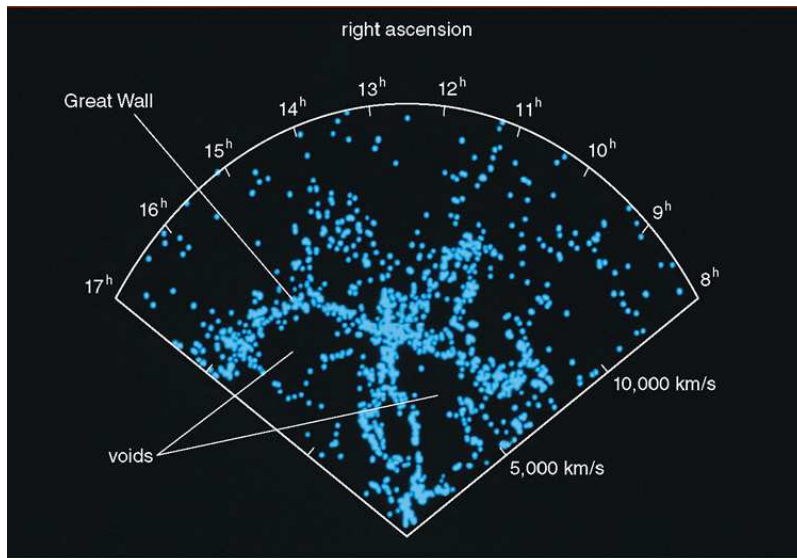
Abell 2218 cluster of galaxies

Region shown = 1.4×10^6 lyr



Credit : Joshua Barnes (University of Hawaii)

Multiple galaxy collisions



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