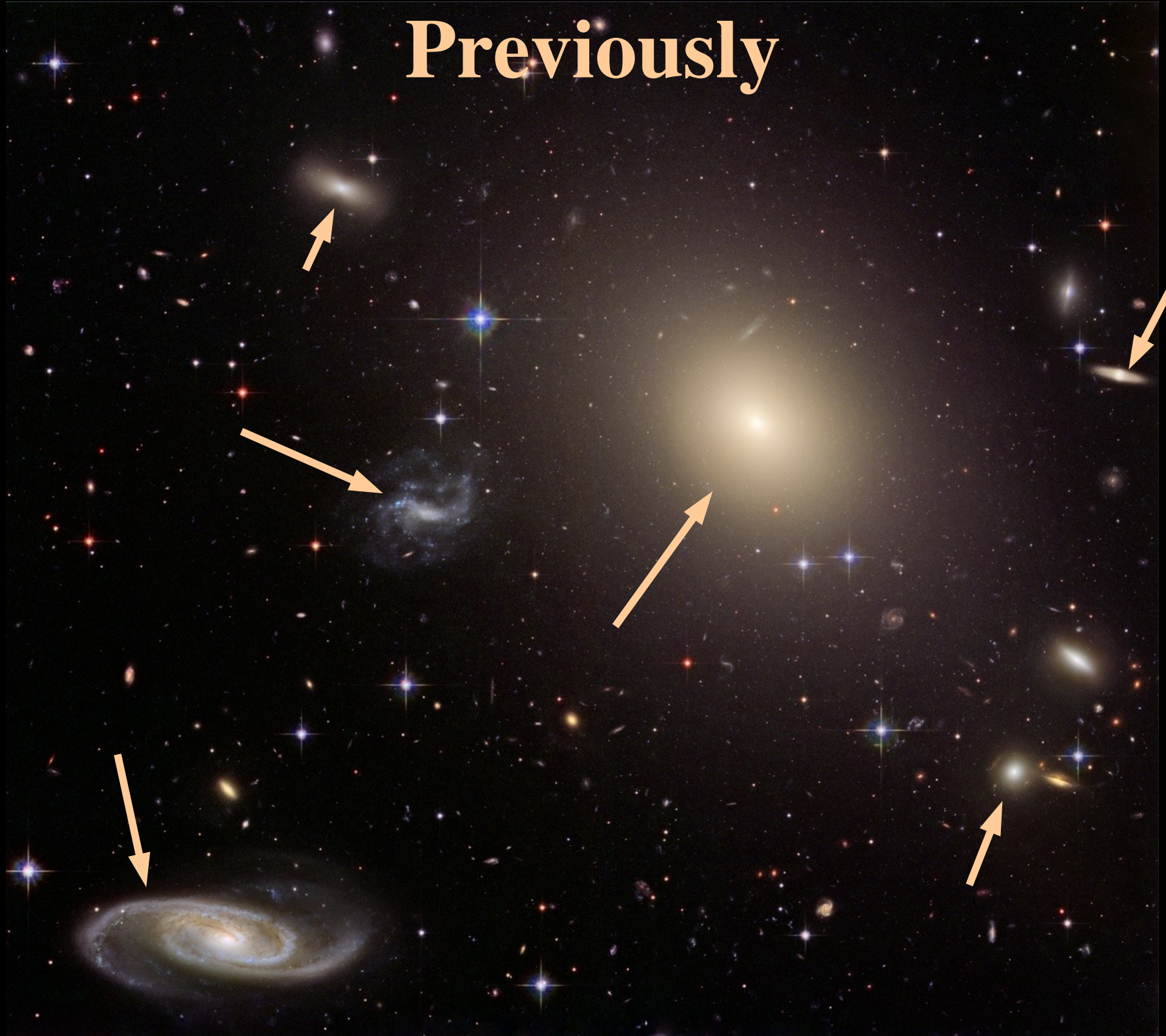
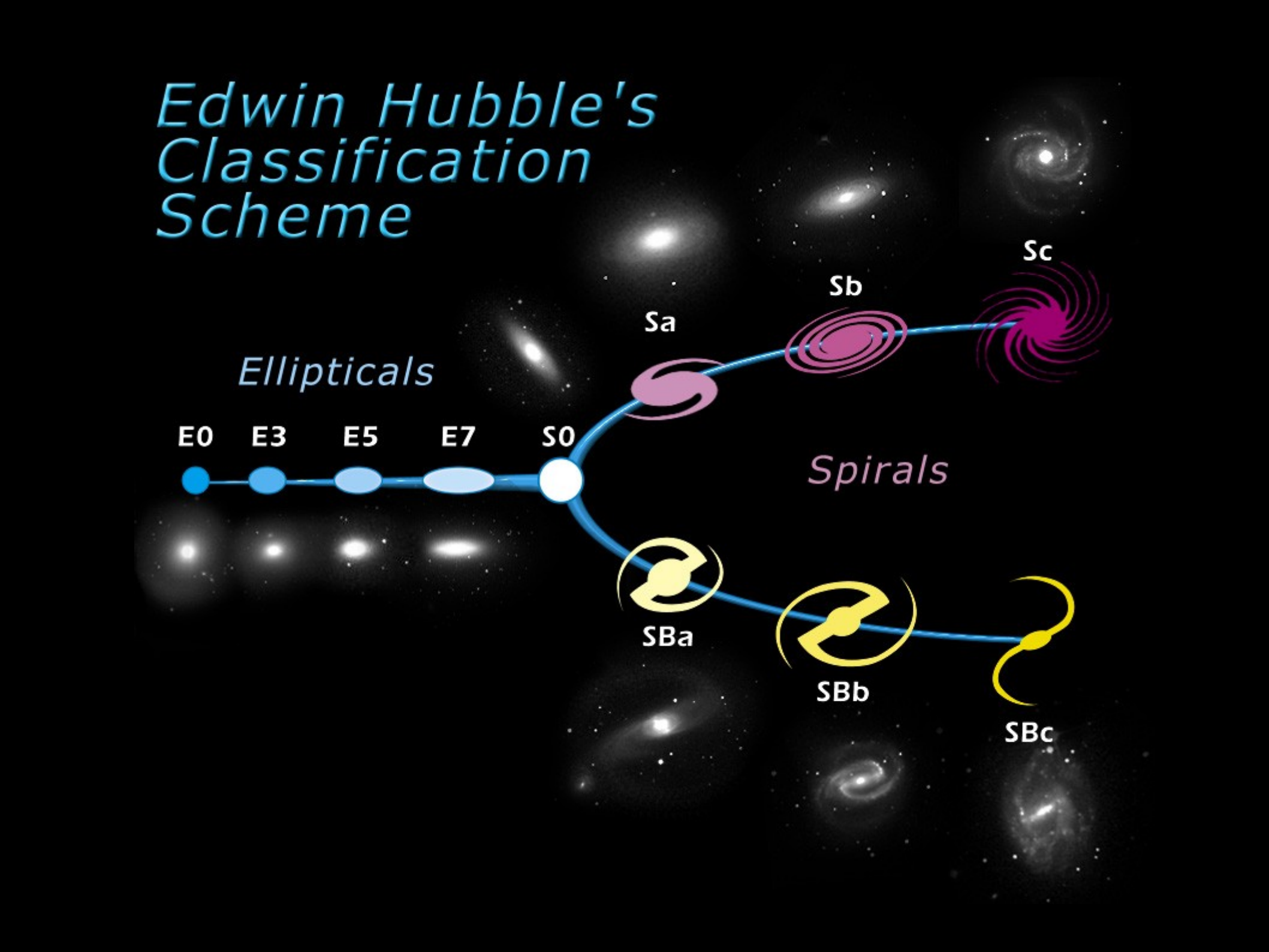
Previously




Edwin Hubble's Classification Scheme
Ellipticals
E0
E3
E5
E7
S0
Sa
Sb
Sc
Spirals
SBa
SBb
SBc

Irregular galaxies:
These are not on the Hubble tuning fork. They do not have a disk, nor are they elliptical.
They tend to be young, gas-rich and contain Pop I stars.

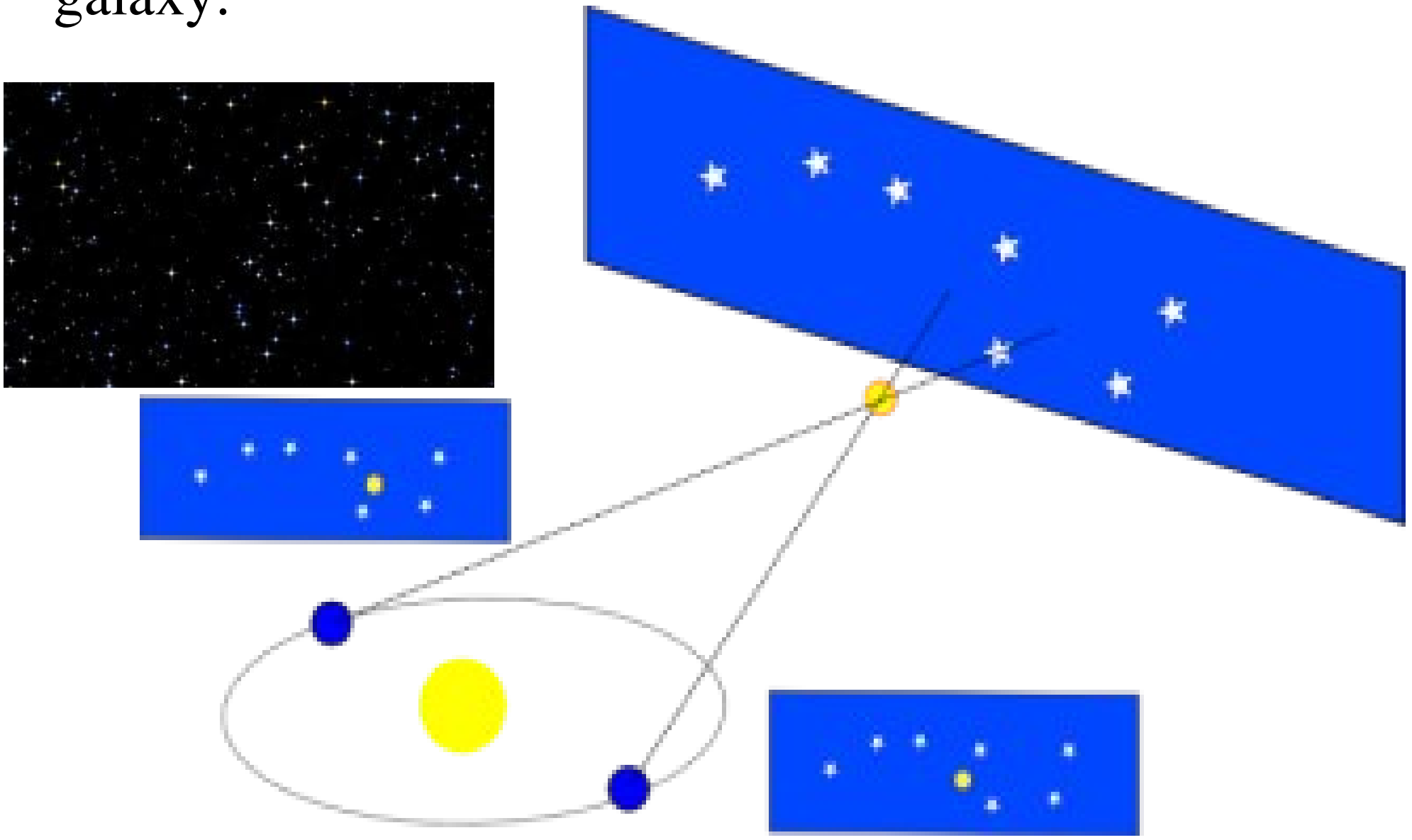
Distances. How far away is everything and how can I tell?

We use something called the distance ladder. That is, each step depends on the previous one.

Distances.
How far away is everything and how can I tell?
There will be summary slides

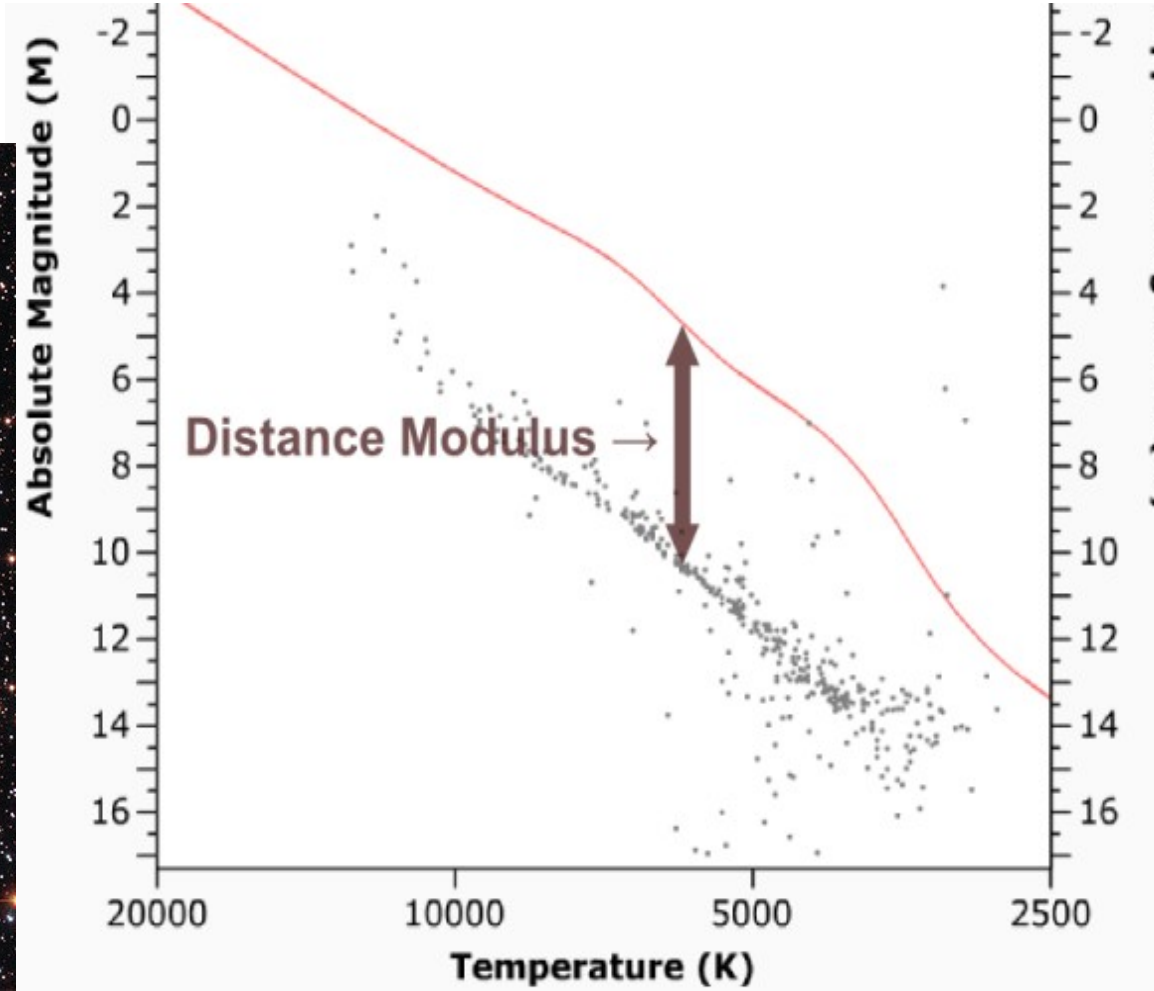
Extra-Galactic Distances

- Parallax- good for nearby stars. GAIA- half our galaxy.



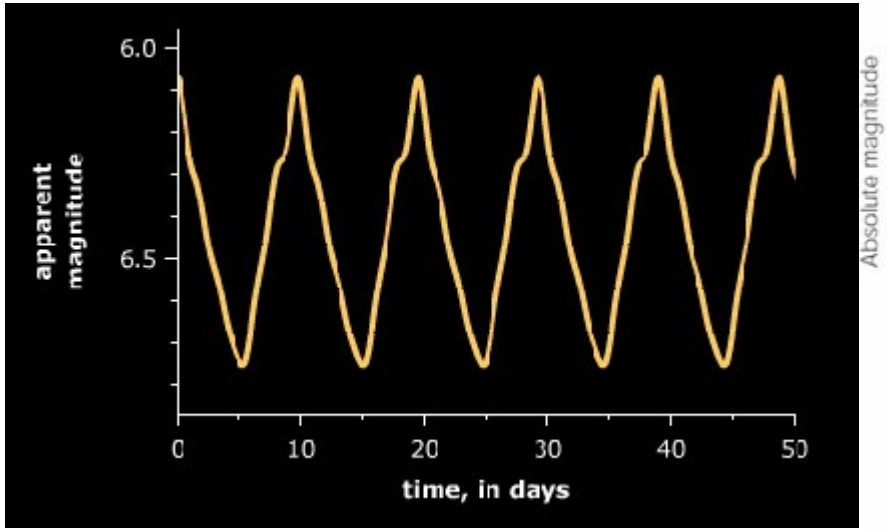
Extra-Galactic Distances

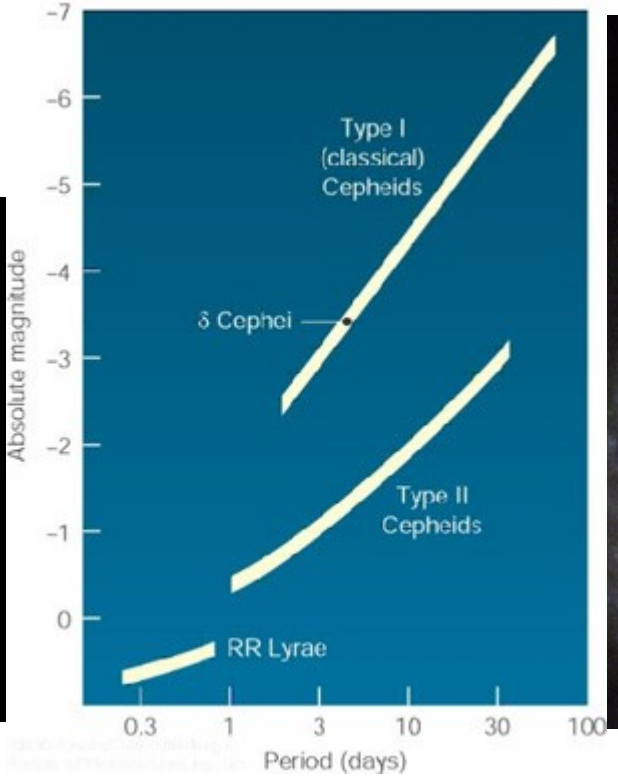
- Parallax- good for nearby stars
- Main sequence fitting- Good for nearby galaxies where individual stars can be resolved (true for eclipsing binaries too).



Extra-Galactic Distances

- Parallax- good for nearby stars
- Main sequence fitting- Good for nearby galaxies where individual stars can be resolved
- Variable stars: Cepheids- supergiant variable stars (Hubble used these).

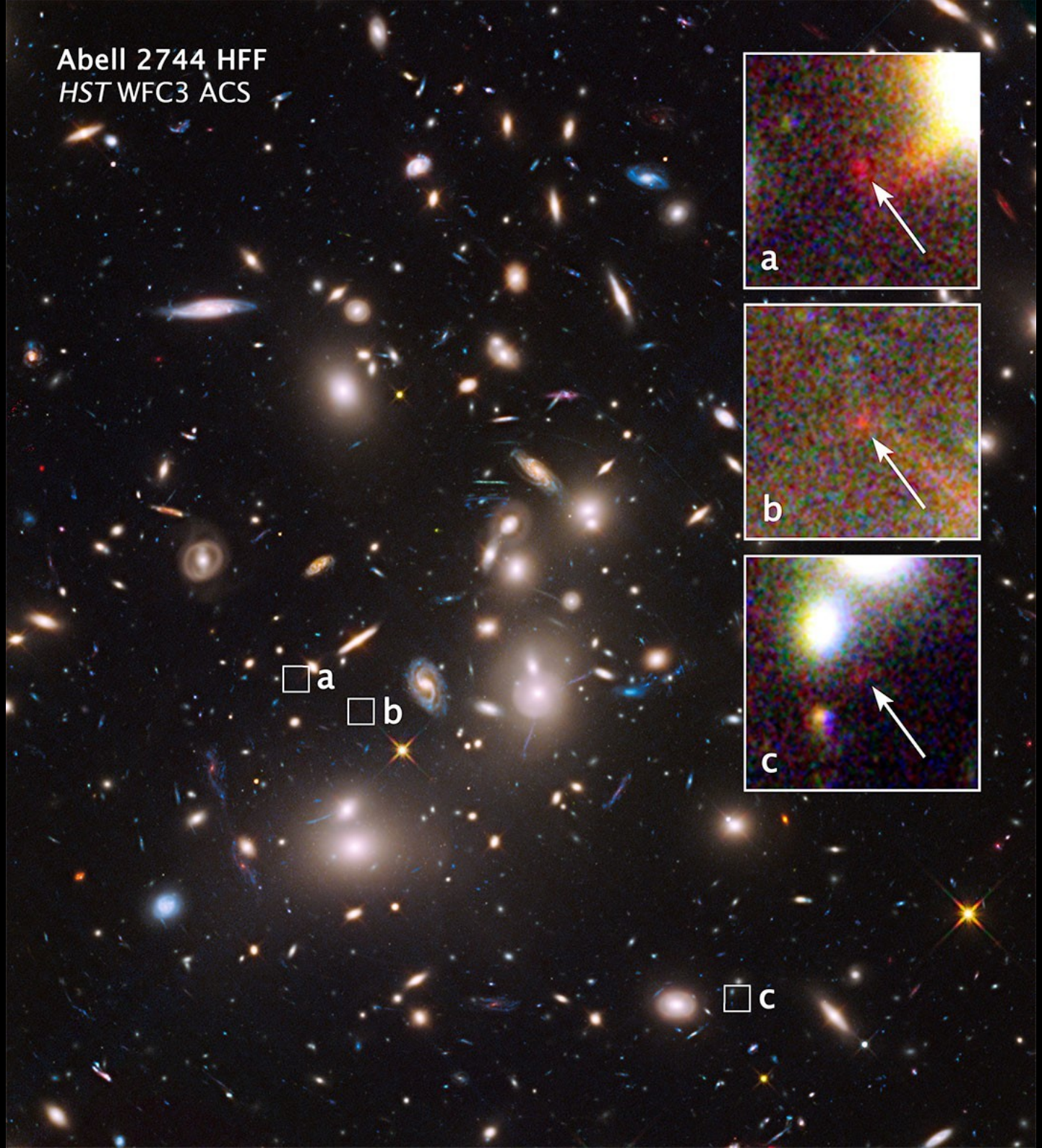




Extra-Galactic Distances

Supernova- Type I: exploding White Dwarfs

Any distance


Abell 2744 HFF
HST WFC3 ACS
a
b
c
a
b
c

Extra-Galactic Distances

- Parallax- good for nearby stars
- Main sequence fitting- Good for nearby galaxies where individual stars can be resolved
- Variable stars: Cepheids- supergiant variable stars
- Supernova- Type I: exploding White Dwarfs
- Redshift (we will get to this)

Extra-Galactic Distances

- Parallax- 1,000 pc (soon 1 Mpc with Gaia)
- Main sequence fitting- 2-3 Mpc
- Variable stars: ~50 Mpc
- Supernova- Type I: Any
- Redshift: Any

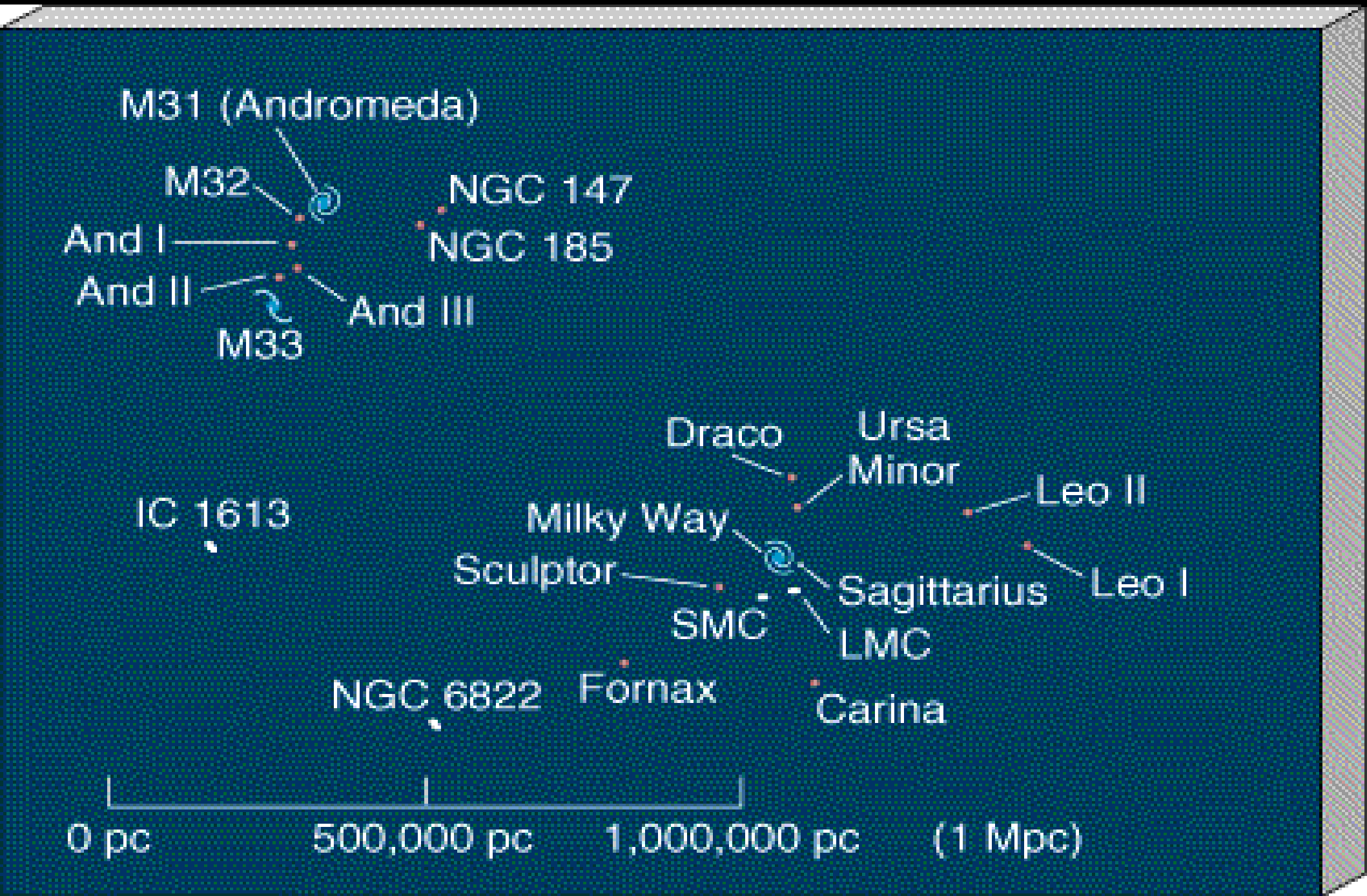
Cosmology.

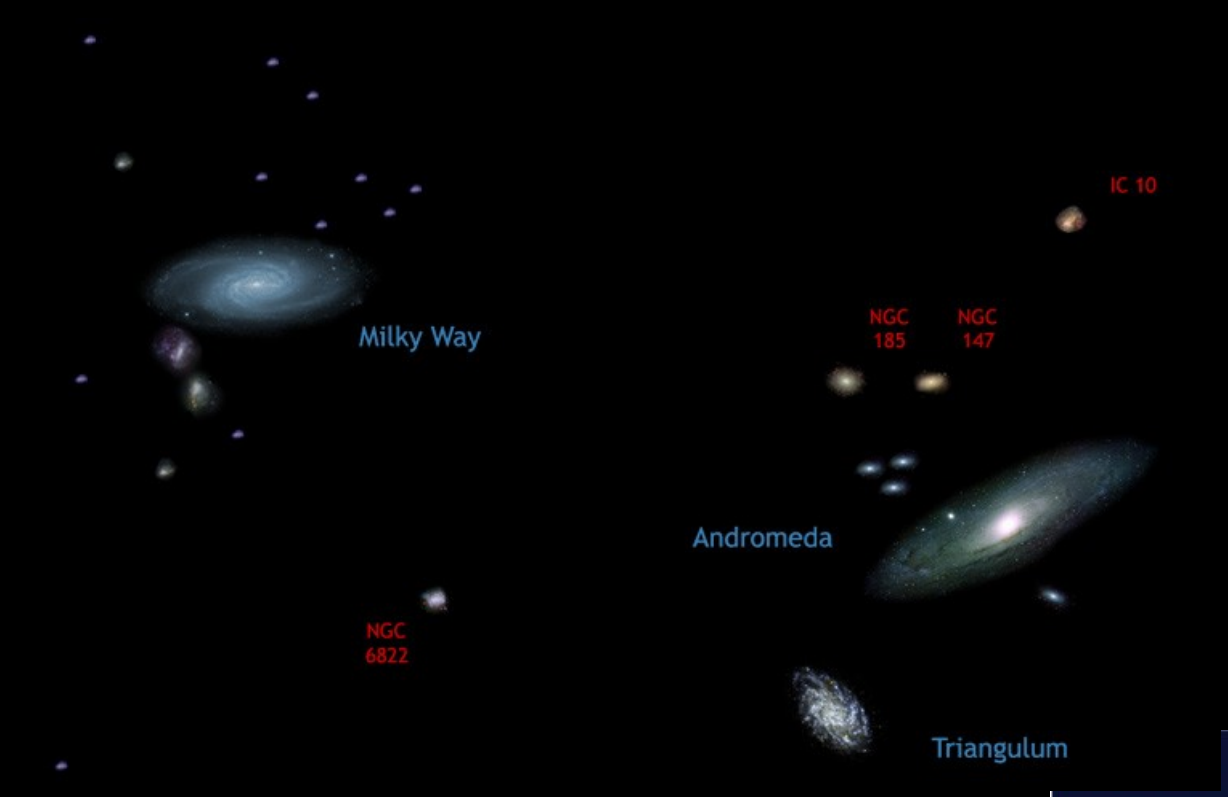
Cosmology is the study of the Universe as a whole. It is about objects larger than individual galaxies and the evolution of the Universe and its contents.

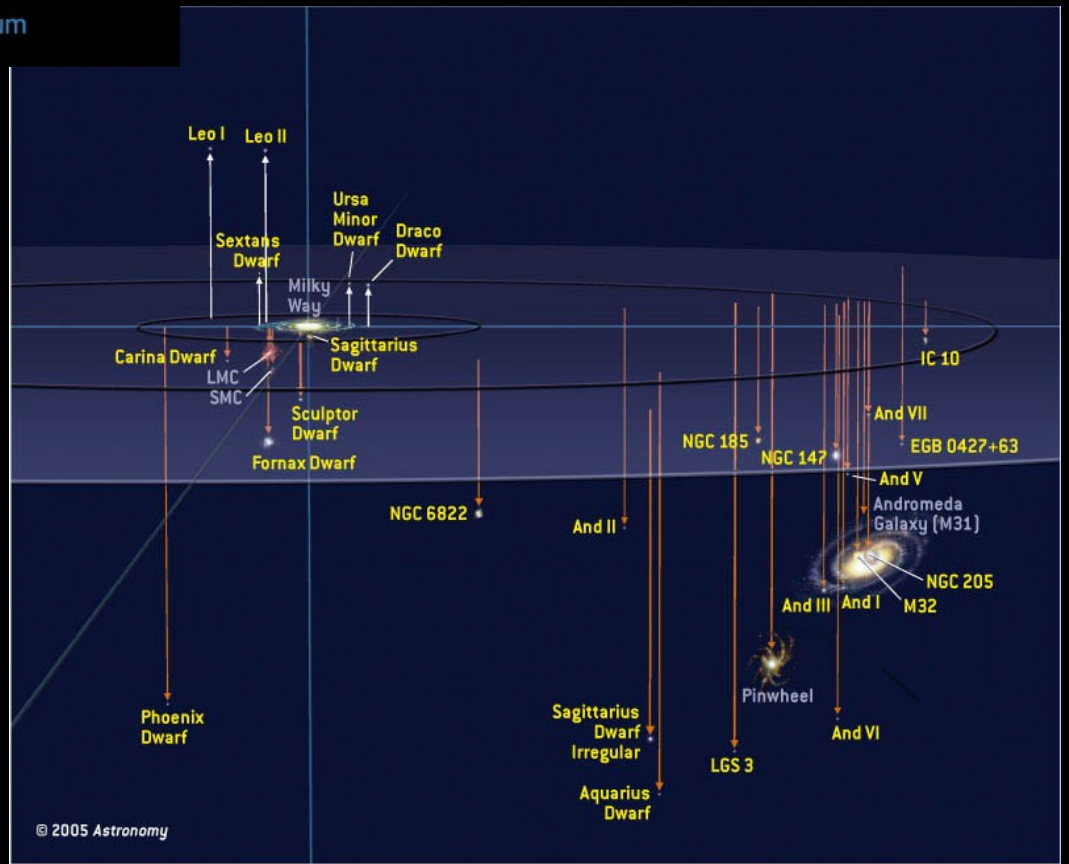
The Local Group:

Our galaxy is a member of a small group (38) of gravitationally bound galaxies.
There are 3 big spiral galaxies: The Milky Way, Andromeda, and Triangulum.
Each of these 3 big galaxies have many smaller, irregular or dwarf elliptical galaxies orbiting them.

The Local Group:




IC 10
Milky Way
NGC 185
NGC 147
Andromeda
NGC 6822
Triangulum


Leo I
Leo II
Ursa Minor Dwarf
Draco Dwarf
Sextans Dwarf
Milky Way
Sagittarius Dwarf
Carina Dwarf
LMC
SMC
Sculptor Dwarf
Fornax Dwarf
IC 10
And VII
NGC 185
NGC 147
EGB 0427+63
And V
Andromeda Galaxy (M31)
NGC 6822
And II
NGC 205
And III
And I
M32
Pinwheel
Phoenix Dwarf
Sagittarius Dwarf Irregular
And VI
LGS 3
Aquarius Dwarf
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