

Lecture 22

21 April 2009

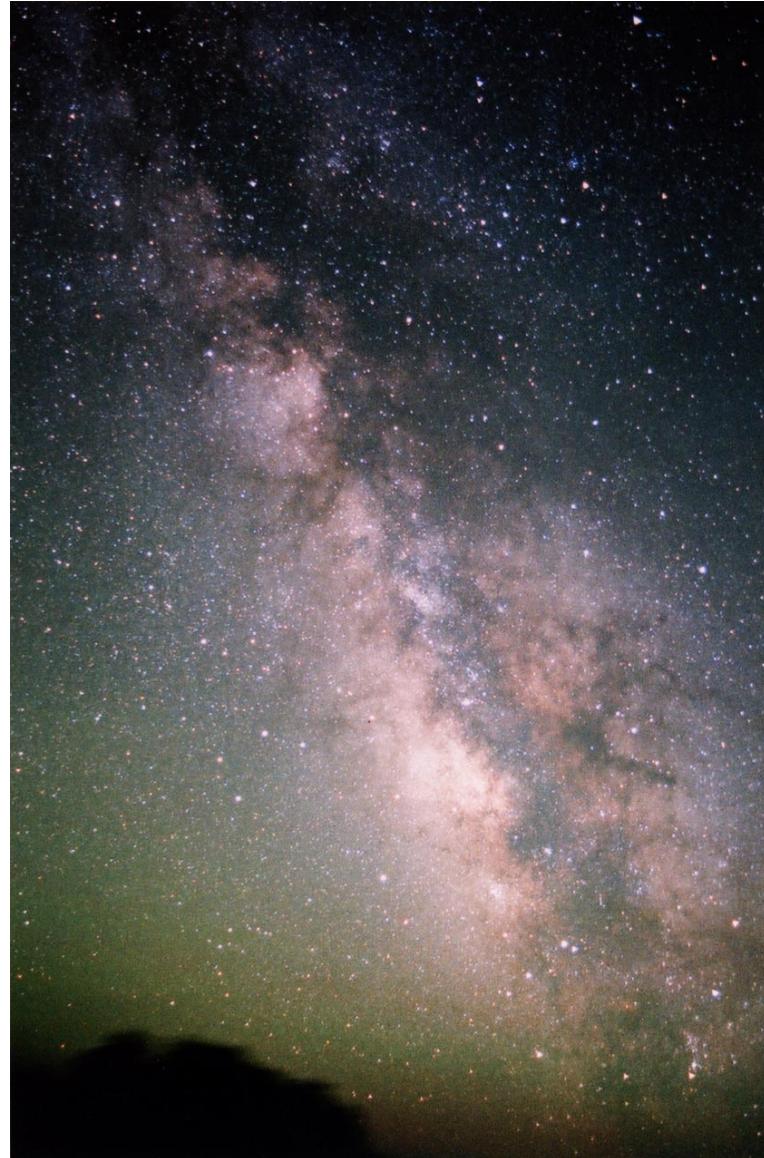


HOMEWORK 08:
Due this evening,
11:59pm

- **SCIENCE TOPICS:**
Galaxies
Dark Matter
- **READING**
Ch.14, Sec 14.1, 14.3, 14.6
Ch.15, Sec 15.1
- **PRACTICE: Ch 14**
Review: 1, 2, 5, 6
Self-test: 1, 2, 5, 6, 10,

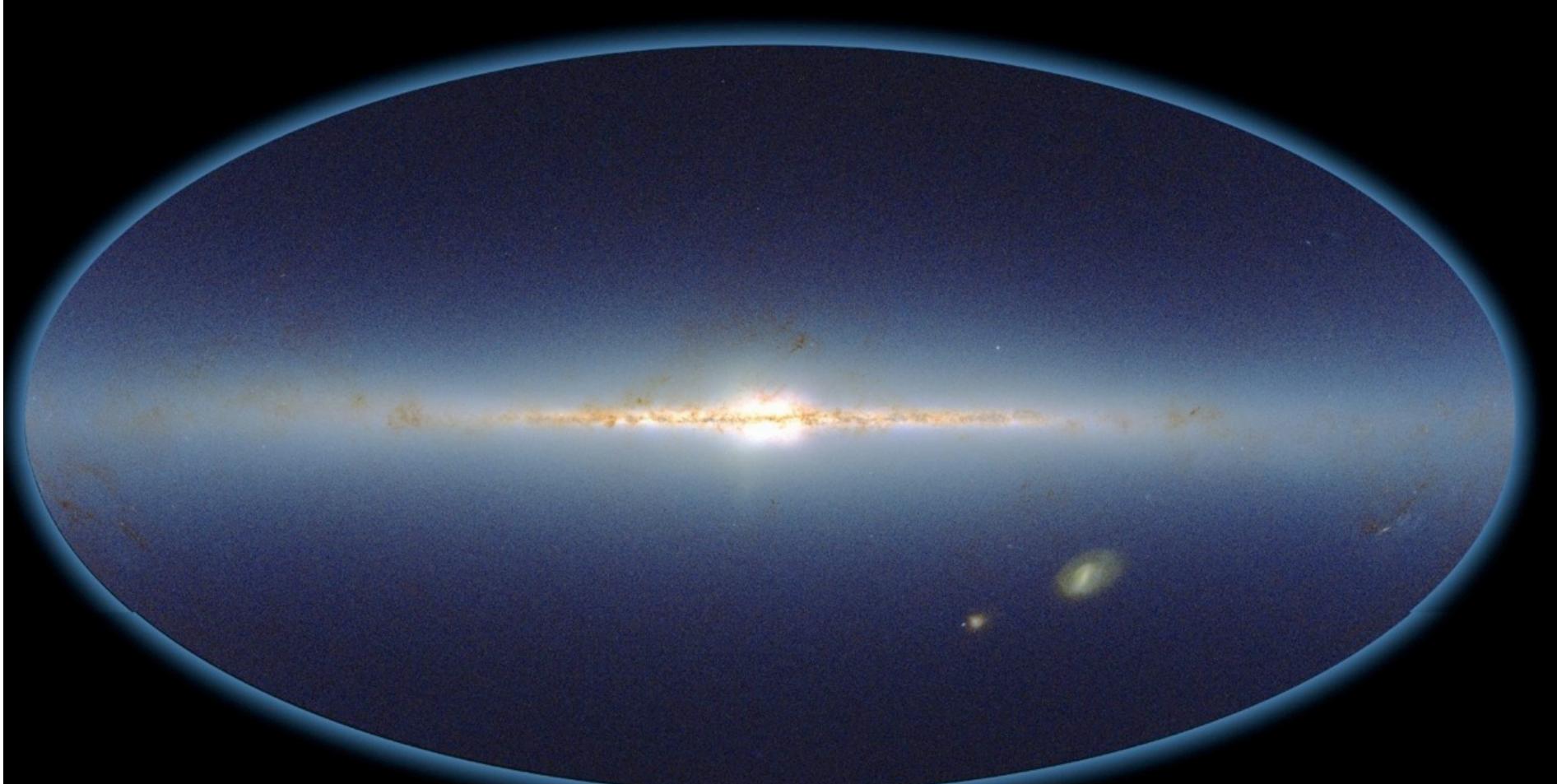
Galaxies

The Milky Way



The Milky Way

2MASS Covers the Sky

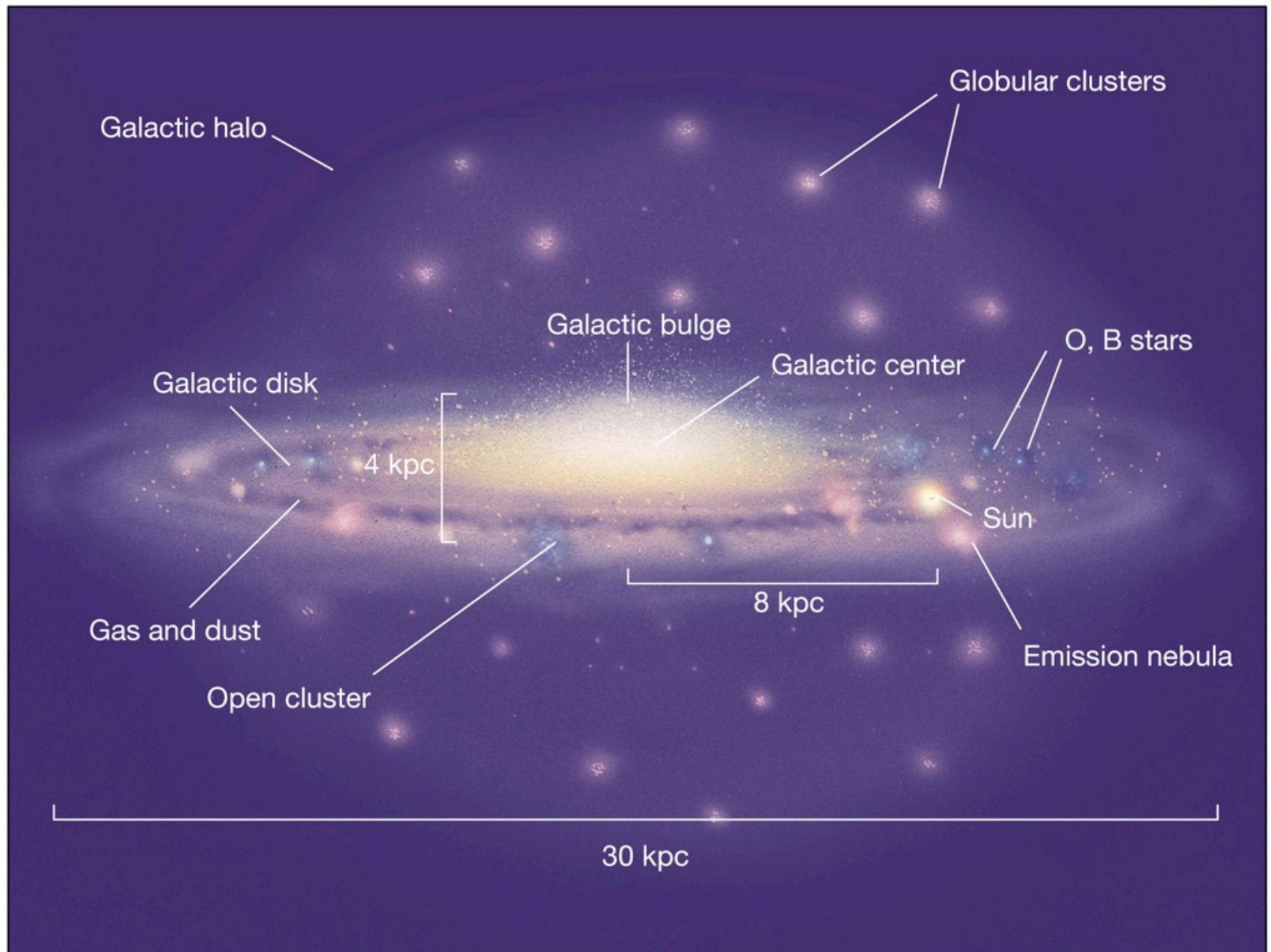


The Two Micron All Sky Survey

Infrared Processing and Analysis Center/Caltech & Univ. of Massachusetts

M31, the Andromeda galaxy

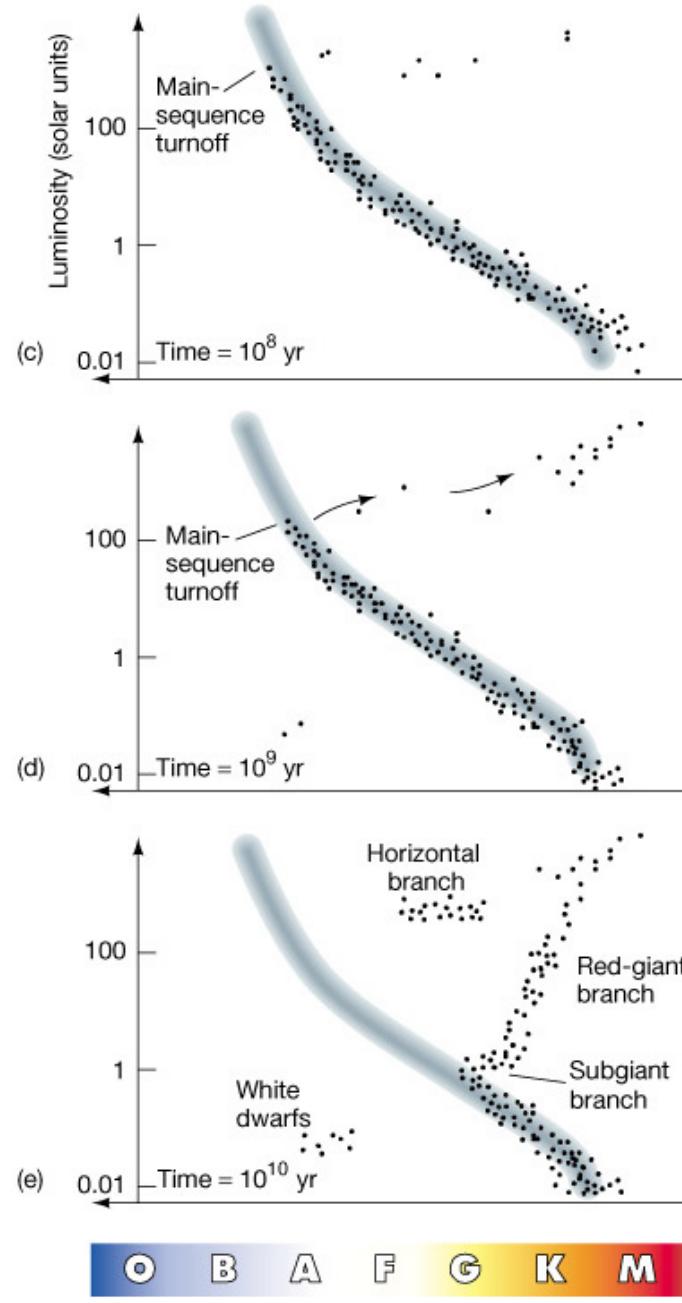
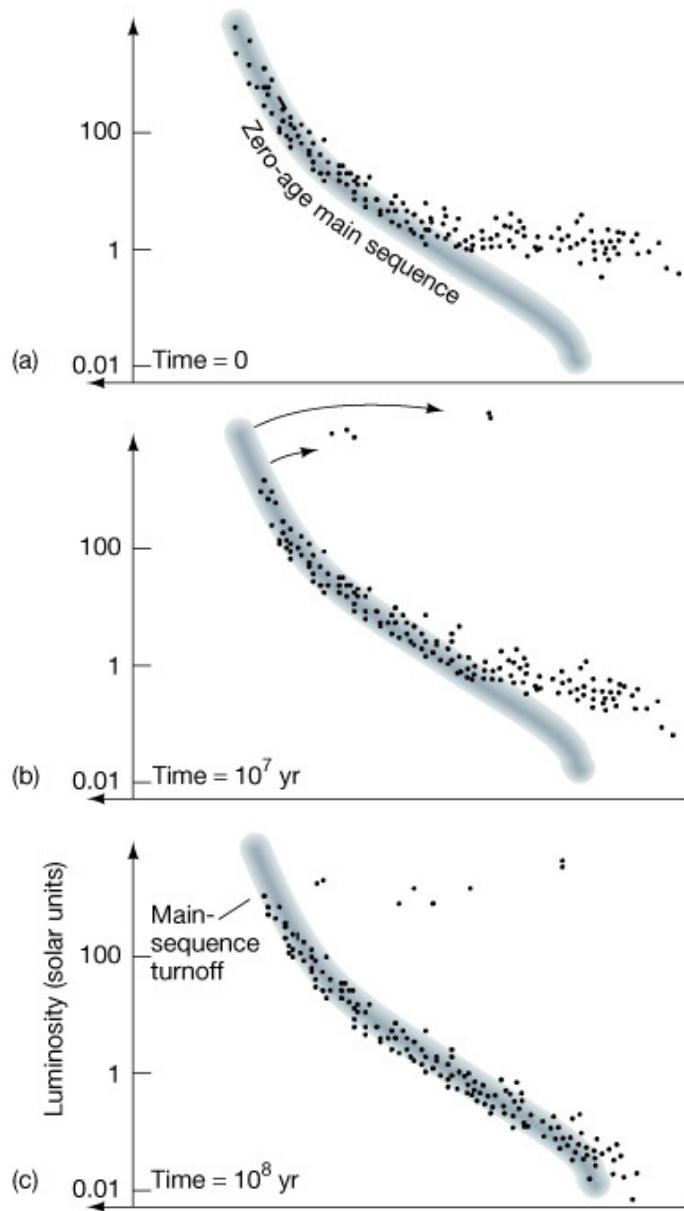




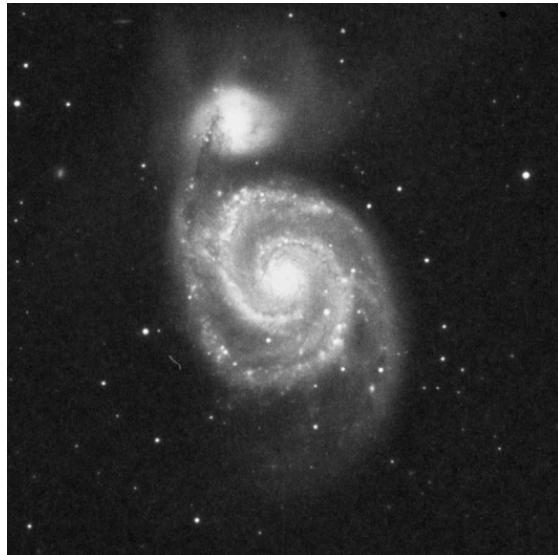


- A SPIRAL GALAXY
- Bird's Eye View
- Spiral arms
- Blue colors
- Young stars
- Gas and dust

M74 (with Gemini/GMOS)



Spiral galaxies



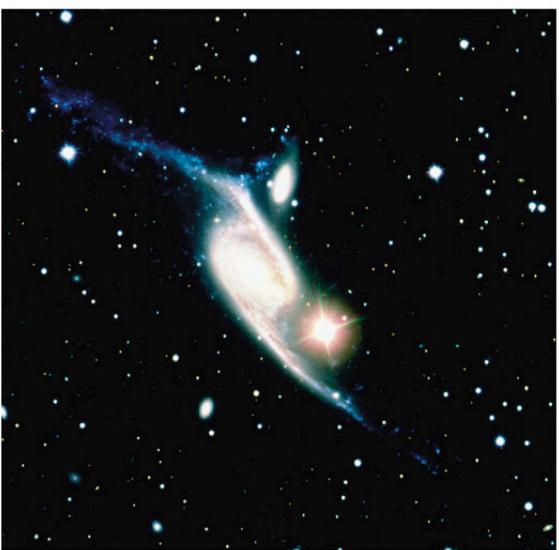
(a) NGC 3992

Type SBA



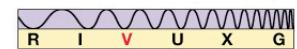
(b) NGC 1365

Type SBb



(c) NGC 6872

Type SBc



The Sombrero Galaxy



Visible + Infrared

Visible

Infrared

Sombrero Galaxy/Messier 104

NASA / JPL-Caltech / R. Kennicutt [University of Arizona], and the SINGS Team

Spitzer Space Telescope • IRAC

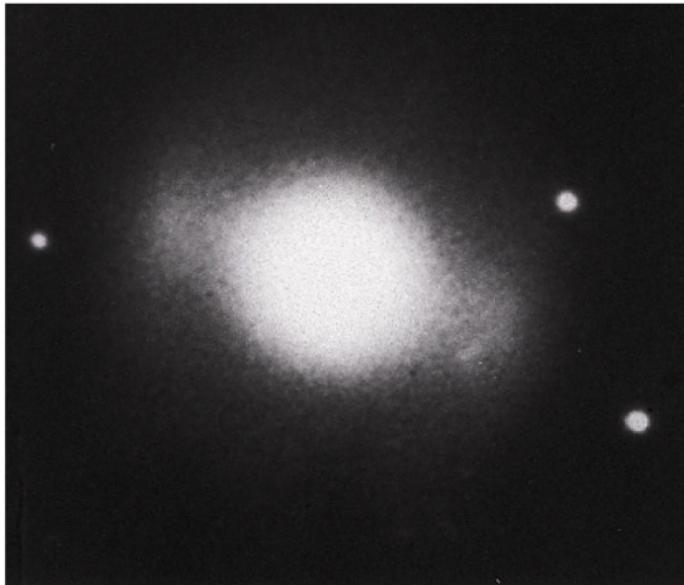
Visible: Hubble Space Telescope/Hubble Heritage Team

ssc2005-11a

- 
- AN ELLIPTICAL GALAXY
 - “Spheroid” (American to British) football shaped
 - Yellow/Red colors
 - Old stars
 - Little/no gas and dust

M87 © Anglo-Australian Observatory
Photo by David Malin

Elliptical Galaxies

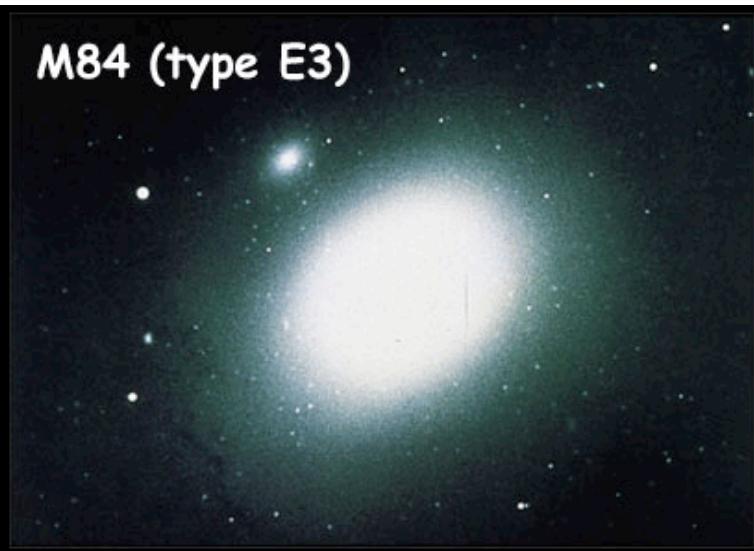


(b) NGC 2859

Type SB0



M49 (type E1)



M84 (type E3)

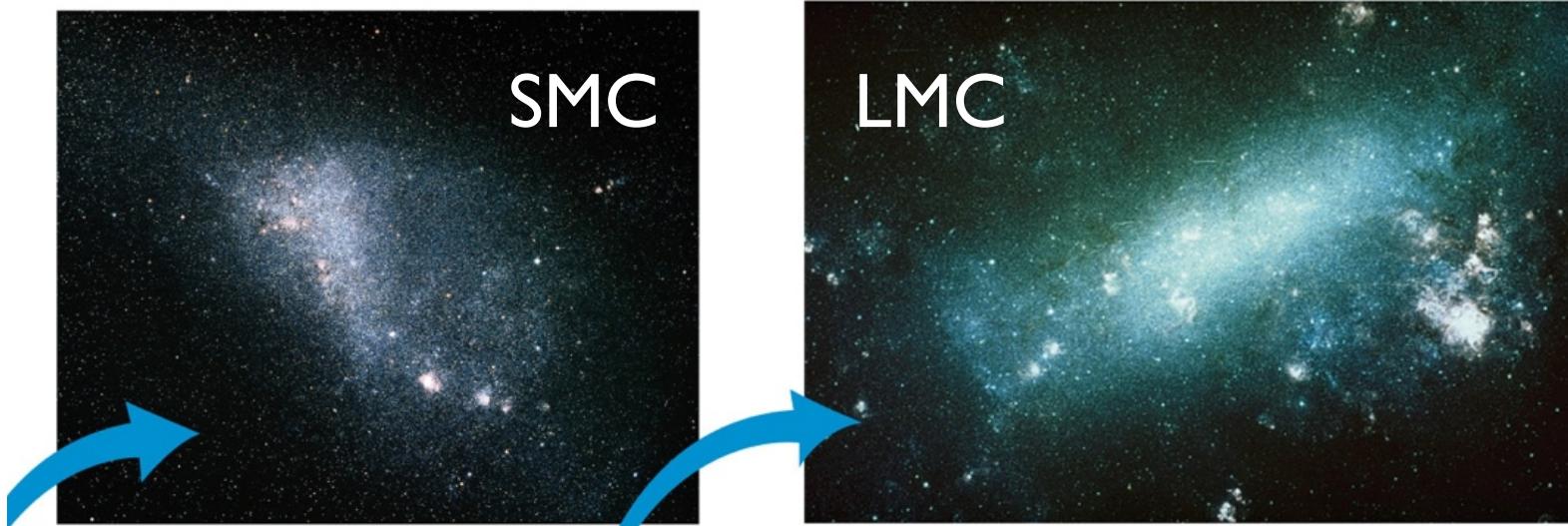
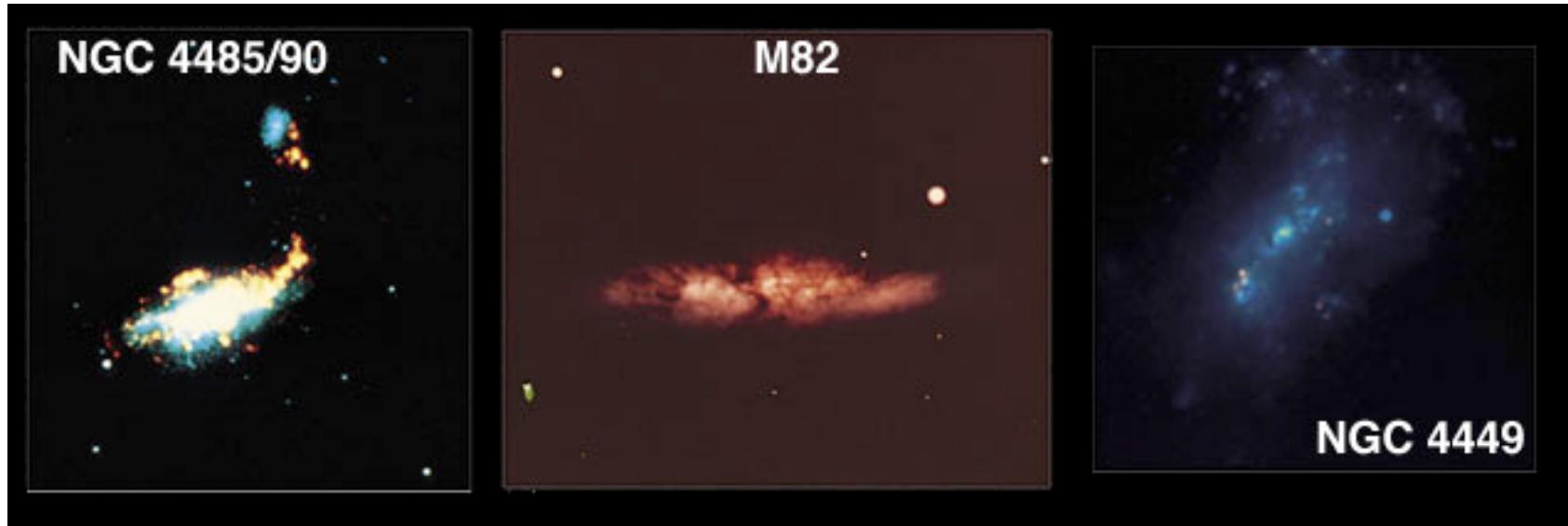


- AN IRREGULAR GALAXY
- “Messy”
- Blue colors
- Young stars
- Lots of gas and dust

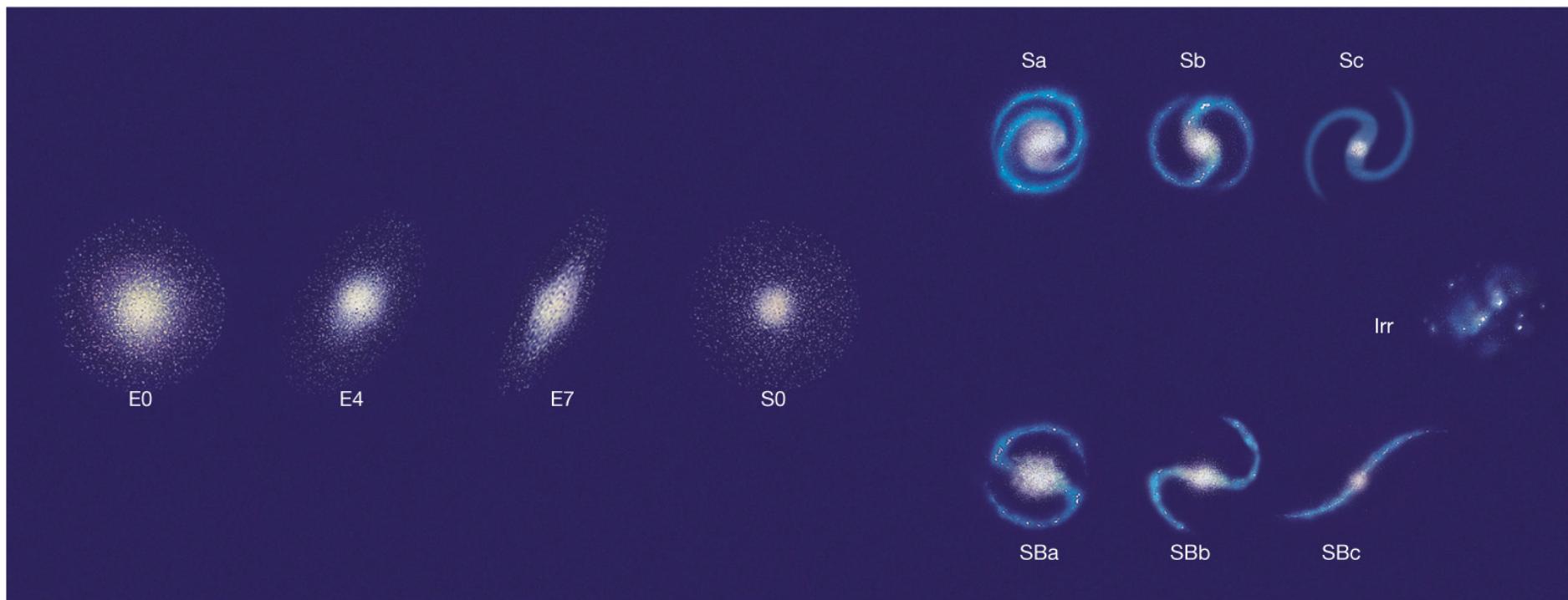
Large Magellanic Cloud

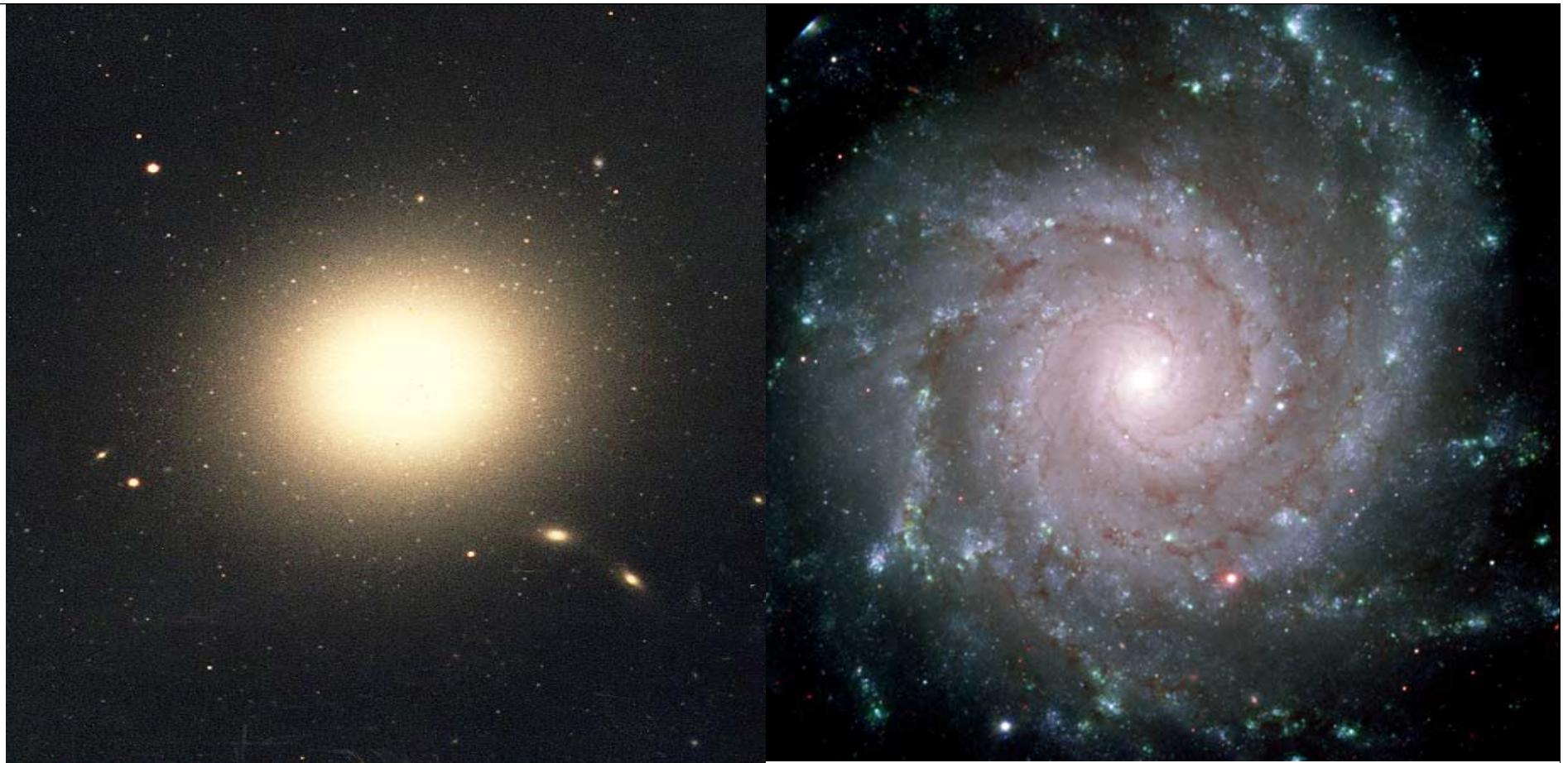
© Anglo-Australian Observatory/Royal Observatory, Edinburgh.

Irregular Galaxies

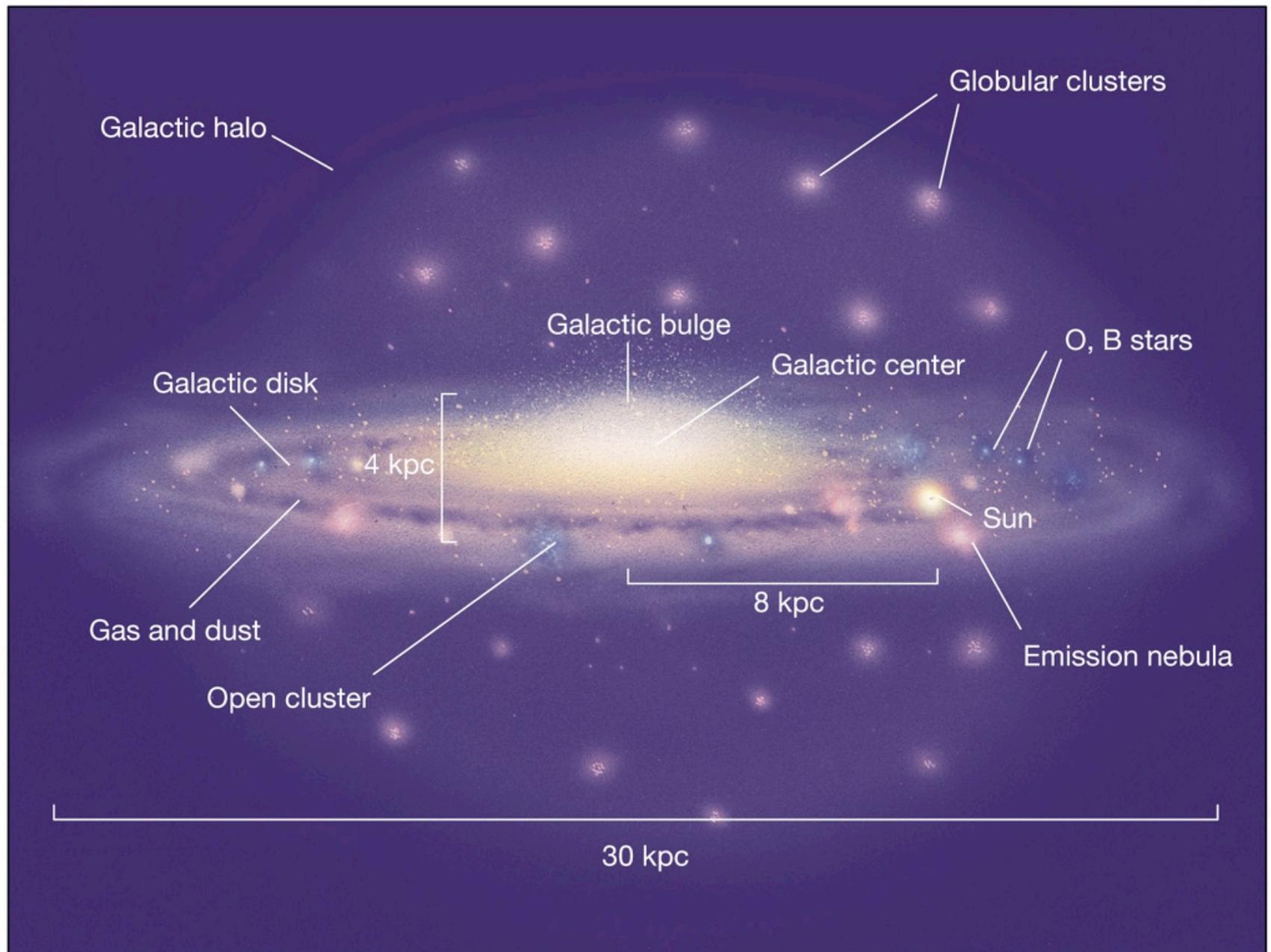


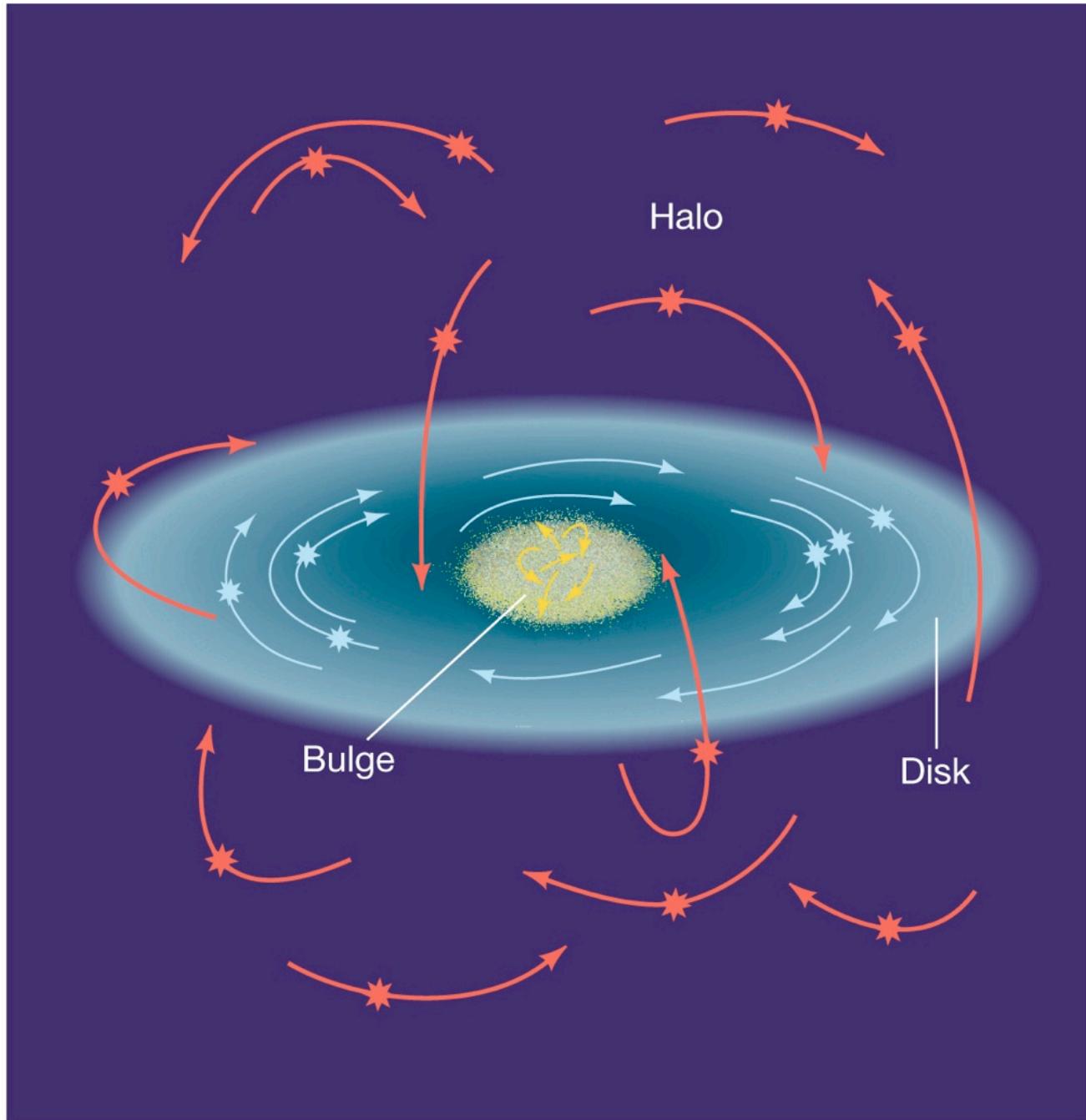
Hubble “Tuning-Fork” Diagram



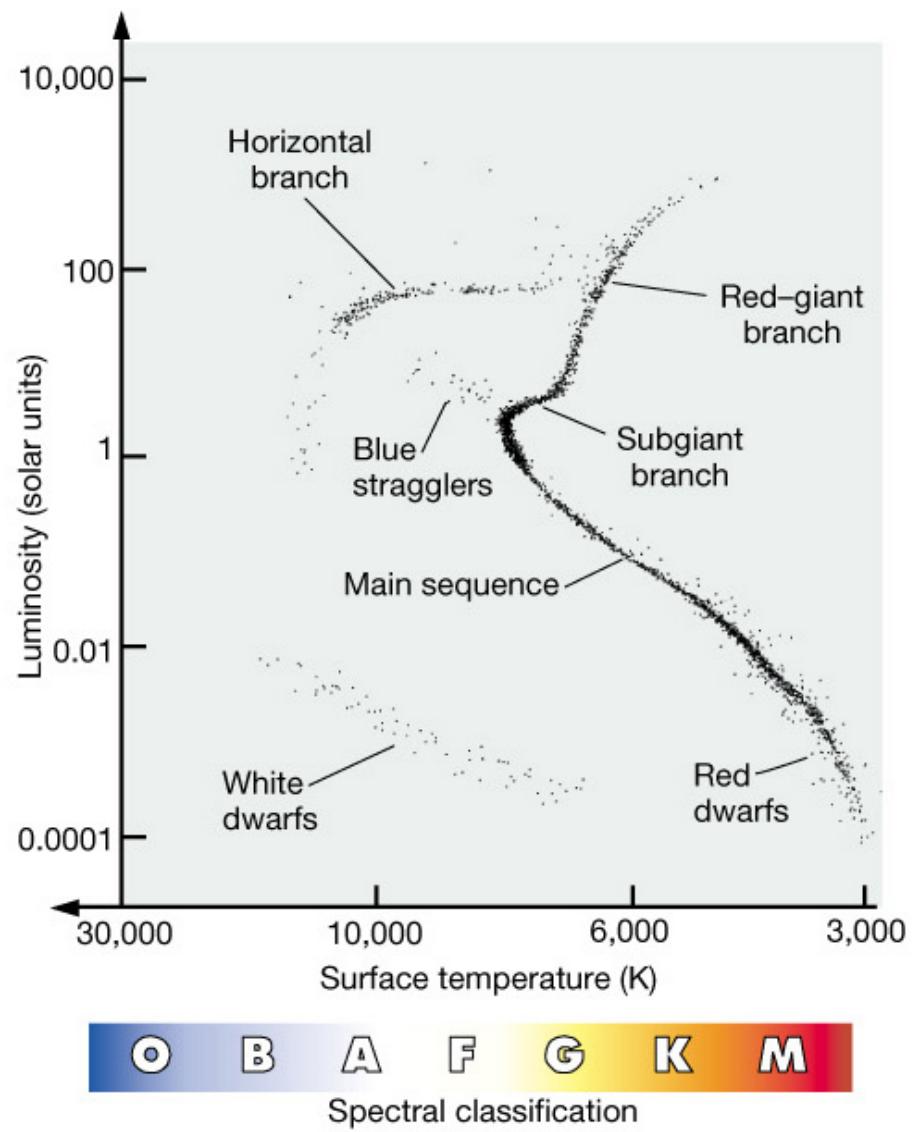
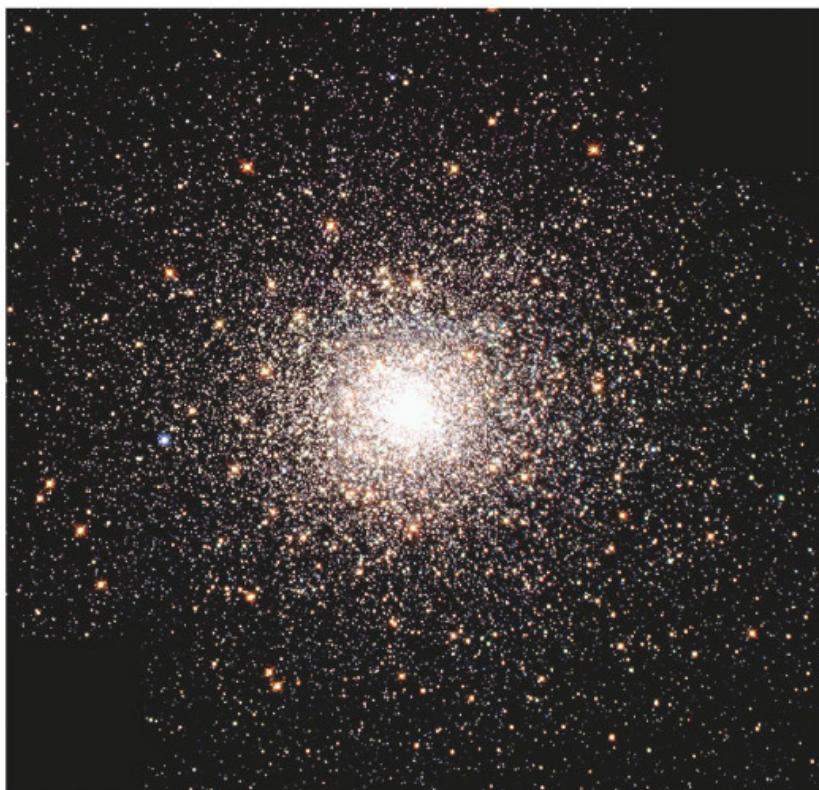


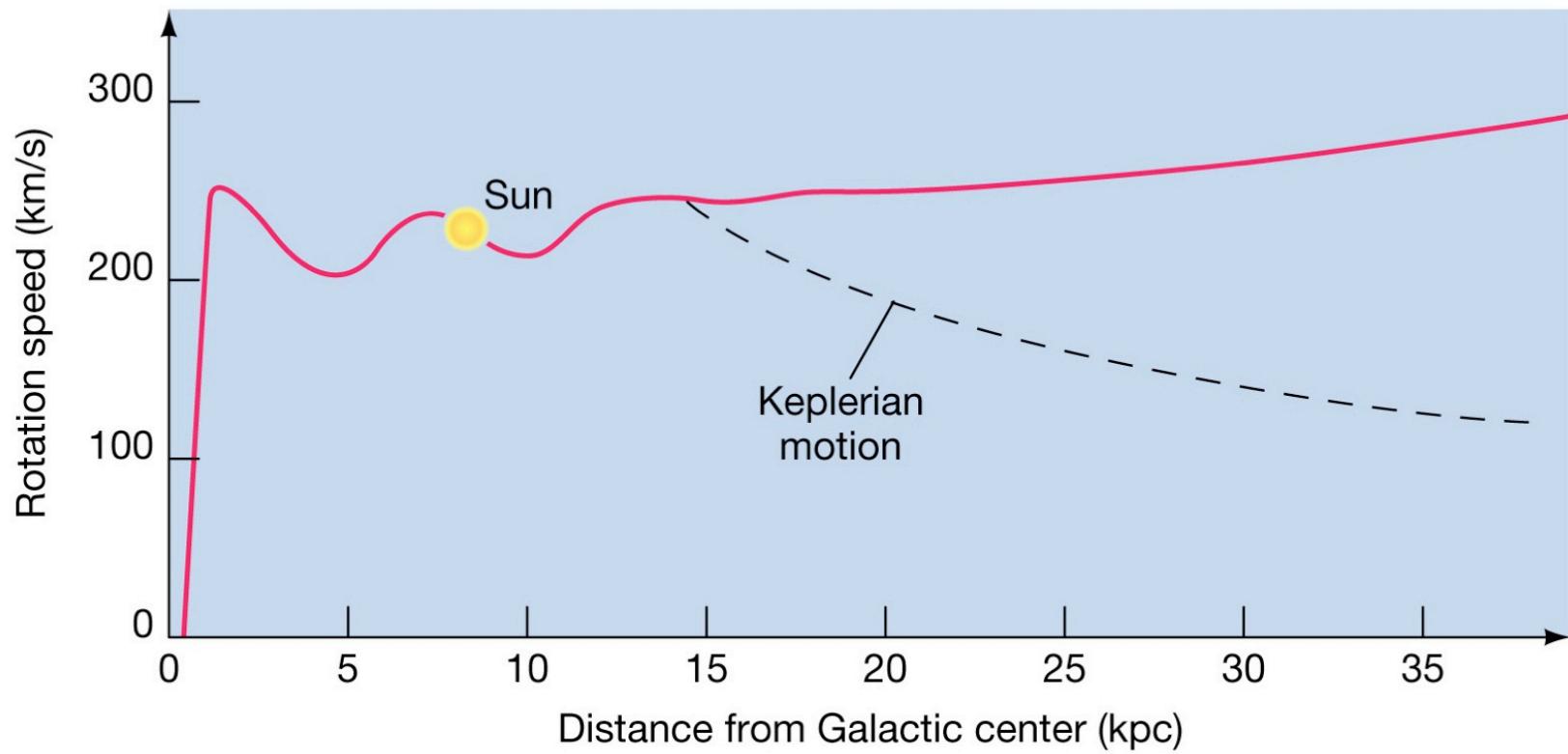
- 3 main types: **Ellipticals**, **Spirals**, **Irregulars**
- **BIG QUESTIONS:**
- **Why** are there different type of galaxies?
- **How, where** and **when** did galaxies form?

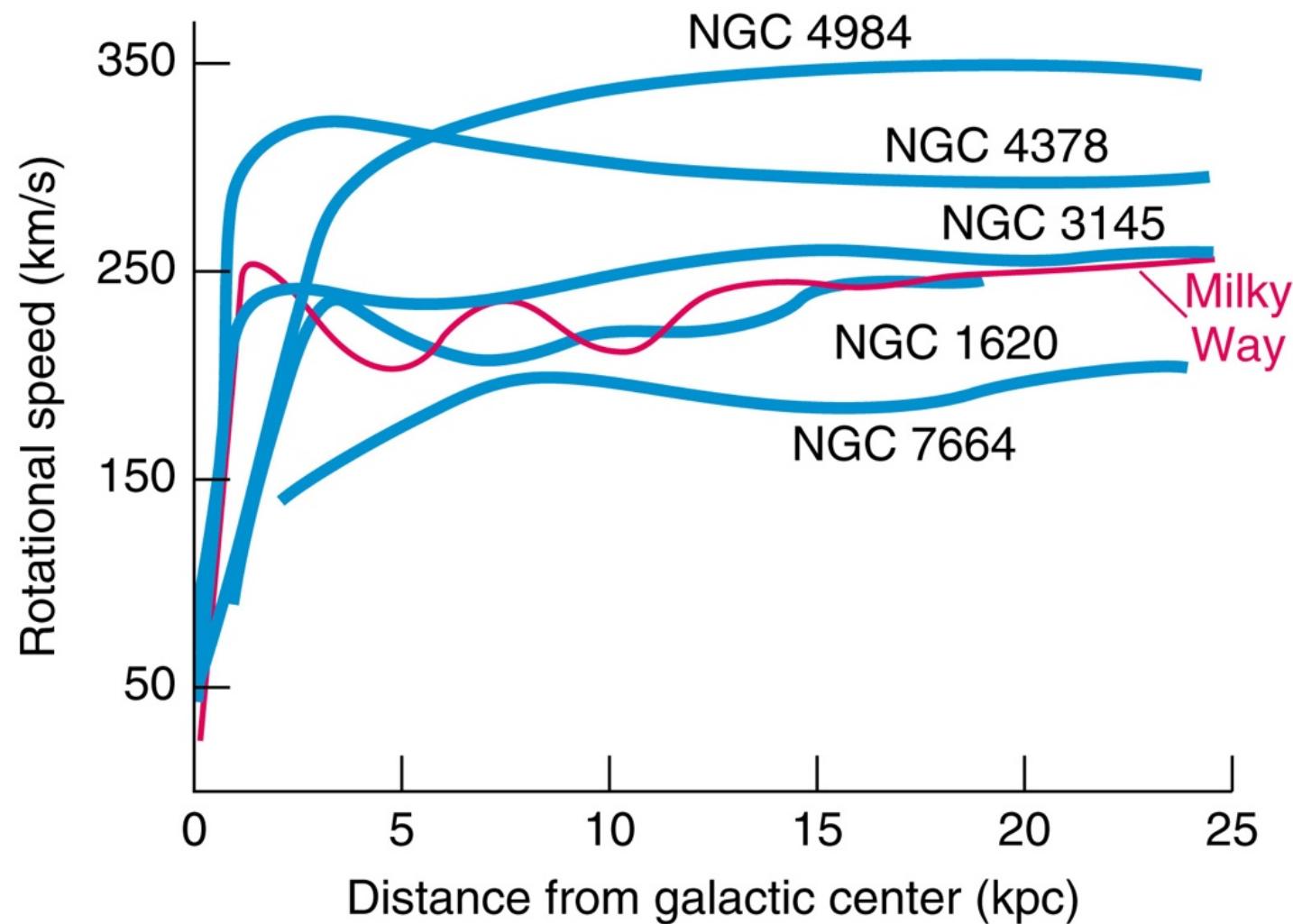


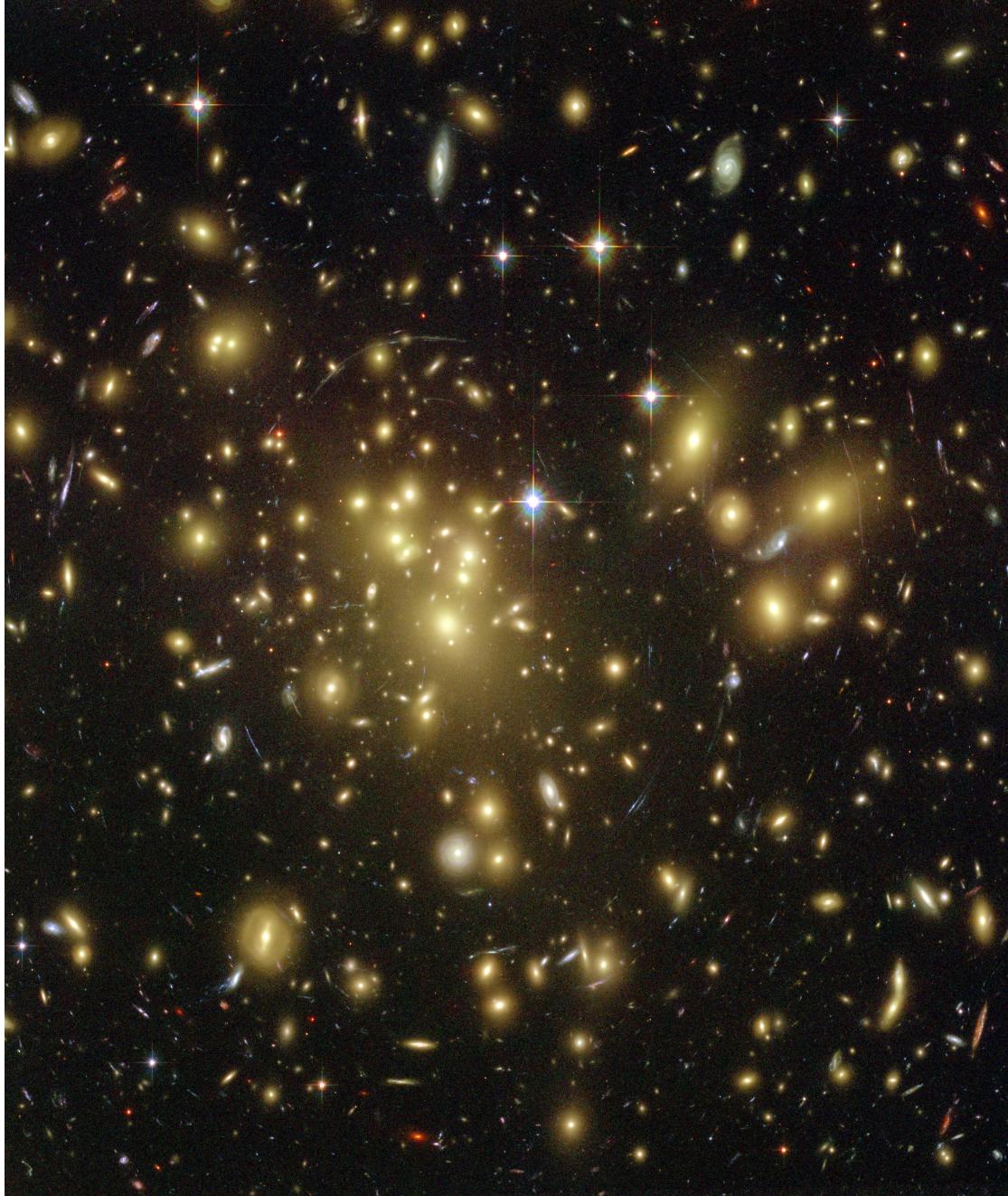


H-R Diagram of a Globular Cluster









- Galaxies can be found on their own or in groups
- Abell 1689
- Galaxy Cluster
- Mainly Elliptical galaxies

**There is mass (matter) in
the outskirts of galaxies
and in clusters of galaxies
that we know is there (due
to its gravitational effects)
but that we can't see....**

We call this “Dark Matter”.

**We don't know what most (80%)
of the Dark Matter is made of.**