

Chapter

The Universe

25.3

Be able to...

Describe the size and structure of the Milky Way Galaxy.

List the different types of galaxies.



Types of Galaxies



Spiral
NGC 4414



Elliptical
M87



Peculiar
Centaurus A



Irregular
Small Magellanic Cloud



Barred Spiral
NGC 1530

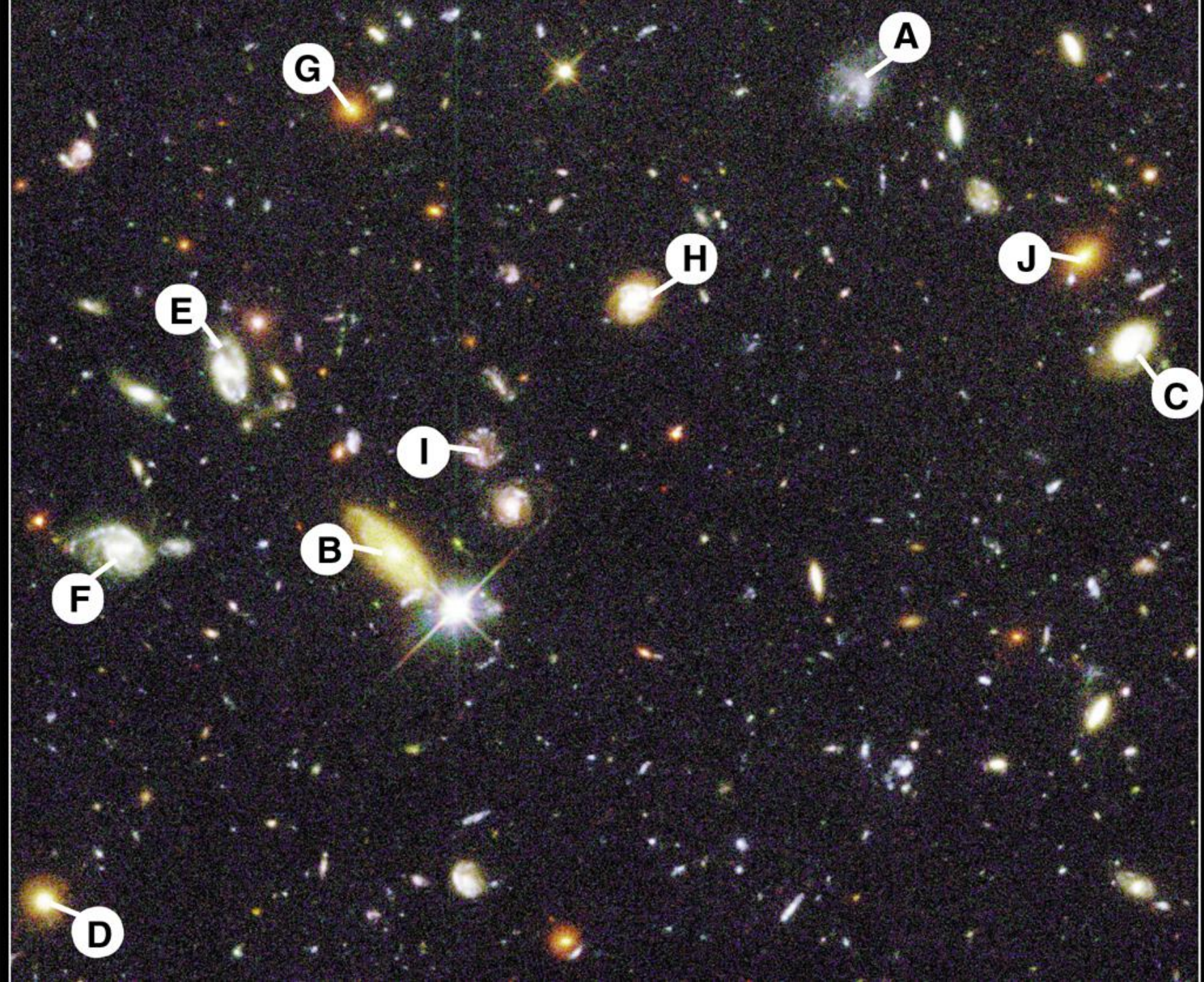
Optical galaxy images copyright AURA/NOAO/NSF
except NGC 4414, courtesy AURA/STScI/NASA



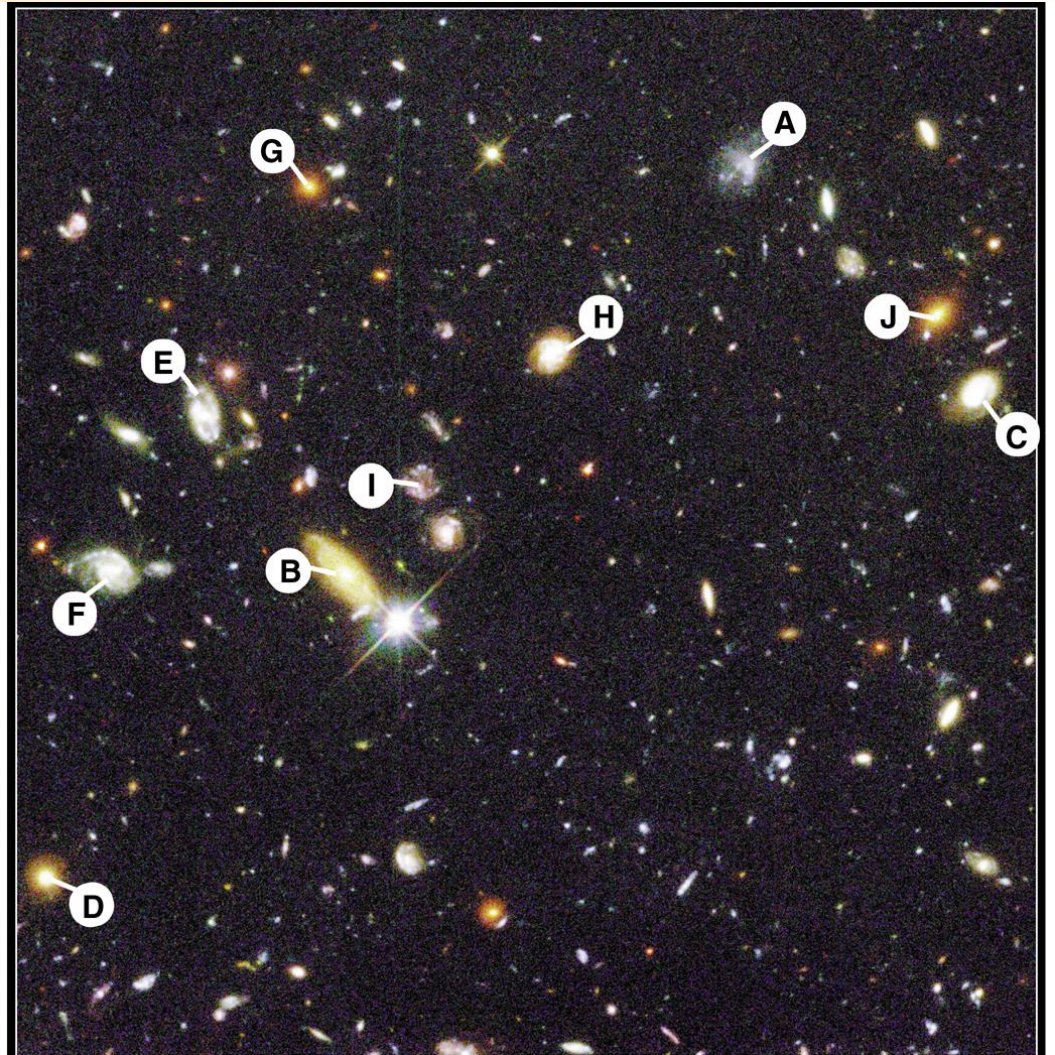
Chapter **The Universe**

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- **The "Hubble Deep Field" image was taken by the Hubble Space Telescope December 18 - 28, 1995.**
- **It was taken of a region near the handle of the Big Dipper, and covers a patch of sky about only 0.05 degrees across (equivalent to the width of a dime viewed 75 feet away).**
- **This region was chosen because there are very few stars there. So nearly every object in the image is a galaxy.**



- A. Irregular
- B. Spiral
- C. Spiral
- D. Elliptical
- E. Barred spiral
- F. Barred spiral
- G. Elliptical
- H. Spiral
- I. Irregular
- J. Elliptical



Galaxy

- ◆ A **galaxy** is a group of stars, dust, and gases held together by gravity.

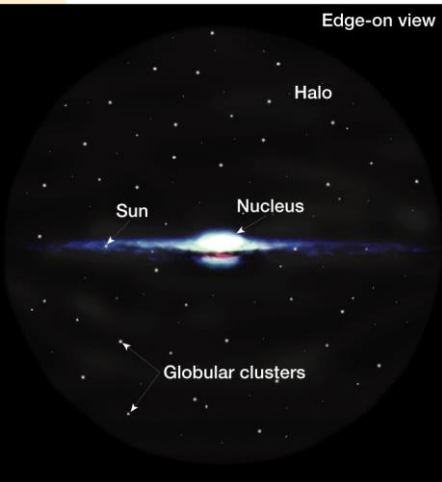
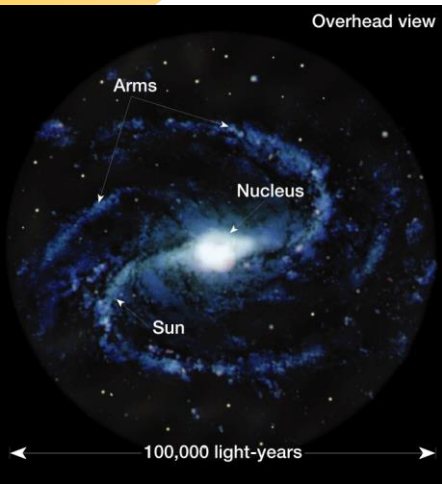




The Milky Way Galaxy

◆ Size of the Milky Way

- The Milky Way is a **spiral galaxy**
- **100,000** light-years wide
- **10,000** light-years thick at the nucleus.
- **~200 billion stars in it**
- It has a central bulge and the entire disk is surrounded by a **halo**.



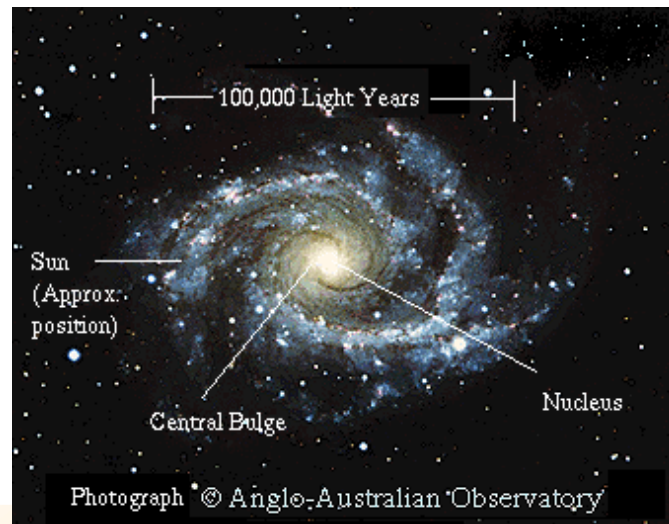
The Milky Way Galaxy

WELCOME
TO THE
MILKY WAY
EARTHLINGS



Structure of the Milky Way

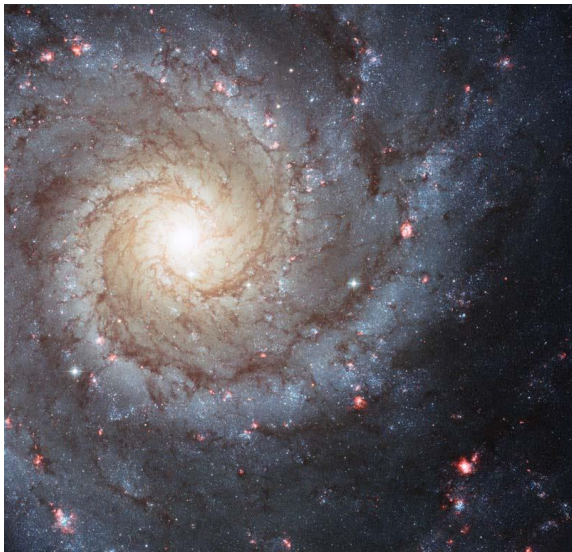
- ◆ Milky Way has at least three distinct spiral arms.
- ◆ A massive black hole (Sagittarius A) is at the center of it.
- ◆ We live on the outer edge of the galaxy
- ◆ It's hard to study our galaxy
 - To much matter blocks our view.
 - The arms are the most active star-forming regions.



Types of Galaxies

◆ 1) Spiral Galaxies

- About 30 percent of all galaxies are spiral galaxies.
- They have large diameters of 20,000 to 125,000 light-years and contain both young and old stars.



Types of Galaxies

◆ 2) Elliptical Galaxies

- About 60 percent of galaxies are classified as elliptical galaxies.
- Elliptical galaxies range in shape from round to oval.
- Little or no star formation in this type of galaxy.



Types of Galaxies

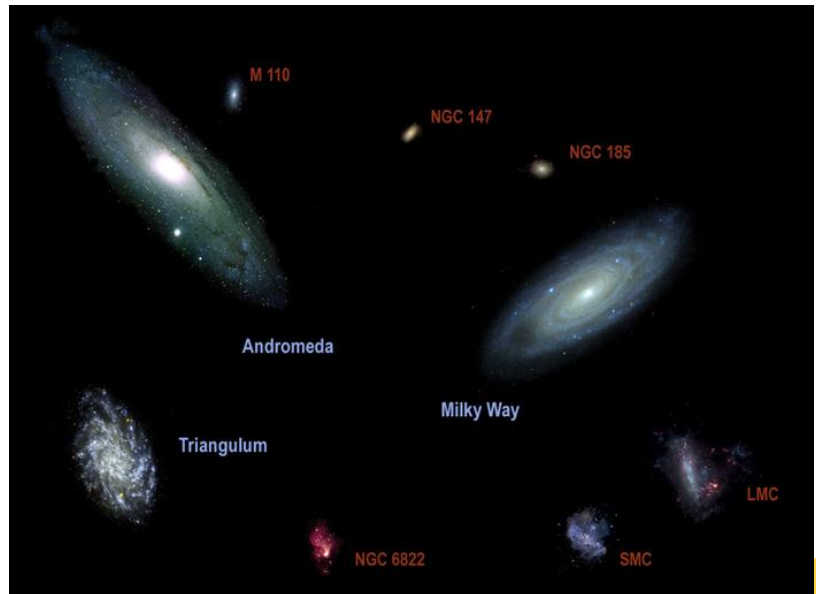
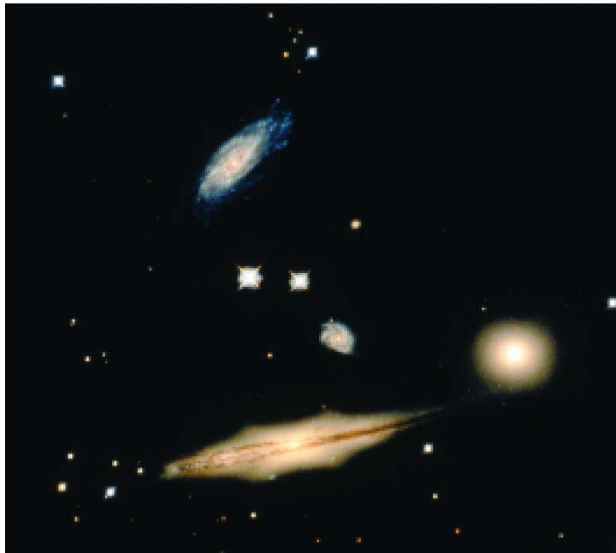
◆ 3) Irregular Galaxies

- Only 10 percent of the known galaxies have irregular shapes and are classified as irregular galaxies.
- Irregular galaxies contain young stars.



Galaxy Clusters

- A **galaxy cluster** is a system of galaxies containing several to thousands of member galaxies.
- Our Galaxy is in a group of galaxies they call the "**local group**." There are said to be about 45 galaxies in this group.



Chapter

The Expanding Universe

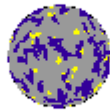
25.3

Be able to...

Describe how the universe began and identify the evidence that indicates the universe is expanding.

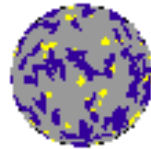
Red Shifts

- *Red shift, or a Doppler shift toward the red end of the spectrum, occurs because the light waves are “stretched,” which shows that Earth and the source are moving away from each other.*
- The **red** shifts of distant galaxies indicate that the universe is expanding.



The Big Bang

- ◆ The **big bang theory** states that at one time, the entire universe was confined to a dense, hot, supermassive ball.
- ◆ Then, about 13.7 billion years ago, a violent explosion occurred, hurling this material in all directions.



The Big Bang

◆ Supporting Evidence

- The red shift of galaxies supports the big bang and the expanding universe theories.
- Scientists discovered a type of energy called cosmic ***background radiation***. Scientists think that this radiation was produced during the big bang.