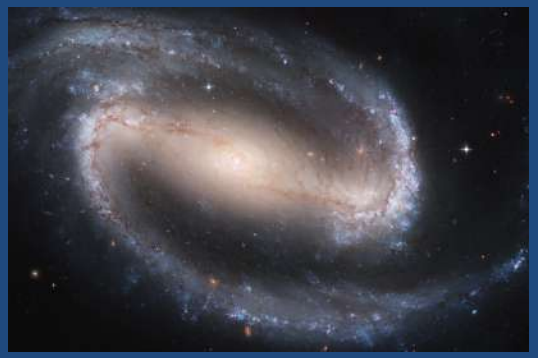
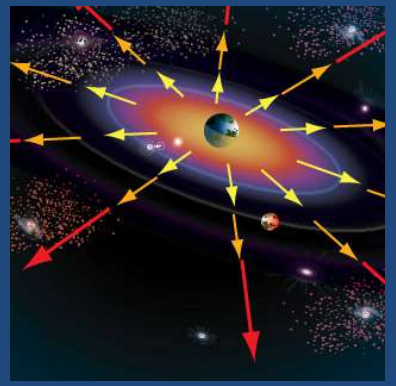
Galaxies, Other Objects and the Expansion of the Universe

- Types of Galaxies
- Asteroids
- Meteors, Meteoroids, and Meteorites
- Comets
- The expansion of the Universe





Galaxies

- Using a system invented by Edwin Hubble, astronomers classify galaxies into three major types:

1. _____

2. _____

3. _____

Galaxies

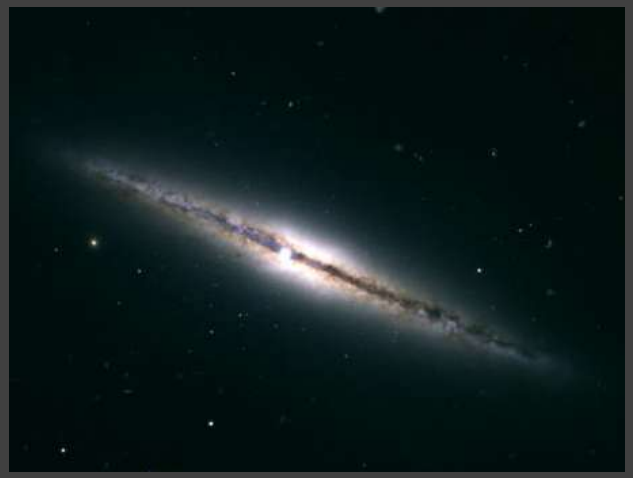
- The sizes of the three types span a wide range, from
  - _____
    - _____

to

  - _____
    - _____

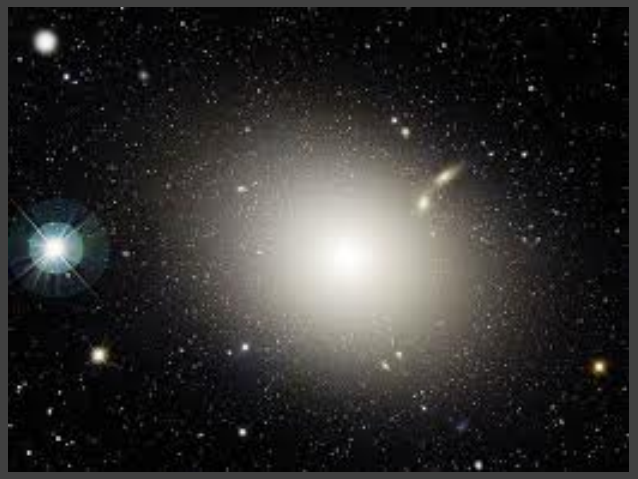
Spiral Galaxies





- _____
- Looks like a plate with a bulge from the side
- Has many long “arms” spiraling out from the centre
- Ex/ Ours – the Milky Way Galaxy

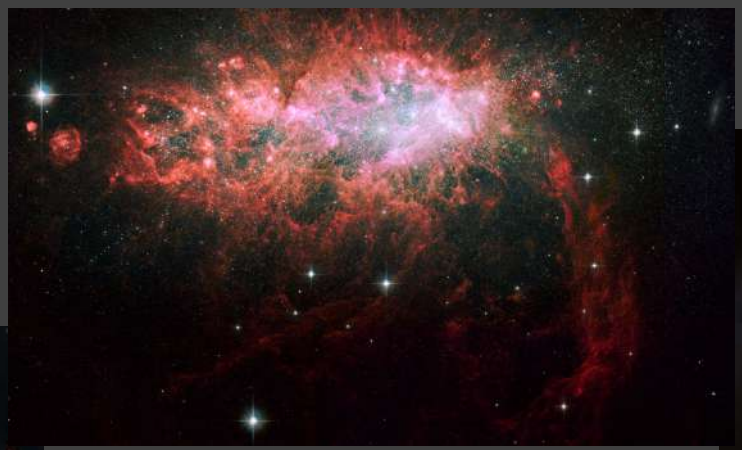
Elliptical Galaxies



- Range in shape from a perfect sphere to a stretched-out ellipse
- Contain some of the oldest stars in the universe
- _____

Irregular Galaxies

- A “none of the above” category; neither spiral nor elliptical
- _____



The Local Group

- We combine galaxies into groups based on location
- The Milky Way belongs to a group of about 40 Galaxies called the Local Group
- The diameter of the Local Group is about 10 million light years across

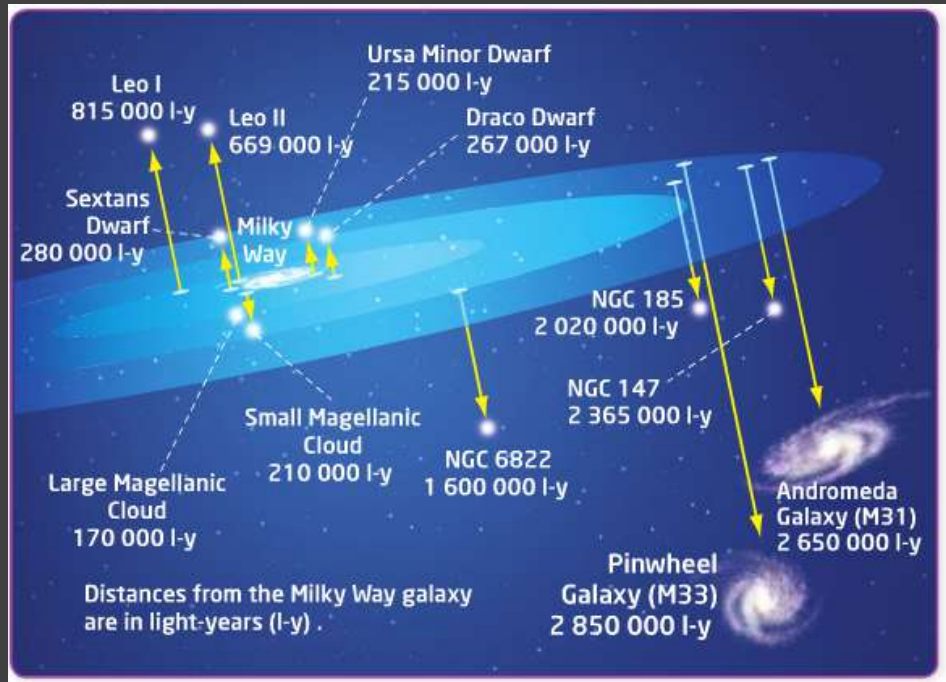


Figure 9.6 This image shows some of the galaxies in the Local Group. The yellow arrows are scaled to help you visualize the distances of each galaxy from the Milky Way.

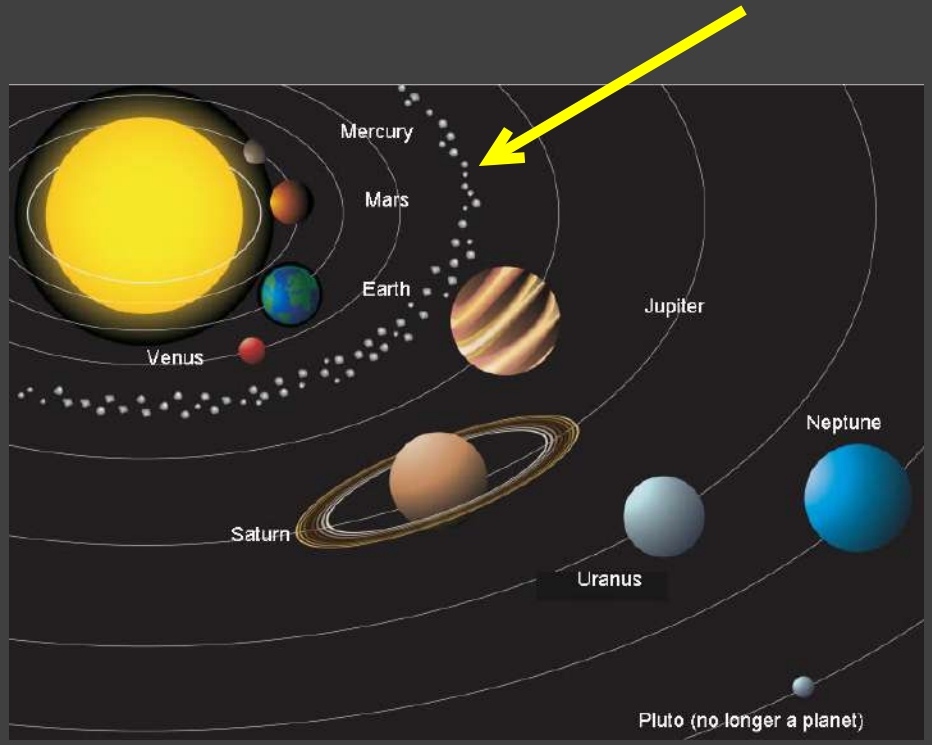
- There are 24 galaxies in the universe for every person living on Earth!

Note: images are not to scale

Other Objects In The Solar System

Asteroids

- Small rocky objects that orbit the Sun
- Thousands of small rocky objects in a ring is called the ASTEROID BELT (Between Mars and Jupiter)



Asteroids

- Size ranges from 6 meters to 933 km
- _____
- _____

Meteors and Meteorites

- Meteoroid is a lump of rock of metal that is pulled down by Earth's gravity

- Generally a small asteroid that has broken up or debris left behind by a comet

- A Meteor is a bright streak of light across the sky as a meteoroid burns up.

- Meteorite is a large meteoroid that _____

February 2013 Meteor Explosion over Russia

- The Meteor had an initial mass of about 12,000–13,000 metric tones (heavier than the Eiffel Tower), and measured between 17 and 20 meters in size (65 feet).

- It was moving at approximately 18.6 km/s (over 41,000 mph or 66,960 km/h), almost 60 times the speed of sound.

- It exploded 23.3 km above the ground releasing 500 kilotons of TNT, 20–30 times more energy than was released from the atomic bomb detonated at Hiroshima but without the radiation.

- The explosion injured thousands due to the release of energy which created a shockwave shattering windows and topping smaller structures.

Comets

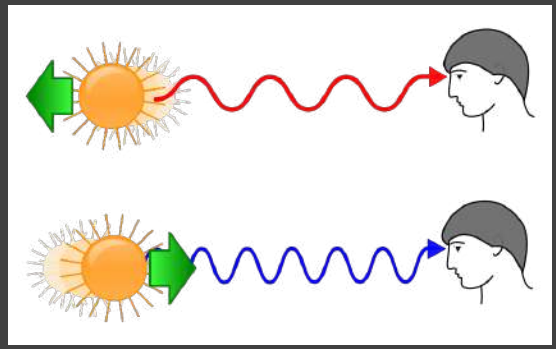
- Chunk of frozen matter (usually ice) that travels in a very long orbit around the sun.
- Comets have tails a few million km long
- When the comet approaches the sun, it is warmed. _____

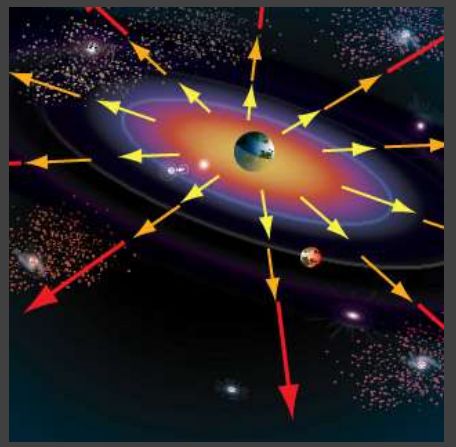
The Big Bang Theory

- The Universe started out as an extremely compact, small and unimaginably dense structure
- The Universe began expanding _____

The Universe is Still Expanding

- We know this due to the phenomenon known as red and blue shift.
- When objects are moving away at a fast rate, they appear red. When they are moving towards you quickly, they appear blue.
- _____





The Universe Timeline