

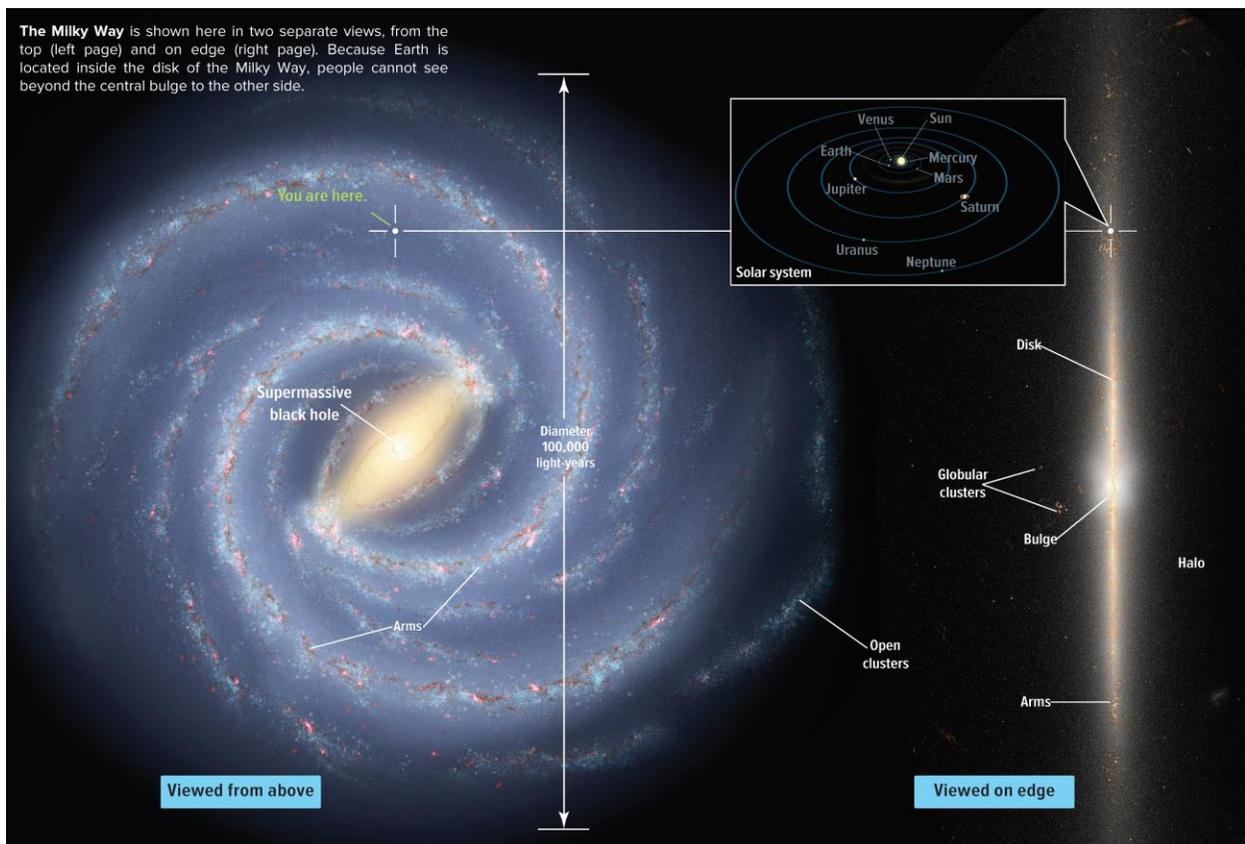
# Notes Unit 4- The Universe: Part 9 Objects in the universe

## 4.4- Galaxies and the Universe

**Galaxies** are huge collections of stars. The Milky Way is one of billions of other galaxies in the universe. The universe contains hundreds of billions of galaxies, and each galaxy can contain hundreds of billions of stars.

### The Milky Way

The solar system is in the Milky Way, a spiral galaxy that contains gas, dust, and almost 200 billion stars. The Milky Way is a member of the Local Group, a cluster of about 30 galaxies. Scientists expect the Milky Way will begin to merge with the Andromeda Galaxy, the largest galaxy in the Local Group, in about 3 billion years. Because stars are far apart in galaxies, it is not likely that many stars will actually collide during this event.



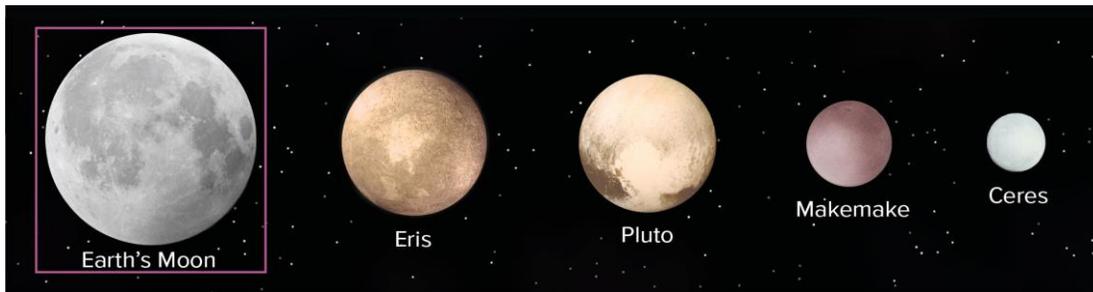
The **Big Bang theory**, the universe began from one point billions of years ago and has been expanding ever since.



### 3.4- Dwarf Planets and Other Objects

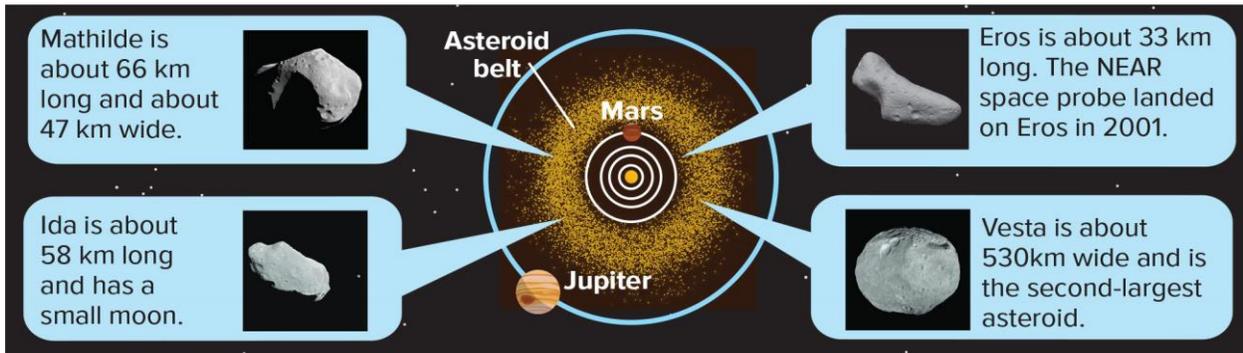
**Dwarf Planets-** In 2006, the International Astronomical Union (IAU) adopted “**dwarf planet**” as a new category. The IAU defines a dwarf planet as an object that orbits the Sun, has enough mass and gravity to form a sphere, and has objects similar in mass orbiting near it or

crossing its orbital path. Astronomers classify Pluto, Ceres, Eris, Makemake (MAH kay MAH kay), and Haumea (how MAY uh) as dwarf planets.

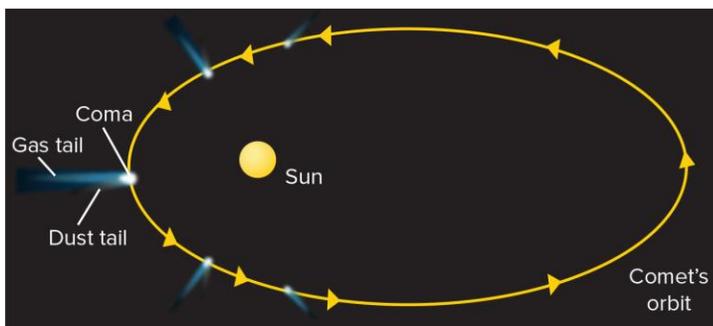


**Asteroids-** are pieces of rock and ice. Most asteroids orbit the Sun in the asteroid belt. The asteroid belt is approximately 3.2 AU from the Sun between the orbits of Mars and Jupiter, as shown above. Hundreds of thousands of asteroids have been discovered. The

largest asteroid, Pallas, is over 500 km in diameter.



**Comets-** are mixtures of rock, ice, and dust. The particles in a comet are loosely held together by the gravitational attractions among the particles.

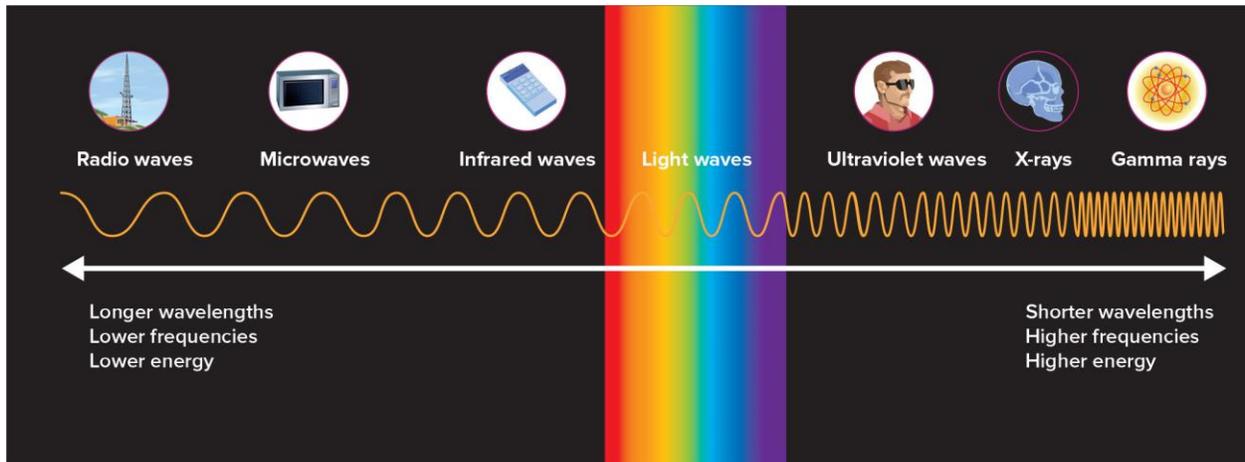


Every day, many millions of particles called meteoroids enter Earth's atmosphere. A **meteoroid** is a small, rocky particle that moves through space.

## 1.1- Observing the Universe

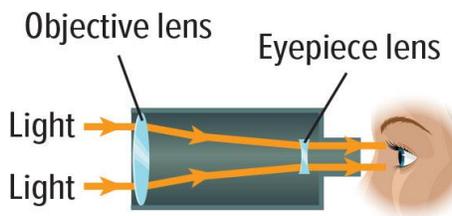
Electromagnetic waves are different from mechanical waves, such as sound waves. Sound waves can transfer energy through solids, liquids, or gases.

**Electromagnetic waves** can transfer energy through matter or through a vacuum, such as space. The energy they carry is called radiant energy.

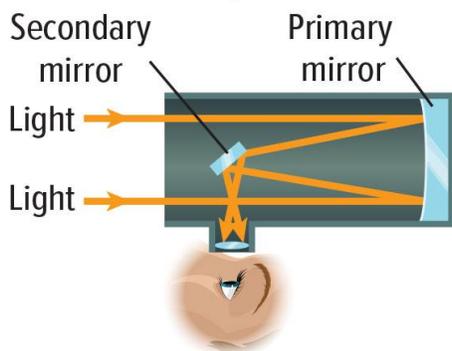


**Telescopes** enable astronomers to observe many more stars than they could with their eyes alone. Telescopes are designed to collect a certain type of electromagnetic wave.

### Refracting telescope



### Reflecting telescope



**Hubble Space Telescope-** The first optical space telescope was launched in 1990. The *Hubble Space Telescope* is a *reflecting* telescope that orbits Earth.