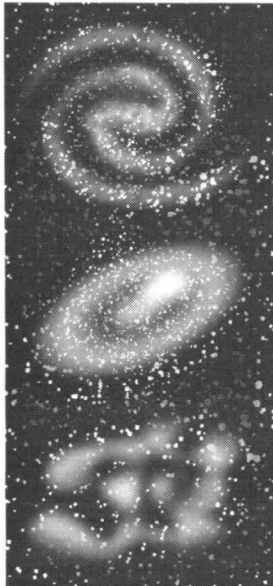
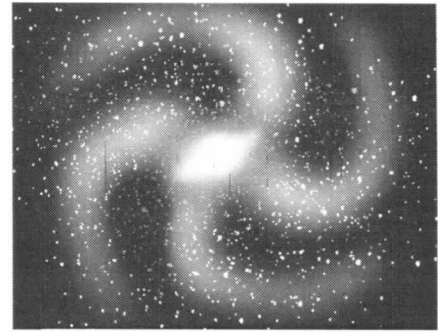


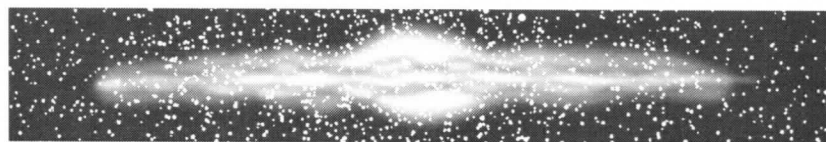
Unit 9: The Milky Way Galaxy and Beyond

Student Information

Stars are found in clustered groups called **galaxies**. Some of them are giant spirals, some of them are shaped like ellipses, and others are irregular in shape. We live in a large, spiral galaxy called the **Milky Way**. The stars shine in such numbers in one strip across the sky that they look like spilled milk; thus, the name, Milky Way. The Milky Way is home to a huge number of stars, about 100 billion, and it has an estimated mass of around 200 billion times the mass of the sun. Most of the outer region of the Milky Way is a flattened spiral of stars called the Galactic disc. The stars in the Galactic disc are organized into three or four spiral trails, called arms. Our sun is along the Orion spiral arm.



Our galaxy resides in a region of space that contains about 36 galaxies that are clustered together in what astronomers call the **local group**. Most of the galaxies in the group are smaller than the Milky Way and do not have its spiral shape. Galaxies come in several shapes and sizes. Scientists have divided them into three basic types: **spiral galaxies**, **elliptical galaxies**, and **irregular galaxies**. **Spiral galaxies** are pinwheel-shaped galaxies like our own Milky Way. They have a flat disc-like part that is filled with stars, gas, and dust. The stars wind outward from the center in spiral arms. Sometimes there is a spherical bulge in the center of them. **Elliptical galaxies** are galaxies without spiral arms. They are shaped like ellipsoids (three-dimensional ellipses) or spheres. There are more elliptical galaxies than any other type. **Irregular galaxies** are small galaxies that do not have a definite shape. Some of them just look like big clusters of stars, while others have some structures that look like unattached pieces of spiral arms.



Constellations are groups of stars imagined to form figures or designs in the night sky. They were given names by early Greek astronomers after animals, mythological characters, or familiar objects. The star Polaris (North Star) in the constellation Ursa Minor (the Little Bear) is above Earth's North Pole. Ursa Minor is also known as the Little Dipper. By finding the last star, Polaris, in the handle of the Little Dipper, travelers could know in which direction north lay. Astronomers officially recognize a total of 88 constellations. Different constellations are visible at different times of the year. Constellations also change during the night because stars rise and set like the sun due to Earth's rotation. Constellations seen in the Southern Hemisphere are different from those seen in the Northern Hemisphere.

Name: _____ Date: _____

Quick Check

Matching

- | | |
|------------------------------|---|
| _____ 1. Milky Way | a. galaxies that do not have a definite shape |
| _____ 2. elliptical galaxies | b. galaxies without spiral arms |
| _____ 3. irregular galaxies | c. Little Dipper |
| _____ 4. constellations | d. looks like spilled milk |
| _____ 5. Ursa Minor | e. groups of stars imagined to form figures or designs in the night sky |

Fill in the Blanks

6. Stars are found in clustered groups called _____.
7. Most of the outer region of the Milky Way is a flattened spiral of stars called the _____.
8. Scientist have divided the galaxies into three basic types: _____, _____, and _____.
9. _____ are galaxies without spiral arms.
10. _____ are small galaxies that do not have a definite shape.

Multiple Choice

11. Astronomers officially recognize a total of _____ constellations.
- a. 1924 b. 88 c. a hundred billion d. 124
12. The last star in the handle of the Little Dipper is called _____.
- a. Polaris b. Little Bear c. the Milk Way d. the spiral arm
13. Constellations change during the night because _____.
- a. they are big clusters of stars b. it's dark
- c. stars are a flattened spiral d. stars rise and set

What Is a Comet?—A “Dirty Snowball”

Structure of Comets

Like the planets and the asteroids, comets are also members of our solar system. The appearance of a comet near Earth is a spectacular sight. These small members of our solar system are actually ice, rock, frozen gas, and dust. They are sometimes described as “dirty snowballs.” The structure of a comet includes three parts. The **core**, or **nucleus**, is made up of frozen water and gases mixed with pieces of rocks and metal. The halo, called the **coma**, is a cloud of gas that surrounds the nucleus. Extending out from the coma is one or more **tails**. As the comet moves closer to the sun, the ice thaws and turns to vapor. This forms the coma of a comet. The nucleus and the coma form what is called the head of a comet. The comet’s tail, a cloud of gas and dust, appears as a streak of light that points away from the sun.

How Comets Form

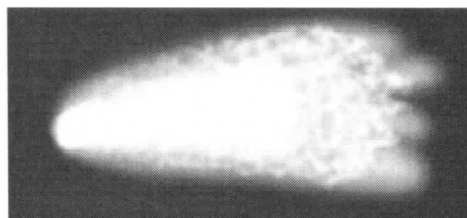
Comets are believed to be formed from the **Oort cloud**, a vast, moving mass of icy cosmic debris that lies beyond the orbit of Pluto. Gravity from a passing star causes a chunk of icy rock to break free. The force propels the comet toward the inner regions of our solar system. As it approaches the sun, the ice within it vaporizes and forms the glow. Very bright comets can be seen without a telescope. Comets travel in long **ellipses**, or deep orbits, around the sun. For most of their trip around the sun, they are invisible. Comets were formed billions of years ago when the solar system was young.

Long-Distance Travelers

Most comets take many years to complete a single orbit called a **period**. Short-orbit comets complete their orbits in less than two hundred years. These comets move within the area in which the planets are located. Other comets have huge, deep orbits that may take millions of years to complete. With each solar trip, a comet loses some of its material because the nucleus is being vaporized. Over time, it appears less bright, and all that is left are small particles. These small particles, which are spread throughout the comet’s orbit, combine with particles from other sources and form **meteoroids**.

Famous Comets

The most famous short-orbit comet is Halley’s comet. Halley’s comet appears every 75 to 76 years. Its most recent arrival was in 1986, and it is expected to return in 2061. NASA is planning a future mission called Comet Rendezvous and Asteroid Flyby (CRAF). The mission may include flying with a comet’s nucleus for a period of time, and a lander may set down on the comet’s nucleus. Would you like to be a part of that future encounter?



Name: _____ Date: _____

What Is a Comet?: Reinforcement Activity

To the student explorer: Can you explain what a comet is? _____

Analyze: Why are comets sometimes called "dirty snowballs"? _____

Directions: Complete the sentences below.

1. The three parts of a comet are the nucleus, the _____, and the _____.
2. Comets orbit the sun in long _____.
3. _____ comet orbits the sun every 75 to 76 years.
4. The _____ is a moving mass of icy cosmic debris from which comets are thought to originate.
5. For most of their trip around the sun, comets are _____.
6. Comets get _____ each time they complete a solar trip.
7. The _____ of a comet is a cloud of gas and dust that appears as a streak of light.
8. The comet's _____ is made of frozen water, gas, and pieces of rocks and metals.
9. The _____ is a cloud of gas that surrounds the nucleus.
10. Comets formed _____ of years ago when the solar system was young.
11. Small pieces of an old comet's nucleus combine with other particles in space to form _____.
12. Ice and dust _____ as the comet comes near the sun.

Directions: Can you label the parts of the comet drawn below?

A. _____ B. _____ C. _____

