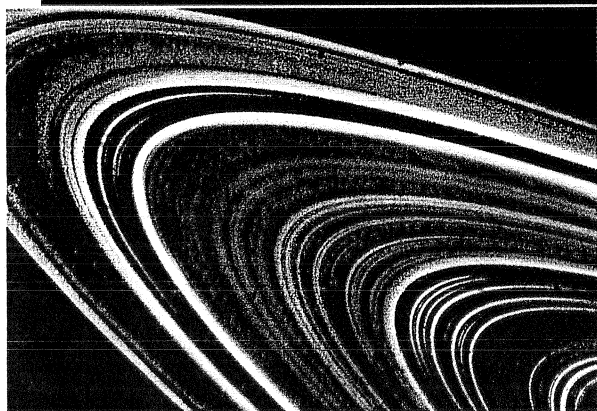


Chapter 17 The Solar System



▲ **Figure 17-1** Saturn's majestic rings, shown here in false colors, were first seen by Galileo in 1610.

Saturn is the second largest planet in our solar system. Its beautiful rings make it the easiest planet to recognize. Like Jupiter, Saturn is a huge ball made mostly of gas. It is surrounded by clouds. Saturn is ten times farther from the Sun than Earth is. To the naked eye, it looks bright yellow. Computers often enhance the images taken of Saturn using false colors. This allows its atmosphere and its many individual rings to be seen.

► What do you think Saturn's rings might be made of?

Contents

- 17-1 What is the solar system?
- 17-2 What do we know about orbits?
 - **The Big Idea:** What keeps the planets and moons in orbit?
- 17-3 What do we know about Earth's Moon?
- 17-4 What are the other moons in the solar system?
 - **Lab Activity:** Looking Back in Time
- 17-5 What do we know about Mercury, Venus, and Earth?
- 17-6 What do we know about Mars?
- 17-7 What are asteroids and meteoroids?
- 17-8 What do we know about Jupiter and Saturn?
- 17-9 What do we know about Uranus, Neptune, and Pluto?
- 17-10 What is a comet?

17-1

What is the solar system?

Objectives

Name the planets that make up the solar system.
Describe how they are grouped.

Key Terms

solar system: Sun and all the objects that orbit the Sun

nebula (NEHB-yuh-luh): cloud of gas and dust in space

orbit: curved path of one object around another object in space

Formation of the Solar System The **solar system** is the Sun and all the objects that orbit it. Scientists are not sure how the solar system formed. However, several theories have been developed. One popular theory states that the solar system formed from a spinning cloud of gas and dust called a **nebula**.

Scientists think that gravity caused the nebula to shrink, or contract, to form the Sun. After the Sun formed, the leftover gas and dust in the nebula formed the other objects in the solar system. This took many millions of years.

The Sun contains more than 99.8 percent of the mass in our solar system. The planets make up most of the rest of the mass.

1 DEFINE: What is a nebula?

The Sun's Family The Sun has a "family" of nine planets, more than 90 moons, and countless chunks of debris made of rock, ice, and gas. Together, these objects fill a volume of space about 10 trillion km in diameter. Almost all of this space is surrounded by one or more sphere-shaped clouds of comets.

Ancient peoples observed that the planets changed their positions among the stars. The planets seemed to wander in the sky. The word *planet* comes from a Greek word meaning "wanderer."

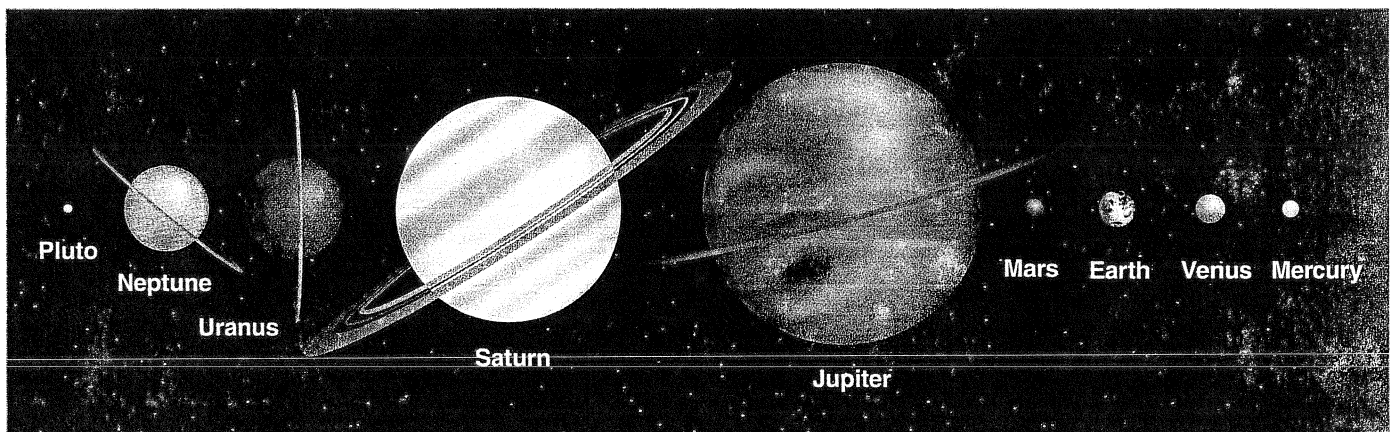
Earth is one of the nine planets in the solar system. Like the other planets, Earth moves in a curved path around the Sun. This path is the planet's **orbit**. All of the planets orbit the Sun in the same direction.

2 EXPLAIN: Why were the planets called wanderers?

The Inner and Outer Planets The nine planets are often divided into the inner planets and the outer planets. Mercury, Venus, Earth, and Mars are the inner planets. They are all fairly small and rocky.

The outer planets are the gas giants Jupiter, Saturn, Uranus, and Neptune. Pluto is also an outer planet. However, like the inner planets, Pluto is small and rocky. The inner and outer planets are separated by the Asteroid Belt, which contains billions of smaller rocks.

3 CLASSIFY: Which are the inner planets?



▲ Figure 17-2 The solar system contains nine planets. They are divided into the inner planets and the outer planets.

✓ CHECKING CONCEPTS

1. The solar system may have formed from a _____.
2. The solar system contains _____ planets.
3. A nebula is a _____.
4. The path of a planet around the Sun is the planet's _____.
5. The planets can be divided into two groups, the inner planets and the _____ planets.
6. The _____ separates the inner and outer planets.



THINKING CRITICALLY

7. **SEQUENCE:** List the planets in order from nearest to the Sun to farthest from the Sun.
8. **HYPOTHESIZE:** Why is the solar system often referred to as the Sun's "family"?

BUILDING SCIENCE SKILLS

Researching As seen from Earth, some planets seem to have unusual motions in their orbits. For example, early astronomers were puzzled to discover that for part of the year Mars and some other planets seemed to move backward in their orbits compared with the movements of Earth. Do research to find out why Mars and some other planets seem to sometimes exhibit these "retrograde" motions. Draw a diagram of these motions and write a report explaining them.



◀ **Figure 17-3** Mars, along with some other planets, exhibits retrograde motion.



How Do They Know That?

PLANETS BEYOND THE SOLAR SYSTEM

Are there planets going around other suns?
Are there other solar systems?

It isn't easy to find planets around other suns. Planets are very small compared with stars and usually have less than one-billionth the brightness. Still, it is possible to find planets orbiting other stars. Jupiter is the largest planet in our solar system. The Hubble Space Telescope or other more powerful telescopes now being built may someday be able to detect planets around other stars if they are at least as large as Jupiter.

Planets have a gravitational effect on stars the same way that stars have a gravitational effect on planets. Planets cause a star to wobble. Telescopes can detect this wobble. Using this method, a planet was discovered in orbit around the star 51 Pegasi in 1995. Since then, many more "extrasolar" planets have been discovered.

Thinking Critically Why are planets that orbit other stars called extrasolar planets?

FIRST TEN EXTRASOLAR PLANETS DISCOVERED

Name of Parent Star	Star's Distance From Sun (In Light Years)	Year Found	Minimum Mass of Planet (Earth = 1)
51 Pegasi	50	1995	150
55 Cancri	44	1996	270
47 Ursae Majoris	46	1996	890
Tau Böötis	49	1996	1,230
Upsilon Andromedae	54	1996	220
70 Virginis	59	1996	2,100
16 Cygni B	72	1996	480
Rho Coronae Borealis	55	1997	350
Gliese 876	15	1998	670
14 Herculis	55	1998	1,050

▲ **Figure 17-4**