Be a Scientist!

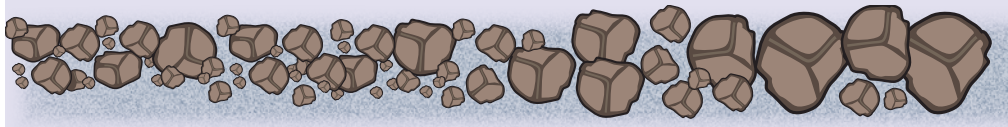
On the Internet, look at pictures of real asteroids and study their irregular shapes. Then make two different model asteroids. Shape the asteroids out of clay and sand, and use pebbles or beads on the surface. Add different amounts of material to make the asteroids different sizes and shapes.

What do you think would happen if two asteroids collided? Write a prediction with reasons. Now test your hypothesis. Place the asteroids in a large plastic bowl and seal the lid. Shake and swirl the bowl for 30 seconds. How did each asteroid change? Record the results and compare them with those of your classmates.

Beyond the Book

Visit a planetarium or research online to learn about near-Earth asteroids (NEAs).

Notes



The Asteroid Belt

FOCUS Question

What is the Asteroid Belt, and how did it form?

Systems and System Models

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What Is an Asteroid?

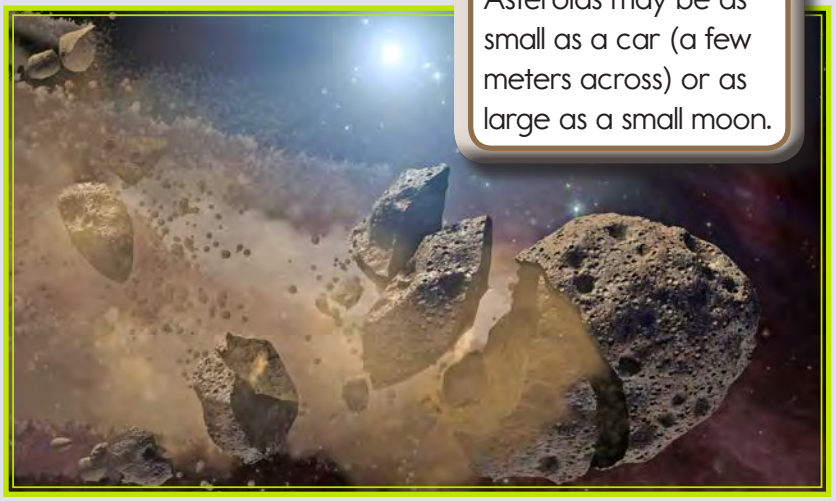
Our solar system has one star, eight planets, and many moons. But did you know there are millions of other objects traveling around the Sun? Millions!

These objects are *asteroids*—rocky space bodies that orbit the Sun. They are too small to be planets, and they have no atmosphere, or air. Most are irregular in shape. They are not spheres, like the Sun and planets. Their surfaces may be craggy and marked by craters.

Asteroids have been around since our solar system formed 4.6 billion years ago. They are the "leftovers" from those early days.

Do You Know?

Asteroids may be as small as a car (a few meters across) or as large as a small moon.



Notes

Read-Think-Write

Write your answers on separate paper. Use details from the text as evidence.

1. Look at the chart on page 3. Why do asteroids have shorter days and longer years than Earth?
2. What role did Jupiter play in the formation of the Asteroid Belt?
3. According to the text, what was the first object spotted in the Asteroid Belt, and how is it classified?
4. How might the impact of a large asteroid have killed off the dinosaurs?
5. How are asteroids and rocky planets alike and different?

FOCUS Question

What is the Asteroid Belt, and how did it form? Write a short story about the life of an asteroid. Begin when your asteroid was "born" and trace its journey to its orbit in the Asteroid Belt. How did it get there, and what will happen to it next?

Short Days, Long Years

One *day* is the time it takes an object in space to make one complete rotation, or spin. Asteroids spin quickly. A day on an asteroid may last for just a few hours! A year is the time it takes an object in the solar system to make one complete orbit of the Sun. Most asteroids have longer years than Earth because they are farther from the Sun.

Look at the chart below to see how long a day and a year are on some well-known asteroids. Compare them to a day and year on Earth.

ASTEROID ORBITS AND ROTATIONAL PERIODS

	Earth	Eros	Gaspra	Ida	Lutetia
Day (Rotation)	24 hours	5 hours	7 hours	just over 4 hours	just over 8 hours
Year (Orbit)	365 days	643 days	just over 3 Earth years	nearly 5 Earth years	nearly 4 Earth years

Asteroid orbits are measured in Earth hours and Earth years.

Rockin' in the Ring

Millions of asteroids hang out in the Asteroid Belt. This area of space lies between Mars and Jupiter. How did they get there?

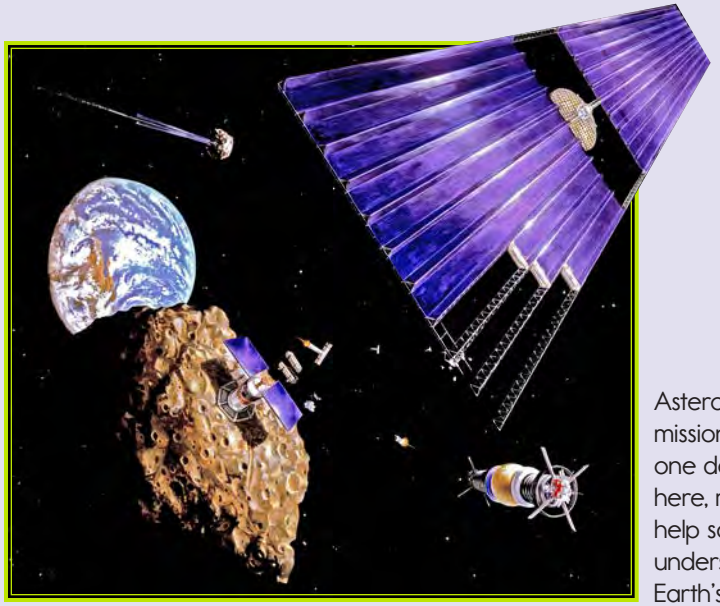
When the solar system was forming, dust and gas swirled around the Sun. Some of the dust and gas collided and clumped together. Once the clumps became large enough, their gravity pulled in even more of the debris. These growing clumps became the planets and their moons. Once Jupiter formed, its massive gravity tugged on the smaller, leftover clumps. This kept them from forming into larger bodies. These leftover bits and pieces are asteroids.

This drawing of the solar system shows the planets aligned.

Why We Care About Asteroids

Why should we care about asteroids? Since some of them come close to Earth, it's good to keep an eye on their orbits, but they also have a story to tell. They are made of the same stuff as Earth and the other rocky planets. Studying them helps us understand how Earth may have formed.

Also, asteroids contain minerals that people value. In fact, they are so rich in minerals that companies have made plans to mine them. Some asteroids also have water. They might serve as distant sources of water as we explore space.



Asteroid-mining missions, like the one depicted here, may help scientists understand Earth's origins.

Studying Asteroids

Astronomers have found and named many asteroids in the Asteroid Belt. The first probe to study asteroids up close was *Galileo* in 1991. Ten years later, NASA's *NEAR* space probe reached Eros. It was the first space probe to safely land on an asteroid.

Japan's *Hayabusa* probe landed on the asteroid Itokawa in 2006. It scooped up a sample from the surface and carried it back to Earth.

In 2010, the *Rosetta* craft got a close look at Lutetia. This ancient asteroid is covered with craters. *Rosetta* was able to map the surface of the asteroid.

A craft called DAWN reached the asteroid Vesta in 2011. A year later, it headed for Ceres.

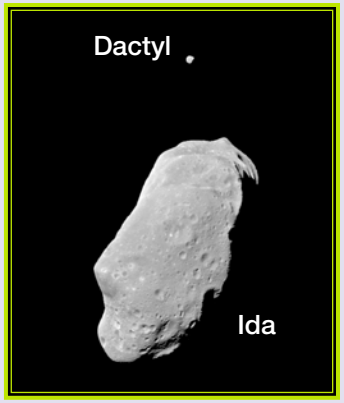
Artist's drawing

Notable Asteroids

The first object spotted in the Asteroid Belt was Ceres, in 1801. It is much larger than other Belt objects. Because of its size, Ceres is now classified as a dwarf planet, like Pluto.

Ceres

NASA's *Galileo* probe studied an asteroid named Ida (EYE-duh) in 1993. It found a surface peppered with craters. More surprising was a small, orbiting moon. The moon, called Dactyl (DAK-tul), may be a piece of Ida that broke away in an impact with another asteroid.



Dactyl

Ida

Kleopatra

Radar images show that Kleopatra is shaped like a dog bone! It has two moons. It is more like a pile of rubble stuck together than one solid rock. The moons may have broken away from the spinning asteroid.

How to Avoid Asteroids

Some asteroids travel out of the Belt. If they get too close to a planet, they may crash into it.

An asteroid chunk 20 meters (66 ft.) wide fell to Earth over Russia on February 15, 2013. It blew up in the air. The powerful blast broke windows and damaged buildings. More than one thousand people were hurt.

Scientists use telescopes to track the orbits of nearby asteroids. We may be able to knock large ones off track before they reach Earth.

Word Wise

A small piece of an asteroid that could fall to Earth is called a *meteoroid.* If it enters Earth's atmosphere, it is called a *meteor.* Once it lands on Earth, we call it a *meteorite.*

The Barringer Crater, located in northern Arizona, formed when a huge meteor hit Earth 49,000 years ago.

Dinosaur Doom?

About 65 million years ago, most of the dinosaurs became extinct. Scientists believe that a few different causes may be to blame, but a large asteroid may have played a key role.

The object was about 10 kilometers (6 mi.) wide. It left a crater in Mexico 180 kilometers (110 mi.) wide. The impact was far greater than an atomic bomb blast. Clouds of dust and ash blocked the Sun for months, and temperatures dropped. Plants died. Then the animals that ate plants also died. Eventually meat eaters died off, too. Nearly 75 percent of all plants and animals were gone.

Some scientists believe that an asteroid falling to Earth resulted in the dinosaurs' extinction. *Artist's drawing*