

The Ultimate Thrill Ride

by Todd Gernert



What does it take to overcome gravity?

INFORMATIONAL TEXT

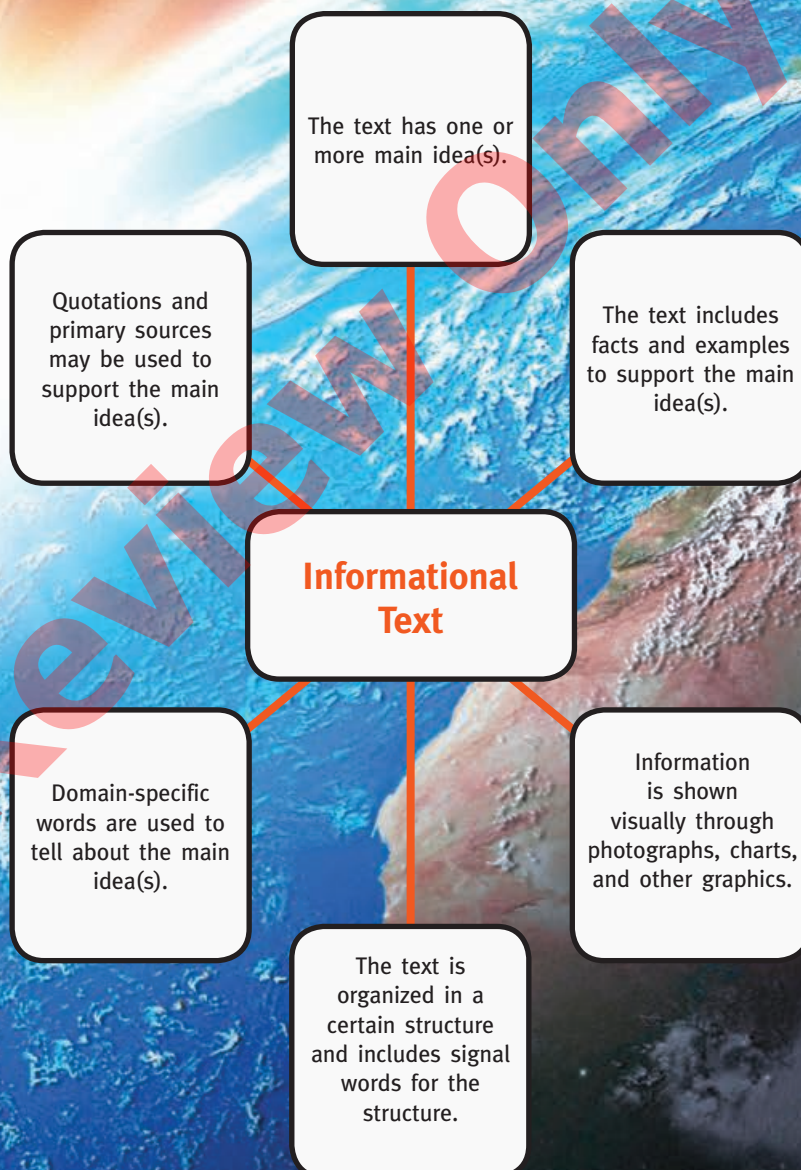
SCIENCE & TECHNOLOGY

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Informational Text

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Blast

A rocket is about to take off. The astronauts are strapped into their seats. The rocket's engines fire up: 5 ... 4 ... 3 ... 2 ... 1 ... Blast off!

The rocket zooms up into the air faster and faster. But the astronauts don't feel as if they are soaring up. Instead, they feel as if a huge weight is pressing down on them. A powerful force is pulling them back toward the ground. That force is **gravity**!

How have people found ways to **defy** gravity in order to reach outer space? How does gravity affect Earth and the other planets? And how did people learn about outer space before rockets were invented? Keep reading to find out.

Astronauts zoom into space in a shuttle. The shuttle looks like a plane. Rocket boosters launch it into outer space. ►

Off!





▲ astronauts in a shuttle



Outer Space

Today, astronauts can zoom into outer space on a rocket. But for most of human history, people did not have that technology. So they had to study outer space from Earth, by looking up at the sky.

In 1609, a scientist named Galileo Galilei made one of the first telescopes. He used it to observe the night sky. He saw what very few scientists of his time believed:



The moon moves around Earth.



Earth and the other planets all move around the sun.



The sun is the center of what scientists now call the solar system.

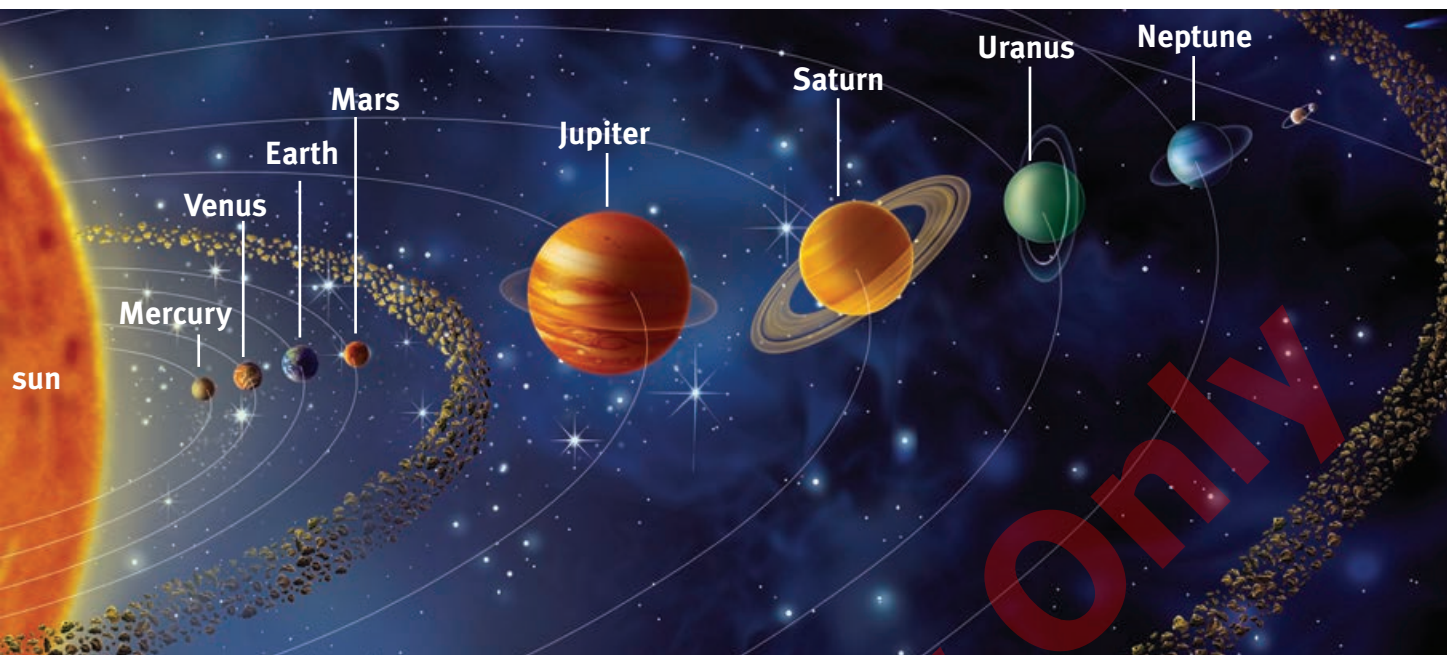
Galileo's observations became the basis for today's understanding of outer space—and helped lead to space travel.

▼ At night, the moon and stars can be seen in the sky.



▼ In this etching, Galileo (at right of telescope) shows his telescope to a crowd.





Earth's Orbit

Before Galileo, many people thought that the sun moved around Earth. Galileo helped prove that Earth and the other planets revolve around the sun. Earth's path around the sun is called an **orbit**. Another scientist of the time named Johannes Kepler showed that the orbit was not a circle. The orbit formed an ellipse, or an oval shape.

Earth takes about 365 days to complete one orbit around the sun. People base the yearly calendar on Earth's orbit. That is why one year has 365 days.

▲ The sun is the center of the solar system. The lines in this diagram represent the orbits of the planets.

The Aztec Calendar

At its most powerful, the Aztec Empire (1325–1521) ruled over a large part of what today is called Mexico. The Aztecs created a yearly calendar based on what they observed in the sky. Similar to modern-day calendars, their calendar for a year was 365 days. However, their calendar divided the days into 18 months, rather than the 12 months of the modern-day calendar.

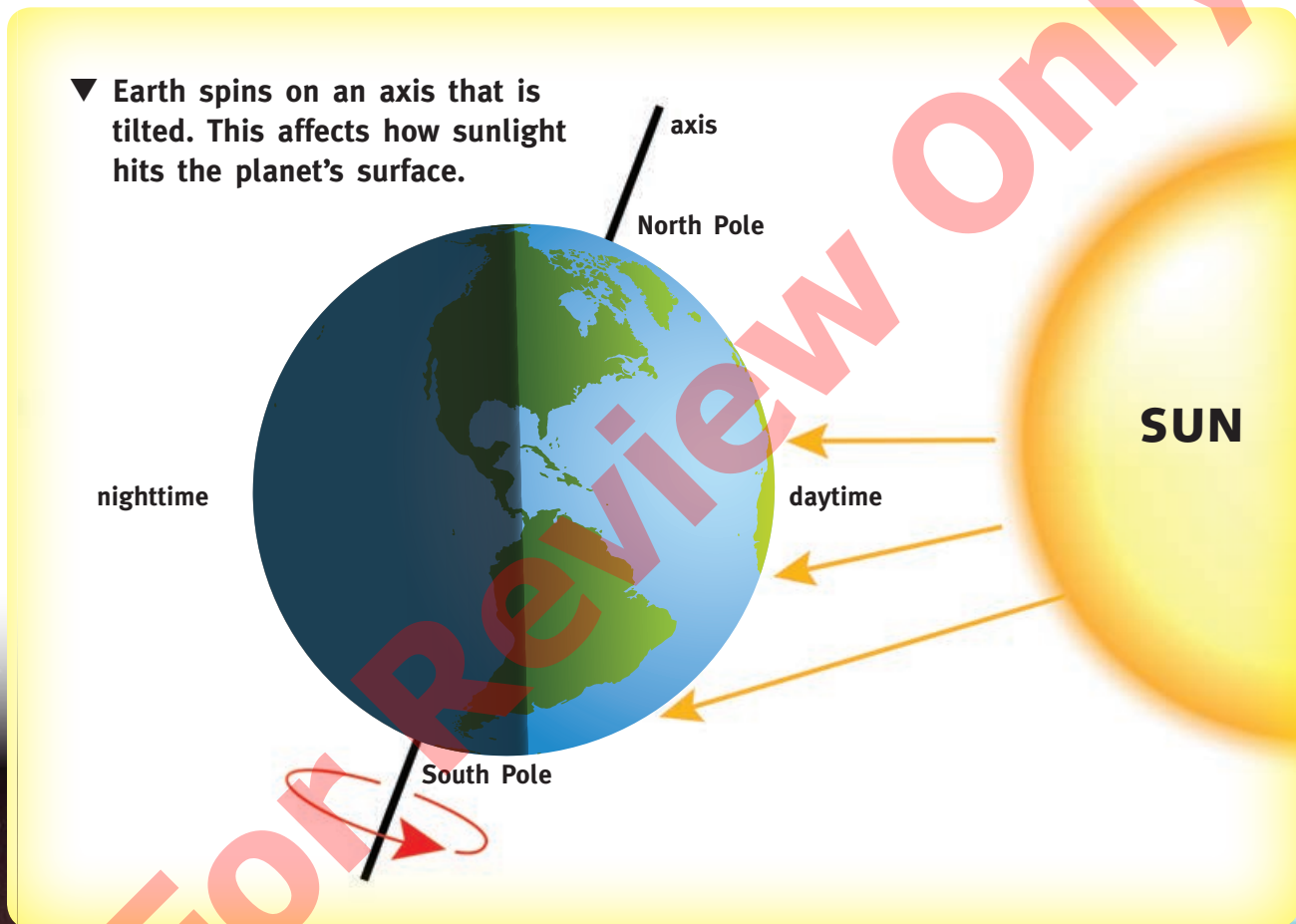
the Aztec calendar stone



Earth's Rotation

As Earth travels around the sun, Earth is also spinning on its **axis**. Earth's axis is tilted. This imaginary line runs in a straight line from the North Pole to the South Pole.

There is no up or down in space. But if viewed from space, with the North Pole at the top, Earth appears to spin counterclockwise, from left to right.



It takes Earth 24 hours to complete one spin, or **rotation**. As Earth spins, the sun shines on the parts of Earth that are facing the sun. The parts facing the sun experience what people call daytime. The parts not facing the sun experience what people call nighttime.

People base one day on how long it takes Earth to complete one rotation. That is why one day is equal to 24 hours.



Sunrise, Sunset

The sun seems to appear in the east in the morning. Then, in the evening, the sun seems to vanish in the west as night falls. All day, it looks as if the sun is moving across the sky.

But the sun does not move. It stays in the same place. It is Earth that is spinning.



Earth's Moon

Earth has one natural **satellite**—the moon. The moon is a large, round, rocky body. It moves around Earth. The moon has mountains and valleys, similar to those on Earth. It also has craters, which are holes in the moon's surface. These craters are caused by meteoroids (stony or metallic bodies) flying through space and hitting the moon.

The moon often looks as if it lights up and shines at night. But that light is really sunlight reflecting, or bouncing, off the moon's surface.



SATELLITES

Objects that orbit planets are called satellites. The moon is a natural satellite. But scientists have launched more than 2,200 artificial satellites into space. As these devices orbit Earth, they take pictures, collect data, make maps, and even send television signals. The largest artificial satellite is the International Space Station. It is big enough for people to live on for months!



THE MOON



THE INTERNATIONAL SPACE STATION



▲ The Hubble Telescope is a satellite. The telescope takes pictures of outer space. It sends the pictures back to scientists on Earth.

The Moon's Orbit

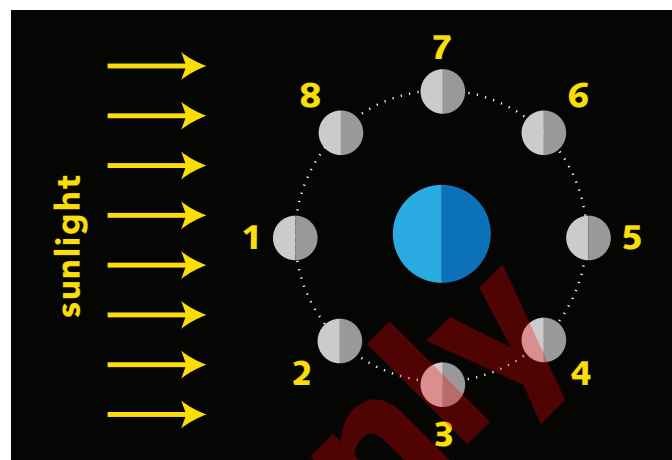
Like Earth, the moon also has an orbit. The moon's orbit makes a path around Earth. It takes the moon about 30 days to complete one revolution around Earth. Again, knowing this has allowed people to measure and understand time.

The moon is a sphere, but it appears to change shape as it travels around Earth. Sometimes, all of the lit-up part of the moon is visible from Earth. So the moon looks like a full circle. Other times, only a portion of the lit-up part is visible, so the moon looks like a half circle or even smaller.

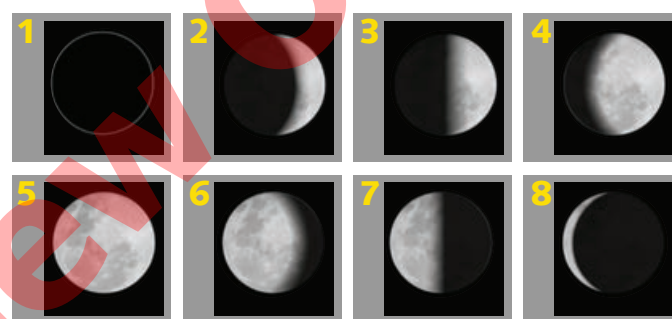
The Quest for Knowledge

The study of Earth, the sun, the moon, and the other planets has led to many questions about time, space, and forces like gravity. The search for answers has led people to invent new technology. These advancements have allowed people to see, and to travel, farther into space than ever before.

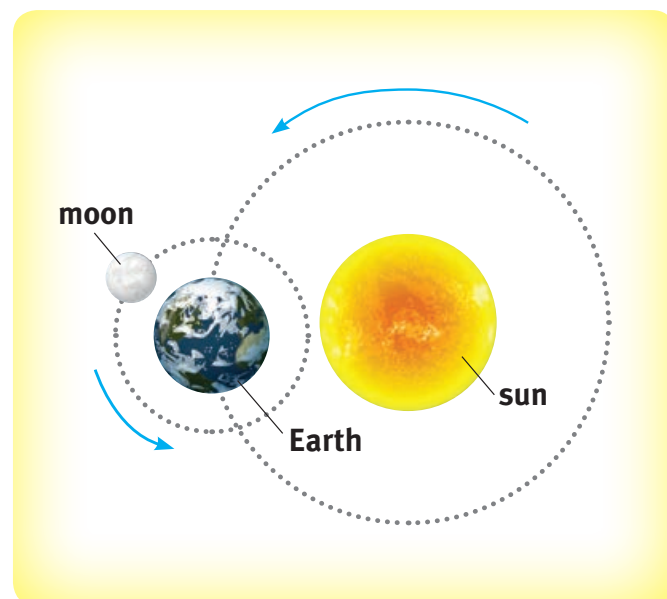
How Sunlight Hits the Moon



How the Moon Looks from Earth



▲ The sun's rays hit the side of the moon that faces the sun as the moon orbits Earth.



▲ As Earth orbits the sun, Earth's moon orbits Earth.