

Activities

- Have students access information about Mars' atmosphere and surface features. Is there air on Mars? Is there gravity? Is water present? What is the climate and temperature on Mars? Based on scientific exploration, is there evidence of changes in atmosphere or surface over time?
- Have groups of students research a planet or moon and design a life form that could theoretically live there.
- Divide the class into two teams to research and debate the controversy: is Pluto a planet?

Internet Resources

Periodically, Internet Resources are updated on our web site at www.libraryvideo.com

- imagine.gsfc.nasa.gov/
"Imagine the Universe!" is a site designed for teenagers to explore the mysteries of the structure and evolution of the Universe. It includes lesson plans, activities and more.
- amazing-space.stsci.edu
These "Amazing Space" online activities developed in conjunction with NASA are designed to inspire and educate students about the wonders of our universe.
- www.exploratorium.edu/spectra_from_space/
This Exploratorium site describes space probes that are now in orbit, including the Hubble Telescope, listing their purposes and some of their interesting discoveries.
- mars.jpl.nasa.gov/
"Mars Exploration" from NASA contains lessons, resources and programs about Mars along with links to standards in mathematics, science and technology.
- pds.jpl.nasa.gov/planets/
"Welcome to the Planets™" presents some of the best images from NASA's planetary exploration program along with detailed information on the planets and the space probes used.
- planetquest.jpl.nasa.gov
This site chronicles the missions involved in the discovery of numerous planets around stars other than the Sun, confirming that our solar system is not unique. Information about the quest to find another Earth is updated as new discoveries are made.

Suggested Print Resources

- Garlick, Mark. *The Story of the Solar System*. Cambridge University Press, New York, NY; 2002.
- Hawking, Steven. *The Universe*. New York, NY; 2001.
- Kirshner, Robert. *The Extravagant Universe: Exploding Stars, Dark Energy, and the Accelerating Cosmos*. Princeton University Press, Princeton, NJ; 2002.
- Lorenz, Ralph. *Lifting Titan's Veil: Exploring the Giant Moon of Saturn*. Cambridge University Press, New York, NY; 2002.
- Voit, Mark. *Hubble Space Telescope: New Views of the Universe*. Harry Abrams Publishing, New York, NY; 2000.

TEACHER'S GUIDE

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V6056



Planets

Grades 4–8

The *Eyewitness DVD Series* explores the natural world with fascinating film footage and nature photography fused with striking special effects and stunning graphics. The programs offer a unique "eyewitness" view of events that shape the Earth and the living things that inhabit it.

Interactive menus allow viewers to easily select and replay any section of a program. Other features include interactive assessment quizzes and "Hotspots" — video icons that appear throughout the program and allow students to further explore specific science content or areas of interest. Each title contains a segment that reveals all the behind-the-scenes wizardry that goes into the production of the *Eyewitness* series, along with recommended web sites for further research.

Included in this guide is a brief synopsis of the program, background on the science concepts presented in the show, discussion topics, activities, vocabulary and additional resources for students to explore.



Background

In early cultures, the astronomer was half-scientist, half-magician. After all, someone who could predict when and where the Sun would rise could surely foretell other events. Astrology, fortune-telling from the positions of the stars and planets, still thrives. Even monarchs and political leaders have consulted astrologers when making important decisions. Our Earth once seemed the center of the Universe, bigger than the Sun. Now we know that it is but a tiny “blue gem,” floating in space and time.

Billions of years ago, from a swirling mass of cloud, the Sun was born. At its center, the heat and pressure triggered a nuclear explosion that has been going on ever since — and is the source of the Sun’s energy. At the same time, the outside of the “cloud” began to form into the planets — dense rocky ones nearest the Sun, and at the far reaches, much bigger creations mostly made of gas. The Sun with the nine planets orbiting around it became our solar system.

Heading out from the Sun, the first planet is the tiny, battered Mercury. A sphere of rock the size of our Moon, Mercury is a planet of dramatic extremes. The Sun’s massive gravitational pull has robbed it of nearly all of its atmosphere. Mercury only takes 88 Earth days to orbit the Sun, giving it the shortest year in the solar system. But it spins on its axis so slowly that its day, strangely, lasts twice as long as its year.

The second planet out from the Sun is Venus. Named for the Roman goddess of love, it is a symbol of all that is gentle. A mixture of carbon dioxide and sulfuric acid, the planet suffocates in an extreme form of the “greenhouse effect.” The surface of Venus is whipped by colossal storms with hurricane-force winds and a rain of burning acid.

Mars appears a blood-red color and has always been linked with anger and conflict. According to astrology, people born under its influence are supposed to be fiery and hot-headed. In fact, the red coloring comes from iron oxide — better known as rust. Far from being the bloodthirsty, heroic god of war, Mars is just quietly rusting away.

Beyond Mars lies the asteroid belt: billions of fragments of rock that some scientists believe are left over from the birth of the solar system. The asteroid belt marks the limit of the inner rocky planets.

Beyond the asteroid belt are the outer planets, also called the gas giants. Jupiter, named after the king of all Roman gods, is the biggest planet in our solar system. All of the gas giants have rings, but Saturn’s are the brightest and are easily visible from Earth.

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William Herschel was a music teacher with only an amateur’s interest in astronomy. Outraged by the cost of telescopes, he built one of his own, enabling him in 1781 to discover a whole new planet — Uranus, the seventh planet out from the Sun. In 1846, astronomers finally found the eighth planet exactly where they expected and they named it after the Roman god of the sea — Neptune. It was not until 1930 that fuzzy, indistinct pictures finally led to the identification of the ninth planet, given the name Pluto after the Roman god of the underworld.

Vocabulary

Neil Armstrong & Buzz Aldrin — The Apollo 11 astronauts who became the first humans to step onto the moon on July 20, 1969.

asteroids — Odd-shaped rock and/or metal pieces which orbit the Sun, varying in size from small enough to hold, to big enough to land on. There are approximately one million asteroids that orbit the Sun in a belt between the inner and outer planets.

Nicolaus Copernicus (1473–1543) — A Polish astronomer who discovered that the Sun was the center of the solar system, a concept known as the heliocentric theory.

Earth — The third planet from the Sun. Our home features a breathable atmosphere containing oxygen, large amounts of liquid water and a range of temperatures suitable for sustaining life.

Yuri Gagarin — The Russian cosmonaut who was the first human to orbit the Earth in space in 1961.

Galileo Galilei (1564–1642) — An Italian astronomer and physicist who studied the skies with one of the first telescopes.

Hubble Space Telescope — The first large optical telescope launched above the Earth’s atmosphere carrying instruments that were sensitive to visible and ultraviolet light. The telescope was built by NASA with major contributions from the European Space Agency, and was launched in 1990.

Jupiter — The fifth planet from the Sun, which is the largest in the solar system, is comprised of gases and liquids, and features very severe weather. It is also known for the Great Red Spot, a wind storm that is three times the size of the Earth.

Mars — The fourth planet from the Sun, known as the “red planet” because the soil contains iron oxide (rust), which is often blown into the air, giving the sky a reddish-pink appearance.

Mercury — The first planet from the Sun, a deserted ball of rock that resembles the Earth’s moon, which contains no oxygen and a thin atmosphere.

Neptune — The eighth planet from the Sun, an extremely windy and cold planet that is colored blue by its gases.

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Isaac Newton (1642-1727) — The English scientist who stated that a planet’s orbit around the Sun is due to the forces of inertia and gravity.

Pluto — The ninth planet from the Sun. It is the coldest in the solar system — a solid, rocky planet that would take 12 years to reach if traveling from Earth. Its irregular orbit actually brings it closer to the Sun than Neptune for 20 years of its 249-year orbit.

Saturn — The sixth planet from the Sun. It is a gas planet with many moons, best known for its large rings made of icy chunks.

solar system — The Sun, the nine planets and their moons, as well as other objects that orbit the Sun.

Uranus — The seventh planet from the Sun, a gas planet with smaller and darker rings than those of neighboring Saturn.

Venus — The second planet from the Sun. It is the hottest in the solar system, featuring a solid, rocky surface, with volcanoes and channels, surrounded by a thick, toxic atmosphere.

Venera probes — A series of Soviet space probes that parachuted through the multiple cloud decks of Venus, landed softly on the surface, and sent back pictures before disintegrating.

Discussion Topics

- In recent decades, the issue of the “greenhouse effect” has forced many industries to take action to reduce the amount of carbon dioxide and sulfuric acid that is emitted into the air. Compare the atmospheres of Venus and Earth, discussing what would happen if the Earth’s clouds began to trap more of these elements beneath them.
- Ask students to explain why a telescope orbiting above the Earth’s atmosphere can retrieve images of a better resolution than images taken from earthbound observatories.

Focus Questions

1. What does the word “planet” mean?
2. How did the Navajo explain the night sky?
3. What did the Japanese think caused the moon to form?
4. When was the solar system formed?
5. What is Mercury like during the day? At night?
6. Which planet is most easily seen from Earth?
7. Which planet was first named for an English king?
8. What is Galileo Galilei known for?
9. Who was Copernicus?