

- 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 to investigate these distant worlds.
- www.solarviews.com/eng/voyager.htm
This site chronicles the history of NASA's Voyager missions.
- www.jpl.nasa.gov/galileo/
"Galileo: Journey to Jupiter" contains images and information about the giant of our solar system and its many moons.

Suggested Print Resources

- Garlick, Mark. *The Story of the Solar System*. Cambridge University Press, New York, NY; 2002.
- Lorenz, Ralph. *Lifting Titan's Veil: Exploring the Giant Moon of Saturn*. Cambridge University Press, New York, NY; 2002.
- Price, Fred. *The Planet Observer's Handbook*. Cambridge University Press, New York, NY; 2000.
- Trefil, James & David H. Levy. *Other Worlds: Images of the Cosmos from Earth and Space*. National Geographic Society, Washington, D.C.; 1999.
- Voit, Mark. *Hubble Space Telescope: New Views of the Universe*. Harry Abrams Publishing, New York, NY; 2000.

TEACHER'S GUIDE

Paula J. Bense, M.Ed.

Curriculum Specialist, Schlessinger Media

COMPLETE LIST OF TITLES

- | | |
|-----------------------|------------------------------|
| • 21ST CENTURY COSMOS | • THE SEARCH FOR NEW PLANETS |
| • THE CASE FOR MARS | • STELLAR EVOLUTION |
| • THE ENIGMA OF VENUS | • THE STORY OF COMETS |
| • EXTREME ASTRONOMY | • TRAVELING TO OUTER PLANETS |
| • HUBBLE'S HERITAGE | |

Teacher's Guides Included
and Available Online at:



800-843-3620



Program Copyright 2001 by Soapbox Productions Inc.
Teacher's Guide Copyright 2003 by Schlessinger Media,
a division of Library Video Company
P.O. Box 580, Wynnwood, PA 19096 • 800-843-3620
All rights reserved.



Traveling to Outer Planets Worlds Apart

Grades 9–12

This series tells the stories behind the science of astronomy in an informative and entertaining way. Fast-paced and visually rich, viewers journey to exotic destinations within our solar system from moons and planets to comets and asteroids. Featuring advances in scientific investigation, this series investigates cosmic mysteries including the birth and death of stars, the structure of the universe, and the search for extraterrestrial life.

This guide provides a brief synopsis of the program, background on the science concepts presented in the show, discussion topics, activities, vocabulary and additional resources.



Program Summary

Over a generation of space exploration, scientists have learned some pretty strange facts about our planetary neighbors. After surveying the obvious first targets, the inner and outer planets, scientists are turning to the many smaller worlds orbiting those planets for information about our solar system. It is clear that an amazing variety of bizarre landscapes await the space probes that have been designed to explore the moons of distant planets.

A new generation of space missions is already underway and, in *Traveling to Outer Planets*, the scientists designing these space probes introduce us to some of the mysteries they hope to solve.

The Galileo Project recently observed Io, the volcanic moon of Jupiter. Scientists have learned that Io has more than 300 volcanoes, dozens of them active simultaneously. They're powered by magma far hotter than any on Earth, and some of them are squirting fountains of lava four hundred kilometers high. One cause of this tumultuous behavior is the fact that Io experiences a continuous gravitational tug-of-war from its massive parent and the 38 other moons that orbit Jupiter.

Europa, also of Jupiter's family, has an icy surface that may conceal a liquid ocean considerably larger and deeper than the Pacific. Is it really wet under there, and if so, could there be anything swimming (or at least growing) inside Europa? This world is rapidly becoming the number one priority for explorers of the outer solar system. In 2008, the Europa Orbiter will be launched, beginning a three-year journey to Jupiter. Once there, if not destroyed by radiation, the spacecraft will orbit Europa, using radar and laser altimeters to map the surface. Someday, a landing will be made on this world. Will our robots find an ice-encrusted ocean whose deep dark waters are teeming with life?

We look at Triton, a not-quite-frozen world orbiting backwards around Neptune; at the two asteroid-like moons of Mars; and at Iapetus, the Saturnian moon that's snow-white on one side and charcoal-black on the other. And no survey of moons could leave out Titan, Saturn's largest moon. Its thick, foggy atmosphere is being probed by radar and shows hints of oceans and continents, but the "oceans" would likely be seas of unthinkably cold liquid natural gas.

Asteroids are small compared to planets or even moons, but by human standards they're impressively big chunks of rock, metal or (in some cases) mystery material. None can be seen well from Earth, so it was an enormous advance in our understanding when in early 2000, a spacecraft dropped into orbit around asteroid number 433, better known as Eros. We talk to the scientists who rescued the mission from a near-disaster early in the flight and find what they're learning. One day, astronauts may visit some of these "lesser" worlds of the solar system.

Vocabulary

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 millions of asteroids that orbit the sun in a band between the inner and outer planets called the Kuiper Belt.

astronomical unit — The average distance between the Earth and the sun. 1 au is about 150 million kilometers, or about 93 million miles.

Cassini-Huygens Mission — A joint NASA/ESA space probe designed to study Saturn and map the topography of Titan, Saturn's largest moon.

Charon — Pluto's moon.

(Continued)

Europa — One of Jupiter's many moons. While not as big as Earth's moon, there is evidence that mysterious Europa harbors an ocean.

Europa Orbiter — NASA spacecraft planned for launch in 2008 on a three year journey to Jupiter. Once there it will map the surface of Europa if not damaged by radiation.

ESA — Acronym for the European Space Agency. An intergovernmental organization comprised of 15 European countries working together to explore space.

extremophiles — Organisms that thrive in harsh environments that would kill other creatures.

Galileo — NASA mission to study Jupiter's atmosphere, moons, and magnetosphere. The Galileo spacecraft was carried into space and released in 1989 by the shuttle Atlantis. It arrived at Jupiter in 1995 and completed its primary mission of sending back images from Jupiter's moon Io before going on to explore Europa.

Ganymede — A moon of Jupiter and the largest moon in the solar system.

Hubble Space Telescope — The first large optical telescope launched above the Earth's atmosphere carrying instruments 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.

Huygens — A capsule aboard the spaceprobe Cassini that will parachute through Titan's atmosphere.

Io — A moon of Jupiter with many active volcanoes.

infrared — Radiation with slightly longer wavelengths and slightly lower frequencies than those of visible light.

NASA — Acronym for the National Aeronautics and Space Administration, a U.S. government agency formed in 1958 with the goal of making space exploration possible.

nebula — An interstellar cloud of gas and dust.

Titan — Saturn's largest moon.

Triton — One of Neptune's moons.

Activities & Discussion

- Do you think Pluto should be considered a planet? Why or why not?
- Ask students to research our moon along with Jupiter's moon, Io, and to compare and contrast them.
- Lead students in a discussion about the possibility of other life forms being present in our solar system and direct them to research organisms called extremophiles.

Suggested Internet Resources

Periodically, Internet Resources are updated on our Web site at www.LibraryVideo.com

- www.thursdaysclassroom.com/16sep99/teach6.html

This online lesson plan describes Jupiter's magnetosphere, discusses the effect of such a huge force field on Jupiter's moons and explains how students can make their own electrospheres.

(Continued)