E/PO Resources from NASA Planetary Science Missions / Programs

Big Question	Topic	E/PO Program and Website	Science and E/PO Topic Highlights	Example Resources	Ways Resource Could Be Used	How / Where to Get It
How has our solar system evolved to its current diverse state?	Earth's Moon	Gravity Recovery and Interior Laboratory (GRAIL) (*http://solarsystem.nasa.gov/grail/education.cfm*) Lunar Reconnaissance Orbiter (*http://lro.gsfc.nasa.gov/education.html*) MyMoon (*http://mymoonspace.com*) International Observe the Moon Night (*http://observethemoonnight.org*)	Craters on our Moon have demonstrated that, far from being perfect and unchanging, the planets and moons have undergone violent transformations over time. Scientists have found signs of volcanic pits beneath the lunar surface and detected the presence of ice in permanently-shadowed craters at the Moon's south pole.	International Observe the Moon Night Ice Zones: Where We Look for Ice MyMoon	The purpose of International Observe the Moon Night is to instill in the public a sense of wonderment and curiosity about our Moon. Students draw conclusions about where on a planetary body scientists might look for ice – and why – and learn that our Moon may have areas with ice. The public is invited to explore how they experience the Moon through literature, music, science, art, conversation, and more.	*http://observethemoonnight.org* *http://www.lpi.usra.edu/education/explore/LRO/activities/iceZones* *http://mymoonspace.com*
	Small Bodies, Big Impact	Dawn (*http://dawn.jpl.nasa.gov/education*) EPOXI (*http://epoxi.umd.edu/4education*) Stardust-NExT (*http://stardustnext.jpl.nasa.gov/education/index.html*)	Some of the smallest bodies in our solar system have had the biggest impact on our understanding of how the solar system formed. Small bodies like comets, asteroids and the small objects in the distant Kuiper Belt have been very difficult to see, much less study.	Vegetable Light Curves Cooking up a Comet	Students observe the surface of rotating potatoes to see how astronomers determine the shape of asteroids from variations in reflective brightness. Students will learn the basic components and demonstrate how the comet's head and tail form by observing a comet model.	*http://dawn.jpl.nasa.gov/DawnClassrooms/light_curves/index.asp* *http://solarsystem.nasa.gov/docs/Comet_Cooking.pdf*
	Evolving Worlds (Planetary Evolution)	Juno (*http://www.nasa.gov/mission_pages/juno/education*) Mars Science Laboratory (MSL) (*http://mars.jpl.nasa.gov/participate/marsforeducators*)	Planets start out full of energy, but over billions of years, they change. They can lose their atmospheres and oceans, and they may gather craters. Planets cool and shrink, becoming denser as they move into their senior years.	Discovering Plate Boundaries	Students discover the processes that occur at plate tectonic boundaries using four global data maps: 1) Earthquake location and depth, 2) Location of recent volcanic activity, 3) Seafloor Age, and 4) Topography and Bathymetry.	*http://plateboundary.rice.edu*
	Volcanism in the Solar System	Lunar Reconnaissance Orbiter (*http://lro.gsfc.nasa.gov/education.html*) MErcury Surface, Space ENvironment, GEochemistry and Ranging (MESSENGER) (*http://messenger.jhuapl.edu*) Mars for Earthlings (*http://serc.carleton.edu/marsforearthlings/index.html*) Mars Odyssey (*http://mars.jpl.nasa.gov/odyssey*) Mars Reconnaissance Orbiter (*http://mars.jpl.nasa.gov/mro*)	Planetary scientists have found evidence of volcanism on every terrestrial planet and on many of the moons and even some asteroids! Volcanic activity acts as a window to a planet's interior. The type of volcanism and the composition of the lava give scientists a peak underneath the crust.	Making and Mapping a Volcano Cake Batter Volcano PSRD: Timeline of Martian Volcanism	After creating vinegar / baking soda eruptions, students use Play-Doh to mark where the lava flowed. To understand some of the geological processes and the structures that form as lava flows across planetary landscapes, students use cake batter as an analog for lava. Volcanism was continuous throughout Martian geologic history until about one to two hundred million years ago.	*http://ares.jsc.nasa.gov/ares/education/program/DestMars/destmarsLes3.pdf* *http://www.spacegrant.hawaii.edu/class_acts/CakeLavaTe.html* *http://www.psrd.hawaii.edu/May11/Mars_volc_timeline.html*
How did life begin and evolve on Earth? Are we alone?	Got Life? Astrobiology	Astrobiology Magazine (*http://www.astrobio.net*) From the Earth to the Solar System (FETTSS) (*http://fettss.arc.nasa.gov*) Mars Science Laboratory (MSL) (*http://mars.jpl.nasa.gov/msl*)	As we study our solar system and worlds beyond, we search for information about our relationship with the universe -- where else does life exist? How does life evolve? Are we alone?	Life in the Extreme DPS Slide Set: Methane in the Martian Atmosphere	Students are given one of 14 examples of extremophiles. They sort themselves into groups and discover that all known life on Earth requires liquid water to survive. This four-slide PowerPoint by the Division of Planetary Science includes basic information for grades 9-14 about methane in the Martian atmosphere.	*http://nightsky.jpl.nasa.gov/download-view.cfm?Doc_ID=480* *http://dps.aas.org/files/marsmethane.ppt*

Thematic educator resources from NASA at the Year of the Solar System website: **http://solarsystem.nasa.gov/yss**. Even more resources at NASA Wavelength: **http://nasawavelength.org**.

Contact us at planetaryforum@lpi.usra.edu

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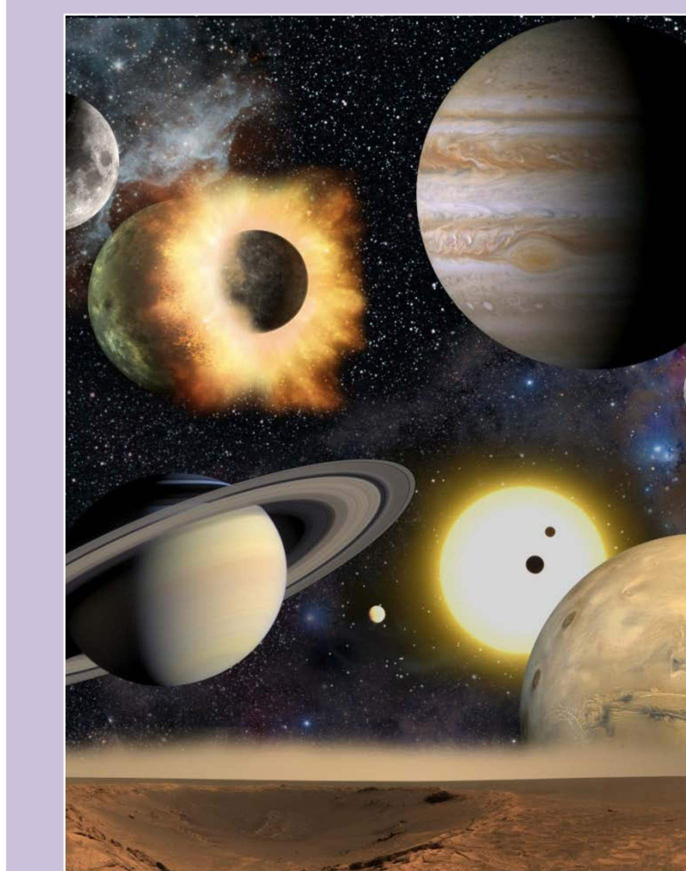
National Aeronautics and Space Administration

NASA Science Mission Directorate

Planetary Science Education and Public Outreach Resources:

A Sampler and Quick Start Guide



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How did our Sun's family of planets and bodies originate?	Scale of the Solar System	Eyes on the Solar System (*http://eyes.nasa.gov*)	The placement of the Sun, planets, moons, asteroids, and comets, and the distance between them, are important concepts in our understanding of the formation and evolution of the solar system.	Eyes on the Solar System	This interactive computer program shows the placement of spacecraft and objects in the solar system in the past, present, and future.	*http://eyes.nasa.gov*
	Birth of Worlds (Solar System Formation)	EPOXI (*http://epoxi.umd.edu/4education*) Juno (*http://www.nasa.gov/mission_pages/juno/education*)	The processes of solar nebula collapse and accretion explain why there is so much space in space, where we find the various types of planets and other small bodies, and why the planets all lie in about the same plane and orbit the Sun in the same direction. Despite their diversity, all the planets, dwarf planets, comets, and asteroids in the solar system formed together, along with the Sun, as a system 4.5 billion years ago.	Cosmic Chemistry: Planetary Diversity DPS Slide Set: The Chaotic Early Solar System	Students make decisions about possible patterns or groupings of the physical and chemical compositions of internal structures and atmospheres of planets. This four-slide PowerPoint by the Division of Planetary Science includes basic information for college-level introductory courses about how the solar system ended up in its current configuration.	*http://genesismission.jpl.nasa.gov/educate/scimodule/PlanetaryDiversity/index.html* *http://dps.aas.org/files/chaoticsolarsystem.ppt*
How has our solar system evolved to its current diverse state?	Gravity: It's What Keeps Us Together	Gravity Recovery and Interior Laboratory (GRAIL) (*http://solarsystem.nasa.gov/grail*)	Gravity is the powerful force that glues our universe together. It helped form our solar system, the planets, and the stars. It holds the planets in orbit around the Sun and moons in orbit around the planets, and it creates tides. This fundamental force of gravity will help scientists model the interior of our Moon, Earth, and other planets, and measure the masses of distant objects.	Heavyweight Champion: Jupiter!	Students weigh themselves on scales modified to represent their weights on other worlds to explore the concept of gravity and its relationship to weight.	*http://www.lpi.usra.edu/education/explore/solar_system/activities/bigKid/heavyweightChampion*
	Impacts in the Solar System	Lunar Reconnaissance Orbiter (*http://lro.gsfc.nasa.gov/education.html*) MErcury Surface, Space ENvironment, GEochemistry and Ranging (MESSENGER) (*http://messenger.jhuapl.edu*)	Collisions are at the core of solar system formation and continue to be one of the most important processes throughout our solar system. Those impact scars, and the materials that make up the objects themselves, tell the story of our solar system's formation -- and how planets and their moons continued to change since those early days.	Splat! What if It Hit my Town?	Students model ancient lunar impacts using water balloons. By measuring the diameter of the crater area, they discover that the Moon's largest impact basins were created by huge asteroids! Use this interactive to adjust the type and size of the impactor and the location on Earth. It shows the region of the resulting crater and several of the devastating effects beyond the crater.	*http://www.lpi.usra.edu/education/explore/marvelMoon/activities/familyNight/splat/index.shtml* *http://killerasteroids.org/interactives/impact/index.php*
	Magnetospheres: Planetary Shields	Juno (*http://www.nasa.gov/mission_pages/juno/education*)	The vast sea of space in our solar system is filled with powerful radiation and bombarded with high-speed atomic particles. Also, the Sun generates a continuous stream of particles – solar wind. The high energy radiation, the high energy particles, and the solar wind could prove dangerous to life on Earth's surface. Earth's planetary shield -- Earth's magnetic field working with the atmosphere -- protects us.	Terrabagga: Using a Magnetometer	This activity models real-world uses of a magnetometer instrument. Students will see how magnetic fields of the planets and moons are found.	*http://www.windows2universe.org/teacher_resources/terrabagga_edu.htm*
	Windy Worlds (Atmospheres)	Cassini (*http://saturn.jpl.nasa.gov/education/overview*) Juno (*http://www.nasa.gov/mission_pages/juno/education*)	Many of the planets in our solar system have significant atmospheres, but none are breathable to us except Earth's. The weather systems on other planets can help us to better understand our own world. Venus' atmosphere is much thicker than our own, and Mars' is much thinner; both are primarily composed of carbon dioxide with no free oxygen. The outer planets' atmospheres are deadly combinations of gases with unimaginable wind and temperature extremes.	Goldilocks and the Three Planets Weather Stations: Storms	Students compare the spectra of the atmospheres of Earth, Venus and Mars to determine their composition in this computer interactive. Students test how cornstarch and glitter in water move when disturbed. They compare their observations with videos of Jupiter's and Earth's storm movements.	*http://lasp.colorado.edu/home/education/k-12/project-spectra/goldilocks-interactive* *http://www.lpi.usra.edu/education/explore/solar_system/activities/weatherStations/storms*
	Water and Ice in the Solar System	Cassini (*http://saturn.jpl.nasa.gov/education/overview*) Lunar Reconnaissance Orbiter (*http://lro.gsfc.nasa.gov/education.html*) Mars Exploration Rover (*http://marsrovers.jpl.nasa.gov/classroom*) Mars Odyssey (*http://mars.jpl.nasa.gov/odyssey/participate*) New Horizons (*http://pluto.jhuapl.edu/education*)	Ice is common in our solar system, from deposits at the poles of Mercury and the Moon to Mars, comets, and the ice-covered moons and rings around distant Jupiter and Saturn. Water is important in the search for life in our solar system; it was present in the past on the surface of Mars and still exists under Europa's icy shell today.	Mars Student Imaging Project DPS Slide Set: An Ocean Below Enceladus' Icy Crust Ice Investigators	Teams of students will work with scientists, mission planners, and educators on the THEMIS team to image a site on Mars using the THEMIS camera on the Mars Odyssey spacecraft. This four-slide PowerPoint by the Division of Planetary Science includes basic information for college-level introductory courses about water beneath Enceladus' icy surface. This citizen science project searches for the final target of the New Horizons mission on a journey that will take it past Pluto and on to icy bodies in the outer edges of this solar system.	*http://marsed.mars.asu.edu/msip-home* *http://dps.aas.org/files/enceladusocean.ppt* *http://cosmoquest.org/iceinvestigators*