



Our Future Awaits

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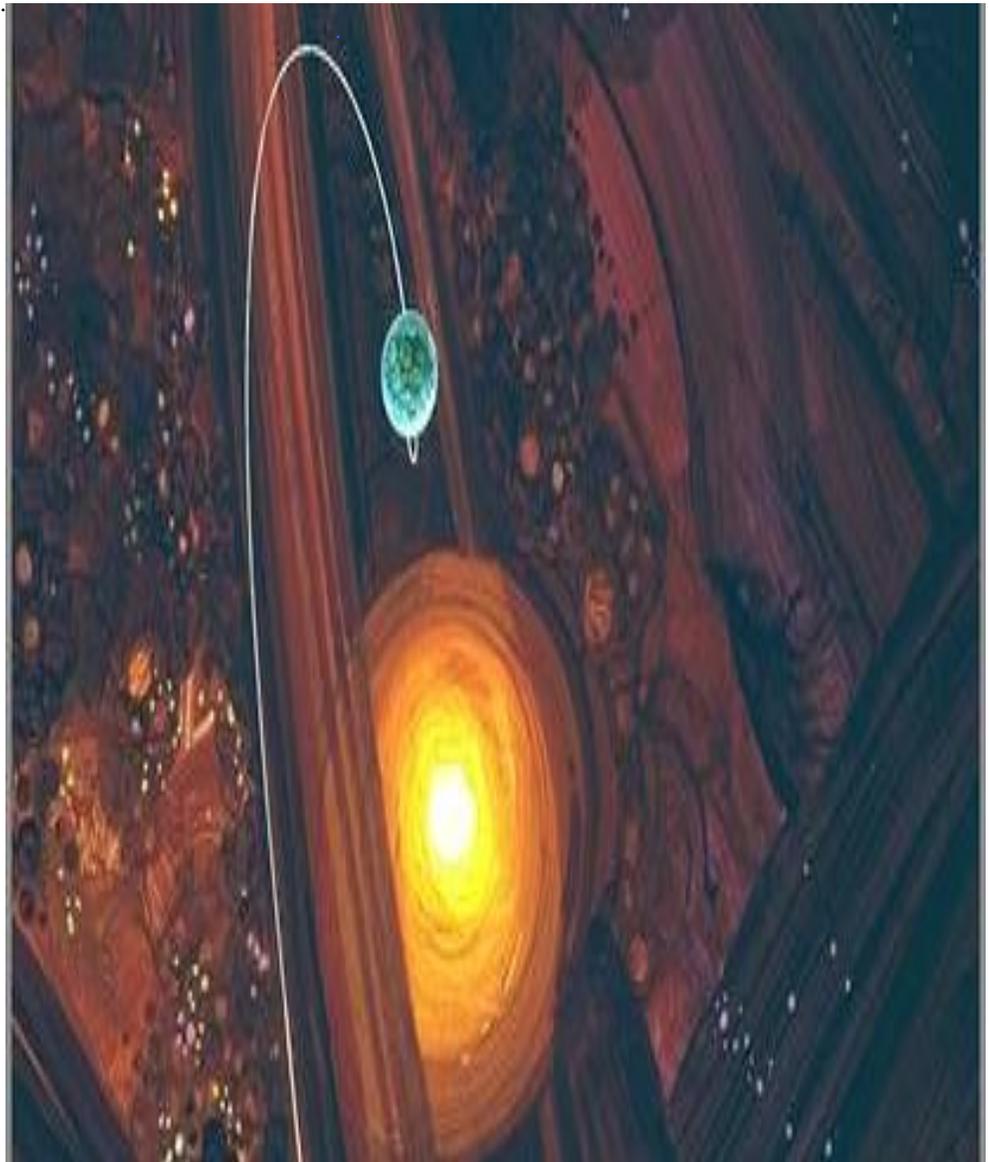
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Welcome to the
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Solar System Overview

[Journey to the End of the Universe](#) 6.30 m.
http://www.youtube.com/watch?v=Ufl_Nwbl8xs&feature=related

[Astronomy Picture of the Day](#)
<http://apod.nasa.gov/apod/>

[Incredible Astronomy Picture History](#)
1995 – 2015

[The Detailed Universe](#)
<https://www.youtube.com/watch?v=IVqMXPfYwI> 4.25 m.



Space Science Matrix

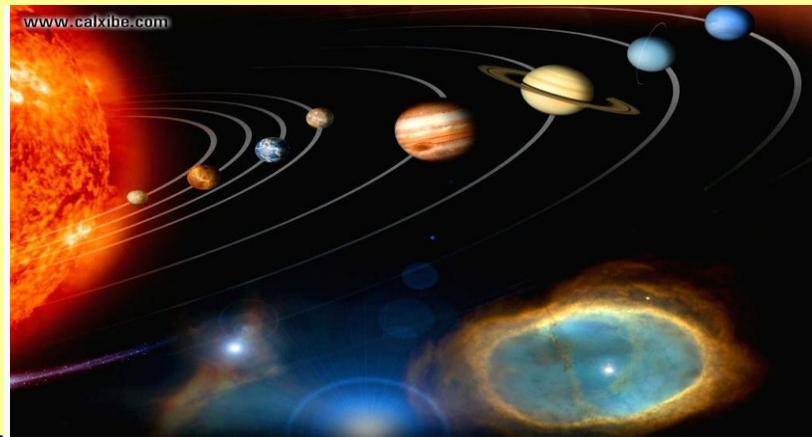
Solar System Overview

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[A Space Journey \(HD\)](http://www.youtube.com/watch?v=Un5SEJ8MyPc&feature=related)

<http://www.youtube.com/watch?v=Un5SEJ8MyPc&feature=related> 8.59 min.

[The Largest Galaxy in the Universe: IC 1101](https://www.youtube.com/watch?v=UE8yHySiJ4A) 5.39 m.

<https://www.youtube.com/watch?v=UE8yHySiJ4A>

[National Geographic: Hubbles Amazing Universe](https://www.youtube.com/watch?v=qcfN_HN4TVg) 45.48 m.

https://www.youtube.com/watch?v=qcfN_HN4TVg



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[Space Science Matrix](#)

Solar System Overview

Welcome to the World of Science

Welcome

A Resource for All Science Information

The
ISC Science Information Project
is a joint project of participating
Individuals and Organizations
for the sole purpose of enabling
rapid access to
The World's Knowledge
In
Science, Technology and Engineering

The Project provides direct links to view science data from NASA, NOAA, DOE, EPA, DEP, DOI, NPS, USDA, ED, USGS, NIH, SI Research Centers, et al., in the governmental sector, from universities, colleges and laboratories, from technical societies around the world (AGI, AGU, GSA, NESTA, etc.), and from science/engineering/technical information available thru our international partners and the independent research and testing organizations.

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*Scroll down and click on the live Internet link listed for each subject of interest.
(Note: You may save this PDF file and use it for direct Internet access to any chosen subject URL.)

[IAU - Naming of Astronomical Objects](#)

<https://www.iau.org/public/themes/naming/>

[Seeing Beyond - The James Webb Space Telescope](#) 14.02 m.

<https://www.youtube.com/watch?v=ah6KrqABzmk>

[The Hubble Deep Field](#) 4.16 m.

<https://www.youtube.com/watch?v=mcBV-cXVWFw>



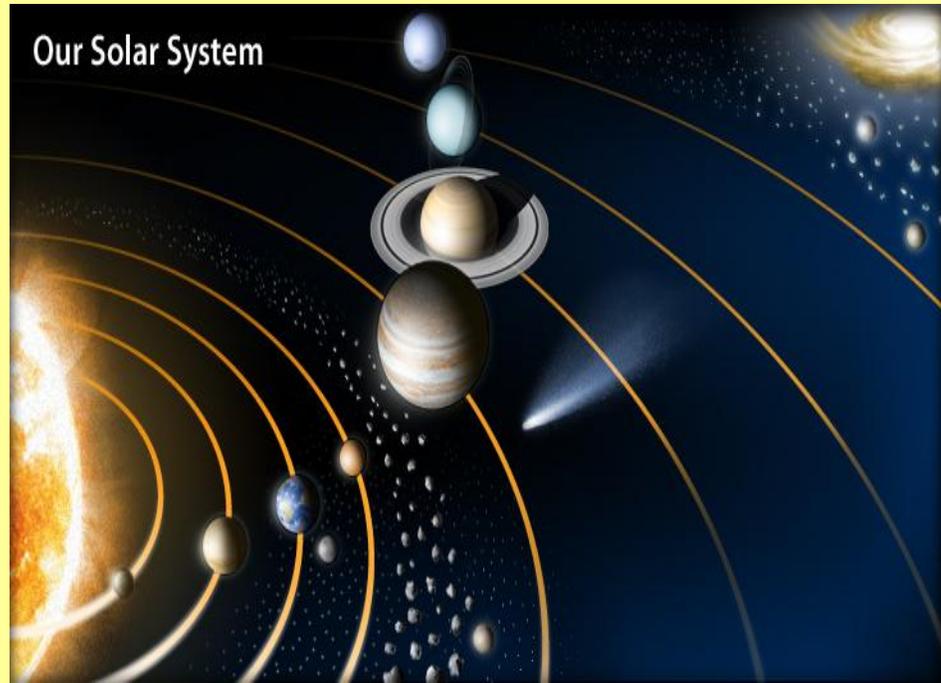
**Space
Science
Matrix**

**Solar
Systems
Overview**

**Solar
Regions**

Welcome to the
World of Science

Solar Systems Overview



Solar System Overview

<http://solarsystem.nasa.gov/>
<http://solarsystem.nasa.gov/planets/>
http://en.wikipedia.org/wiki/Solar_System

Defining our Place in the Cosmos – the IAU

http://www.iau.org/public/place_in_cosmos/ <http://iau.org/>

NASA Master Science Plan - 2014

http://science.nasa.gov/media/medialibrary/2014/05/02/2014_Science_Plan-0501_tagged.pdf

NASA Media Usage Guidelines

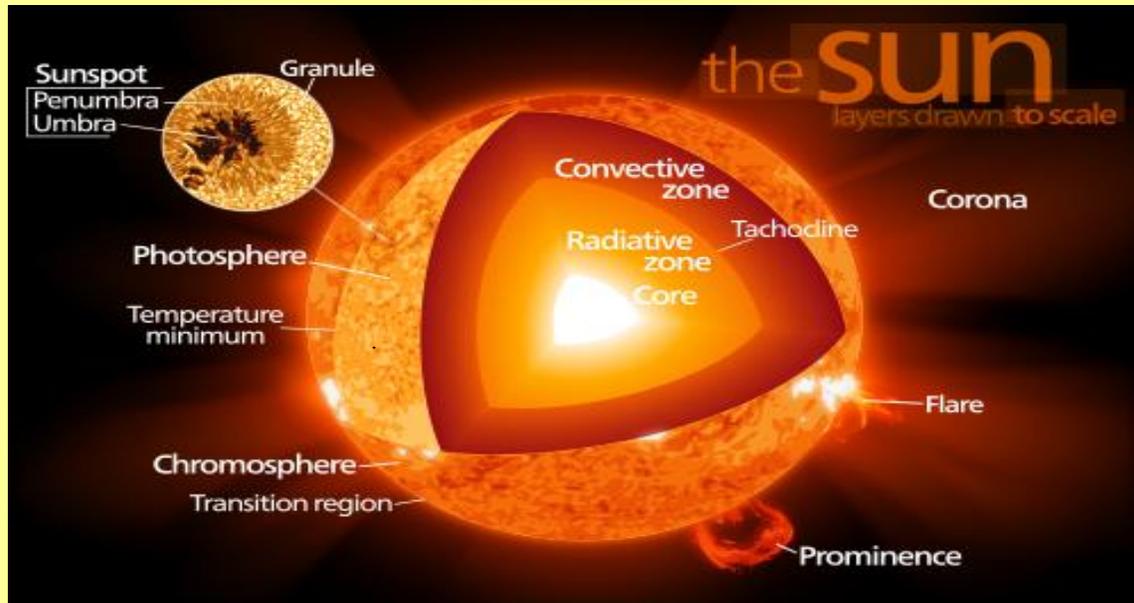
<http://www.nasa.gov/multimedia/guidelines/index.html>

NASA Eyes on our Solar System

"Eyes on the Solar System" is a 3-D environment full of real NASA mission data. Explore the cosmos from your computer. Hop on an asteroid. Fly with NASA's Voyager spacecraft. See the entire solar system moving in real time. It's up to you. You control space and time. <http://eyes.nasa.gov/index.html> (Java required.)



The Sun



The sun is a star - a hot ball of glowing gases at the heart of our solar system. Its influence extends far beyond the orbits of distant Neptune and Pluto. Without the sun's intense energy and heat, there would be no life on Earth. And though it is special to us, there are billions of stars like our sun scattered across the Milky Way galaxy.

Solar System Overview - <http://solarsystem.nasa.gov/planets/>
<http://solarsystem.nasa.gov/planets/sun>

The Sun - <http://solarsystem.nasa.gov/planets/sun>
<http://en.wikipedia.org/wiki/Sun>

The four planets closest to the sun -- Mercury, Venus, Earth, and Mars -- are called the terrestrial planets because they have solid rocky surfaces. The four large planets beyond the orbit of Mars -- Jupiter, Saturn, Uranus, and Neptune -- are called the gas giants.

SDO - Solar Dynamics Laboratory – GSFC <http://sdo.gsfc.nasa.gov/>

The Extreme Ultraviolet Imaging Telescope (EIT) image of a huge, handle-shaped prominence was taken on Sept. 14, 1999. Taken in the 304 angstrom wavelength, prominences are huge clouds of relatively cool dense plasma suspended in the Sun's hot, thin corona. At times, they can erupt, escaping the Sun's atmosphere.

Handle on the Sun - Heliophysics - <http://science.nasa.gov/heliophysics/>

STEREO - Solar TERrestrial RELations Observatory - <http://stereo.gsfc.nasa.gov/>

Earth Directed Solar Flare Jan. 29, 2013

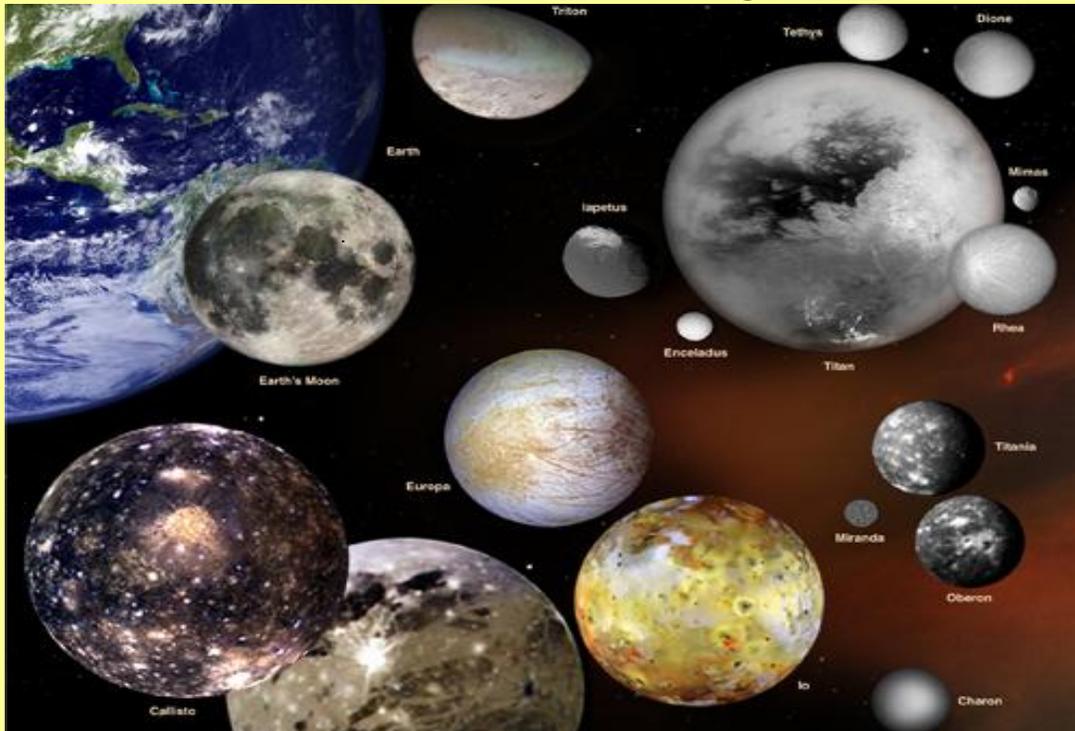


New Sunspots Jan. 14, 2013 CME - Coronal Mass Ejection

<http://www.sciencedaily.com/releases/2013/01/130114172116.htm>



Moons of Our Solar System



Pictured are Earth's Moon; Jupiter's Callisto, Ganymede, Io and Europa; Saturn's Lapetus, Enceladus, Titan, Rhea, Mimas, Dione and Tethys; Neptune's Triton; Uranus' Miranda Titania and Oberon; and Pluto's Charon.

Earth's Moon

<http://www.jpl.nasa.gov/spaceimages/details.php?id=PIA00405>

Galilean Moons

http://lasp.colorado.edu/education/outerplanets/moons_galilean.php

http://en.wikipedia.org/wiki/Galilean_moons

Saturn's Lapetus, Enceladus, Titan, Rhea, Mimas, Dione and Tethys

<http://www.jpi.usra.edu/resources/outerp/ssat.html>

Neptune's Triton

<http://www.solarviews.com/eng/triton.htm>

Uranus' Miranda, Titania and Oberon

http://voyager.jpl.nasa.gov/science/uranus_moons.html

Pluto's Charon

<http://www.jpl.nasa.gov/spaceimages/details.php?id=PIA00827>

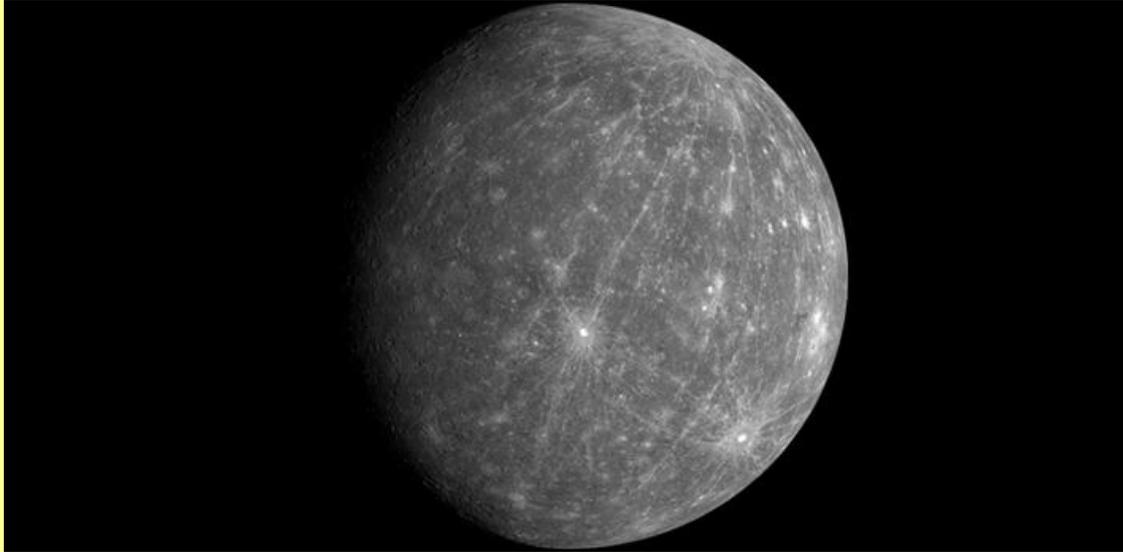
New Sunspots Jan. 14, 2013

CME - Coronal Mass Ejection

<http://www.sciencedaily.com/releases/2013/01/130114172116.htm>



Mercury - The Swiftest Planet – 1st Planet from the Sun



Sun-scorched Mercury is only slightly larger than Earth's Moon. Like the Moon, Mercury has very little atmosphere to stop impacts, and it is covered with craters. Mercury's dayside is super-heated by the sun, but at night temperatures drop hundreds of degrees.

Mercury speeds around the sun every 88 days, traveling through space at nearly 50 km (31 miles) per second -- faster than any other planet. One Mercury solar day equals 175.97 Earth days.

Mercury's elliptical orbit takes the small planet as close as 47 million km (29 million miles) and as far as 70 million km (43 million miles) from the sun.

Temperatures on Mercury's surface can reach 800 degrees Fahrenheit (427 degrees Celsius). Because Mercury's atmosphere is so thin, the surface cannot retain that heat so nighttime temperatures can drop to -290 degrees Fahrenheit (-179 degrees Celsius).

Mercury is the second densest planet after Earth, with a large metallic core having a radius of 1,800 to 1,900 km (1,100 to 1,200 miles), about 75 percent of the planet's radius. In 2007, researchers using ground-based radars to study the core found evidence that it is molten (liquid). Mercury's outer shell, comparable to Earth's outer shell (called the mantle), is only 500 to 600 km (300 to 400 miles) thick.

Spacecraft visits by Mariner 10, and NASA's MESSENGER in 2008 and 2009 made discoveries about the magnetic field and how Mercury's crust was formed.

<http://photojournal.jpl.nasa.gov/targetFamily/Mercury>

<https://pds.jpl.nasa.gov/planets/choices/mercury1.htm>

[http://en.wikipedia.org/wiki/Mercury_\(planet\)](http://en.wikipedia.org/wiki/Mercury_(planet))



VENUS - The Hottest Planet - 2nd Planet from the Sun



Computer simulated global view of Venus.

Click image for full-resolution.

Image credit: NASA/JPL

Venus is a dim world of intense heat and volcanic activity. Similar in structure and size to Earth, Venus' thick, toxic atmosphere traps heat in a runaway "greenhouse effect."

The scorched world has temperatures hot enough to melt lead. Glimpses below the clouds mountains.

Venus spins slowly in the opposite direction of most planets.

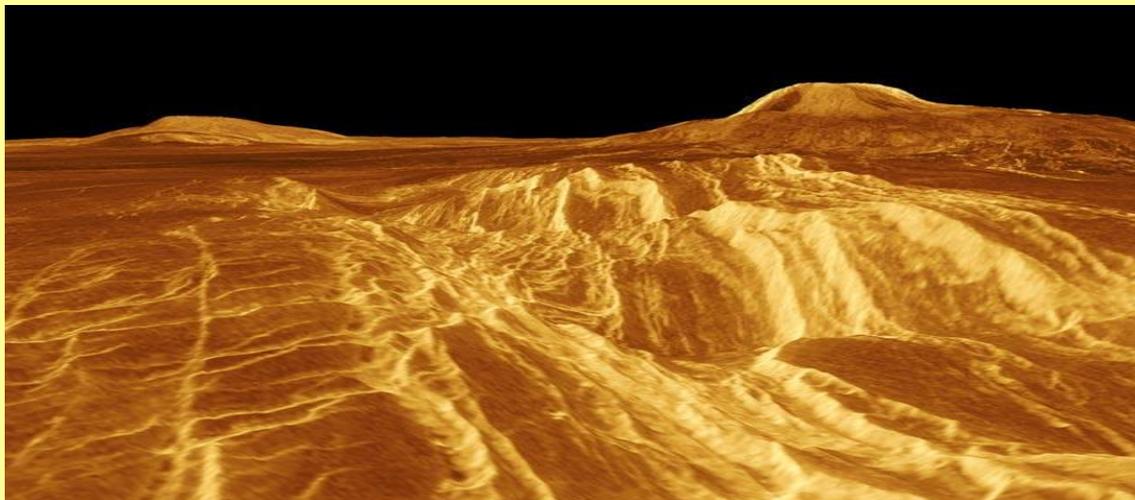
Magellan spacecraft radar data enabled scientists to penetrate Venus' thick clouds and create simulated views of the surface.

www.jpl.nasa.gov/magellan

<http://www.jpl.nasa.gov/mariner2/>

<http://en.wikipedia.org/wiki/Venus>

http://en.wikipedia.org/wiki/Venus%27_atmosphere



640 x 480 · 53 kB · jpeg-<http://www.jb.man.ac.uk/~slowe/transit2004>



Earth – The Ocean Planet – 3rd Planet from the Sun



Earth is an ocean planet. The only Ocean Planet in our solar system. Our home world's abundance of water -- and life -- makes it unique in our solar system. Other planets, plus a few moons, have ice, atmospheres, seasons and even weather, but only on Earth does the whole complicated mix come together in a way that encourages life -- and lots of it.

<http://www.jpl.nasa.gov/earth/>

[NASA Eyes on the Earth](http://www.jpl.nasa.gov/eyes-on-the-earth.html)

<http://eyes.jpl.nasa.gov/eyes-on-the-earth.html>

[IAU - Origin of the Constellations](http://www.iau.org/public/constellations/)

<http://www.iau.org/public/constellations/>

[Synopsis - The Blue Planet](http://en.wikipedia.org/wiki/Earth)

<http://en.wikipedia.org/wiki/Earth>

[History of the Earth](http://en.wikipedia.org/wiki/History_of_the_Earth)

http://en.wikipedia.org/wiki/History_of_the_Earth

[Atmosphere of the Earth](http://www.nasa.gov/mission_pages/sunearth/science/atmosphere-layers2.html)

http://www.nasa.gov/mission_pages/sunearth/science/atmosphere-layers2.html

[Structure of the Earth](http://www.britannica.com/science/Earths-crust)

<http://www.britannica.com/science/Earths-crust>

[Earth Science](http://en.wikipedia.org/wiki/Earth_science)

http://en.wikipedia.org/wiki/Earth_science



Earth's Moon



The distinct bright ray crater at the bottom of the image is the Tycho impact basin. The dark areas are lava rock filled impact basins: Oceanus Procellarum (on the left), Mare Imbrium (center left), Mare Serenitatis and Mare Tranquillitatis (center), and Mare Crisium (near the right edge). This picture contains images through the Violet, 756 nm, 968 nm filters. The color is "enhanced" in the sense that the CCD camera is sensitive to near infrared wavelengths of light beyond human vision

<http://www.jpl.nasa.gov/spaceimages/details.php?id=pia00405>

Orbit of the Moon

http://en.wikipedia.org/wiki/Orbit_of_the_Moon

Earth's Moon: Facts & Figures

<http://solarsystem.nasa.gov/planets/moon/facts>

Moon Facts

http://news.nationalgeographic.com/news/2004/07/0714_040714_moonfacts.html

Facts about the Moon for students

<http://www.primaryhomeworkhelp.co.uk/moon/facts.htm>

1:1 Million-Scale Maps of the Moon - IAU

<http://planetarynames.wr.usgs.gov/Page/moon1to1mShadedRelief?map=lo>



Mars - The Red Planet - 4th Planet from the Sun



Mars is the fourth planet from the sun. It is sometimes called the "Red Planet" because of its red soil. The soil on Mars appears red because it contains iron oxide (rust). Mars is one of the brightest objects in the night sky. It has been known since ancient times. The planet is named for the Roman god of war.

<http://mars.nasa.gov/>

<http://mars.nasa.gov/mer/home/>

<http://en.wikipedia.org/wiki/Mars>

http://solarsystem.nasa.gov/kids/index.cfm?Filename=mars_kids

Mars Exploration Rover Missions (MER)

MER-A *Spirit* and MER-B *Opportunity*
2003 to 2013

http://en.wikipedia.org/wiki/Mars_Exploration_Rover

Curiosity 'ROVER' - NASA Mission to Mars

<http://marsprogram.jpl.nasa.gov/msl/>

Mars Science Laboratory - Curiosity

Mission Details - Raw Camera Images - The Latest from Mars

<http://mars.jpl.nasa.gov/msl/multimedia/raw/>

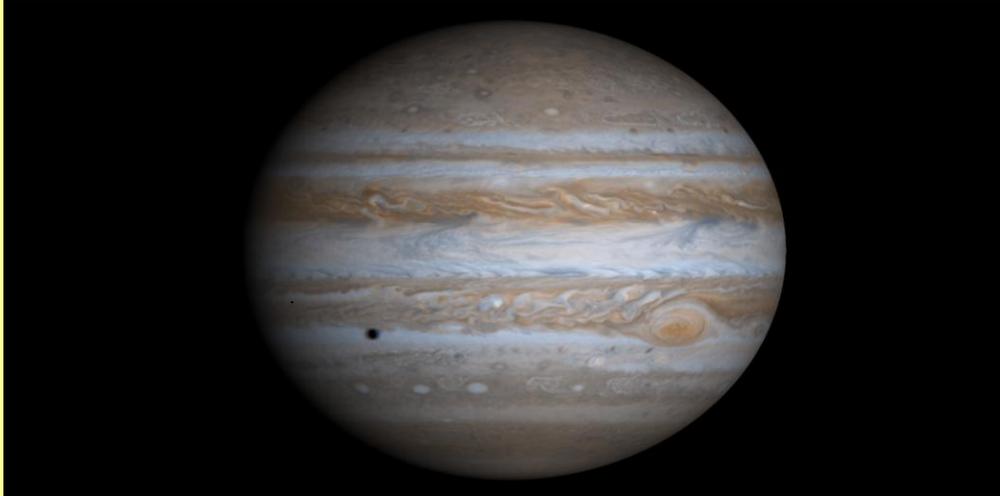
Compare Earth to Mars

<http://mars.nasa.gov/allaboutmars/extreme/quickfacts/>

http://www.nasa.gov/vision/earth/environment/Sibling_Rivalry.html



Jupiter - The Largest Planet - 5th Planet from the Sun



Jupiter, the most massive planet in our solar system -- with dozens of moons and an enormous magnetic field -- forms a kind of miniature solar system. Jupiter does resemble a star in composition, but it did not grow big enough to ignite. The planet's swirling cloud stripes are punctuated by massive storms such as the Great Red Spot, which has raged for hundreds of years. Jupiter's 4 Galilean moons are [Io](#), [Europa](#), [Ganymede](#), & [Callisto](#)

Jupiter Journal

<http://solarsystem.nasa.gov/planets/jupiter>

<http://photojournal.jpl.nasa.gov/targetFamily/jupiter>

<http://solarsystem.nasa.gov/aboutus/>

<http://www.computers4kids.uk.com/demo%20cd/Website%20Links/Grade%207/7.4%20%20Earth%20and%20Beyond/Jupiter%20-%20Wikipedia,%20the%20free%20encyclopedia.htm>

Jupiter Facts & Figures

<http://en.wikipedia.org/wiki/Jupiter>

JUNO - NASA Mission to Jupiter

Launch Date - Aug. 5, 2011

Jupiter Orbit Insertion - July 2016

http://www.nasa.gov/mission_pages/juno/news/juno20120917.html

Juno will, for the first time, see below Jupiter's dense cover of clouds. NASA's Juno Mission will study how Jupiter, the largest planet in our solar system, formed and became the dynamic world we see today. Juno will orbit Jupiter 33 times, skimming to within 3,100 miles (5,000 kilometers) above the planet's cloud tops every 11 days, for approximately one year.

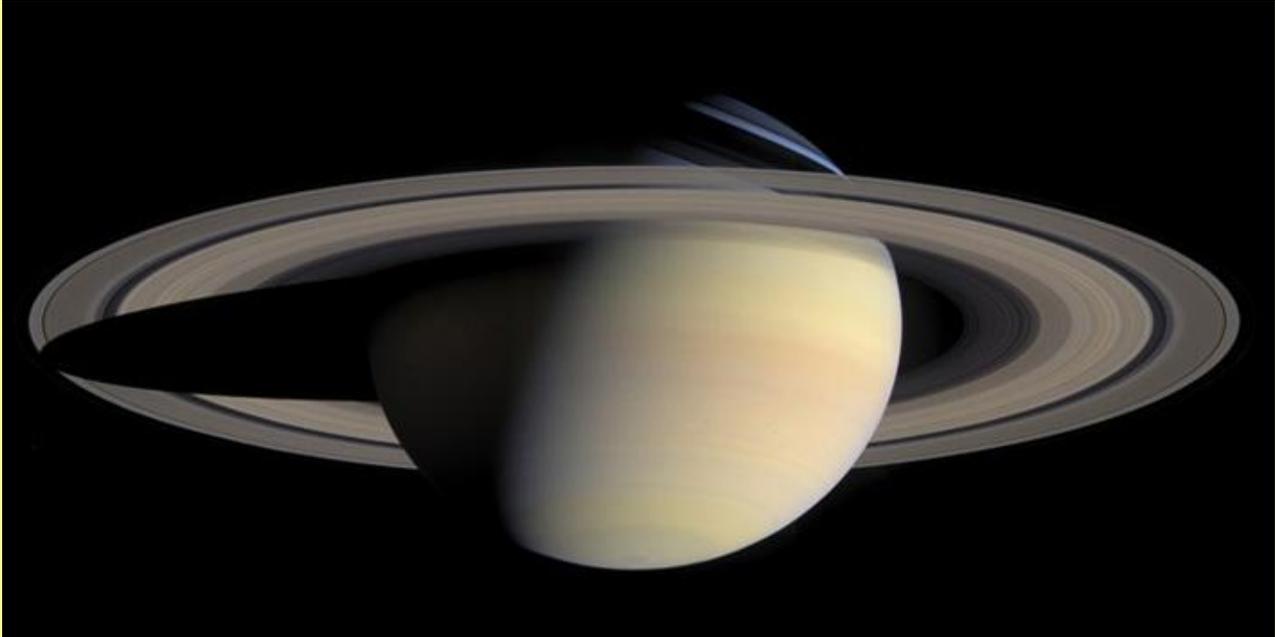
[Juno's Deep Space Maneuver \(DSM-1\) occurred on Sept. 10, 2012 - DSM-2 was completed on Aug. 9, 2012 - and DSM-3 the earth flyby assist will occur on Oct. 13, 2013 - enabling Juno to then complete it's Jupiter Orbit insertion in July 2016.](#)

[Juno's Europa Moon Mission - 2020's](#) <http://www.jpl.nasa.gov/missions/europa-mission/>





Saturn - The Ringed Planet - 6th Planet from the Sun



Adorned with thousands of beautiful ringlets, Saturn is unique among the planets. All four gas giant planets have rings -- made of chunks of ice and rock -- but none are as spectacular or as complicated as Saturn's. Like the other gas giants, Saturn is mostly a massive ball of hydrogen and helium. <http://saturn.jpl.nasa.gov/science/index.cfm?SciencePageID=47>

Rings of Saturn

Rings A thru G +, Ring Arcs, Ringlets, Gaps, Divisions, Spokes & Moonlets

Multiple Hypotheses for Origins

<http://spaceplace.nasa.gov/saturn-rings/en/>

<http://www.nasa.gov/audience/forstudents/k-4/stories/nasa-knows/ring-a-round-the-saturn.html>

<http://en.wikipedia.org/wiki/Saturn>

http://en.wikipedia.org/wiki/Rings_of_Saturn

Saturn – NASA Cassini Solistice Mission to Saturn

Goals: Cassini was designed to explore the Saturnian system from orbit: the planet and its atmosphere, rings & magnetosphere, and its moons - particularly Titan and Enceladus. Cassini also carried Europe's Huygens probe to its rendezvous with Titan. Launch date Oct. 1997 - Landed Jan. 14, 2005.

<http://saturn.jpl.nasa.gov/mission/introduction/>

[Mission end date Sept. 2017.](#)

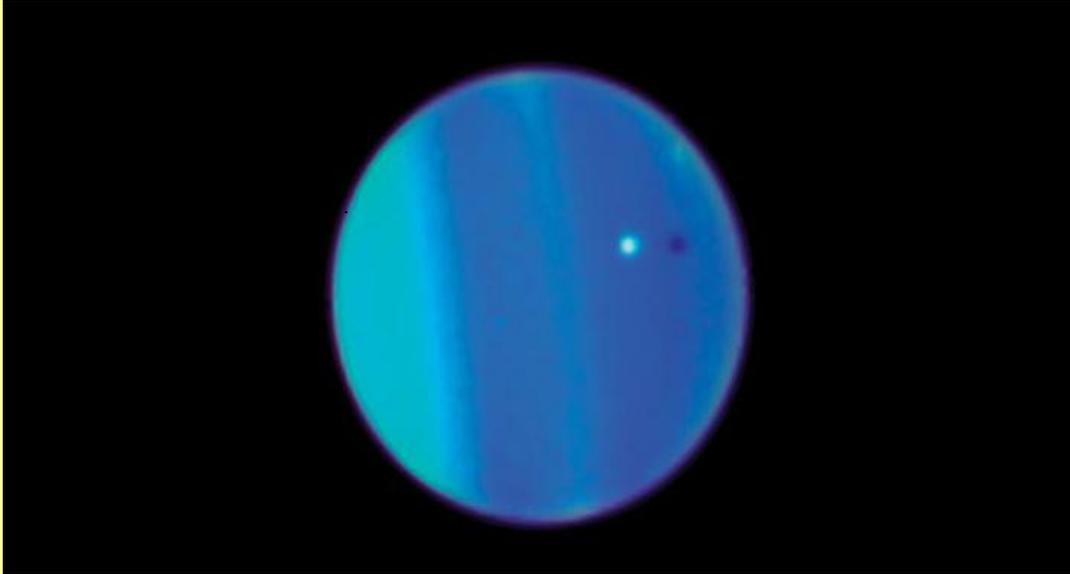


<http://saturn.jpl.nasa.gov/>



Uranus - 7th Planet from the Sun - An ICE Giant

Uranus and Ariel



Uranus is the only giant planet whose equator is nearly at right angles to its orbit. A collision with an Earth-sized object may explain Uranus' unique tilt. Nearly a twin in size to Neptune, Uranus has more methane in its mainly hydrogen and helium atmosphere than Jupiter or Saturn. Methane gives Uranus its blue tint. Ariel is Uranus's moon.

<http://solarsystem.nasa.gov/planets/profile.cfm?Object=Uranus>

<http://solarsystem.nasa.gov/planets/ariel/indepth>

<http://photojournal.jpl.nasa.gov/target/Ariel>

<http://www.jpl.nasa.gov/spaceimages/details.php?id=PIA01356>

http://voyager.jpl.nasa.gov/science/uranus_moons.html



<http://voyager.jpl.nasa.gov/gallery/uranus.html>



Uranus – 7th Planet from the Sun – An ICE Giant

Uranus in Detail

Keck telescope reveals a raft of new details about the planet's enigmatic atmosphere.



http://solarsystem.nasa.gov/multimedia/display.cfm?Category=Planets&IM_ID=15383

Uranus – Voyager 1 – NASA Mission to Jupiter, Saturn, Uranus and Neptune

This still image and set of animations show NASA's Voyager 1 spacecraft exploring a new region in our solar system called the "magnetic highway." In this region, the sun's magnetic field lines are connected to interstellar magnetic field lines, allowing particles from inside the heliosphere to zip away and particles from interstellar space to zoom in.

Image credit: NASA/JPL-Caltech ›

Uranus - The Sideways Planet

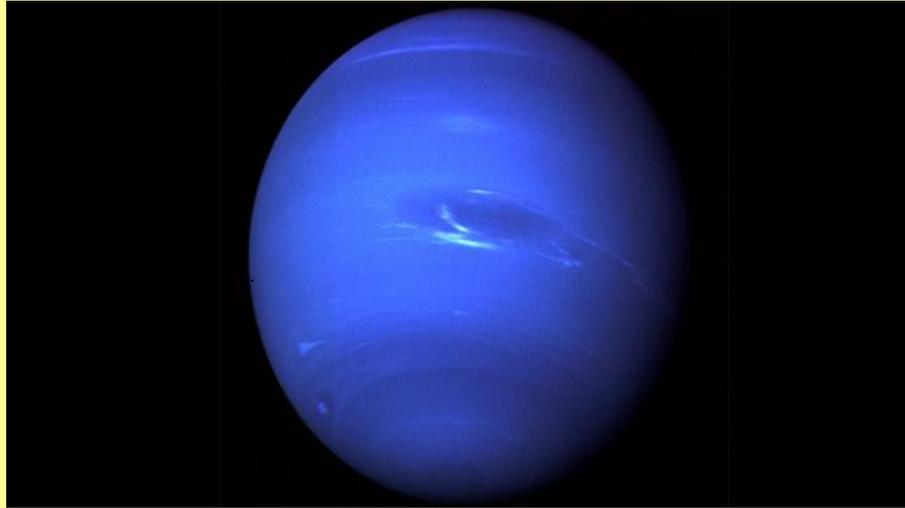
<http://solarsystem.nasa.gov/planets/uranus>



http://voyager.jpl.nasa.gov/news/voyager_1_new_region.html



Neptune - 8th Planet from the Sun - The Blue Gas Giant



Dark, cold and whipped by supersonic winds, Neptune is the last of the hydrogen and helium gas giants in our solar system. More than 30 times as far from the sun as Earth, the planet takes almost 165 Earth years to orbit our sun. In 2011 Neptune completed its first orbit since its discovery in 1846.

<https://pds.jpl.nasa.gov/planets/choices/neptune1.htm>

Neptune – Facts & Figures

Neptune – the Windiest Planet <http://solarsystem.nasa.gov/planets/neptune>

<http://solarsystem.nasa.gov/planets/neptune/basic> <http://en.wikipedia.org/wiki/Neptune>

Neptune – Voyager 2 – NASA Mission to Jupiter, Saturn, Uranus and Neptune

Voyager 2 is the only human-made object to have flown by Neptune. In the closest approach of its entire tour, the spacecraft passed less than 5,000 km above the planet's cloud tops. It discovered five moons, four rings, and a "Great Dark Spot" that vanished by the time the Hubble Space Telescope imaged Neptune five years later



http://solarsystem.nasa.gov/missions/profile.cfm?Sort=Target&Target=Neptune&MCode=Voyager_2

Voyager 1 did not target Neptune before continuing on to chart the far edges of our solar system.



Dwarf Planet Overview

1



Dwarf planets Eris, Pluto and Ceres in comparison to Earth are shown. Pluto's moon Charon also is shown.
<http://www.jpl.nasa.gov/edu/teach/activity/space-shorts-what-is-a-dwarf-planet/>
http://en.wikipedia.org/wiki/Dwarf_planet

The International Astronomical Union decided in 2006 that a new system of classification was needed to describe these new worlds, which are more developed than asteroids, but different than the known planets. Pluto, Eris and the asteroid Ceres became the first dwarf planets. Unlike planets, dwarf planets lack the gravitational muscle to sweep up or scatter objects near their orbits. They end up orbiting the sun in zones of similar objects such as the asteroid and Kuiper belts. <http://www.iau.org/>

[Measuring the Universe](http://www.iau.org/public/measuring/) <http://www.iau.org/public/measuring/>

Pluto

Discovered in 1930, Pluto was long considered our solar system's ninth planet. But after the discovery of similar intriguing worlds deeper in the distant Kuiper Belt, icy Pluto was reclassified as a dwarf planet. This new class of worlds may offer some of the best evidence about the origins of our solar system. Pluto is also a member of a group of objects that orbit in a disc-like zone beyond the orbit of Neptune called the Kuiper Belt. This distant realm is populated with thousands of miniature icy worlds, which formed early in the history of our history of our solar system. These icy, rocky bodies are called Kuiper Belt objects or transneptunian objects.

<http://solarsystem.nasa.gov/planets/pluto/indepth>
<http://en.wikipedia.org/wiki/Pluto> <http://www.iau.org/public/pluto/>



Dwarf Planet Overview

2

Pluto

Pluto is about two-thirds the diameter of Earth's Moon and probably has a rocky core surrounded by a mantle of water ice. More exotic ices like methane and nitrogen frost coat its surface. Owing to its size and lower density, Pluto's mass is about one-sixth that of Earth's Moon.

Eris

It takes icy Eris 557 Earth years to complete a single orbit around our sun. The plane of Eris' orbit is well out of the plane of the solar system's planets and extends far beyond the Kuiper Belt, a zone of icy debris beyond the orbit of Neptune. Eris may be slightly smaller than Pluto but is a large dwarf planet^[1] in the Solar System. (And was formerly designated as the 10th planet.) <http://solarsystem.nasa.gov/planets/eris> [http://en.wikipedia.org/wiki/Eris_\(dwarf_planet\)](http://en.wikipedia.org/wiki/Eris_(dwarf_planet))

Ceres

Pluto is more massive than Ceres -- the dwarf planet that resides in the asteroid belt between Mars and Jupiter -- by a factor of 20. Ceres is the only dwarf planet in the inner Solar System, and the largest asteroid.

<http://www.jpl.nasa.gov/news/news.php?feature=4505>

<http://dawn.jpl.nasa.gov/>

[http://photojournal.jpl.nasa.gov/mission/Dawn?subselect=Target:Ceres:](http://photojournal.jpl.nasa.gov/mission/Dawn?subselect=Target:Ceres)

[http://en.wikipedia.org/wiki/Ceres_\(dwarf_planet\)](http://en.wikipedia.org/wiki/Ceres_(dwarf_planet))



Dwarf planets Eris, Pluto and Ceres in comparison to Earth are shown. Pluto's moon Charon also is shown.
<http://solarsystem.nasa.gov/planets/eris>