

Astronomy for Kids - Jupiter

King of the Planets

The fifth planet in our solar system is also the largest planet in our system, both in size and mass. Jupiter's diameter of over 85,000 miles is almost twelve times that of Earth and its mass is well over twice as much as all the rest of the planets put together. These facts make it appropriate that the planet is named after the king of all the other gods in ancient Roman mythology.

Jupiter is also the first of the gas planets in our system. A gas planet is one that does not have a solid surface like Earth. Instead, you can think of Jupiter, as well as the rest of the gas planets, as being a giant ball of mostly hydrogen and helium. Scientists believe that Jupiter has a small rocky core at its center, but even the core of this giant planet is much larger than our Earth.

Jupiter's size not only makes it the largest planet in our solar system, it has also helped us explore the outer planets. Scientists have used the planet's gravity to accelerate spacecraft and send them one their way to Saturn, Uranus and Neptune.

Jupiter Facts	
Distance from Sun	Approximately 466 million miles
Number of Moons	At least 61
Diameter	85788 miles
Length of Day	10 Earth hours
Length of Year	12 Earth years
Name	Comes from the Roman king of the gods.
Visited by	Pioneer 11, Viking, Galileo and others

Ruler of the Night Skies

Jupiter's extremely large size has made it a favorite observation subject for professional and amateur astronomers ever since Galileo used his first primitive telescope almost four hundred years ago. Using even a small telescope, you are able to see the distinctive color bands of Jupiter's atmosphere as well as the four large Galilean moons. Using a medium-sized telescope, you should be able to see the Great Red spot just south of Jupiter's equator. In fact, you can see the four Galilean moons of Jupiter using just a good pair of binoculars.

You can check the [Sky Maps](#) section here at Astronomy for Kids. If Jupiter is visible during the current month, we will tell you where and when to see it.



A Miniature Solar System

Considering that Jupiter is by far the largest planet in our solar system, it is only fitting that it also has the largest number of moons. The four large Galilean moons, along with at least fifty-seven smaller moons, some of which haven't even been named yet, make up what looks like a small scale solar system.

The four Galilean moons are both easy to see with a small telescope and are fascinating subjects in their own right. Ganymede, the largest of Jupiter's moons, is larger than the planets Pluto and Mercury. Europa apparently has an ocean under its icy surface and tiny Io has many active volcanoes. You can find out more about the interesting moons of Jupiter by clicking on the link at right.



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The Great Red Spot

Jupiter's Great Red Spot is one feature of our solar system that almost everyone is at least somewhat familiar with. This red spot is actually a huge storm that has been raging on Jupiter for at least 400 years.

Although the Great Red Spot is the most famous feature of Jupiter, it is just one part of the complex atmosphere of the giant planet. The distinctive color bands that we see in pictures of Jupiter are a result of very high winds, the makeup of the planet's atmosphere and the planet's high rotation speed. A "day" on Jupiter is just a little over ten hours long, which means that not only is Jupiter huge, but it rotates very fast on its axis. Click on the link at right to learn more about the planet's fascinating atmosphere.

Great Red Spot



The Great Red Spot of Jupiter.

Comet Shoemaker-Levy 9 Hits Jupiter!

In July of 1994, something occurred in our solar system that only happens at most once every several thousand years. Over a period of about a week, pieces of comet Shoemaker-Levy 9 crashed into Jupiter. This was the first time in history that we were able to see and closely study such a spectacular event. Telescopes around the world, as well as the Hubble Space Telescope watched in awe as fragment after fragment of the comet hit the planet, leaving scars in the clouds that remained visible for over a year. It was a very exciting time. Click on the link at right to learn more about this extremely rare event.

Impact!



A comet hits Jupiter!.

Jupiter's Rings

As the Voyager spacecrafts traveled through our solar system, they sent back many pictures things we expected to see, and even more images that were a complete surprise. One of the many new facts we learned from these missions was that Jupiter has rings. Of course we had known that Saturn had rings for several hundred years, but the discovery of rings around Jupiter was completely unexpected. It turned out that all of the gas planets have rings, but we didn't even suspect this until Voyager sent back the pictures. You can learn more about the very faint rings around Jupiter by clicking on the link at right.

Jupiter's Rings



The rings of Jupiter.

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Find Out More About Jupiter

[Jupiter Page at the Nine Planets Site](#)

The Jupiter section of the Nine Planets site has more detail about the giant planet.

[The Voyager Missions](#)

Visit the Voyager mission web site to learn more about the spacecraft that gave us our first real tour of the outer solar system.

[The Galileo Mission](#)

The Galileo spacecraft arrived at Jupiter in December of 1995 and continues to send back exciting information and pictures.

[Galileo](#)

Find out more about the man who gave us our first looks into many of our planetary neighbors.

Astronomy for Kids - A Cassini Portrait of Jupiter

A Cassini Portrait of Jupiter



Image courtesy of: NASA, Cassini Mission

While on its way to Saturn, the Cassini spacecraft sent back this picture of Jupiter.

Astronomy for Kids - The Moons of Jupiter

The Moons of Jupiter

As the largest planet in our solar system, it is only fitting that Jupiter also has the largest number of moons. At last count, Jupiter has a total of sixty-one moons, ranging from tiny "moonlets" only a few miles in diameter up to giant Ganymede, which is larger than two of the planets in the solar system. The four largest moons are called the Galilean moons because they were discovered by Galileo Galilei when he started using his primitive telescope almost five hundred years ago.

Tortured, Volcanic Io

Io is the closest Galilean moon of Jupiter. This small (2178 miles in diameter) moon, is a little larger than our own Moon, but has a much more active life than the Moon of Earth. Io is constantly being expanded and contracted by the gravitational pull of Jupiter, Europa and Ganymede. The continuous tugging on the small moon has many effects, some of which we are just beginning to understand. First of all, the constant expansion and contraction generates a lot of heat on and within the moon. Second, the constant flexing of the surface actually cracks the surface of Io and may eventually break the small moon into pieces. Third the cracks in the surface probably play a part in the almost constant volcanic eruptions we now know are part of everyday life on Io. These eruptions also mean that the surface of Io is regularly changed by the flows from the volcanic eruptions. The eruptions make "lakes" of molten lava. In addition, there appear to be other "lakes" on the surface of the planet that we aren't able to explain fully. All in all, Io is a very mysterious place.

Of all the surprises that the Voyager mission provided, perhaps none was as startling as the picture at right showing a volcanic eruption on this small moon. Until we saw this picture, we had assumed that Earth was the only body in the solar system that had active volcanoes. Legend has it that one of the excellent software engineers at the Jet Propulsion Laboratory (JPL) secretly inserted a routine to look for volcanoes on Io. If this is true, we all benefitted greatly from his or her initiative. We have since learned that not only does Io have active volcanoes, but it is slowly being torn apart by the constant tugging it undergoes from Jupiter and other Galilean moons. These large gravitational forces, along with the almost constant volcanic eruptions, make the surface of this moon a hot, ever-changing landscape.

Io

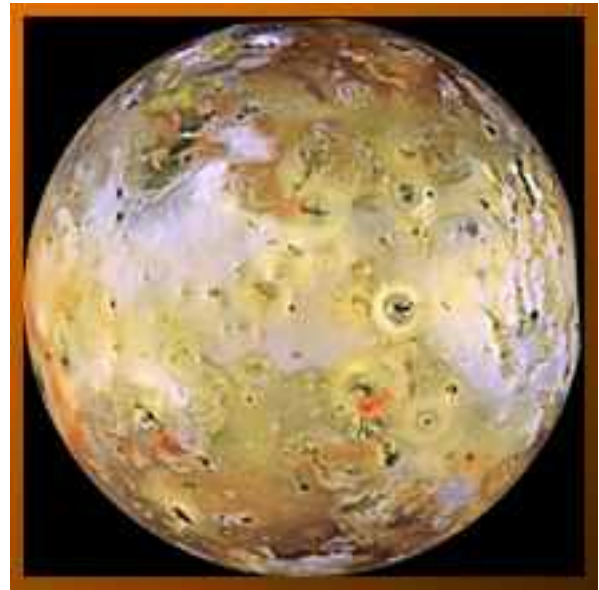


Image courtesy of: JPL/Galileo Mission

Io Erupts

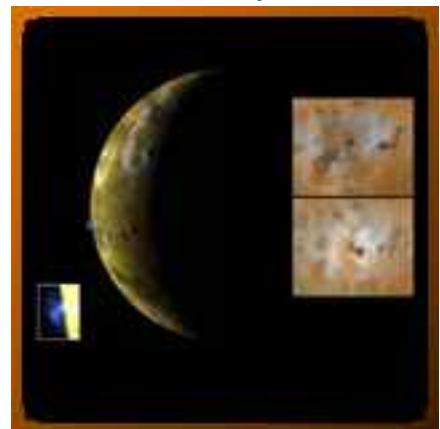


Image courtesy of: JPL/Voyager Mission

Astronomy for Kids - The Moons of Jupiter

Frozen, Watery Europa

The Galileo mission to Jupiter has sent back enough information about Jupiter and its moons to keep scientists busy for years to come. One of the most exciting pieces of news from this lengthy mission has been the discovery of a watery, liquid ocean under the icy surface of this Galilean moon, which is just a little smaller (1882 miles in diameter) than Earth's Moon.

All that we really knew before was that Europa, the second of the Galilean moons, was a frozen world with many interesting patterns on its icy surface. The discovery of the subsurface ocean has scientists around the world excited, and there are preliminary plans on the works now to send another mission to explore this small moon. There is even a small chance that some form of life manages to survive in the submerged ocean. Only further research will give us the final answer.

Europa

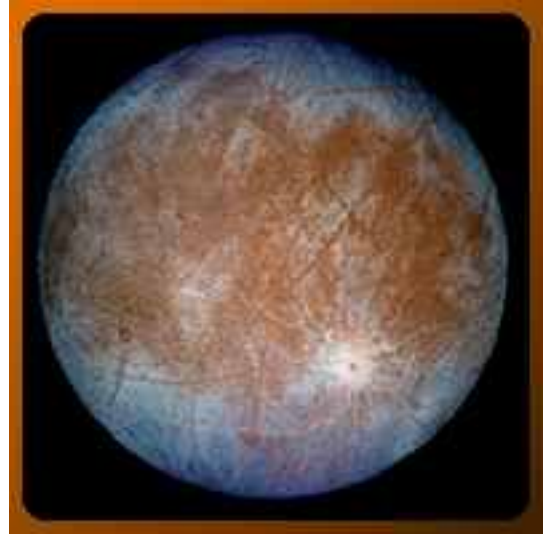


Image courtesy of: JPL/Galileo Mission

Cold, Rocky, Huge Ganymede

The third Galilean moon is not only the largest (3157 miles in diameter) moon of Jupiter, it is the largest moon in the solar system and is actually larger than the planets Mercury and Pluto. By comparison, our own Moon is about 2085 miles in diameter.

Ganymede is another example of the wealth of information sent back by the Galileo mission. The spacecraft has told us that this giant moon has a very liquid iron core, surrounded by a large layer of material that probably is some kind of silicon-based substance with a thin outer layer of ice. You could kind of think of it as a giant M & M candy, except it probably wouldn't be very good to eat. The giant moon also has many craters, much like our own Moon, but the craters are, mysteriously, not very deep and appear to be smoothed out, as opposed to the craters on our Moon.

Ganymede



Image courtesy of: JPL/Galileo Mission

The Galileo mission has also taught us that, at one time, there were active volcanoes on Ganymede, but there are no volcanoes now. The giant moon also has fault lines, like the famous San Andreas fault in California. The lines tell us that at one time the moon's surface was flexing and changing like Io's does now, although that activity seems to have come to a stop. This shows once again that the more you learn, the more questions there are.

Astronomy for Kids - The Moons of Jupiter

Frozen, Cratered Callisto

The last of the Galilean moons of Jupiter is Callisto. In keeping with the tradition of the other Galilean moons, Callisto offers us other mysteries to ponder. Although Callisto appears to be nothing more than a heavily cratered moon, much like our own Moon, the Galileo mission has uncovered hints of what may be an ocean lurking beneath its cold surface. Is there actually another moon of Jupiter with a subterranean ocean? Only further exploration will tell us for sure. With a diameter of 2880 miles, Callisto is quite a bit larger than our own Moon, but is still much smaller than giant Ganymede.

The surface of Callisto also has many more craters than Ganymede, and although the craters appear to be very ancient, they aren't as smooth as the ones on Ganymede, so the icy surface of Callisto doesn't appear to be as "active" as the one on Ganymede. How Ganymede and Callisto could appear to be so different is another mystery that scientists are trying to solve.

Callisto



Image courtesy of: JPL/Galileo Mission

A List of Jupiter's Moons

Here is a list of all the named moons of Jupiter. Although the planet has 39 moons that we know about, not all of them have names yet. This list is just the ones that are "lucky" enough to have been named. They are in order from the closest to the furthest away from Jupiter. The distances of most of these moons from Jupiter should give you an even better idea of the size of the planet and it's accompanying moon system.

Metis - Only about 24 miles in diameter, this moon orbits Jupiter from a distance of 76,800 miles

Adrastea - Tiny, about 12 miles in diameter, Adrastea circles Jupiter from about 77,400 away.

Amalthea - This small moon, 118 miles in diameter, was a target of the Galileo spacecraft on it's final pass around Jupiter. It is about 108,000 miles away from the planet.

Thebe - Sixty miles in diameter, this moon orbits Jupiter from a distance of 133,200 miles.

Io - The first of the Galilean moons, Io is still as far away from Jupiter, 253,200 miles, as our Moon is from Earth

Europa - Europa orbits Jupiter from a distance of 402,000 miles.

Ganymede - Ganymede is 642,000 miles away from Jupiter.

Callisto - Callisto orbits Jupiter from a distance of 1,129,800 miles, or more than four times the distance from Earth to our Moon.

Leda - Not quite ten miles in diameter, this tiny moon is 6,656,400 miles away from Jupiter.

Himalia - A little over 51 miles in diameter, this moon orbits Jupiter from a distance of 6,888,000 miles.

Lysithea - This twenty-two miles in diameter moon is a little over 7,000,000 miles away from Jupiter.

Elara - This moon is a little under 46 miles in diameter and orbits Jupiter from a distance of 7,042,200 miles.

Ananke - This tiny moon, eighteen miles in diameter, orbits Jupiter from a distance of 12,720,000 miles.

Carme - This moon is a little over 24 miles in diameter and orbits Jupiter from a distance of 13,560,000 miles.

Pasiphea - This thirty miles in diameter moon orbits Jupiter from a distance of 14,100,000 miles.

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Sinope - This twenty-two miles in diameter moon orbits Jupiter from a distance of 14,220,000 miles.

Astronomy for Kids - The Clouds of Jupiter

The Clouds of Jupiter

Since Jupiter is a gas planet, it is actually all clouds made up mostly of hydrogen and helium. The "clouds" that we see that make up the colored bands and spots are on the very topmost layers of the giant planet. Any planet's atmosphere, even that of Earth, is like an ocean of gas. Like any ocean, an atmosphere has currents and these currents are what cause wind here on Earth and the swirls in Jupiter's clouds that you see in the picture at right. The different colors in Jupiter's clouds are still something of a mystery even with all the information we have from the Galileo and Voyager missions. Scientists believe that they are made up of combinations of sulfur and phosphorus, but it is still very much a mystery as to how the color patterns keep changing. Although the "winds" on the planet are moving at several hundred miles an hour, we aren't sure whether the winds are caused by the planet's high rotation speed or from internal heating or some combination of the two.

Perhaps the long term study of the data returned by the Galileo mission will provide more answers to some of these questions. The answers may only come with future missions to the planet. Only time will tell for sure. In the meantime, we can just appreciate the beauty of the planet.

The Great Red Spot

Like a giant, colorful, mysterious hurricane, the Great Red Spot has been raging away on Jupiter for at least the last 350 years. It was first observed in 1655 by the French astronomer Jean-Dominique Cassini. When viewed through a telescope, in a picture like the one at right, you may first believe that the spot isn't all that large. This is because Jupiter is so huge. The Great Red Spot is large enough to contain three Earths, and shows no signs of getting smaller anytime soon.

Even with all the information that the Galileo and Voyager missions have sent back to Earth, the spot is still very much a mystery to us. It acts like a hurricane, but no hurricane on Earth has lasted so long. We aren't even completely sure what elements make up the colors of the Red Spot, although some combination of phosphorus seems to be the best bet. The Great Red Spot is still another mystery that time and research will solve for us.

Jupiter's Clouds



Image courtesy of: JPL/Galileo Mission

The Great Red Spot



Image courtesy of: JPL/Voyager Mission

Astronomy for Kids - The Clouds of Jupiter

A Cloud "Cake"

Among the things that we do know about Jupiter's atmosphere is that it actually has lightning much like thunderstorms here on Earth. When the Galileo mission arrived at Jupiter, one of the first things it did was to drop a small package of instruments, called a probe, into the planet's atmosphere. The information the probe sent back allowed scientists to construct the three-dimensional image of the cloud layers shown at right. Unfortunately, the spot where the probe was dropped turned out to be very quiet, so we weren't able to learn more about Jupiter's lightning, but scientists were able to determine that there are three distinct layers of clouds, each being made up of different materials.

Jupiter's Cloud Layers

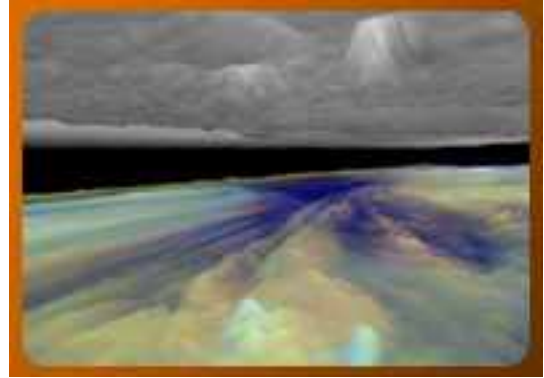


Image courtesy of: JPL/Galileo Mission

The topmost, or highest, cloud layer is made up mostly of ammonia ice clouds. The next layer's clouds are made of a combination of ammonia and hydrogen sulfide, while the lowest cloud layer is made up of water ice, with a little liquid water. There isn't liquid water in the form of oceans like we have here on Earth, but there is some water. The Galileo probe told us that there wasn't as much water as expected, but that has been the result of where the probe entered Jupiter's atmosphere.

Astronomy for Kids - Shoemaker-Levy 9 Hits Jupiter!

A String of Pearls



Image courtesy of: Hubble Space Telescope

During the Spring of 1993, William and Carolyn Shoemaker and David Levy discovered a new comet, which was a cause for celebration all by itself. The real excitement began after they studied the new comet's orbit through our solar system. They discovered that the comet had passed through our solar system a year earlier and had been broken up into the pieces shown in the picture above. They also discovered that the comet was going to return in 1994 and collide with Jupiter.

The news of a comet impacting Jupiter electrified the astronomy community and the world at large. For the next year, scientists and astronomers prepared to observe something that we had never seen before. It was a very exciting time.

Starting on July 16th and continuing for about a week, we all watched in wonder as pieces of the comet rained down on Jupiter. The impacts had a greater effect than we had even dreamed they would. The impacts were so large that the Hubble Space Telescope captured breathtaking images like the one at right. Some larger telescopes here on Earth were also able to see the impact sites, which are the dark patches in the images at the right. You can also see Jupiter's Great Red Spot in the image, which should give you a good idea just how large the comet's impacts were.

The numerous black smudges visible in this picture show how different fragments of the comet hit Jupiter at different times. By the time the impacts started, the fragments of the comet were scattered out over thousands and thousands of miles, which explains why it took almost a week for the last fragment to hit the giant planet.

Impact!



Image courtesy of: Hubble Space Telescope

The impacts of comet Shoemaker-Levy-9 were so violent that their effects remained visible for almost a year after the comet hit Jupiter. The image at right is a series of images taken by the Hubble Space Telescope over a period of a year.

The impacts gradually faded from view, but it took over a year for the largest impact sites to disappear completely. Those of us lucky enough to be a part of this experience will never forget it.

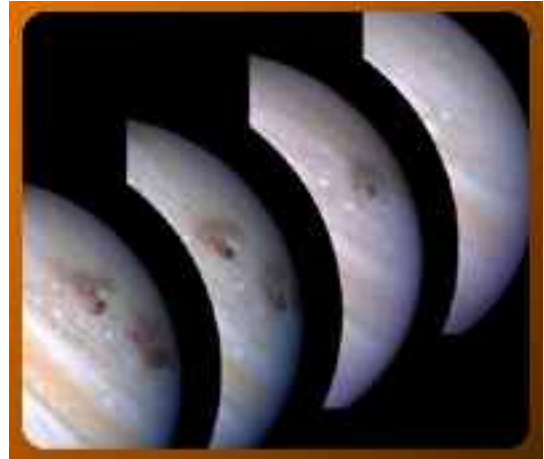


Image courtesy of: Hubble Space Telescope

Astronomy for Kids - Jupiter's Rings

The discovery of rings around Jupiter, as well as those around Uranus and Neptune, was another in the long list of surprises that the Voyager missions sent back as they made their journey through the outer solar system. The rings of Jupiter are far too thin to be seen from Earth and are even too thin for the powerful Hubble Space Telescope to see. This image of Jupiter and its rings was taken by the Galileo mission and should give you a good idea of just how thin the rings really are.

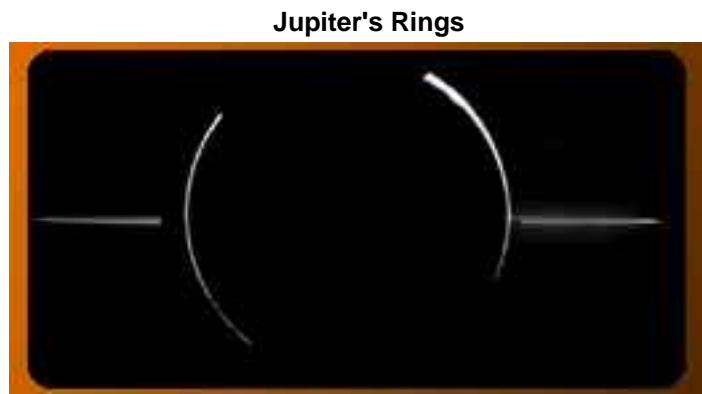


Image courtesy of: JPL/Galileo Mission

The sight of one of Jupiter's Galilean moons above the rings makes for a very impressive image as you can see from the picture at the right. The Galileo spacecraft took this very impressive image of the icy moon Europa apparently hovering just above Jupiter's ring system. Information sent back by the Galileo spacecraft have enabled scientists to determine that the rings are made up of dust particles from Jupiter's moons. The current explanation for this is that Jupiter's moons have been hit by comets and other bodies and the dust resulting from these impacts have formed into the planet's ring system.



Image courtesy of: JPL/Galileo Mission