

# Parent's Guide: To Our Solar System & Beyond

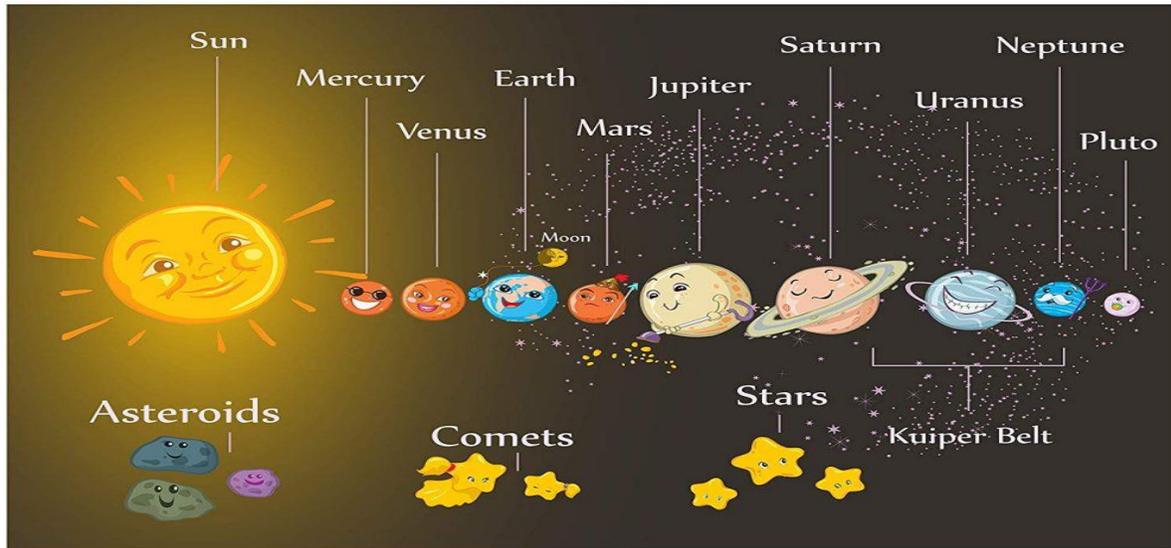


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Even today the vastness of space, including the Milky Way, still holds many mysteries. Although space travel is a reality and astronomers better understand what they see, they are still making new discoveries about the stars and galaxies beyond the Milky Way. For people who are interested in learning about the galaxy and the universe, it is best to start with the basics.

For parents who are interested in teaching the basics about the Solar System to their kids at home or help them with their school or afterschool activities, this guide helps them learn how our solar system formed, how it was discovered and the names of the planets, dwarf planets and regions of space that orbit our sun.

## The Solar System

The Sun is the heart of our Solar System. All of the bodies in the Solar System including planets, comets and asteroids revolve around it. The "Solar System is made up of the Sun and eight planets and their moons. When we gaze up at the sky at night we see many moving points of lights that move among the stars. These "wandering stars" are planets.

### How did the Solar System form?

Solar System was formed when a cloud of dust and gas was disturbed perhaps by a supernova or the explosion of a nearby star. The explosion caused waves in space, which squeezed clouds of dust and gas. Gravity pulled the gas and dust together causing the cloud to collapse into a solar nebula.

The cloud spun and got denser and hotter in the center. A disk of dust and gas surrounding it was cool around the edges but hot in the center. As the disk got thinner and thinner, particles and clumps stuck together to form planets or moons. Planets like Earth, made of rocky material, formed near the center of the cloud. Planets like Jupiter formed near the outer regions where icy matter settled. The center got so hot that it turned into a star, the Sun!

It took millions of years for the planets to form. Each planet was the result of varying collisions of balls of ice and rock. The formations that never got big enough to turn into planets became asteroids.

- The biggest part of our solar system is the Sun followed by Jupiter.
- The four planets closest to the sun, Mars, Earth, Venus and Mercury are “called the terrestrial planets”, as in terms of structure these planets are, Earth-like.
- The four large planets beyond Mars are called gas giants.
- The two furthest planets are Uranus and Neptune.
- The Solar System also has smaller objects like dwarf planets, comets and interplanetary dust!
- Our Solar System is part of the Milky Way galaxy, which contains 200 billion stars.

## What’s It Made Of?

The Sun is the principal component of the Solar System. The Sun is also called a G-Type Main-Sequence Star! Each second, it converts approximately 600 million tons of hydrogen to helium. The objects of the inner Solar System are composed mostly of rock such as iron and nickel. Jupiter and Saturn are composed mainly of gases such as hydrogen, helium and neon. Ices like water, ammonia, methane, hydrogen sulfide and carbon dioxide are also found in various places in the Solar System. Icy substances comprise the majority of the satellites of the giant planets as well as most of our ice giants, Neptune and Uranus.

The Sun contains 99.86% of our system’s mass and is composed primarily of hydrogen and helium.

## More Information

[Our Solar System](#) (from Solar System NASA)

[The Solar System For Kids](#) (from Canisius College)

[Views of the Solar System](#) (from Solarviews.com)

[Ask an Astronomer for kids: The Sun](#) (from IPAC)

[About the Sun](#) (from Stanford Solar Center)

[Exploring our Solar System: Planet and Space For Kids](#) (video)

[Here comes the Sun](#) (Video)

[Solar Eclipse for Kids](#) (Video)

# Inner Solar System

## MERCURY

Mercury is the smallest planet and the closest to our Sun in our Solar System. It is heavily cratered and looks very similar to the moon! Craters were created when comets and asteroids bombed Mercury during its formation. Mercury also has gentle, rolling plains and cliffs. Mercury either freezes or bakes, depending on which side is lit by the Sun! Temperatures can reach 950 degrees F (510 degrees C). The dark side can be as cold as minus 346 degrees F (minus 210 degrees C).

### More information

[Mercury Facts for Kids](#) (from Planetsforkids.com)

[The Planet Mercury](#) (from National Weather Service)

[10 Strange facts about Mercury](#) (space.com)

[Planet Mercury](#) (Video)

[Mercury: The Swiftest Planet](#) (Gallery from NASA)

## VENUS

Venus is the second planet from the Sun. Earth and Venus are often called twins because they are similar in mass, density, size, gravity and composition. Venus is the hottest world in the Solar System. Temperatures on Venus reach 800 degrees F (465 degrees C), which is hot enough to melt lead! Venus is dry because of the intense heat. About two-thirds of the surfaces are plains with thousands of volcanoes covering the surface.

### More information

[All about Venus](#) (from NASA Spaceplace)

[Mission to Venus](#) (from National Geographic)

[Venus facts for kids](#) (from Coolkidsfacts.com)

[Venus: Planetary hotspot](#) (Gallery from NASA)

## EARTH

Earth is the third planet from the Sun and the fifth-largest of the eight planets in the Solar System. It was formed approximately 4.54 billion years ago. Earth is an ocean planet and is the only planet that has liquid water on its surface. Our abundance of water and life make it unique in our Solar System. It is the only planet known to possess life! Earth is home to 8.7 million species of life including humans! It is the only planet that has an atmosphere containing 21% oxygen. Earth is the only inner planet to have one large satellite, the Moon.

### More information

[All about Earth](#) (from NASA Spaceplace)

[Planet Earth facts and information](#) (from National Geographic)

[The Planet Earth: Astronomy and Space for Kids](#) (video)

[Earth: Our home planet](#) (Gallery from NASA)

## MARS

Mars is the fourth planet from the Sun and is the second smallest in the Solar System. Mars is red because it is rusty. There's lots of iron in the soil and Mar's air causes it to turn red like rusty iron on Earth. With a diameter a little over half of Earth. Only Mercury is smaller. The poles of Mars are covered in ice. Mars is the only planet whose surface can be seen in great detail from Earth.

### More information

[Facts about Mars](#) (from National Geographic)

[All about Mars](#) (from NASA Spaceplace)

[Fantastic Mars facts for kids](#) (video)

[Mars: The Red Planet](#) (Gallery from NASA)

## Outer Solar System

The Outer Solar System is home to the gas giants and their moons. This region is further from the Sun and contains objects made of methane, water and ammonia. The four outer planets make up 99% of the mass orbiting the Sun.

## JUPITER

Jupiter is the largest of all planets in the Solar System combined. It protects Earth by steering comets towards the sun or pushing them to the outer edges of the Solar System or beyond. Jupiter has dozens of moons orbiting. Its atmosphere resembles the sun and is made up mostly of helium and hydrogen. Do you know that Jupiter is so big that it could hold more than 1,300 Earths?

### More information

[All about Jupiter](#) (from NASA)

[The science of Jupiter](#) (from Mission Juno NASA)

[Jupiter for Children: Astronomy and Space for Kids](#) (video)

[Jupiter: Twice as double as all the other planets combined](#) (Gallery from NASA)

## SATURN

Saturn is the second-largest planet and is big enough to hold 760 Earths! It's a gas giant made up of hydrogen and helium. Saturn is known for its extraordinary rings that span up to more than 200 times its diameter! Saturn's rings are made up mostly of chunks of dirty ice, particles ranging from small grains to huge boulders even as big as a house! Saturn has at least 62 moons. The largest moon, Titan, is larger than Mercury. Life found on Earth could not live on Saturn and most scientists believe that there is no form of life existing on Saturn."

### More information

[All about Saturn](#) (from Nasa Spaceplace)

[Ask an Astronomer for kids – Saturn](#) (from IPAC)

[All about Saturn for Children: Astronomy and Space for Kids](#) (video)

[Saturn: Jewel of our Solar System](#) (Gallery from NASA)

## URANUS

Uranus is the seventh planet from the sun and third largest in diameter. It is blue-green in colour because of the methane gas in its hydrogen-helium atmosphere. It's known as an ice giant since more than 80 per cent of its mass is made up of water, methane and ammonia ices. Uranus has two sets of rings. One system has mostly narrow dark rings while the outer system has a red and blue ring. Uranus is known for its unusual tilt where it basically orbits the sun on its side!

### More information

[All about Uranus](#) (from NASA Spaceplace)

[Uranus Fun Facts for Kids](#) (from Easyscienceforkids.org)

[All About Uranus for Kids: Astronomy and Space for Children](#) (video)

[Uranus: The sideways planet](#) (Gallery from NASA)

## NEPTUNE

Neptune is the eighth planet from the Sun and is the third-largest planet in our Solar System. Neptune is cold, dark and has whipping supersonic winds. Neptune is one of four gas giants like Uranus, Saturn and Jupiter. It is composed mostly of gas. It's a great ball of helium, "and hydrogen. It has 13 moons. The largest moon, Triton, is about the same size as our moon. Neptune has three main and unusual rings with bright clumps of dust.

### More information

[Ask an astronomer for kids – Neptune](#) (from IPAC)

[Neptune facts for kids](#) (from Spacedictionary.com)

[All About Neptune for Kids: Astronomy and Space for Children](#) (video)

[Neptune: The Windiest Planet](#) (Gallery from National Geographic)

## PLUTO

Pluto was once considered a major planet but was reclassified as a dwarf planet in 2006. It is located in the Kuiper Belt, a shadowy zone populated by a trillion or more comets. Pluto is one of the coldest places in the Solar System at minus 375 degrees F (minus 225 degrees C). With little gravity, a ten-foot basketball dunk becomes a 150-foot Pluto dunk!

### More information

[All about Pluto](#) (from NASA Spaceplace)

[Ask an Astronomer for kids – Saturn](#) (from IPAC)

[All about Saturn for Children: Astronomy and Space for Kids](#) (Video)

[Pluto: Dwarf Planet](#) (Gallery from NASA)

## MOONS

Moons are natural satellites that orbit around various planets in the solar system. There are 140 known moons. Moons can be large like our moon or even small pieces of debris. Some of these moons are larger than the planet Mercury.

### Read more

[Moons by Scott S. Sheppard](#) (from Carnegiescience)

[Moons](#) (from NASA)

[Atlas of Moons](#) (from National Geographic)

## THE MOON (EARTH'S MOON)

Earth's Moon is special because it is the only object in the solar system where humans have journeyed. While the Moon is a satellite of Earth, the Moon is bigger than Pluto. Scientists believe that the Moon was formed when a giant impact knocked off about 10 percent of the Earth's mass.

The Moon is rocky and pockmarked with craters formed by asteroids millions of years ago. Temperatures reach 273 degrees F (134 degrees C) on the sunny side of the Moon and as low as minus 243 degrees F (minus 152 degrees C) on the dark side of the Moon.

### More information

[Ask an Astronomer for kids – The Moon](#) (from IPAC)

[SkyTellers Moon Phases activities for young children](#) (from LPI)

[Facts about the Moon](#) (from National Geographic)

[All about the Moon: Astronomy for kids](#) (video)

[Earth's Moon: Our natural satellite](#) (Gallery from NASA)32

## COMETS

Comets are among the rarest and brilliant bodies in the night sky. They are made out of dust and ice and can be thought of as a dirty snowball!

Comets come from the Kuiper Belt and the Oort Cloud. A comet will spend billions of years there. Once in a while two comets will come close to one another or crash causing a change in direction.

On these rare occasions, the comet will streak into the Inner Solar System. When they enter the warmer Inner Solar System they begin to shine. They begin to melt and leave magnificent tails. After thousands and thousands of years, they meltdown to ice and dust.

### More information

[Fun Comet Facts for Kids](#) (from Ouruniverseforkids.com)

[Comets learn the facts](#) (from National Geographic)

[All about comets: Astronomy for kids](#) (video)

[Comets](#) (Gallery from NASA)

## ASTEROIDS

An asteroid is a leftover planetesimal orbiting the Sun but guided by Jupiter. Compared to the planets, asteroids are mere specks of dust. The largest by far, Ceres has about 1/300th of the volume of Earth. The others in the 'big four' asteroids, Pallas, Vesta and Hygieia, have about a tenth the volume of Ceres. Ceres is the only one of the four whose gravity has pulled it into a roughly spherical shape. Vesta and Pallas are sort of spherical, but only sort of.

### More information

[Asteroids](#) (from National Geographic)

[What are asteroids made from](#) (from Universetoday.com)

[What is an asteroid](#) (video)

[Asteroids](#) (Gallery from NASA)

## METEORITES

Meteorites are rocks and chunks of metal that come from space and land on the ground. But they don't start out as meteorites.

Meteorites start out as meteoroids, which are chunks of space metal or space rock that come from asteroids and orbit around the Sun like the Earth does. With so much space traffic, sometimes collisions happen, just like on the busy streets where you live.

When meteoroids crash into Earth's atmosphere, they become meteors. Our atmosphere acts like a superhero's shield and causes them to burn up before they hit the ground. This is why they sometimes look like a streak of light in the sky as they fall.

## More Information

[Meteorites](#) (from Space.com)

[What is a Meteor Shower?](#) (from NASA Spaceplace)

[Meteor Showers](#) (video)

[Meteors & Meteorites](#) (Gallery from NASA)

## Further Exploration Solar System

[Ask an Astronomer](#) answers the most burning question about a topic in astronomy or about an object in space?

[The Nine Planets](#) provides detailed information with regards to the solar system. This website is suitable for young adults and older.

[Views of the Solar System](#) offers a multitude of good introductory content about the solar system, including images, movies, animations, and illustrations (many copyrighted). The site is best for young adults and adults.

[The Planetary Photojournal](#) provides excellent copyright-free images of the bodies of our solar system. Aimed at ages 11 and up, the site is easy to navigate.

[Windows to the Universe](#) provides background information at beginner, intermediate, and advanced levels in many topics, including the solar system, Earth, and Jupiter.

[NASA's Science Mission Directorate](#) helps teens up with NASA's latest mission results and peruse their multimedia pages for awesome images and podcasts. You can also follow NASA tweets!

[Earth as a Peppercorn](#) is a large-scale outdoor model of the solar system that can be used in place of or in addition to the Explore! solar system scale activities.

[From Earth to the Solar System \(FETTSS\)](#) is a collection of free high-resolution images covering the topics astrobiology, planetary science, and astronomy. The images can be downloaded for free from this NASA website and printed and displayed as exhibits or in other formats.

[NASA's Solar System Missions site](#) provides information about all the missions in our solar system "past, present, and future — with links to the mission Web pages. Many of the missions listed have educational materials.

[Eyes on the Solar System](#) combines video game technology and NASA data to create an environment for users to ride along with NASA spacecraft — including Juno — and explore the cosmos. Appropriate for ages 8 and up.

[Evolution of the Solar System](#) is a graphic timeline of our solar system's birth and evolution. There is a gallery and accompanying activity for youth ages 12–17.

## Astronomy

Identify local astronomical societies by entering your zip code at [Astronomical League](#) or searching at [Sky and Telescope](#).

Check out a short tour of interesting objects in this month's night sky Space Telescope Science Institute's [Tonight's Sky](#) movie, updated monthly. This is an especially useful resource for coordinating with your local astronomical society to showcase constellations, deep sky objects, and planets. Happy stargazing!

Use the tools at the Night Sky Network's [Night Sky Planner](#) to plan a stargazing event or connect with current sky events. Find sky charts, information about the rise and set times for the Sun and Moon, Moon phase, and weather forecasts for your location.

[Stellarium](#) is planetarium software that shows exactly what you see when you look up at the sky, during the day or night. It's easy to use, and free. Appropriate for use with children ages 10 and up.

[The Solar System Ambassadors Program](#) is a public outreach program in which volunteers communicate the excitement of JPL's space exploration missions and information about recent discoveries to people in their local communities.

[Phil Plait's Bad Astronomy](#) site offers a knowledgeable take on common misconceptions in astronomy and space science — and at the movies. Lots of fun and very informative, this site written for young adults to adults helps educators tackle misconceptions directly.

The [Afterschool Universe Program Curriculum](#) consists of 12 sessions that cover topics such as stars, galaxies, and more. The hands-on activities are targeted at middle school out-of-school-time settings and have been rigorously pilot-tested and evaluated. Facilitators can find training videos on the [Afterschool Universe YouTube channel](#).

## Magnetic Fields

The Exploratorium offers [Auroras: Paintings in the Sky](#), where you can find a self-guided tour about the auroras (or northern and southern lights) and Earth's magnetic field.

Visit [www.spaceweather.com](http://www.spaceweather.com) for news, information, and images relating to the Sun and Earth, including auroras. For a fee, skywatchers of all ages can sign up for the astronomy alert service, Spaceweather PHONE.

## Missions

[Living in Space](#) – Check out what the astronauts eat, wear, and much more on this interesting website.

NASA's [Juno](#) webpage provides information on the JUNO mission as well as images, animations and audios. This site is great for older children and adults.

NASA's [New Horizons](#) webpage offers information about the mission to the dwarf planet Pluto and the Kuiper Belt. The site is appropriate for older children and adults.

The [Cassini spacecraft](#) successfully went into orbit around Saturn in 2004. In December 2004 it released the Huygens probe, which reached the surface of Titan in January 2005 and provided a wealth of information about this moon. [Videos and more](#) has tons of videos and animations for people of all ages.

The [Mars Exploration Rover mission](#) sent rovers Spirit and Opportunity to the surface of Mars to search for evidence of past water — and they found it! Life as we understand it requires water. The findings of the Mars rovers will prompt future exploration looking for evidence of past or present life on the Red Planet.

[The MESSENGER](#) mission to the planet Mercury launched in 2004 and arrived at this little-studied planet in 2011.

The [Stardust mission](#) sampled the tail of Comet Wild 2 in January 2004 and returned sample material in January 2006. Comets are “leftovers” from the formation of our solar system, and samples will help scientists understand what the composition of our early solar system was like and what processes occurred in the development of our wide “neighborhood.”

## Child-friendly Apps

There are many apps that can help learn about the stars, planets in the sky but many can be confusing for kids. The apps we found have been tested with kids and were found to be both fun and learning.

[Star Walk Kids](#): As you hold your phone up and point it towards the sky, Star Walk Kids follows your motions using the built-in gyroscope to match the map on your screen to the stars seen from your location.

[Kids Discover Space](#): An interactive book is packed with over 200 spectacular images, interactive diagrams, timelines, fun facts and surprises.

[Galaxies by Kids Discover](#): Top-notch animation, engaging activities, and the entire app is very intuitive. Kids will have fun while learning.

[GoSkyWatch](#) Planetarium: Displays the sky view at the correct orientation when held at any angle, not just landscape or portrait. Simple operation, no buttons to press or modes to select, just point to the sky to start exploring.

[Sun by KIDS Discover](#): For kids who want to know all about this recycled, middle-aged and rather common star that gives us life, Sun is the one.

## Computer Games

There are also many great computer games that help kids discover more about space and our solar system. We selected the most interesting ones in our opinion to help children learn, in a more interactive and funny way.

[Fly to Mars](#) : This Fly to Mars game is a simulation of sending a spacecraft to Mars. You need to launch your rocket in anticipation of where Mars will be in seven months time.

[Build a Solar System](#): Great game for students looking to explore the rotation and orbit of the planets in our solar system

[Deflect an Asteroid](#): Earth is below, and there are various rocks on screen. Push them off any side except the bottom. Earth is down there. Earth doesn't want your rocks.

[Planetary Pinball](#) : A "pinball" game that uses charged particles in various magnetic fields

## TAKE THE QUIZ

### Dictionary

Apogee – The point in its orbit around the earth at which an object is furthest from the Earth.

Asteroid – An asteroid is a chunk of rock and metal in outer space that is in orbit around the Sun.

Aurora – Glows seen over the polar regions which occur when energized particles from the Sun react with particles from the Earth.

Axis – An imaginary straight line on which an object rotates.

Black Hole – A region of space around a very small and extremely massive collapsed star within which gravity is so strong that not even light can escape.

Comet – A small, frozen mass of dust and gas rotating around the sun in an elliptical orbit.

Constellation – A grouping of stars which many times form a shape or pattern.

Eclipse – When a celestial object such as a moon or a planet moves directly into the shadow of another celestial object.

Galaxy – A huge collection of stars, gas and dust measuring many light-years across.

Light Year – The distance which a ray of light would travel in one year. This is about 6,000,000,000,000 (6 trillion) miles.

Meteor – The luminous phenomenon observed when a meteoroid is heated by its entry into the Earth's atmosphere.

Meteorite – That part of a relatively large meteoroid that survives passage through the atmosphere and falls to the surface of a planet as a mass of metal or stone.

Milky Way – The spiral galaxy containing our Sun. As seen from Earth, the constellation Sagittarius marks the direction to its center.

Nadir – That point on the celestial sphere directly opposite the zenith and directly below the observer. The lowest point.

Nebula – A cloud of gas and dust in space, that appear in many shapes and colors.

Nova – A star which suddenly flares up to many times its original brightness before fading again.

Orbit – An orbit is when something goes all the way around something else and returns to its starting position.

Perigee – The point in its orbit around the Earth at which an object is closer to the Sun.

Revolve – To cause to travel in a circle or orbit.

Rotate – To turn about a center point or axis.

Satellite – A small object orbiting a larger one.

Sidereal Period – The time it takes one object to complete one orbit around another.

Solar System – The description given to the system dominated by the Sun and including the Planets, Minor Planets, Comets, planetary satellites and interplanetary debris that travel in orbits around the Sun.

Star – Stars are huge, glowing balls of gases. The closest star to Earth is the sun.

Supernova – A huge stellar explosion involving the destruction of a massive star and resulting in a sudden and tremendous brightening.

Zenith – The point in the sky directly above the observer. The highest point.