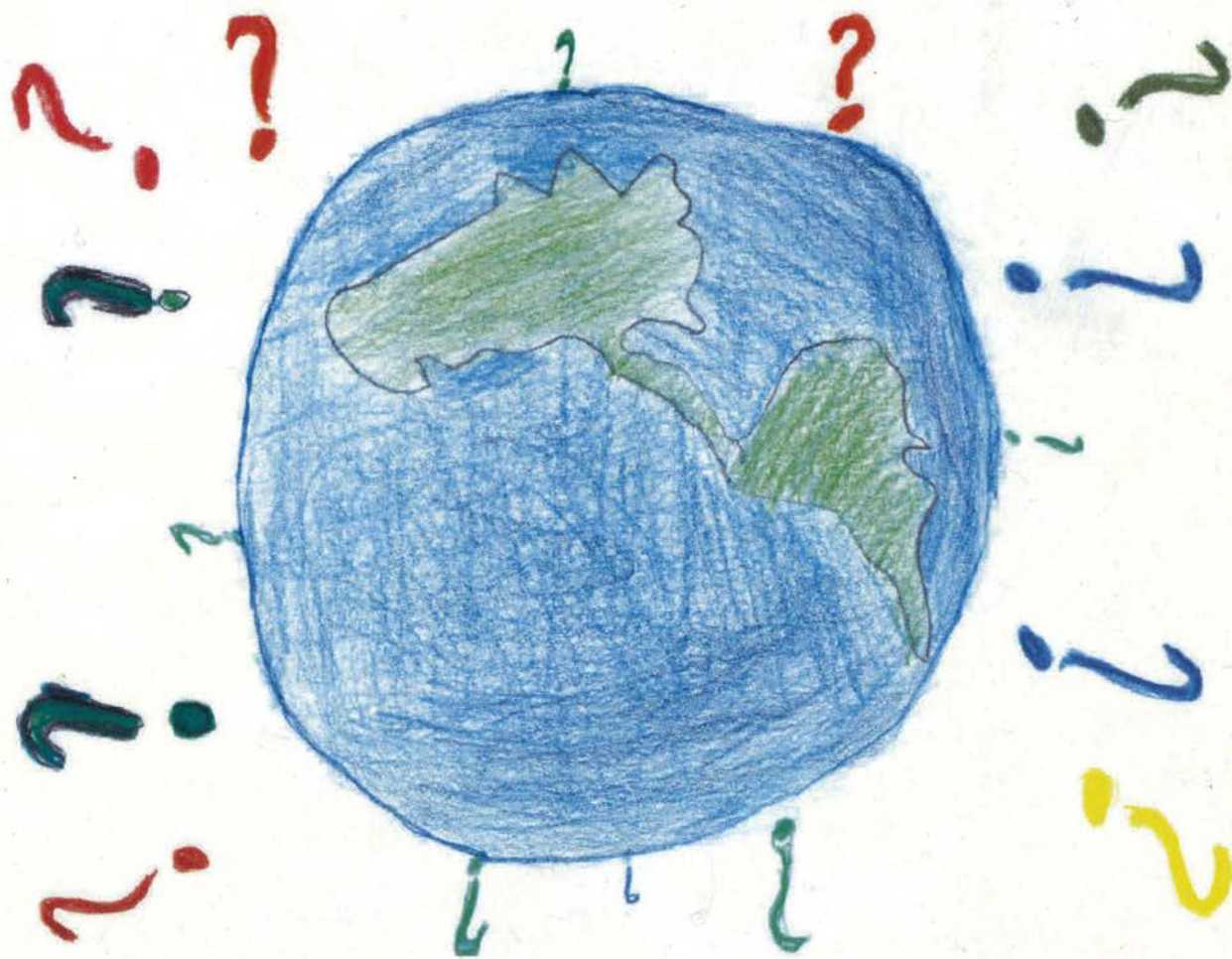


What's Up?

Frequently Asked Questions About Space
Created *By Kids, For Kids*



**Written and Illustrated By The 2007-2008
3rd Grade Class at the Genesee Community
Charter School in Rochester, New York**

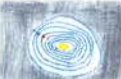




Introduction

This book is the final product our class created at the end of a 3-month Learning Expedition called *What's Up?* During our expedition we made observations and developed theories as we wrote in our sky journals, and as we learned about our solar system and explored patterns like day and night. We also asked lots of questions. We thought other kids might like to know the answers to these questions so we decided to create this book.
















We want to thank two people in particular who helped us in our expedition and with this book. Mr. Adam Frank, a physicist at the University of Rochester, came and spoke to our class and also provided feedback to several students for their explanations. We also want to thank our Art teacher Ms. Lockner. The sketches we made helped us understand the answers to our questions, and they will also help the readers of this book!

To learn about The Genesee Community Charter School visit www.gccschool.org, and for information about Expeditionary Learning Schools visit www.elschools.org.

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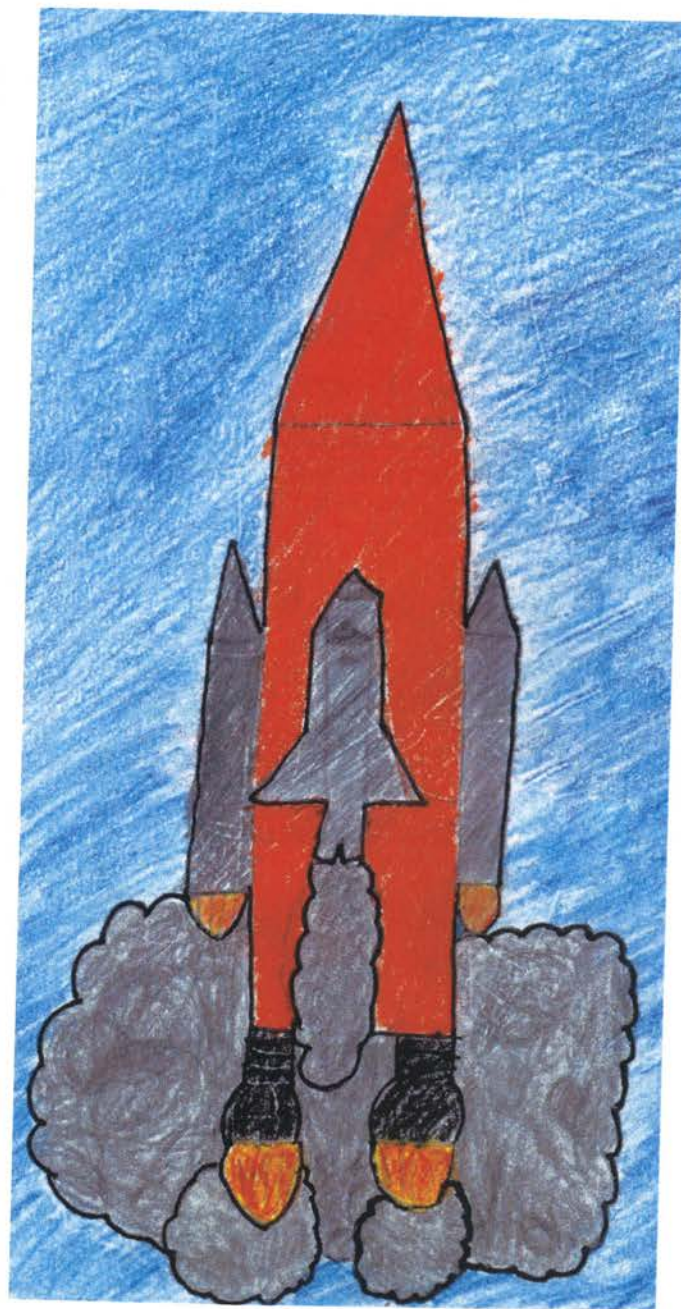
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How Do Astronomers Know What They Know?

By Olívía S.

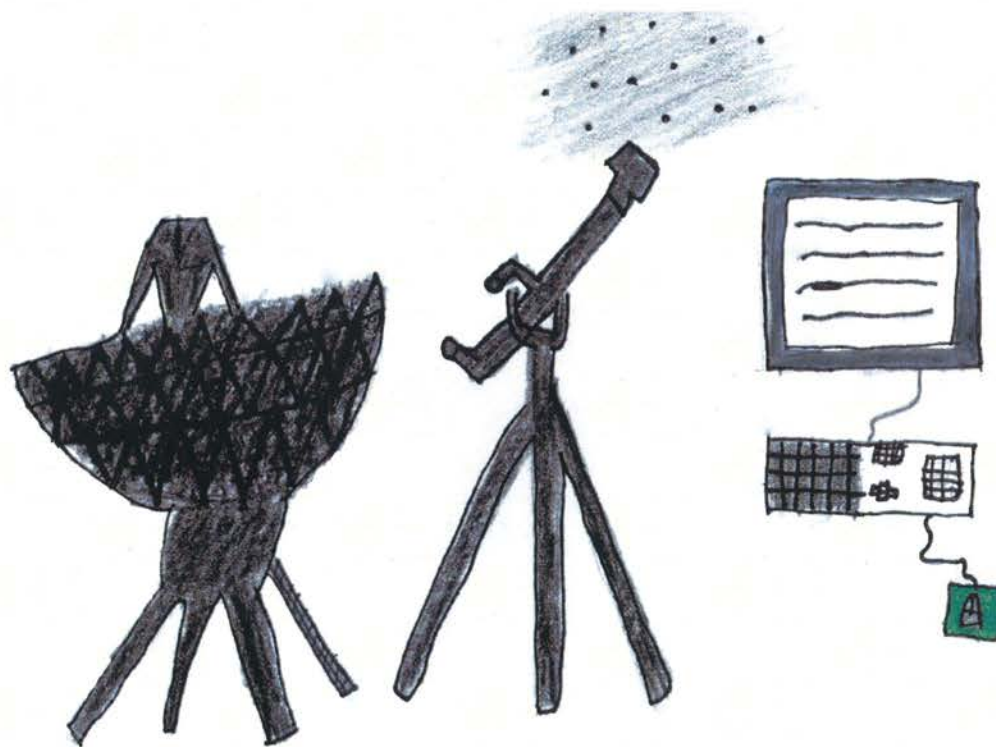
For many years astronomers have been exploring and using different tools to learn more about space. One is called a telescope. A telescope is a tool that astronomers (scientists who study space) use to look at objects in space more clearly. Sometimes it's like the object is looking back at you because it makes it look so big! A very important telescope is called the Hubble Telescope. It is a telescope that astronomers sent into space to orbit Earth. The reason it's so important is because it can take clearer pictures than the telescopes on Earth because it doesn't have to look through the atmosphere.



5,4,3,2,1 Blast Off! Space shuttles are very important and in many different ways. They will blast off and shoot up into our atmosphere taking people into space. The most recent mission was at 11:48 A.M. on Tuesday October 23, 2007. Astronauts went into space to add another piece to the space station.

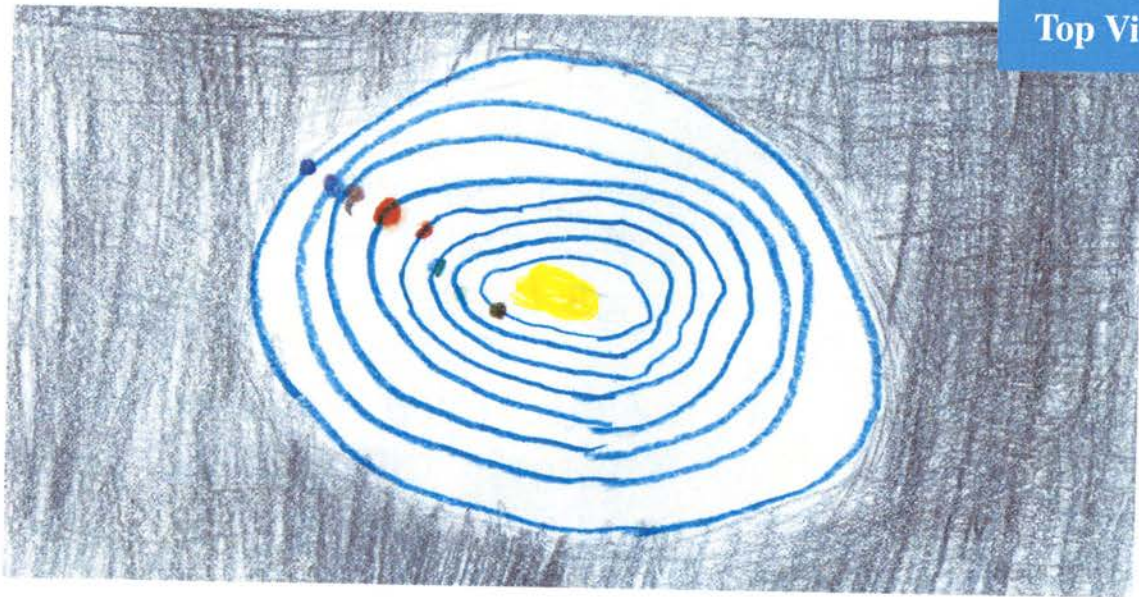
A really cool way that astronomers learn more is by communicating with each other. It is called scientific communication. It all starts when an astronomer will learn something. For example, let's say, about Jupiter, and then they publish it in a magazine or on a computer. At the same time, another astronomer does the same thing but with a little more or different information. They will look at each other's information and they will meet together and talk about what they learned. Sometimes the groups are bigger and they become a symposium. A symposium is a meeting or conference that people use to talk about a couple things, in this example, about Jupiter.

How astronomers know what they know is awesome!



How Do The Planets Go Around The Sun?

By Taylor R.



Top View

Planets go around the sun and all planets follow their own orbit. The planets closer to the sun like Mercury go around the sun fast. And planets that are farther from the sun, like Neptune, go slow. It is like a car race and the people in the inside lane might go faster around because they have a shorter distance and they might be driving faster. For example, Neptune takes about 165 years to go around the sun and Mercury takes only 3 months. Something else you should know is that planets' orbits are not exactly a circle. They are an oval. You can see this when you look at the top view. When you look at our solar system from the side view you see the orbits overlapping because they are in a line.



Side View

Why Do Planets Orbit The Sun?

By Noah W.

Planets orbit the sun because of two forces. One being the sun's gravity. The sun's gravity pulls every planet toward the sun. That's one of the forces that keep us in orbit. The other one being a force that planets have had since the solar system began. The solar system began from an explosion which pushed things away. This pushing is the other force. These two forces cause an orbit. For example, if you tie a ball to a string and swing it around your head, you've created an orbit just like the planets. Do you know why? Because the ball is pushing out and you're pulling in on the string. This push from the ball is just like the planet's push, and you pulling in is like the sun's gravity. The ball moving around your head is like the planet's orbit.



What Is A Planet And How Do Planets Form?

By Jesse D.

A planet is something that orbits the sun. But not everything that orbits the sun is a planet. The definition of a planet is 1) orbit around the sun, 2) have enough mass so that it has a nearly round shape, and 3) to have cleared the neighborhood around its orbit. Clearing the neighborhood means getting anything out of its orbit (like asteroids and other things floating in space). There are 8 planets in our solar system. There are 4 inner and 4 outer planets. The 4 inner planets are Mercury, Venus, Earth, and Mars. The inner planets are made of rock. The 4 outer planets are Jupiter, Saturn, Uranus and Neptune. The outer planets are made of gas and ice.

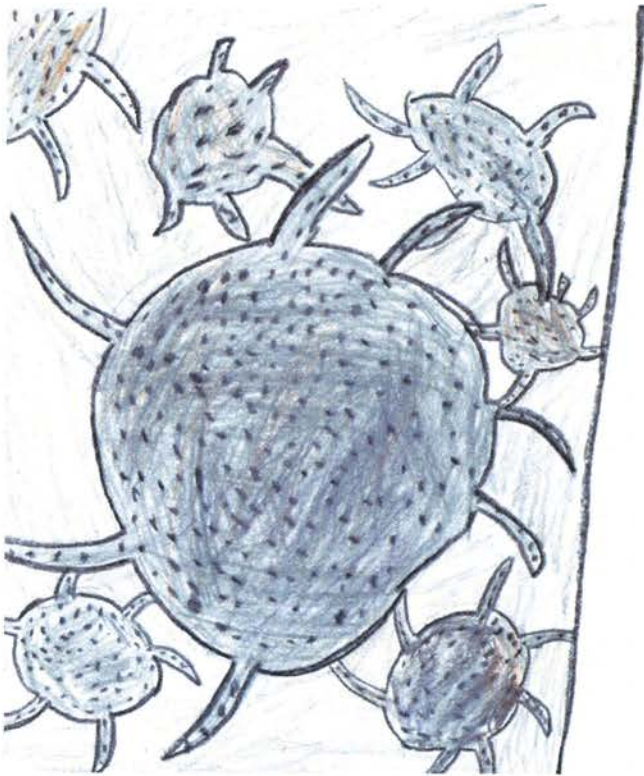


The planets formed when a star made a big explosion. Materials from the explosion started going around the new sun. The materials didn't go out of their orbit because of the sun's gravity. The materials started to clump together and got bigger and bigger because of their own gravity. After a billion years the clumps formed planets.



How Do Scientists Think The Universe Began?

By Elijah G.

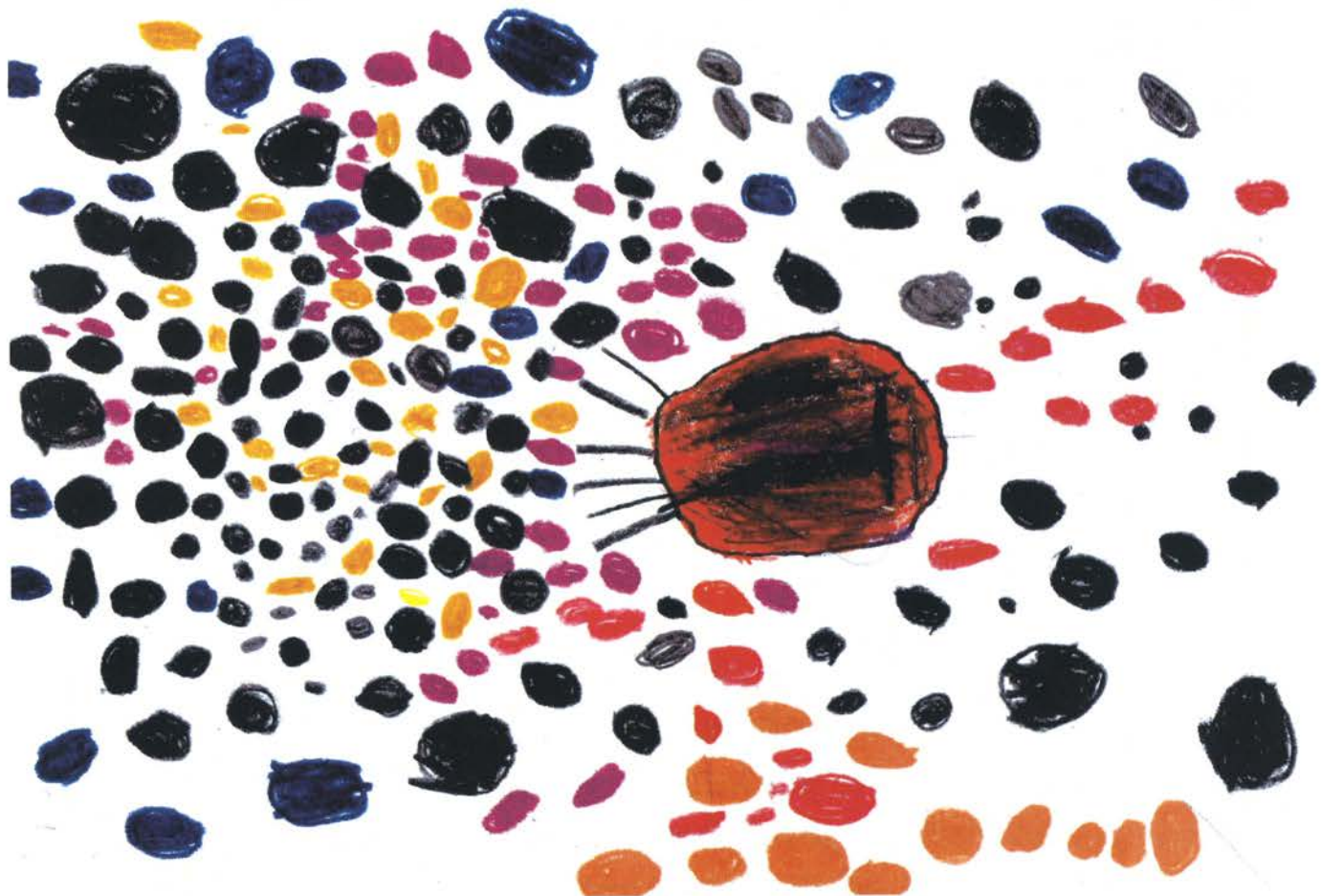


Scientists do not know exactly how the universe began but they have a couple theories and the main theory is called the Big Bang. Astronomers think that the universe started as a tiny microscopic dot, even smaller than an atom. Then they think it exploded. Scientists do not know what caused

this explosion. Every bit of matter started going outwards. Scientists think that the universe expanded bigger than a galaxy in a split second. In this process gravity was acting weird, pushing bits of matter out instead of pulling them in. Then the universe started to cool. Little particles formed. Then the gravity started acting normal again, pulling the particles together creating clouds. After 1 billion years those clouds started forming the galaxies and stars that we see today. Scientists think that the Big Bang happened because they observe that the universe is expanding. For example, if you go home and drop a rock or a pebble into a pond, you will see ripples going outwards. Or if you see an explosion then stuff goes outwards. Like if a meteor hits the water, a big tsunami would be created that goes outwards and creates a humungous wave. Maybe someday this question will be answered for sure, but you never know!

How Do Stars Form?

By Connor W.

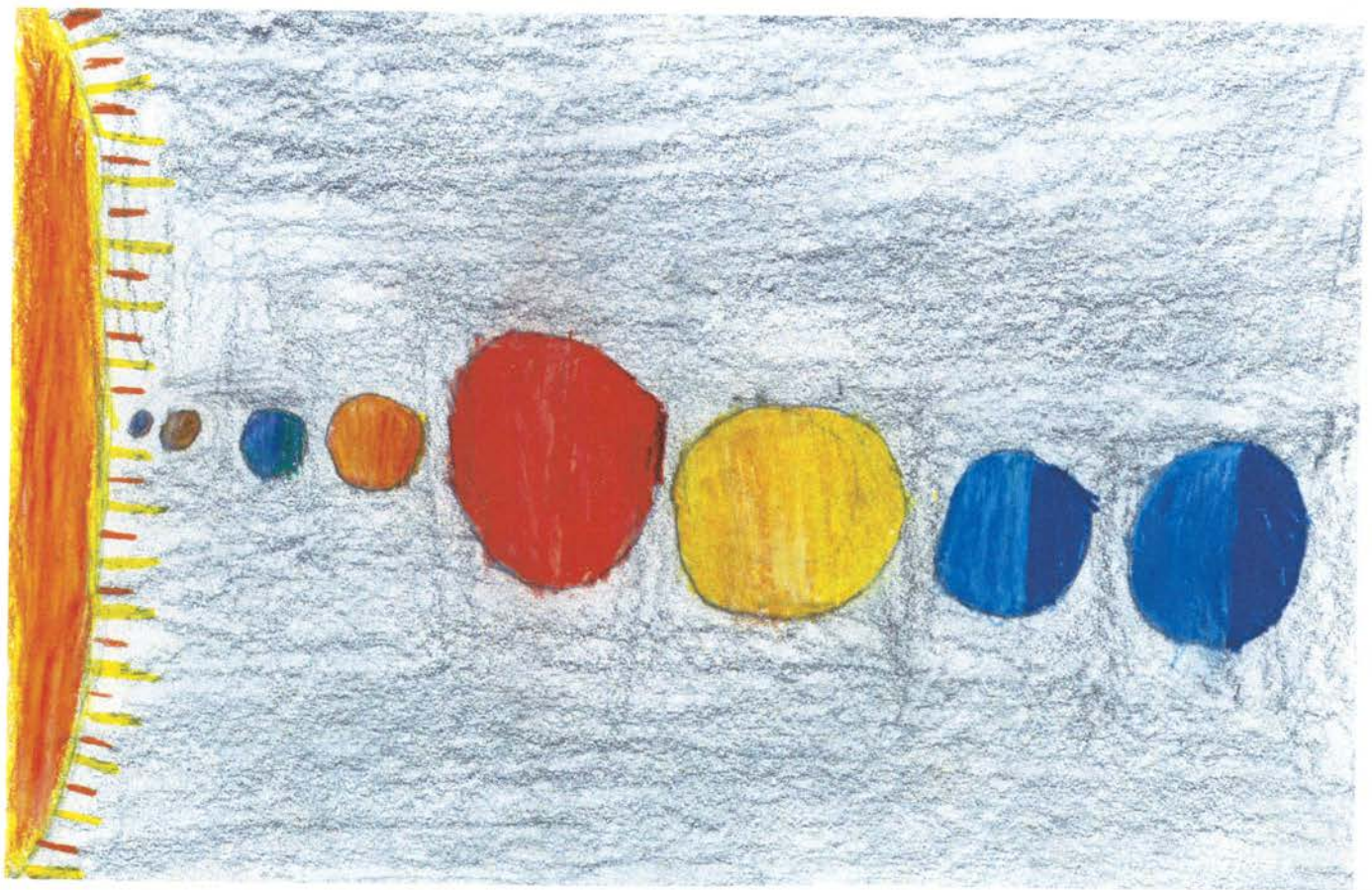


Stars can be different but they all start the same way. They start as a big cloud of gas called a nebula. The nebula has its own gravity and that pulls all the gas to the center. It forms a dark sphere and the temperature rises. Soon it becomes a glowing ball of gas. If this ball of gas gets big enough it will start to shine. The shining light is caused by the nuclear energy in the star. Our sun is the middle of our solar system, and it's a star that formed in the same way as other stars.

Why Do Planets Have Different Temperatures?

By Desiree M.

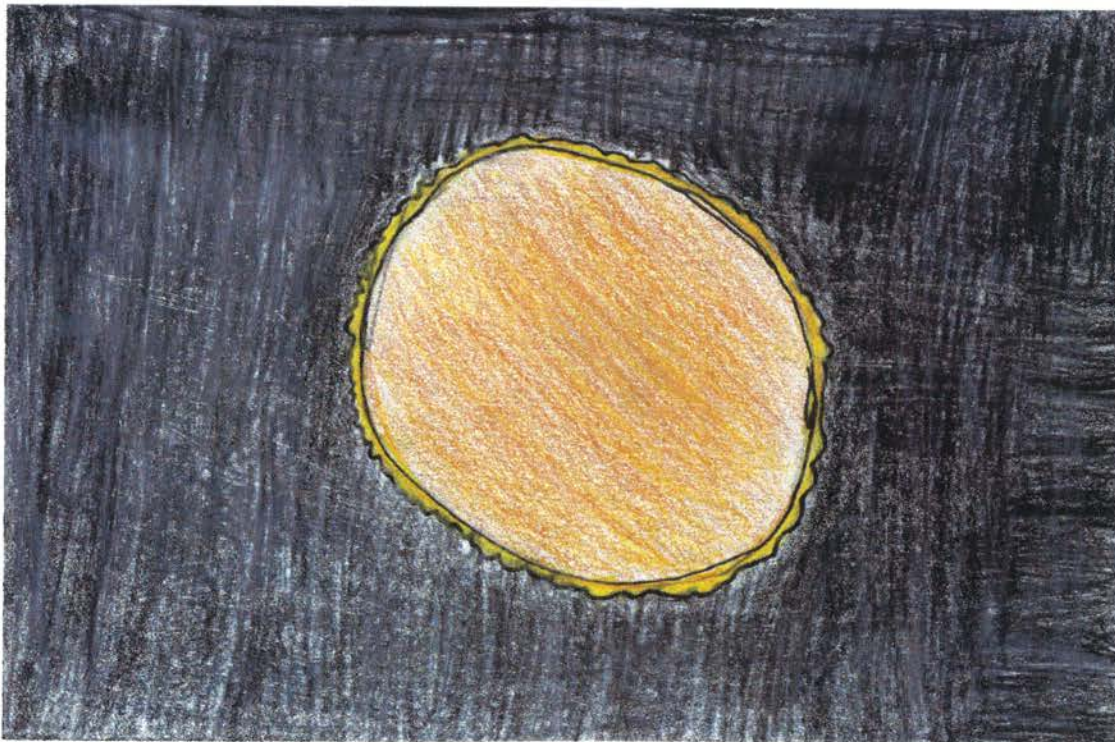
Planets have different temperatures because of their distance from the sun. The sun is larger than all the other things in the solar system. It's really hot. The surface is about 10,000 °F. It is so hot that its heat stretches out into space. Mercury and Venus are the hottest planets because they are close to the sun. Neptune is really cold because it is furthest from the sun. For instance if you were near a candle it would feel warm. As you move away it will feel like it's colder.



What Exactly Is The Sun?

By Jessica V.

The sun is a star. A star is a hot ball of burning gas. It is so hot that if you go too close to the sun you would burn up. The surface of the sun is 10,500 degrees Fahrenheit. It is 850,000 miles wide. A million earths can fit in the sun. The planets orbit the sun. Orbit means to circle around the sun. The sun's gravity makes planets orbit by pulling the planets towards the sun. The sun gives us heat and light but it's not burning like a camp fire. It's that the gas pushes together very hard and that makes it very, very hot. We really need the sun. If we did not have the sun it would be so cold that we couldn't even exist. The earth wouldn't even orbit because the sun wouldn't be there to pull it with its gravity.



What Is Sunlight And How Far Does It Travel?

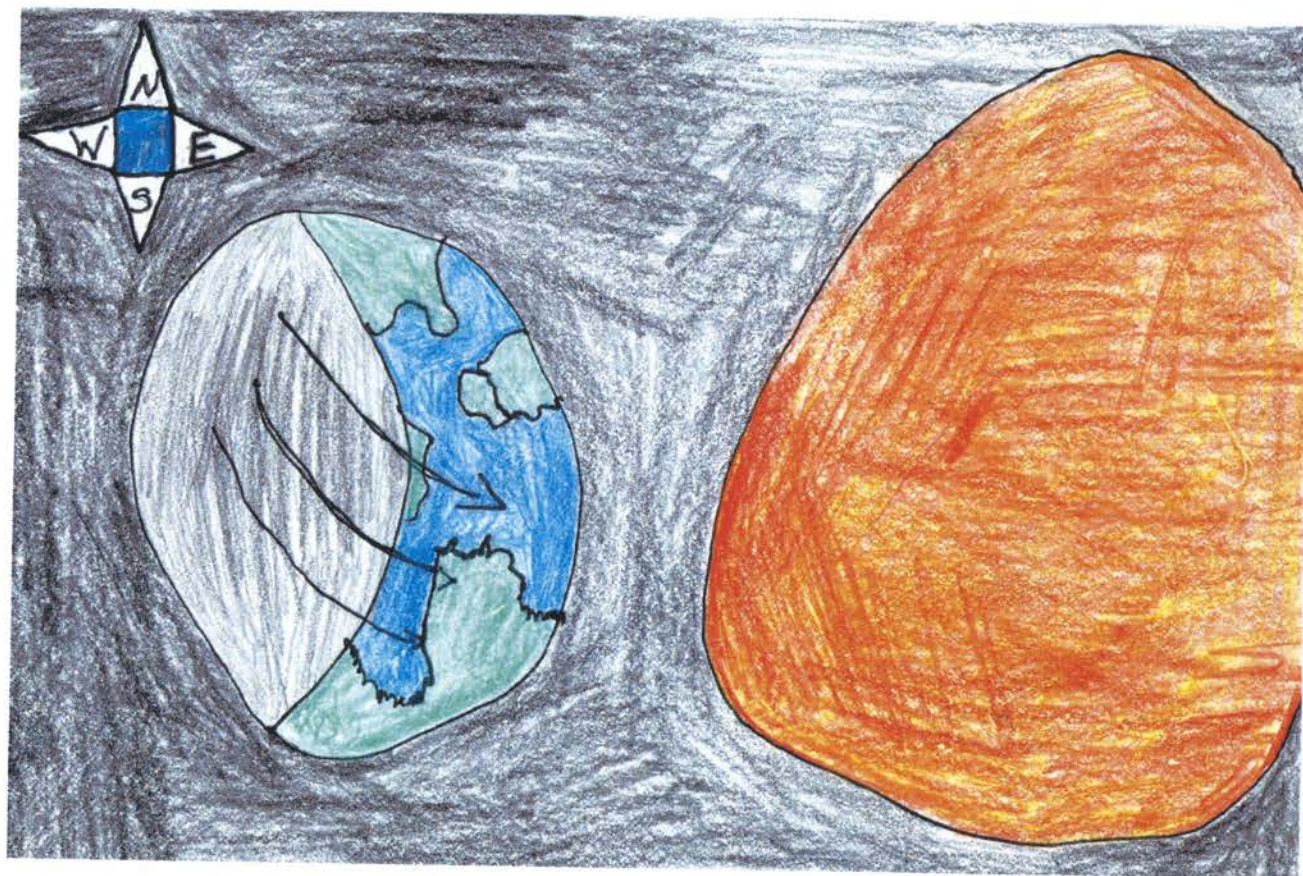
By Nassir J.



The sun's light is made of energy and color. Its light travels out of the galaxy and further, but only the planets in our solar system feel the sun's heat. The sunlight is hot and it shoots in all directions. Colors from the rainbow are inside sunlight. When mist is in the air and sunlight goes through it, it makes a rainbow. Light travels at a speed of 186,000 miles per second. It is fast. It can keep going until it bounces off of something. For example, when we're outside at night we see stars in the sky. It took a long time for sunlight from those stars to reach Earth.

How Can It Be Daytime In One Place On Earth And Nighttime Somewhere Else At Exactly The Same Time?

By Tasha C.

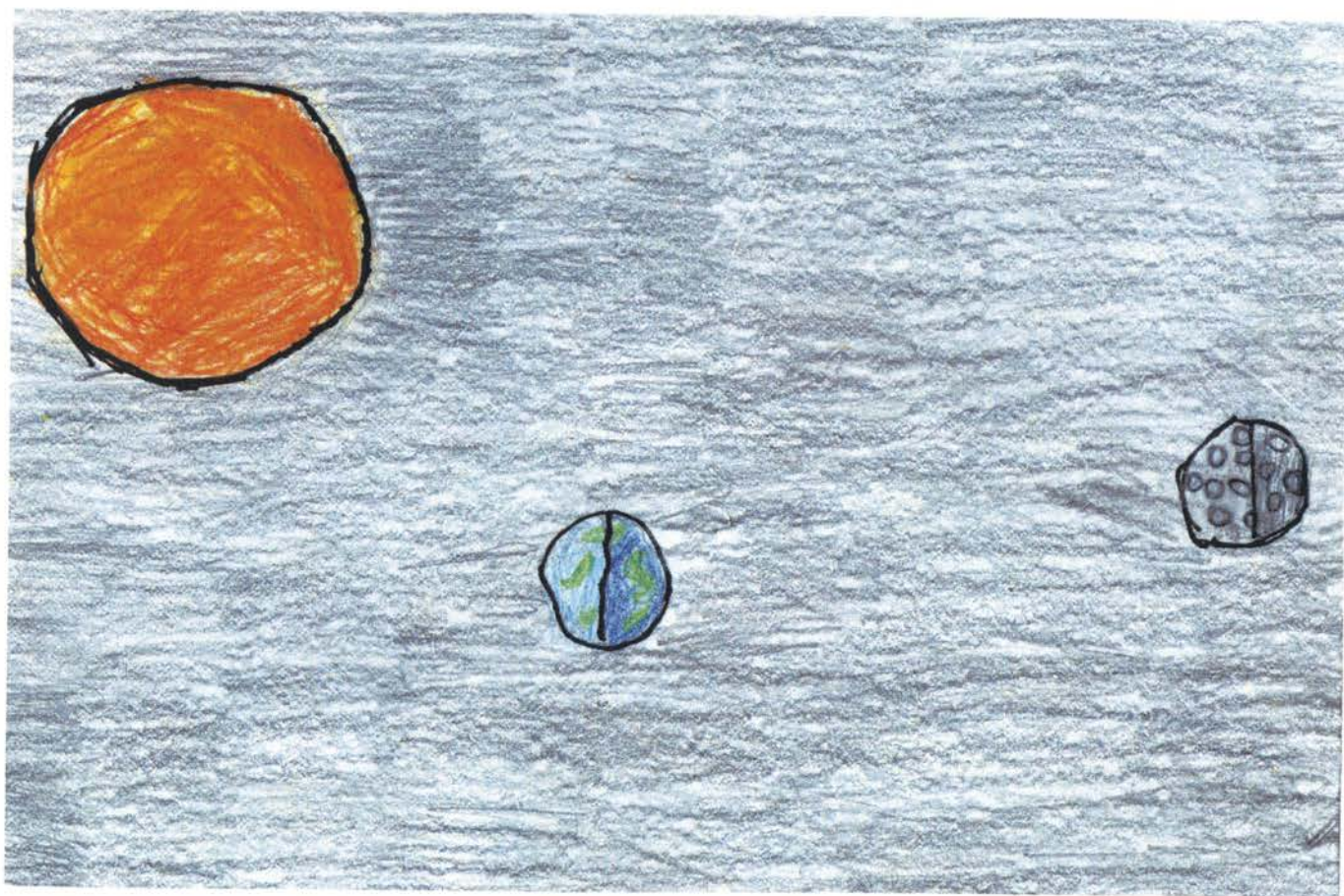


It can be daytime in one place on Earth and nighttime somewhere else because the Earth spins on its axis. The sun is always shining on one side of the Earth. That's when it's daytime. The part of the Earth that is not facing the sun is having nighttime. It takes 24 hours for the Earth to spin around once on its axis. The Earth spinning on its axis causes the pattern to happen over and over again. For example China and Rochester are on the opposite sides of the Earth. When it's 1:30 in the afternoon in Rochester it's 1:30 in the morning in China.

Why Do We See Sunlight Reflecting Off The Moon When Its Dark Outside?

By Dominique R.

Even when it's dark outside we can see the moon because the sun is still shining on the moon. We have night because the Earth spins and our side of the Earth isn't facing the sun. If the moon is not lined up with the Earth, the sunlight doesn't get blocked (see sketch). That is how we can see the moon when it is dark outside.



What Is A Moon And Why Do Planets Have Them?

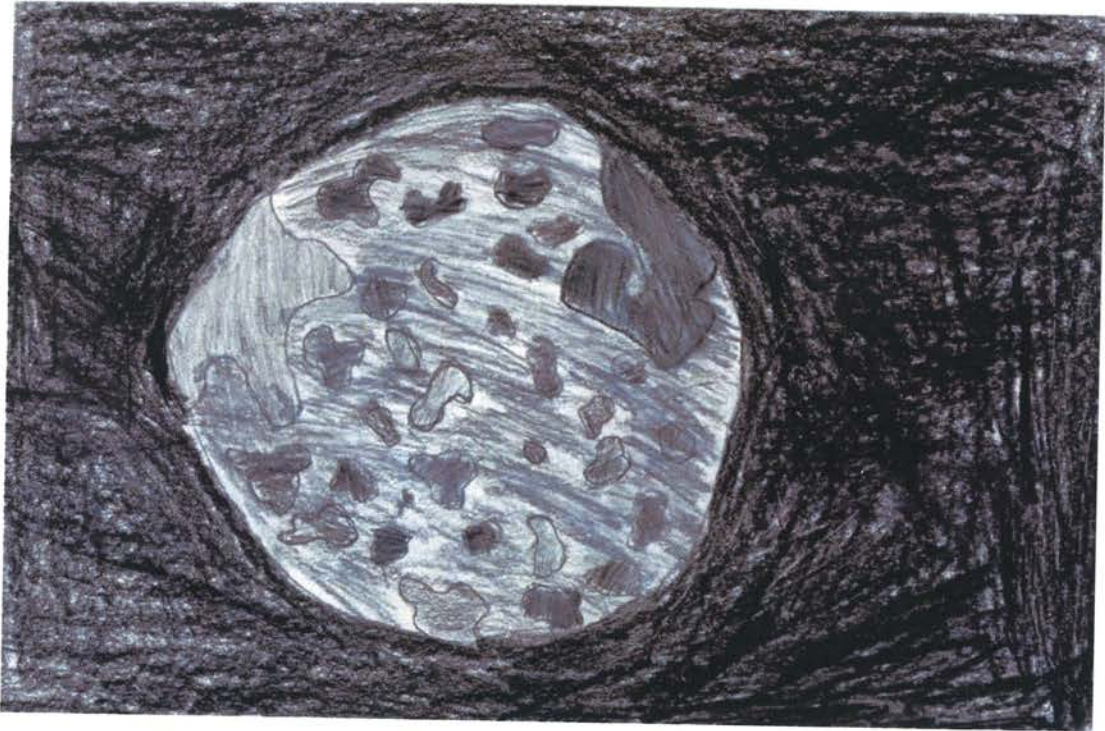
By Brian C.

A moon is a naturally made satellite (an object that orbits a planet). Scientists are not sure why planets have moons but they do have a theory (idea). They also know many facts about our moon. The Earth's moon is rocky. It has no life. It has no oxygen. Scientists think that billions of years ago, something crashed into the Earth. They believe that some of Earth's pieces came together to make the moon. This is the Giant Impact Theory. Scientists think that this theory makes the most sense. For example, they have studied moon rocks. They discovered that the moon is made of rocks found in Earth's outer layer. So, the Giant Impact Theory explains why the moon is made of materials from the Earth.



What Kind Of Rock Is The Moon Made Of?

By Noah D.



The moon is made of two types of rocks, and they are basalt and breccia. Basalt is hardened-up lava, and breccia is made of soil and pieces of rock that were squeezed together. The moon has 3 layers. The inside layer is the core. It is made out of iron and iron is a type of metal. The next layer is the mantle. The mantle is made of magma, and magma is melted rocks. The top layer is the crust and this is where asteroids hit. The Earth has the same amount of layers as the moon. A core, a mantle, and a crust. Astronomers think that 4½ billion years ago a collision happened with Earth and a planet and that's how the moon formed. They think pieces went flying into space and clumped together to form the moon. The moon started orbiting around our planet Earth.

What Is A Lunar Eclipse?

By Sam C.

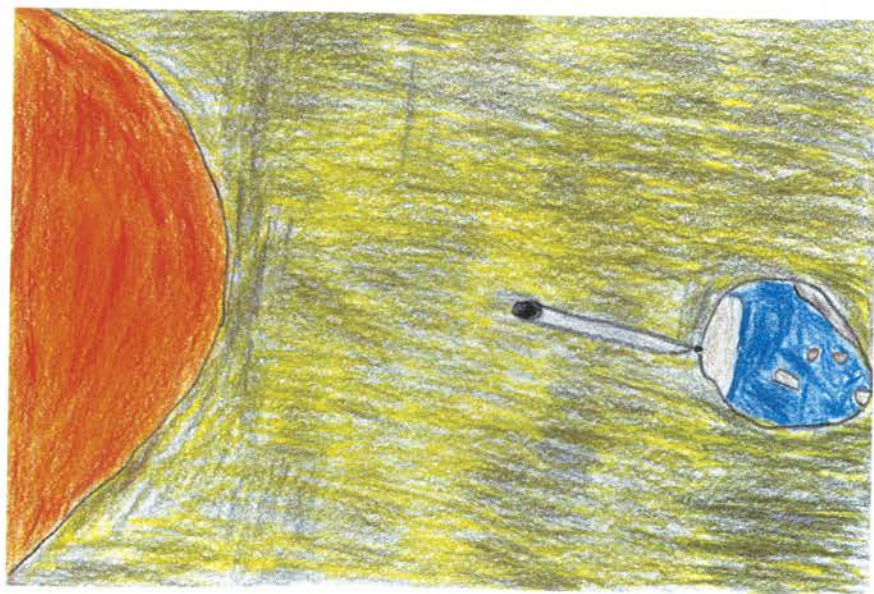


A lunar eclipse is when the Earth moves in front of the moon and makes a shadow. When a lunar eclipse is happening the Earth blocks the sunlight from hitting the moon. When it is happening the Earth and moon are still moving. The shadow moves as the Earth moves. For example, when you make a shadow with your arm and you move your arm the shadow moves. When a lunar eclipse is happening the moon can look red. The moon gets a little sunlight when it is happening. The light bends around the Earth and makes red and pink colors. When a lunar eclipse is happening, the people on the side of the Earth not facing the sun can see the moon look red.

What Is A Solar Eclipse And Why Is It So Rare?

By Webster K.

A solar eclipse happens when the moon goes right in front of the Earth and casts a shadow. The three important things in a solar eclipse are the sun, moon, and Earth. The moon and Earth have to be perfectly lined up for an eclipse to happen. There are two kinds of eclipses, a partial eclipse and a total eclipse. For example, a partial eclipse is when the moon only blocks out part of the sunlight. A total eclipse is when the moon blocks out all the sunlight. To see a total eclipse you have to be right in the middle of the tiny dot (shadow) on Earth. If you were 15 miles away from the shadow you wouldn't get an eclipse. Solar eclipses are rare because the moon is very rarely perfectly lined up with the Earth and sun. Since the moon's orbit (path around something) is not a perfect circle around the Earth, it usually isn't perfectly lined up. Another kind of eclipse is a lunar eclipse. That's when the moon goes behind the Earth and the Earth blocks the sunlight making a shadow on the moon. Solar eclipses are more rare because the Earth's shadow is bigger than the moon's shadow so a lunar eclipse doesn't need to be perfectly lined up.



Is There Up, Down, Left, And Right In Space?

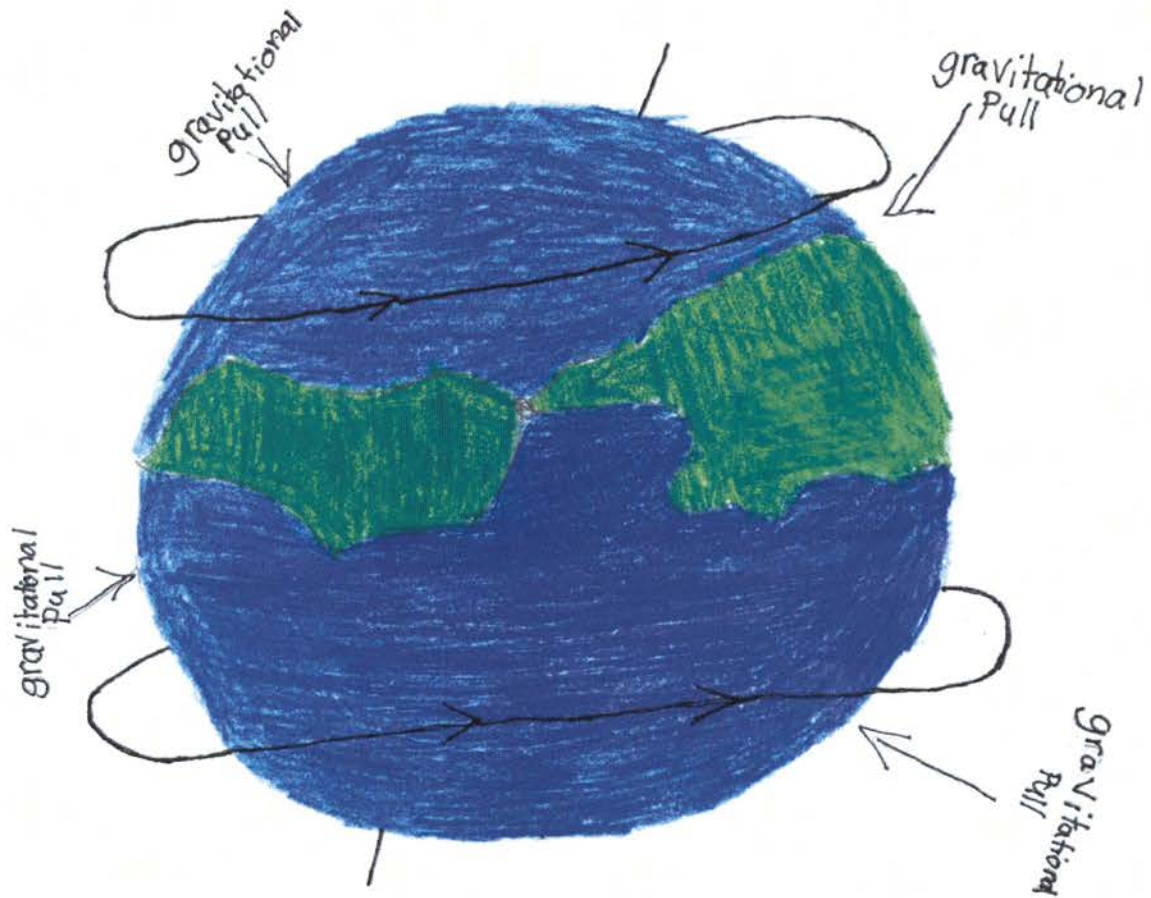
By Lydia R.

No, there is no up, down, left, or right in space. Well, I bet you know what up and down is, but let's go over a quick review. Down as you know is always under your feet and up is always above your head. But for a person on the side of the Earth, up might be sideways for you. Do you get that? The reason we have up and down and left and right is because we have gravity. Gravity tells us which way is down. Down is always towards the middle of the planet. We have a little part in our ear that helps us know gravity's direction. For example, if you closed your eyes and you thought about it you would know what was up and what was down and so forth. But in space there is no gravity, so there's no down. If there's no down, there's no up, left, or right.



Why Don't We Feel The Earth Spinning?

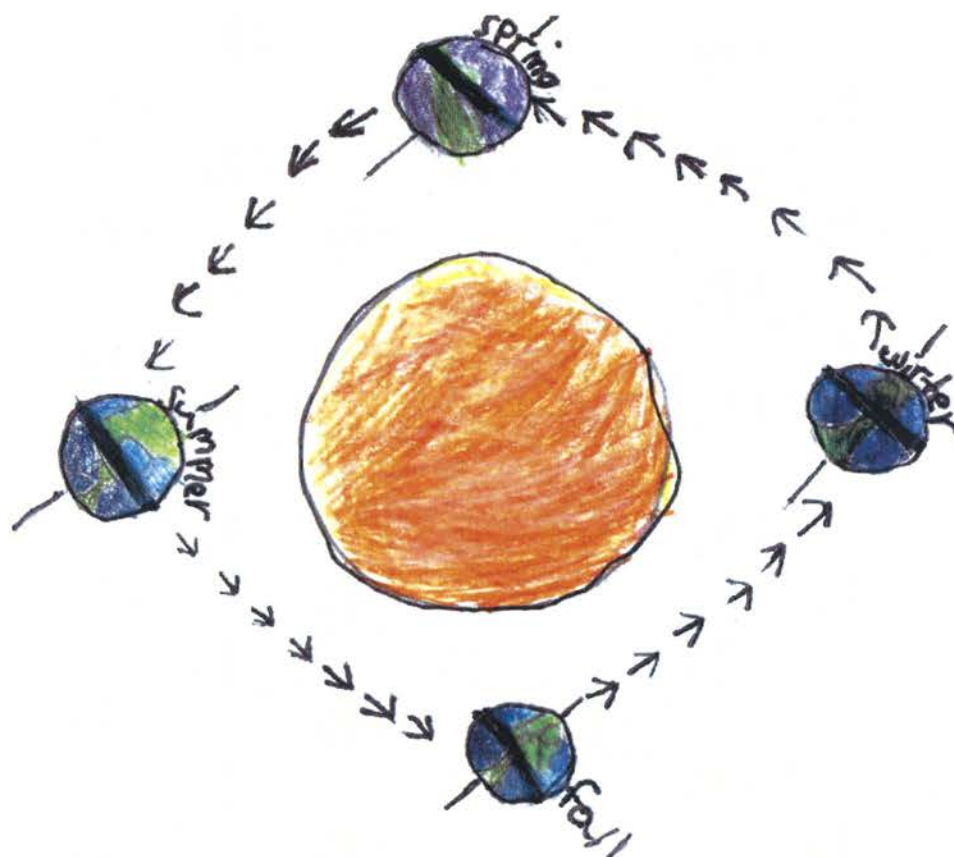
By Emma S.



There are a few reasons we can't feel the Earth spinning. One is because gravity (strong force) holds us on to the Earth. For example, whatever part of the Earth you're on, you are held on to the surface of our Earth. The other reason is because of the Earth's speed. The Earth's speed in the universe is 1,000 miles per hour. That's the speed of Earth's rotation, and it's always going at the same speed so you don't even notice you're moving. For example if you were on a train or plane you don't feel you're moving very fast unless there is a change and then you will feel the motion of the train or plane.

Why Does It Take The Earth Exactly One Year To Orbit The Sun?

By Jordan M.



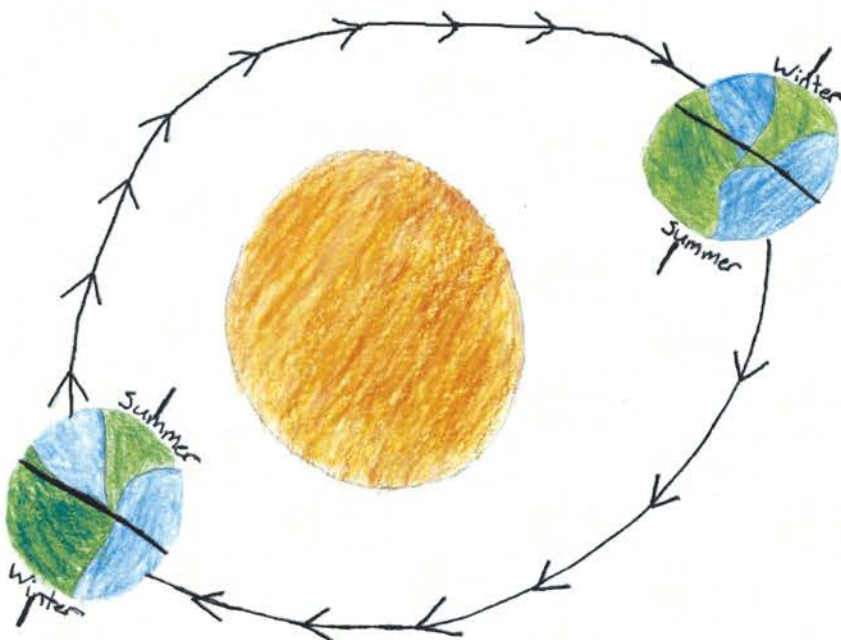
A year on any planet is how long it takes that planet to orbit the sun. Earth moves around the sun in a circular path called an orbit. The Earth revolves around the sun once a year and the cycle continues. It takes the Earth 365 days to orbit the sun. However long it takes a planet to revolve around the sun is that planet's year. The planets that are far from the sun take longer to orbit the sun, and planets that are closer to the sun orbit faster. So a year on Mercury is the same as three months on Earth because Mercury is moving faster.

Why Do We Have Seasons?

By Katherine F.

We have seasons because of the earth's tilt. The earth's tilt isn't like Uranus (which is tilted on its side) but it is not straight up and down either. It's partly tilted. The equator (an imaginary line around the middle of the earth) separates the northern and southern halves of the earth. On the top half is the northern hemisphere and the bottom half is the southern hemisphere. So when the northern hemisphere is tilted towards the sun that means the northern part is having summer and the southern part is having winter (because it is tilted away). The half tilted towards the sun gets more direct sunlight. The other half is tilted away and not getting direct sunlight so its winter on that part. As the earth orbits around the sun the tilt doesn't change. So when the earth orbits to the other side of the sun, the southern hemisphere is now tilted towards the sun and is having summer and the northern hemisphere is tilted away so is having winter. Spring is the transition from winter to summer so that part of the Earth starts to get a little

more direct sunlight. Fall is the transition from summer to winter and that part starts to get a little less direct sunlight. The most important thing that causes the seasons is the tilt of the earth because it gives you direct and indirect sunlight.



Why Do We Have More Sunlight In Summer Than In Winter?

By Shawn O.

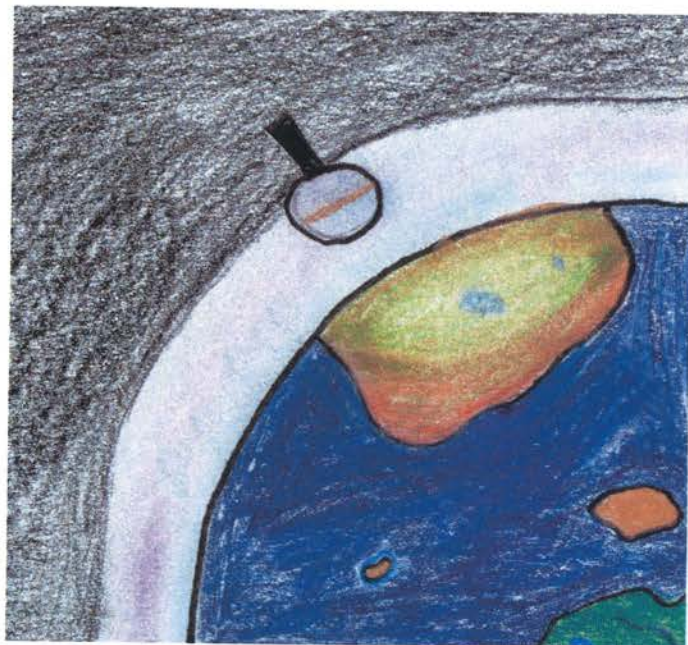
We have more sunlight in summer than winter because of Earth's tilt. So when the Northern Hemisphere is tilted towards the sun it's summer. When it is summer the sun seems to go higher in the sky. Let's say we're in the northern part of the Earth and we are tilted towards the sun. The sun will be a lot higher in the sky in the middle of the day. When the Northern Hemisphere is not tilted towards the sun it is winter. And when it is winter here in the Northern Hemisphere the sun's path is lower in the sky. On the equator (the middle of Earth) you probably will get the same amount of sunlight everyday.



What Is The Atmosphere And Why Do We Need It?

By Cienna C.

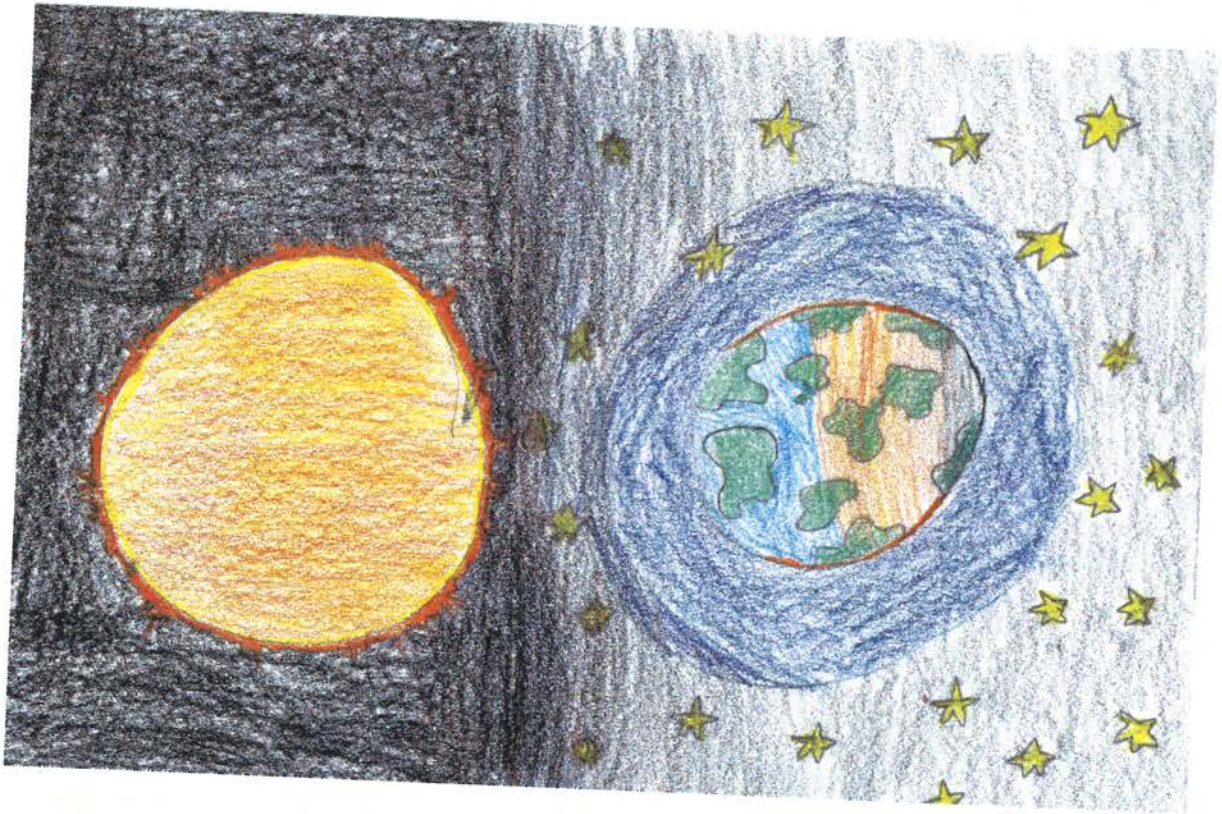
The atmosphere is the many overlapping layers of gas that surround the earth. The atmosphere has five very important layers. The first layer is the troposphere. Your home, school, stores, and many other places you are probably used to seeing are all in this layer. Also the weather occurs (happens) in this layer. The second is the Stratosphere. It is where planes go if the weather is bad because that layer has no weather. The ozone layer is in the top part of the Stratosphere. It filters the dangerous rays from the sun and keeps them from hurting our skin. Next is the mesosphere. It is the third layer. Many meteors burn up every day when they collide with gas particles in that layer. This layer of the atmosphere is too low for a rocket ship to orbit but too high for a plane. Next is the thermosphere. It is the biggest layer of the atmosphere. At the top is where the international space station is. Last but not least is the exosphere. It is where the atmosphere and space connect.



The atmosphere does many very important things for us. The atmosphere keeps the earth the right temperature and contains oxygen which we need to survive. Without the weather from the troposphere we wouldn't have water and we need water to live. Without the atmosphere, life as we know it could not be because the atmosphere has the things we need.

Why Does The Sky Look Blue During The Day?

By Taliha S.



The sky looks blue during the day because sunlight goes through the atmosphere. Well, first we have to talk about something very important. Did you know that sunlight has all the colors of the rainbow in it? Isn't that cool? When the sunlight goes through the atmosphere, blue and purple sunlight gets scattered and the other colors, red, orange, yellow, and green keep going. We don't see the other colors but they are still there, and they come down to Earth and let us see things. Blue and purple sunlight bounce off the dust particles because they are smaller light waves. So that's what makes the sky look blue during the day.

Why Do We See Colors In The Sky At Sunrise And Sunset?

By Finn G.

When the sun passes through a thicker layer of atmosphere we see colors at sunrise and sunset. This happens when the sun is near the horizon (the edge of the Earth where the Earth and sky meet). First you need to know where the colors come from. Actually, all the colors of the rainbow are inside sunlight. When the sun is near the horizon its light passes through more atmosphere to reach our eyes. The red, orange, and yellow light passes through, but the blue, green, and purple colors of the rainbow scatter (bounce off) in the atmosphere. When you look up at the clouds at sunrise or sunset, the red, orange, and yellow light is reflecting off the clouds.



Is There Weather In Space?

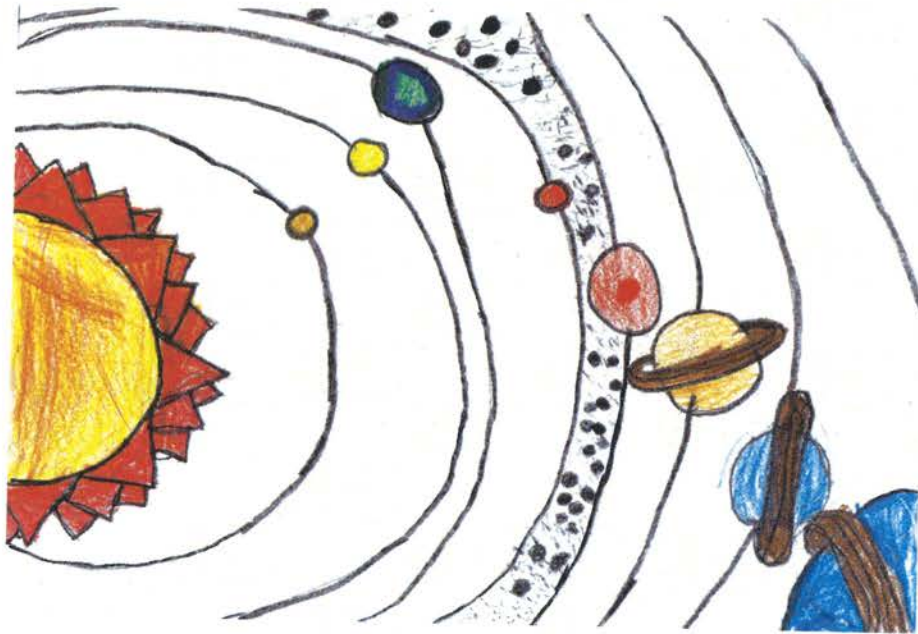
By Jonah M.

Yes! But how? We have space weather because of the sun. Is space weather similar to Earth's weather? Well actually it's not that similar to Earth's weather. As most people know we have storms, snow, hail, rain, and wind. But in space there is solar wind. Solar wind comes from charged electric particles that shoot out off the sun. That is not one bit like the wind we have on Earth. When this solar wind hits the Earth's atmosphere it can interfere with our radios because the particles are electric. But at the same time they can cause beautiful light displays. We call these curtains of light auroras. You can see these on the north and south poles. Sometimes this happens at both poles at the same time. So that's what space weather is!



What are Asteroids And How Do They Move Through Space?

By Maya B.



Asteroids are space rocks and they orbit the sun. The asteroid belt is right between Jupiter and Mars. There are thousands of asteroids in the asteroid belt. Scientists think that billions of years ago the universe started with an explosion and there were left over pieces. The leftover pieces are called asteroids. Asteroids look just like tiny moons. They are mostly made of rock and metal. The asteroids are covered with boulders and rocks. Asteroids have many craters. Craters are holes that are made when smaller asteroids hit them. Sometimes asteroids fall to Earth and make a big or small hole. They are so fast when they are falling from space they push everything out of their way. Scientists think that a long time ago when a big asteroid hit the earth it caused all the dinosaurs to die. If another asteroid is going to hit the Earth, scientists will send a rocket ship with no people on it but with bombs inside. They will shoot the bombs at the asteroid to push it out of Earth's way.

Why Does Jupiter Have So Many Moons?

By Cameron B.

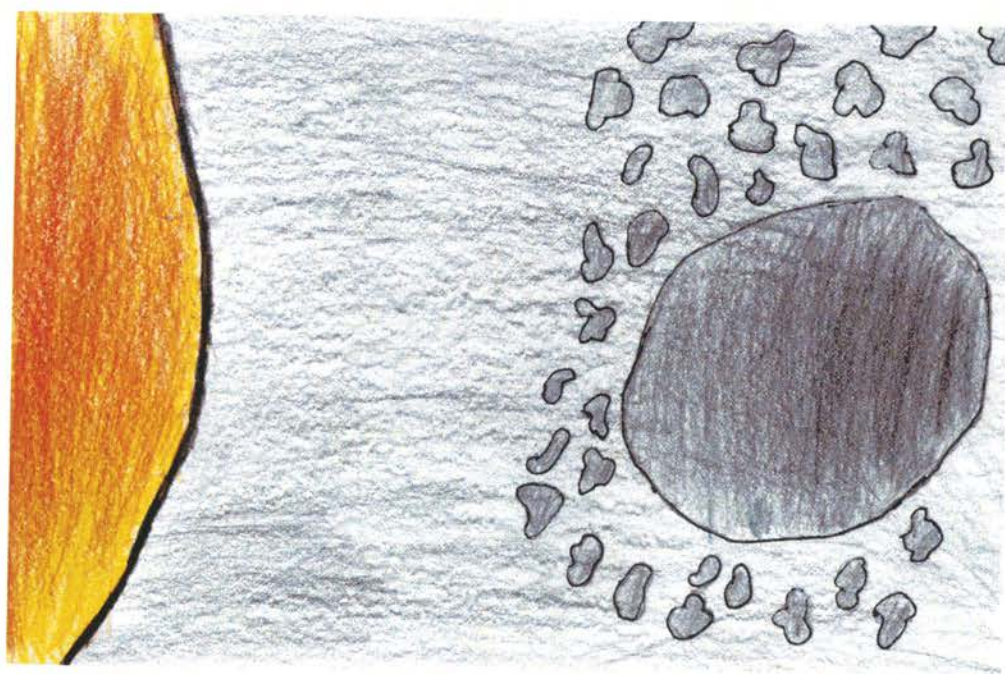


Jupiter has so many moons because it pulled a group of asteroids into its orbit with its strong gravity. Jupiter is right next to the asteroid belt (space rocks that orbit the sun). Jupiter has a lot of gravity (strong pulling force). Jupiter has a lot of gravity because Jupiter is the biggest planet in the solar system. The bigger the planet is, the more gravity it has. Most of Jupiter's moons are asteroids but the other moons are moons that were created when Jupiter was first formed. One group of asteroids that Jupiter has as moons are called the Greeks. The Trojans are another group of asteroids but they do not orbit Jupiter so they are not moons. Jupiter has sixty-three moons and could get more because it has so much gravity and is next to the asteroid belt.

Why Is Pluto Not A Planet?

By Peter C.

Scientists used to think that Pluto was a planet, but recently they changed their minds. The I.A.U. (International Astronomical Union) made a definition (August 2006) of what a planet is and Pluto does not follow one of the rules in the definition. The I.A.U. is a group of scientists that are professional astronomers that do research and define basic bodies and other things in space. There are three rules in the definition. The definition of a planet is... A planet has to be round. It has to orbit a star. And it has to clear its orbit (push everything out of its orbit). Pluto does follow the first two rules but doesn't follow the third rule. Pluto shares its orbit with space rocks. Scientists call Pluto a dwarf planet because it follows two of the rules. There are millions of other dwarf planets in the outer edge of our solar system.



Why Would our Weight Be Different On Different Planets?

By Natalie E.

The reason we weigh different on different planets is because of gravity. The more mass a planet has (amount of material in it), the more gravity there is which makes a bigger pull. For example, I weigh 62 pounds on Earth. On Mercury I would weigh 23.4 pounds because Mercury is smaller and has less gravity (pull). On Mars I would weigh 23.3 pounds. My weight on Mercury and Mars is almost the same weight because Mars and Mercury probably have almost the same gravity (pull). On Jupiter I would weigh 465 pounds because Jupiter is bigger than Earth, Mars, or Mercury and has more gravity (pull). So I would weigh way, way, way more on Jupiter than I ever would on any other planet because Jupiter has the biggest gravity. You can go to www.exploratorium.edu/ronh/weight It's where you get to know how much you weigh on different planets. I had a lot of fun and I hope you do too.



Is There Life In Outer Space?

By Grace C.



Scientists are still trying to figure out if there is life in outer space. They think there could have been life on Mars because they have found signs that there was once water there. Scientists have robots that go to Mars and take photos of its surface to

see if there is life. But sadly, the robots have found no evidence (proof) of life now on Mars. Earth is in what scientists call the life zone. All life needs water. The life zone is where there is liquid water. Earth is the only known planet where all the water won't completely freeze or completely evaporate. Mars and Venus are right at the edge of the life zone. Mercury is TOO, TOO, TOO, HOT for any kind of life and Jupiter, Saturn, Uranus, and Neptune are TOO, TOO, TOO COLD!

Well what about other galaxies? They are too far away to see with any telescope. Scientists have hypothesized (guessed) that there could be life in other galaxies that we can't see. For example life like cats, dogs, humans, or even ALIENS! Even though other galaxies are so far away, that won't stop them from thinking there might be life that we can't see! Projects like SETI (Search for Extra Terrestrial Intelligence) are still searching the sky for life. They use satellite dishes to listen for any communications from life on distant planets. Who knows what will lie in the future?

What Keeps The Sun Where It Is?

By Theo C.



You know the planets in our solar system all orbit the sun and you might think the sun stays still but really the sun orbits the center of the Milky Way galaxy! Our sun, and of course our solar system, travel through this orbit at 828,000 kilometers per hour. Each time we complete an orbit it's 28 million years after the last one was completed! There are quite a few larger orbits, like the Milky Way orbits the center of our super cluster (a super cluster is a group of galaxies). Even though most people think the sun is still it really moves nonstop, very quickly.

What Are Black Holes And What Do They Do?

By David T.

A black hole is a place where the gravity is so intense that even light cannot escape. They are formed when a star with a lot of mass dies. Mass is how much stuff something has in it (in this case a star). When a large star uses up all its fuel it collapses in on itself. Because the star was so big, the core has a very big amount of gravity which pulls the matter back in except it pulls it in even tighter. The gravity pulls it in smaller and smaller so it gets denser and denser (dense means more compact) until it cannot get any smaller. It has so much gravity that anything that gets in its way gets sucked in and lost forever.

