

1. Soaring Through Our Solar System

By Laura G. Smith

¹ Five, four, three, two, one... BLAST OFF! Come along as we explore our solar system! If we were flying high above the Earth, what would you see? The biggest, brightest thing you would see is the sun. You would also see many objects traveling around the sun, including the Earth and its moon!

² The sun, planets, and moons are all part of our solar system. The sun is a huge star in the middle of the solar system. It is the only star we can see during the day. The sun is much brighter than the stars we see at night, because it is much closer to the Earth. It is made of gases that are released in the form of light and heat.

³ The planets are all different sizes. Pluto, the smallest planet, is tinier than the Earth's moon. Jupiter is the largest planet. It is eleven times wider than the Earth! All nine of the planets are much smaller than the sun. If you had a hollow ball the size of the sun, you could fit one million balls the size of the Earth inside it!

⁴ All of the planets in our solar system move around the sun in an oval path called an **orbit**. This path is shaped something like an egg. The sun has a strong force that pulls all of the planets toward it. This force, called **gravity**, is what makes the planets stay in their orbits. As each planet orbits the sun, it is also spinning around like a top. This spinning is called **rotation**. Each planet rotates at a different speed. It takes Jupiter less than 10 hours to rotate one time, but it takes Venus 243 days!

⁵ The planets can be divided into two groups. The first group is called the **inner planets**. The second group is the **outer planets**. The inner planets-Mercury, Venus, Earth, and Mars-are smaller and are made of mostly rock and iron. Jupiter, Saturn, Uranus, and Neptune make up the outer planets, which are much larger. They are made mostly of hydrogen, helium, and ice. Pluto is the smallest planet and the farthest from Earth. Because it is so far away, scientists don't know very much about it. Some scientists think it shouldn't even be included as one of the nine planets.

⁶ There are more than 120 moons that orbit the planets in our solar system. Some planets, like the Earth, only have one moon. Other planets, like Jupiter and Saturn, have as many as 30 moons traveling around them!

⁷ Besides the nine planets and their moons, there are thousands of

other, smaller objects in our solar system. These are small chunks of rocks called **asteroids**. The tiniest asteroids are less than a mile wide. The largest is over 600 miles wide.

⁸ Small chunks of iron and rock that break away from asteroids are called **meteoroids**. Many meteoroids fall close to the Earth. Most of them burn up before they reach the Earth's surface. Meteoroids that fall through the sky like streaks of light are called **meteors** or "shooting stars." When a meteoroid is found on the Earth's surface, it is called a **meteorite**. Scientists can study meteorites to learn important facts about our solar system.

⁹ **Comets** are another part of our solar system. They travel around the sun just like the planets. A comet looks like a fuzzy star with a long tail. It is made of frozen gases, ice, and bits of dust. Every comet takes a different amount of time to make a full orbit. One famous comet called "Halley's Comet" takes about 77 years to orbit once around the sun.

¹⁰ When the telescope was invented in the early 1600's, scientists began to learn much more about the sun, planets, moons, asteroids, meteoroids, and comets that make up our solar system. A long time ago, before we had telescopes, people thought the Earth was in the centre of space and that the sun and other stars orbited around it!

¹¹ Today, with the help of spaceships and other equipment, man is learning even more about our amazing solar system!

Soaring Through Our Solar System

<p>1. The planets in our solar system orbit around the</p> <ul style="list-style-type: none"><input type="radio"/> Sun<input type="radio"/> Mars<input type="radio"/> Moon<input type="radio"/> Earth	<p>2. The sun is the brightest star because</p> <ul style="list-style-type: none"><input type="radio"/> It is the closest star to Earth<input type="radio"/> It has the most gases<input type="radio"/> It is the biggest star in the sky<input type="radio"/> It is the hottest star
<p>3. The planets travel around the sun in an oval path called an</p> <ul style="list-style-type: none"><input type="radio"/> Eggshell<input type="radio"/> Oddball<input type="radio"/> Orbit<input type="radio"/> Asteroid	<p>4. A strong force called _____ pulls the planets toward the sun.</p> <ul style="list-style-type: none"><input type="radio"/> Energy<input type="radio"/> Gravity<input type="radio"/> Magic<input type="radio"/> Rotation
<p>5. Most of the planets are about the same size as the sun.</p> <ul style="list-style-type: none"><input type="radio"/> True<input type="radio"/> False	<p>6. The outer planets are made mostly of</p> <ul style="list-style-type: none"><input type="radio"/> Rocks and iron<input type="radio"/> Water and minerals<input type="radio"/> Hydrogen, helium, and ice<input type="radio"/> Dust particles
<p>7. When a meteoroid is found on the Earth's surface, it is called a</p> <ul style="list-style-type: none"><input type="radio"/> Comet<input type="radio"/> Meteor<input type="radio"/> Asteroid<input type="radio"/> Meteorite	<p>8. In the early 1600's, an important invention was made that helped scientists learn much more about the solar system. This invention was</p> <ul style="list-style-type: none"><input type="radio"/> The telescope<input type="radio"/> A spaceship<input type="radio"/> Halley's Comet<input type="radio"/> A meteorite

2. Our Solar System

By Laura G. Smith

¹ If you look up the word "**solar**" in your dictionary, you'll find its basic definition reads something like: "of the sun," or "relating to the sun." **System** is defined as: "a set of things or parts forming a whole." When you consider the meanings of these words, there is indication that the sun plays a major role among this group of celestial bodies we call the "solar system."

² The sun is, in fact, at the centre of this massive system. There are nine major planets and their satellites, asteroids, comets, dust and gases that are continually traveling around the sun. With a mass that is 750 times as great as that of all of the planets in the solar system combined, the sun has a strong gravitational pull that keeps the other objects in orbit around it.

³ As the planets revolve around the sun, the sun revolves around the centre of the **Milky Way Galaxy**. The Milky Way, which has a circular shape, is made up of dust, gases, planets, and about 100 billion stars. The sun, planets, and other bodies and gases that make up our solar system are only a small speck in this huge galaxy!

⁴ The nine planets of the solar system can be divided into two groups referred to as the **inner planets** (also called **terrestrial planets**) and the **outer planets** (or **major planets**). The inner planets; Mercury, Venus, Earth, and Mars, are small and are composed of mostly rock and iron. Jupiter, Saturn, Uranus, and Neptune make up the outer planets, which are much larger and consist mainly of hydrogen, helium and ice. Because Pluto is the farthest planet from Earth, astronomers know very little about it. Some believe it should not even be considered as one of the major planets. More than 120 natural satellites (also called moons) orbit these various planets in our solar system.

⁵ **Asteroids** (also called **planetoids**) are small bodies that orbit the sun, mostly between Mars and Jupiter, in what is referred to as the **Asteroid Belt** or **Main Belt**. Astronomers first observed asteroids in the early 1800's with the aid of telescopes. There are more than 20,000 asteroids ranging in size from Ceres, which has a diameter of 623 miles, to bodies that are less than 1 mile in diameter. The Asteroid Belt also includes large amounts of dust that astronomers believe were created by collisions between asteroids.

⁶ Small chunks of iron and rock that break away from colliding

asteroids are called **meteoroids**. Many meteoroids fall to the earth's atmosphere, but most are burned up by friction before they reach the earth's surface.

⁷ Meteoroids that fall through the atmosphere, appearing in the night as streaks of light, are called **meteors** or "shooting stars." Those that are found on the earth's surface are known as **meteorites**. As scientists have studied meteorites, they have learned valuable information about the ancient conditions of our solar system. The surfaces of Mercury, Mars, and several satellites of the planets (including the earth's moon) show signs of having been "attacked" by asteroids during the early history of the solar system.

⁸ Some meteors and **interplanetary dust** (dust that is in between or near the planets) may come from comets. Comets generally have three parts: a solid **nucleus** or centre, which is often no bigger than a few miles across; a round **coma**, or head, that surrounds the nucleus and is made up of dust particles and frozen gases; and a long **tail** of dust and gases that escape from the head. Most comets orbit the sun near the outer edge of the solar system. When a comet is drawn closer to the sun, it releases its dust and gases displaying a spectacular, shining tail. The famously known Halley's Comet appears every 75 years. Its most recent appearance was in 1986.

⁹ **Solar wind** is another part of the solar system. It is a very thin gas that streams outward constantly from the surface of the sun and through interplanetary space. The particles in solar wind travel past the earth at speeds of about 300 miles per second. This wind also shapes the tails of comets and leaves its particles in the lunar soil. Samples of these particles were brought back from the moon's surface by manned United States Apollo spacecraft.

¹⁰ Since the invention of the telescope, man has greatly increased his knowledge of our solar system. It almost seems silly to realize that ancient astronomers once believed that the earth was the centre of the universe and that the sun and all of the other stars revolved around the earth! Little by little astronomers are solving mysteries about the universe. As more powerful tools and techniques are developed, astronomers will become even better equipped to satisfy our curiosity about the amazing stars and planets that decorate our sky.

Our Solar System

<p>1. What holds the planets and other bodies of our solar system in orbit around the sun?</p> <p><input type="radio"/> A The gravitational pull of the planets</p> <p><input type="radio"/> B The gravitational pull of the sun</p> <p><input type="radio"/> C The rotation of the bodies</p> <p><input type="radio"/> D The atmosphere</p>	<p>2. The sun revolves around the</p> <p><input type="radio"/> A Solar System</p> <p><input type="radio"/> B Planets</p> <p><input type="radio"/> C The Universe</p> <p><input type="radio"/> D Milky Way Galaxy</p>
<p>3. _____ is the farthest planet from the sun.</p> <p><input type="radio"/> A Pluto</p> <p><input type="radio"/> B Mercury</p> <p><input type="radio"/> C Mars</p> <p><input type="radio"/> D Neptune</p>	<p>4. Small bodies that orbit the sun between Mars and Jupiter are called</p> <p><input type="radio"/> A Asteroids</p> <p><input type="radio"/> B Meteorites</p> <p><input type="radio"/> C Comets</p> <p><input type="radio"/> D Meteors</p>
<p>5. Meteors are often called</p> <p><input type="radio"/> A Shining stars</p> <p><input type="radio"/> B Shooting stars</p> <p><input type="radio"/> C Sparkling stars</p> <p><input type="radio"/> D Shrinking stars</p>	<p>6. The word "interplanetary" means</p> <p><input type="radio"/> A Inside a planet</p> <p><input type="radio"/> B In the universe</p> <p><input type="radio"/> C In between the planets</p> <p><input type="radio"/> D Collision of planets</p>
<p>7. Comets basically have three parts. They are:</p> <p>_____</p> <p>_____</p>	<p>8. Solar wind occurs as gusts of wind on the sun, similar to strong wind gusts on the earth.</p> <p><input type="radio"/> A True</p> <p><input type="radio"/> B False</p>

3a. Moon Talk

By Laura G. Smith

¹ It's the earth's only natural satellite—a glowing globe that appears in the night sky capturing the attention of all who gaze in its direction. Although the earth's moon seems to be "shining" its own light, it is really reflecting light from the sun. Some nights the moon looks like a huge, round, shiny ball, and other nights it appears as just a thin sliver of light. Although the moon seems to be changing shapes, it really isn't. It just looks different because it is reflecting varying amounts of sunlight during each of its **phases**.

² The phases are caused by the continuous movement of the earth and its moon. The earth is constantly "revolving" or traveling in an oval shape around the sun. The path it travels is referred to as its **orbit**. As the earth is orbiting the sun, the moon is orbiting the earth. The moon moves at an amazing average speed of about 2,300 miles per hour! As the earth and moon revolve, different amounts of sunlight are reflected to the earth, causing the moon to change in appearance (ranging from a "new moon" to a waning crescent").

³ It takes the moon one month to travel one time around the earth passing through a complete cycle of its phases. In ancient times, before calendars were used, people looked at the phases of the moon to measure weeks and months. They knew that four weeks passed between one full moon and the next.

⁴ Sometimes, as the moon circles the earth, it passes directly between the earth and the sun. This causes a **solar eclipse**, which blocks our view of the sun for a short while. Another type of eclipse is a **lunar eclipse**. This occurs when the earth passes directly between the sun and the moon briefly blocking out the moon. Before scientists were able to learn what causes eclipses, people were frightened by them and feared the world was coming to an end!

⁵ An Italian astronomer named Galileo made great discoveries about the moon after he built his first telescope in 1609. Although he didn't actually invent the telescope, he developed and improved it. He was the first to realize that the moon's surface was mountainous and pitted, not smooth as others once thought. The deep pits, commonly known as craters, are the most numerous features of the moon's surface. The smaller craters were formed when **meteoroids** (solid objects traveling through space) collided with the moon. Scientists estimate that the moon has half a million craters that are more than one mile wide. These huge pits were more than likely caused by larger bodies such as **comets** or **asteroids**. Although the moon's mountains and pits are somewhat similar to features found on the surface of the earth, other characteristics of the moon are quite different from our home planet.

⁶ For instance, the moon has little or no atmosphere. It has no clouds, no rain, and no wind. The surface of the moon has remained basically unchanged throughout the course of its history because it is not exposed to the many types of weather that we experience living on Earth. Because the moon has no air or water, it cannot support any forms of life such as plants, animals, or humans.

⁷ Temperatures on the rocky surface of the moon get much hotter and colder than any place on the earth. At the moon's equator, temperatures reach as high as 260°F and as low as -280 °F. In some of the moon's deepest craters, the temperature stays near -400°F! Earth, on the other hand, has a protective blanket of invisible insulation - the environment - which protects it from such extreme temperature changes.

⁸ Since the moon is closer to the earth than any of the other planets or stars, it appears to be much larger than the other objects, but it really isn't. The moon's diameter (or distance across the middle) measures about 2,160 miles and is about one-fourth that of the earth. If you held your fist next to your head, it would give you an idea of the size of the moon compared to the size of the earth. If the moon were placed on top of the United States, it would extend almost from San Francisco to Cleveland.

⁹ The force of gravity on the moon's surface is six times weaker than that on the surface of the earth. Gravity is weaker on the moon because the moon's mass (the amount of matter a body contains) is about 81 times smaller than the earth's mass. The gravitational pull on the moon is strong enough to cause the rise and fall of tides on the earth's surface, but it's not strong enough to hold air close to the moon's surface. A boy or girl who weighs 60 pounds on the earth would weigh only 10 pounds on the moon. The earth has a much greater gravitational pull that is strong enough to keep us from floating around in the sky, and it also keeps the moon in orbit around the earth.

¹⁰ The long-time dream of traveling to the moon became history on July 20, 1969, when astronaut Neil A. Armstrong of the United States set foot on it for the first time. The Apollo 11 and Apollo 12 astronauts collected samples, took photographs, set up scientific experiments, and explored the nearby area. This was the beginning of many successful and insightful journeys leading us to better understanding of the mysterious surface of the moon.

Moon Talk

<p>1. The moon's phases are a result of</p> <ul style="list-style-type: none"><input type="radio"/> A The extreme temperatures on the moon<input type="radio"/> B The moon's gravitational pull<input type="radio"/> C The moon orbiting around the earth<input type="radio"/> D Other planets blocking out the moon	<p>2. The moon revolves all the way around the earth in about</p> <ul style="list-style-type: none"><input type="radio"/> A One day<input type="radio"/> B One month<input type="radio"/> C One year<input type="radio"/> D One week
<p>3. When the moon passes directly between the earth and the sun, it causes a lunar eclipse.</p> <ul style="list-style-type: none"><input type="radio"/> A True<input type="radio"/> B False	<p>4. Galileo was the first to realize that the moon's surface was</p> <ul style="list-style-type: none"><input type="radio"/> A Round and smooth<input type="radio"/> B Mountainous and full of pits<input type="radio"/> C Full of life<input type="radio"/> D Dark and mysterious
<p>5. Small craters were formed when _____ collided with the moon.</p> <ul style="list-style-type: none"><input type="radio"/> A Other planets<input type="radio"/> B Space aliens<input type="radio"/> C Meteoroids<input type="radio"/> D Lunar satellites	<p>6. The moon's surface is different from the earth's surface because it</p> <ul style="list-style-type: none"><input type="radio"/> A Has little or no atmosphere<input type="radio"/> B Is not able to support life<input type="radio"/> C Has a much weaker gravitational pull<input type="radio"/> D Just (a) and (b) are correct.<input type="radio"/> E (a), (b), and (c) are correct.
<p>7. The earth is protected from the extremely hot and cold temperatures that the moon experiences because the earth is</p> <ul style="list-style-type: none"><input type="radio"/> A Bigger than the moon<input type="radio"/> B Covered by 71% water<input type="radio"/> C Much closer to the sun<input type="radio"/> D Protected by its environment	<p>8. The moon is held in orbit around the earth by</p> <ul style="list-style-type: none"><input type="radio"/> A The earth's gravitational pull<input type="radio"/> B Its atmosphere<input type="radio"/> C The moon's gravitational pull<input type="radio"/> D The sun's gravitational pull

3b. Race to the Moon!

By Laura G. Smith

¹ On July 20, 1969, millions of people gathered around their TV sets to watch an amazing event in history. It was the day a man walked on the moon for the very first time! That man was American astronaut Neil Armstrong. As he stepped onto the rocky surface of the moon, Mr. Armstrong spoke the famous words, "That's one small step for man, one giant leap for mankind."

² Space travel began 12 years before that first walk on the moon. It started on October 4, 1957 when Russia sent *Sputnik I*, the first **artificial satellite**, into space. A satellite is an object that **orbits** or travels around the sun, earth, or other heavenly body. *Sputnik I* is an "artificial" satellite, because it is man-made. Man-made satellites are used for many different reasons. Some collect information about the weather and send it back to Earth. Others send radio, television, and telephone signals from one place on Earth to another. Artificial satellites can also help sailors or airplane pilots find their way during a bad storm, and some can even spy on the enemy during a war!

³ Russia's second artificial satellite, *Sputnik II*, was launched in November of 1957 carrying a dog named Laika, the first animal sent into orbit. As scientists studied how animals lived in space, it helped them learn how to prepare humans to be able to live in the same conditions.

⁴ While Russia was working hard to develop their space program, the United States was close behind in their exploration of space. The U.S. sent their first artificial satellite, *Explorer I*, into orbit on January 31, 1958. In the 1960's and 1970's, both Russia and the U.S. launched many other satellites and scientific spacecraft for the purpose of gathering and sending information to the earth. It seemed as though the two countries were having a contest to see who would win the "race to space"!

⁵ The next big step in the space race was to launch a spaceship with an astronaut on board. Up until this time, the satellites and other spacecraft that were used to take pictures and collect information did not have men or women traveling on them.

⁶ On April 12, 1961 Russian cosmonaut (a Russian astronaut), Yuri A. Gagarin became the first man to orbit the earth in his spaceship, *Vostok I*. Soon after that, the United States launched its first manned flight on May 5, 1961 as astronaut Alan B. Shepherd, Jr. flew in *Freedom 7*. The flight only lasted 15 minutes, and Shepherd did not go into orbit.

⁷ John H. Glenn, Jr., became the first American to actually orbit the earth. He made three **revolutions** (trips around the earth) on February 20, 1962, during his five-hour flight on *Friendship 7*.

⁸ In 1964 and 1965, three United States spaceships sent more than 17,000 close-up pictures of the moon back to earth in order to help prepare for man to land there. Three years later, three American astronauts flew in the first spacecraft to circle the moon! They orbited the moon 10 times in their *Apollo 8* spaceship. On *Apollo 9* and *Apollo 10* missions, more studies were done to test the lunar landing craft.

⁹ On July 16, 1969, America watched as *Apollo 11* was launched into space! Four days later, Astronauts Neil A. Armstrong and Edwin "Buzz" Aldrin, Jr. stepped out of the Apollo 11 lunar module, *Eagle*, and onto the moon's surface. They explored the nearby area for three hours, picking up rock and soil samples and setting up several scientific experiments. They also planted an American flag in the lunar soil before lifting off of the moon. After an 8-day flight, *Apollo 11* returned safely to Earth, splashing down in the Pacific Ocean on July 24.

¹⁰ So who won the race to the moon?

¹¹ It's not easy to say who won. Russia had powerful rockets that could launch heavy spacecraft on long flights, but the United States launched more spacecraft for communication and weather reporting. By the early 70's, the United States' astronauts had landed on moon, and unmanned Russian spacecraft had explored the moon and brought soil samples to earth. It can be said that each country helped in different ways to bring about man's successful landing on the moon.

Race to the Moon!

<p>1. Space travel began when <input type="radio"/> A John Glenn orbited the earth <input type="radio"/> B America launched <i>Explorer 1</i> into orbit <input type="radio"/> C Russia launched <i>Sputnik 1</i> into orbit <input type="radio"/> D Neil Armstrong first stepped on the moon</p>	<p>2. <i>Sputnik 1</i> is an artificial satellite because it is _____. <input type="radio"/> A Man-made <input type="radio"/> B Not really a satellite <input type="radio"/> C Made of plastic <input type="radio"/> D Not an orbiting object</p>
<p>3. "Laika" was the first _____ in space. <input type="radio"/> A Animal <input type="radio"/> B Woman <input type="radio"/> C Astronaut <input type="radio"/> D Cosmonaut</p>	<p>4. Artificial satellites collect and send information back to the earth for many reasons. List three reasons. _____ _____</p>
<p>5. John H. Glenn, Jr., was the first American to <input type="radio"/> A Walk in space <input type="radio"/> B Orbit the earth <input type="radio"/> C Travel in space <input type="radio"/> D Walk on the moon</p>	<p>6. _____ was the first country to launch a manned spaceship that orbited the moon. <input type="radio"/> A China <input type="radio"/> B Russia <input type="radio"/> C France <input type="radio"/> D America</p>
<p>7. Since America was the first country to put a man on the moon, it's safe to say they won the race to the moon. <input type="radio"/> A True <input type="radio"/> B False</p>	<p>8. When Neil Armstrong stepped out of the lunar module Eagle onto the moon's surface, he said, "That's one small step for man, one giant leap for mankind." Why do you think he said that? _____ _____ _____</p>

