



Professor Wow's

# SPACE ADVENTURES

Science Show

**K-5**

# STUDY GUIDE



# INTRODUCTION



Dear Educators,

This study guide perfectly compliments the STEM-based **Space Adventures Science Show** featuring the zany **Professor Wow**. Throughout the on-stage live performance, you and your students will be treated to humorous and informative segments delving into Astronomy, Earth Science, and Mathematics. Each segment is brimming with opportunities for audience participation, ensuring that children are entertained and fully engaged in the learning experience.

Each live performance is designed to align with science curriculum standards for Grades K-5 and will be tailored to the attending students' grade levels.

No matter which grade level you teach, this study guide will empower you to bring the learning experience into the classroom with insightful questions and engaging activities based on the presented content. Some pages can be reproduced for your students, while others are tailored specifically for you, the teacher. Recognizing the uniqueness of every class, we urge you to confidently select the content that best suits your class's needs.

We're excited for you and your students to experience **Professor Wow's Space Adventures Science Show**. We put much effort into making it fun, educational, and top-notch. Thanks so much for being part of it!

*See you at the show!*  
**Professor Wow**



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# SHOW SYNOPSIS



## It's Never Too Early to Become a Rocket Scientist!

With this exciting vision in mind, **Professor Wow's Space Adventures Science Show** has been carefully crafted to inspire STEM potential in grades K-5. Through interactive science demonstrations, lots of laughter, and captivating storytelling, students are not just entertained but also introduced to basic astronomy concepts, enriching their knowledge and understanding of the universe.

**Professor Wow's Space Adventures Science Show** is an enthralling experience designed for young audiences. The show boasts visually stunning 3D sets, captivating puppets, and lively interactions with the audience. One particularly compelling scene highlights the awe-inspiring sun in our solar system. In addition, students will be introduced to multilingual aliens, emphasizing the importance of kindness and compassion in our universe. The show is not just about watching but also about total audience participation. When a volunteer is chosen from the audience, they will step into the role of a rocket scientist, showcasing their newfound math skills as they hilariously navigate the complexities of sending a rocket to the moon and back. The story of **Mary Sherman Morgan**, the first female rocket fuel scientist, and her groundbreaking invention of liquid fuel that propelled the first satellite into space is brought to life. Other randomly selected students get to embody the iconic Apollo 11 astronauts, **Buzz Aldrin** and **Neil Armstrong**, providing the audience with an immersive experience of space exploration. The audience will be captivated as they are introduced to **Sally Ride**, a trailblazing figure who was the first woman to journey into space.

Get ready for an exciting show that will take your students on a captivating journey through space, igniting their curiosity and stimulating their minds. By the end of the show, they will truly understand that space is limitless, just like their imaginations!

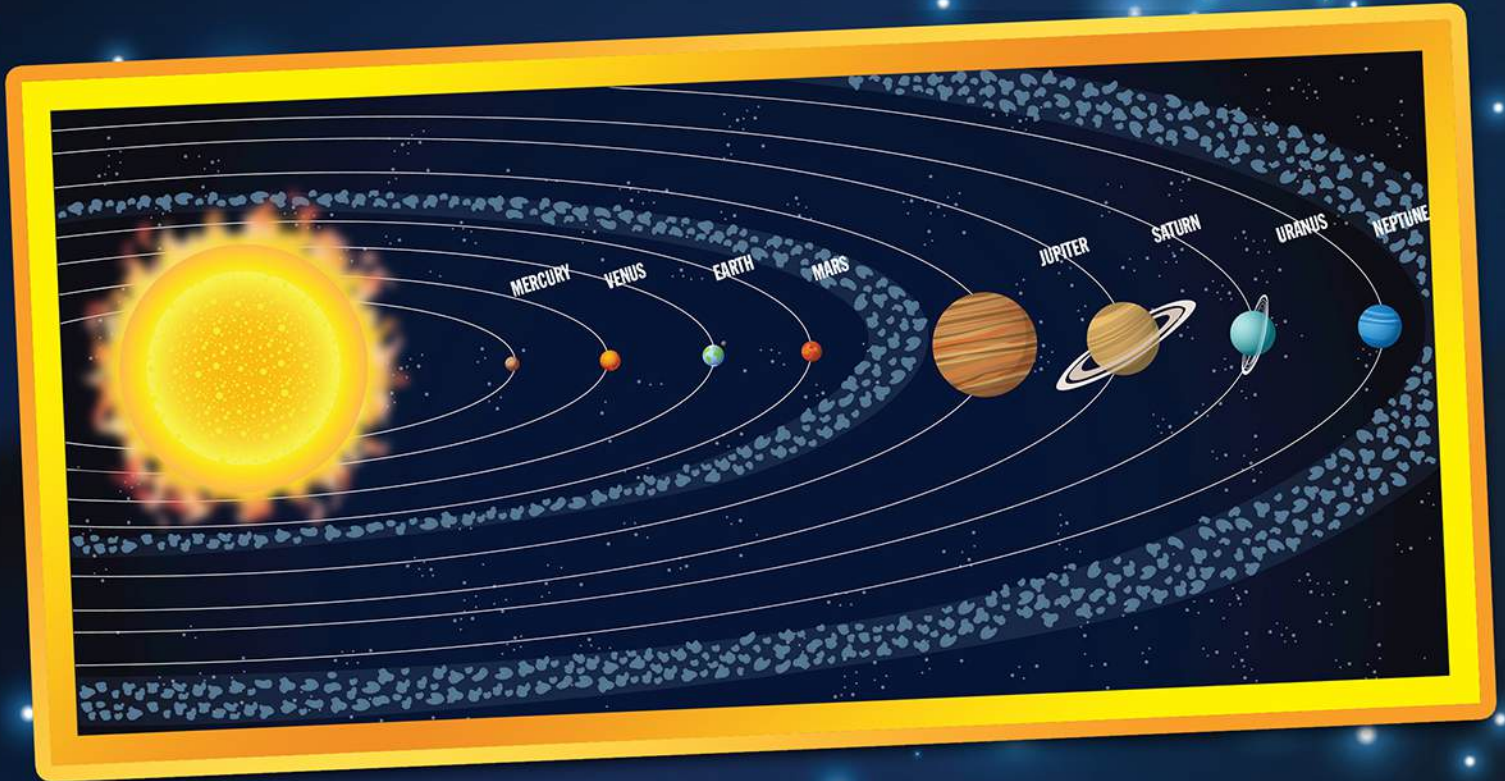




# OUR SOLAR SYSTEM



## SOLAR SYSTEM



The Solar System is like a big, awesome community that revolves around the Sun. It's home to eight planets, five dwarf planets, and hundreds of moons, asteroids, and comets.

The Sun is a 4.5 billion-year-old dwarf star. It is a hot, glowing ball of hydrogen and helium located about 93 million miles from Earth. Without the Sun's energy, life as we know it could not exist on our home planet.

Did you know that all the planets in our solar system move around the sun at different distances and speeds? They follow paths called "orbits," which are shaped like gently squashed circles known as ellipses. Some planets, like Mercury, Venus, Earth, and Mars, are close to the Sun, while Neptune and Uranus are much farther away. Jupiter and Saturn are huge and positioned in between. The force of gravity keeps the planets moving around the Sun in their elliptical orbits.

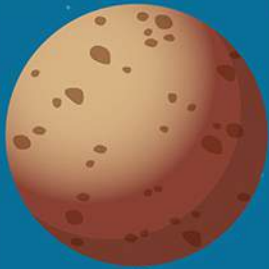
Each planet is unique. They come in different sizes and colors. For instance, Mercury is the smallest, and Jupiter is the biggest. Mars looks red because it's covered in rust, while Uranus appears blue because of the methane in its atmosphere. And you can't forget about Saturn's beautiful, colorful rings made of icy rock. Earth is the only planet in our solar system that we know of that supports life. How cool is that?



# INNER PLANETS



## TERRESTRIAL PLANETS



### MERCURY

Mercury is the smallest planet in our solar system and closest to the sun.

Its gravitational pull affects the orbits of the other planets in the solar system.



### VENUS

Venus rotates slowly from east to west, opposite to most planets.

Its thick atmosphere traps heat, making it the hottest planet with surface temperatures up to 900°F (475°C).



### EARTH

The only known planet inhabited by living things.

The only planet in our solar system with liquid water on the surface.

Has one moon.



### MARS

Fourth planet from the sun.

Mars is a barren, cold desert world with a reddish hue, earning it the nickname "Red Planet" due to its high iron oxide content.

Our solar system consists of eight distinctive planets, each of which shares remarkable similarities. They all possess a spherical shape and follow elliptical paths while orbiting the Sun. Additionally, each planet has its own gravitational pull. Separating the inner planets from the outer ones is the asteroid belt located between Mars and Jupiter. The inner planets, namely Mercury, Venus, Earth, and Mars, are known as terrestrial planets and are particularly similar to Earth. They are all solid, dense, and rocky, and none of them have rings. In comparison to the outer planets, the inner planets are relatively small, have shorter orbits around the Sun, and rotate more slowly. They are primarily composed of cooled igneous rock with inner iron cores.



# OUTER PLANETS



## THE GAS GIANTS



### JUPITER

Jupiter is more than twice as massive than the other planets of our solar system combined.

Fastest spinning planet - one day is about 10 hours.

Has 67 moons.



### SATURN

Saturn is adorned with a dazzling, complex system of icy rings.

Has 7 layers of rings.

Has 146 moons.



### URANUS

Uranus is a planet that rotates at a nearly 90-degree angle, making it appear as if it is lying on its side.

Smallest of the four "Gas Giants".

Has 27 moons.



### NEPTUNE

Neptune is the most distant major planet orbiting our Sun.

Planet is dark, cold, and whipped by supersonic winds.

Has 16 moons.

The outer planets of our solar system are Jupiter, Saturn, Uranus, and Neptune. These planets are characterized by their rings and numerous moons. Unlike the inner planets, the outer planets spin faster but orbit the sun more slowly due to their greater distance. They do not have a solid surface, and it would be impossible for spacecraft to land on them. They are composed mainly of hydrogen and helium gases with thick layers of atmosphere. This is where they got their nickname The Gas Giants. The impressive size of these gas giants sets them apart from the inner planets. Although direct human landing is impossible, scientists employ telescopes, orbiters, and probes to conduct in-depth studies of their atmospheres, magnetic fields, and surface characteristics.



# ASTROIDS



## ASTROIDS

An asteroid is a small, rocky object and when seen in a telescope, it appears as a point of light. Most asteroids are found in a ring between the orbit of Mars and Jupiter called the asteroid belt.

Some asteroids are round, some are elongated, and some even have a satellite.

There are also groups of asteroids near Jupiter's orbit and in the outer Solar System, but they are less common. Asteroids are generally not found beyond Neptune's orbit.





# METEORS & COMETS



## CELESTRIAL OBJECTS



### METEOR

A meteor is a flash of light in the sky that occurs when a meteoroid, a small piece of an asteroid or comet, enters Earth's atmosphere at high speeds and burns up, creating a streak of light. If a meteoroid survives the journey through the atmosphere and hits the ground, it is called a meteorite. Meteorites are very rare and difficult to find.

### COMET

An object made mostly of ice, dust and some rocky bits with a gas halo and tail. Known for its tail, which is the trail that happens when this gaseous dust cloud is blown by solar wind or heat. Comets orbit the sun in regular intervals like the famous Halley's comet appearing every 76 years. (next appearance 2061)



### SHOOTING STAR

Meteors and shooting stars are essentially the same thing. Earth is bombarded daily by small, rocky, or metallic bodies from space known as meteoroids. When these meteoroids enter the Earth's atmosphere, they burn up, creating a stunning display of light often referred to as shooting stars, because of the bright tail of light they create as they pass through the sky.



# TYPES OF STARS



## YELLOW DWARF

Yellow dwarfs are medium-size stars and are the third most common type of stars, following red and orange dwarfs.



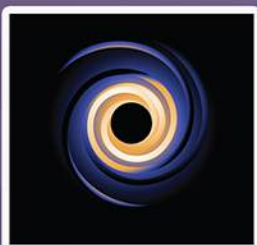
## RED SUPERGIANT

A red supergiant star is a massive star that has used up its hydrogen fuel, causing it to expand and appear cooler with a reddish glow.



## PURPLE PULSAR

- Rapidly spinning neutron stars, also known as pulsars, emit intense beams of electromagnetic radiation, including radio waves, resembling cosmic lighthouses.



## BLACK HOLE

A black hole is a region in space where gravity is so strong that nothing, including light, can escape.



## WHITE DWARF

A "white dwarf" is a term used in astronomy to describe a type of star in its final stage of evolution. It is associated with stars similar to our Sun in terms of moderate mass.



## SUPER NOVA

The explosive death of a massive star at the end of its life is considered one of the most energetic and dramatic events in the universe.



## NEUTRON STAR

The incredibly dense remnant of a massive star that undergoes a supernova explosion, leading to the collapse of its core due to intense gravitational pressure.



# VOLCANOES



## VOLCANOES

**Volcanoes are common on planets and moons in our solar system and beyond.**

### WHAT IS A VOLCANO?

A volcano is an opening in the planet's surface. Sometimes gas, magma, and rock can escape from below the planet's surface, which can cause a volcano to erupt.

Volcano eruptions are usually triggered by an earthquake or other drastic movement beneath the planet's surface.

### HOW DO VOLCANOES FORM?

Planets are made of different layers. The top layer is called the **crust**. Beneath the crust is another layer called the **mantle**. The mantle is made of very hot **magma**, which is rock that has turned to liquid. Over time, magma builds up and can break through the planet's crust, causing an eruption. When this happens, magma becomes **lava**. The lava eventually hardens on the planet's surface. Over time as more eruptions happen, the lava hardens and forms a mountain known as a **volcano**.

### DID YOU KNOW . . .

- **Venus:** Has more than 1,700 volcanic features, including huge flows of basalt lava. Venus might be volcanically active today, but it's hard to tell because of its thick atmosphere.
- **Jupiter:** It's innermost moon, Io, is the most volcanically active body in our solar system.
- **Mars:** Has more volcanic features than Earth, including Olympus Mons, the tallest volcano in our solar system.



# PEOPLE IN SPACE



**MARY SHERMAN MORGAN**

## GENIUS ROCKET GIRL

Mary Sherman Morgan, an American scientist, made history as the first female rocket fuel scientist. Despite limited opportunities for women in chemistry at the time, Mary's dedication to the subject led her to develop Hydne, the fuel used for the first stage of the Juno I rocket. This groundbreaking rocket successfully launched Explorer 1, the United States' first satellite, into orbit in 1958, marking the beginning of the space age.



**NEIL ARMSTRONG**

## 1ST MAN ON THE MOON

On July 20, 1969, Neil Armstrong made history by taking the first step onto the surface of the moon, witnessed by over 450 million people. Armstrong's passion for aviation led him to become a test pilot for experimental aircraft before fulfilling his ambition of venturing into space as an astronaut. His words, "a giant leap for mankind," immortalized this historic moment, leaving an indelible mark on human achievement and space exploration.



**BUZZ ALDRIN**

## 2ND MAN ON THE MOON

Buzz Aldrin is an incredible American former astronaut, engineer, and fighter pilot. He had the amazing opportunity to be the Lunar Module Eagle pilot on the 1969 Apollo 11 mission and was the second person to walk on the Moon after Neil Armstrong. Aldrin has continued to be a passionate advocate for further space exploration, especially for missions to Mars.



**SALLY RIDE**

## 1ST WOMAN IN SPACE

In 1978, while working on her PhD at Stanford University, Sally Ride spotted an ad in the newspaper about joining the US astronaut program. Excited by the opportunity, she applied and was accepted, ultimately becoming the first American woman to fly in space. As her career progressed, she dedicated herself to making science engaging and accessible for girls through Sally Ride Science.



# VOCABULARY



**Alien** – An extraterrestrial life-form, or a being from another planet.

**Astroid** – Small, rocky objects that orbit the Sun, mainly between Mars and Jupiter.

**Asteroid belt** – The region between Mars and Jupiter contains our solar system's largest population of asteroids.

**Astronaut** – A person trained to travel in a spacecraft.

**Astronomer** – The area of air and gas that envelopes Earth and other astronomical objects.

**Black Hole** – A place in space where the pull of gravity is so strong that even light can't get out, and is caused by the collapse of a star.

**Comet** - Objects made of frozen gases, rock, and dust that orbit the Sun.

**Constellation** – A group of stars that form a pattern.

**Corona** – The gaseous outer layer of the Sun's atmosphere.

**Cosmic dust** – Small particles of matter in space.

**Cosmos** – The universe.

**Crater** – A cavity in the ground of a celestial object, typically caused by explosions or meteor impact.

**Dark matter** - Particles thought to exist in space that don't absorb, reflect, or emit light and thus can't be observed.

**Dwarf galaxy** – Small dim galaxies that are abundant in the universe.

**Dwarf planet** – A body in space that resembles a small planet but lacks criteria to class it as such.

**Dwarf star** – A small star with low luminosity.

**Eclipse** – When one celestial body blocks light from reaching another by moving between it and its light source.

**Elliptical orbit** – One object revolving around another in an oval shape. The shape is known as an ellipse.

**Equinox** – When the Sun crosses the celestial equator, day and night are the same length. This happens twice a year.

**Force** – A push or pull on an object when interacting with another.

**Galaxy** – A huge collection of gas, dust, and billions of stars, and their solar systems are held together by gravity.

**Gravity** – The force that pulls objects towards each other.

**Hemisphere** – A half of the Earth, when divided along the lines of either North and South or East and West.

**Inner planets** – Planets that orbit within the asteroid belt, including Mercury, Venus, Earth, and Mars.

**International Space Station** – A man-made object that orbits Earth, where astronauts can live and conduct experiments.

**Kulper belt** – A cold and dark area of our Solar System that contains thousands of comets, asteroids, and other objects.

**Light year** – The distance light travels in one year (nearly 6 trillion miles).

**Mass** – How much material an object is made up of, as opposed to weight, which measures the pull of gravity on an object.



# VOCABULARY



**Meteor** – The streak of light caused when a meteoroid enters a planet's atmosphere and starts to burn from the heat of friction.

**Meteoroid** – A little chunk of rock in space smaller than a pickup truck. If it were bigger, it would be an asteroid.

**Meteorite** – A meteoroid that lands on the surface of a planet.

**Milky Way** – Our galaxy, which contains over 260 billion stars.

**Moon** – A smaller body that revolves around a planet. Most planets in our solar system have at least one moon, and some have dozens.

**Nebula** – A cloud of dust and gas in space.

**Observatory** – A building equipped with materials to make astronomical observations.

**Orbit** – A regular and repeating circuit that one celestial object takes around another.

**Outer planets** – Planets whose orbits are outside the asteroid belt, including Jupiter, Saturn, Uranus, and Neptune.

**Planet** - A celestial body that orbits the sun with sufficient mass for gravity to overcome rigid body forces.

**Pulsar** – Compact stars that spin around hundreds of times a second.

**Quasar** – Supermassive black holes that suck in materials.

**Red Dwarf** – Stars that are very small and cool compared to others.

**Red Giant** – A star that's run out of hydrogen and begins to grow bigger and redder.

**Satellite** – An object intentionally placed into space to orbit a celestial body to collect information.

**Shooting Star** - Streaks of light in the sky occur when meteoroids fall into the Earth's atmosphere and burn up.

**Solar System** – The Sun and the planets, asteroids, comets, and meteors that revolve around it.

**Solstice** – The time when the sun reaches its maximum or minimum declination, causing the shortest or longest days of the year.

**Space** – The three-dimensional expanse in which all material things exist.

**Stars** – Heavenly bodies, except planets, held together by gravity, incredibly hot and are visible at night and look like fixed points of light.

**Starburst** – Starbursts can happen when two or more galaxies collide, causing gas and dust to compress and create new stars.

**Sun** – The star that objects in our solar system orbit.

**Supernova** – The explosive death of a massive star at the end of its life and considered the most energetic and dramatic event in space.

**Telescope** – An instrument that allows us to see into space.

**Universe** – Everything that exists in space.

**Waning** – When the moon becomes gradually less visible.

**Waxing** – When the moon becomes gradually more visible.

**White Dwarf** – When a star has burnt up its fuel and begins to collapse inward.



# READING LIST



## **Astronomy Activity Book For Kids**

by Aurora Lipper  
Published 2021 by Z Kids

## **Hidden Figures: The True Story of Four Black Women and the Space Race**

by Margot Lee Shetterly  
Published 2018 by HarperCollins

## **My First Book of Planets All About the Solar System for Kids**

by Bruce Betts  
Published 2020 by Rockridge Press

## **When I'm an Astronaut: Dreaming is Believing: STEM**

by Samantha Pillay  
Published 2022 by Samantha Pillay

## **There's No Place Like Space**

by Tish Rab  
Published 1999 by Random House Books for Young Readers

## **Women in Space: 23 Stories of First Flights, Scientific Missions, and Gravity-Breaking Adventures**

by Karen Gibson  
Published 2020 by Chicago Review Press

## **Welcome to Mars: Making a Home on the Red Planet**

by Buzz Aldrin  
Published 2015 by National Geographic Kids

## **GREAT WEBSITES FOR KIDS:**

Amazing Space  
Earth and Moon Viewer  
Extreme Science: Space  
NASA Kids Club  
The Space Place  
Space Camp  
Understanding the Universe

## **Jupiter the Gassy Giant: A Funny Solar System Book for Kids about the Chemistry of Planet Jupiter**

by K.J. Field  
Published 2023 by PlutoShine Press

## **I Am the Solar System**

by Rebecca McDonald  
Published 2020 by House of Lore

## **Comets, Meteors, and Asteroids**

by Seymour Simon  
Published 1999 by William Morrow & Co.

## **100 Amazing Facts about Volcanoes: Secrets of the Fire Mountains**

by Marc Dresgui  
Published 2023 by Independently published

## **The Stars: A New Way to See Them**

by H.A. Rey  
Published 2016 by Clarion Boos

