



ASTRONOMY

MOON, GRAVITY, SOLAR SYSTEM, & STARS



5549
GRYPHON ROBOTICS

Example Need / Problem:

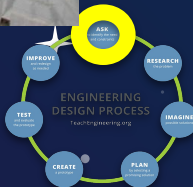
As an aerospace engineer you are tasked with continuing to redesign and make improvements to the way your astronauts will be sleeping in space.

- What is the importance of sleep?
- What happens if you don't have enough sleep?
- How much sleep do you really need?
What makes a good sleep?
- Will your natural sleep cycle be thrown off in space?



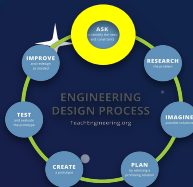
Example Need / Problem:

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As an aerospace engineer you are tasked with continuing to redesign and make improvements to the way your astronauts will be sleeping in space.



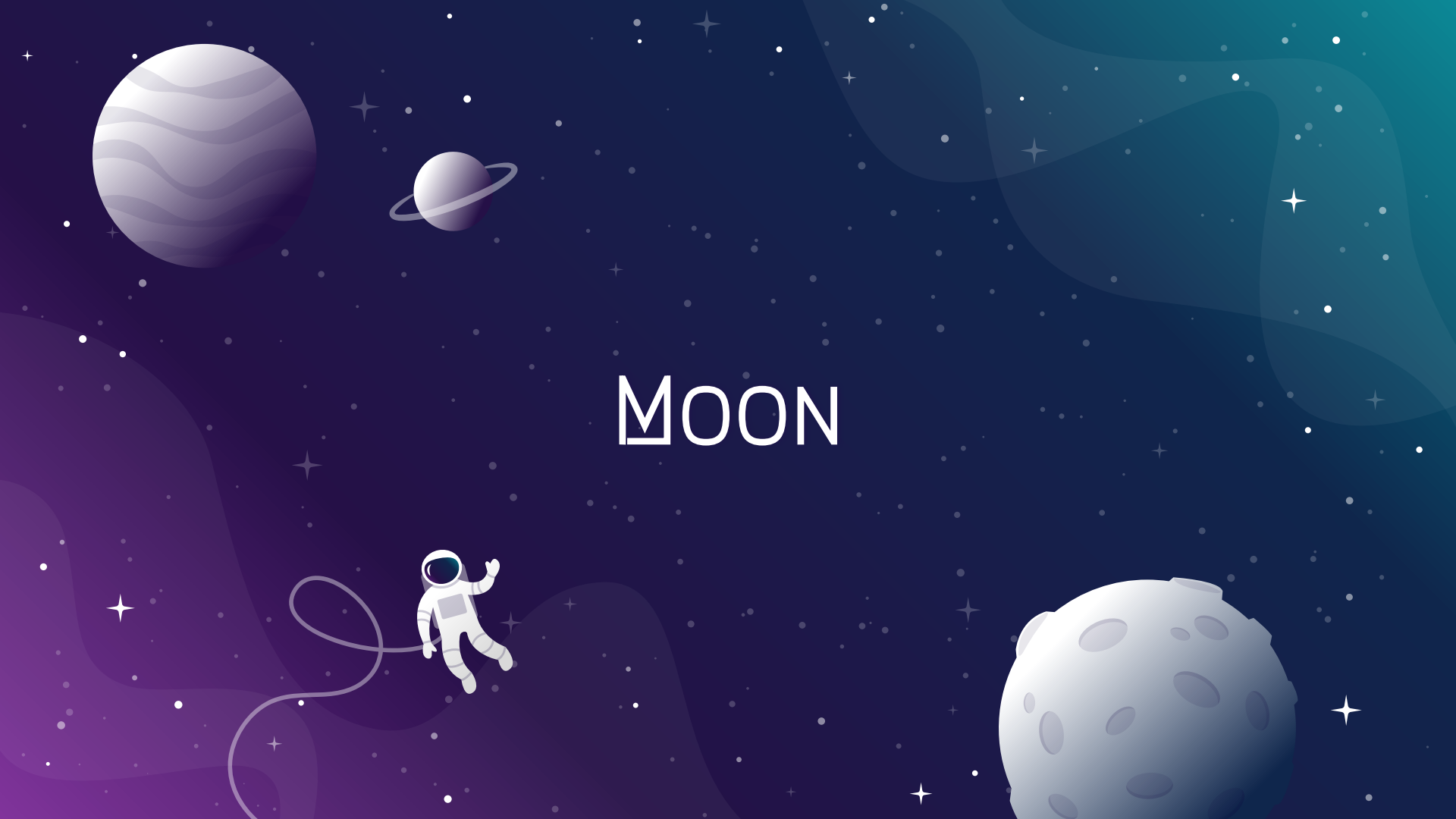
WHAT IS GOING TO HIT THE GROUND FIRST? WITH AIR?
WITHOUT AIR? DOES IT MATTER?



THEY WILL LAND AT THE SAME TIME!



MOON



WHAT IS A MOON?

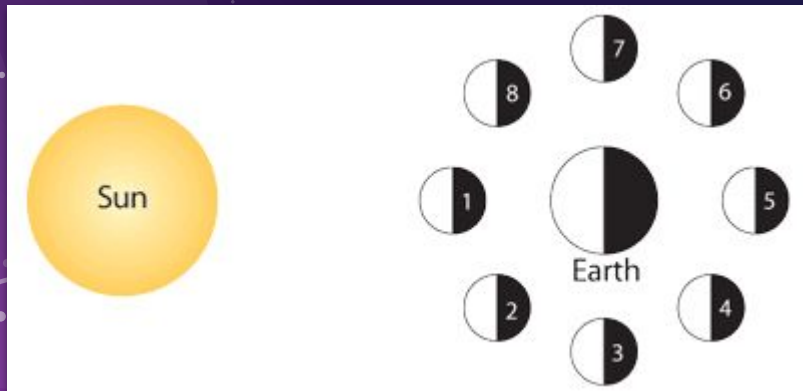
A moon is defined as a “celestial body that makes an orbit around a planet” or in other words, an object in space that moves around another, often larger, object. Our moon is visible on earth because of the sun’s light reflecting off of it. The moon is made up of a combination of rock and metal and the outer crust is formed by a lunar soil.

Learn more in depth [HERE](#)



THE MOON'S PHASES

The phases of the Moon occur because of the reflection of the Sun off the surface of the Moon. We only ever see one side of the Moon because the moon does rotate, only revolves around the Earth. The Moon takes about 27.3 days to complete its rotation around the Earth, but one lunar phase cycle (or from new Moon to New Moon) take about 29.5 days to complete.



In this diagram, the white side of the Moon is what is exposed to the Sun and the Black side is what Earth sees. You can also tell in this diagram how the Moon moves around the Earth, how only one side of the Moon is only ever exposed to the Earth.

For more information click [HERE](#)

THE MOON'S PHASES

1. New Moon (no Moon is visible to Earth)
2. Waxing Crescent (part of the Moon starts becoming visible)
3. First Quarter (the Moon appears as a half circle)
4. Waxing Gibbous (the Moon is almost full)

5. Full Moon (the entirety of the Moon is visible)
6. Waning Gibbous (the Moon starts to shrink)
7. Third Quarter (only half of the moon is visible)
8. Waning Crescent (only a small portion of the Moon is left)



New

Waxing
Crescent

First
Quarter

Waxing
Gibbous

Full

Waning
Gibbous

Third
Quarter

Waning
Crescent

Moon Phase Names

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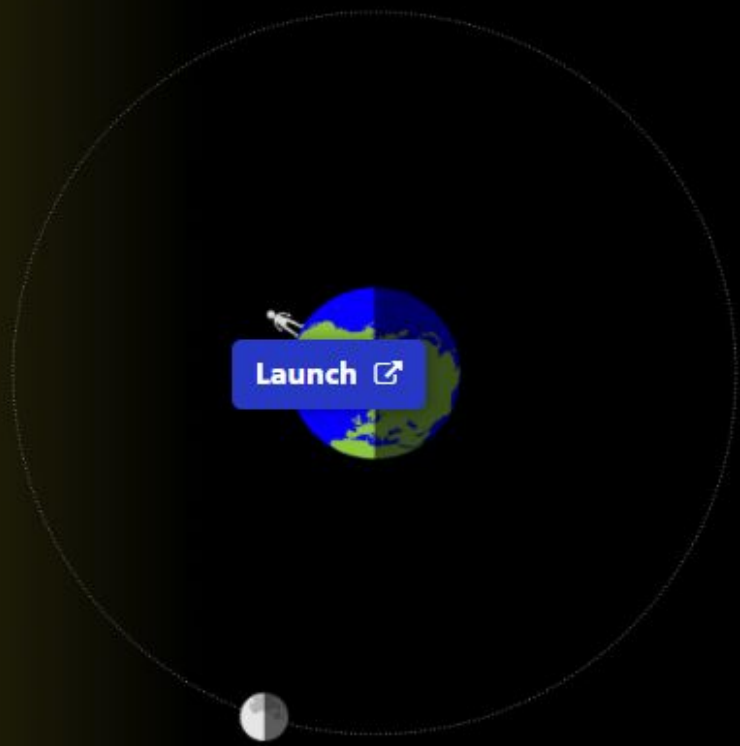
THE MOON'S PHASES - DEMO

Materials:

- Lamp
- Pencil
- Foam Ball



LUNAR PHASE ANIMATION



Time since new Moon: 5 days, 22 hours
Observer's current time: 10:00 AM

Navigation controls including buttons for '< 1 Hour', '> 1 Hour', '<< 1 Day', and '>> 1 Day'. A prominent yellow play button is in the center.

- Show Time Tickmarks
- Show Lunar Landmark
- Show "Moonrise/Moonset" Line



not to scale

ECLIPSES

There are two major types of Eclipses: **Solar** and **Lunar Eclipses**

Solar Eclipses

Solar Eclipses occur when the Moon passes between the Earth and the Sun.

This leaves a shadow over the Sun, momentarily blocking it out. Check out this [animation](#) of a solar eclipse.



ECLIPSES

There are two major types of Eclipses: **Solar** and **Lunar Eclipses**

Lunar Eclipses

Lunar Eclipses occur when the Earth passes between the Sun and the Moon, casting a shadow on the Moon. In a total lunar eclipse the Moon turns red, this is also referred to as a blood moon.





Solar Eclipse Time Lapse



Lunar Eclipse Time Lapse

WHAT DOES THE MOON DO FOR US?

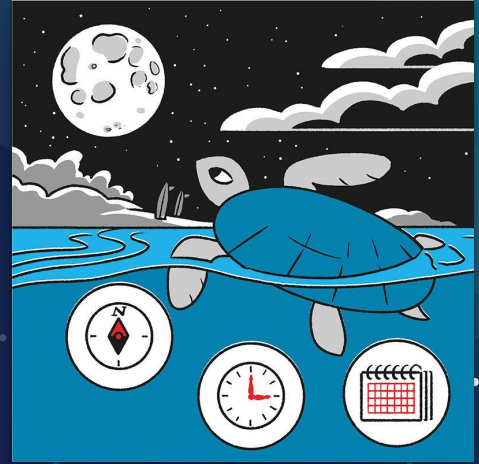
Tides

- Gravitational pull from the Moon and the Sun that affect the Earth
- Higher tides = Earth closest to the Moon and farthest away
- Earth rotations = waterways experience two low tides and two high tides a day
- If the Moon wasn't there, many sea creatures would not be able to survive.

Calendar

- People would track the lunar cycle (roughly 30 days)
- Harvest and other events around the phases of the Moon.

For more information click [HERE](#)



THE MOON LANDING

On July 20th, 1969 Neil Armstrong was the first ever person to step foot onto the Moon. The Apollo 11 mission was the first successful Moon landing in human history.

On the Moon, Armstrong and Aldrin (another astronaut) were able to collect rock samples and lunar soil. This exploration also proved that these types of scientific explorations were possible.

Without the Moon landing, many discoveries would not have been made, including how the Moon has [water](#)!



GRAVITY



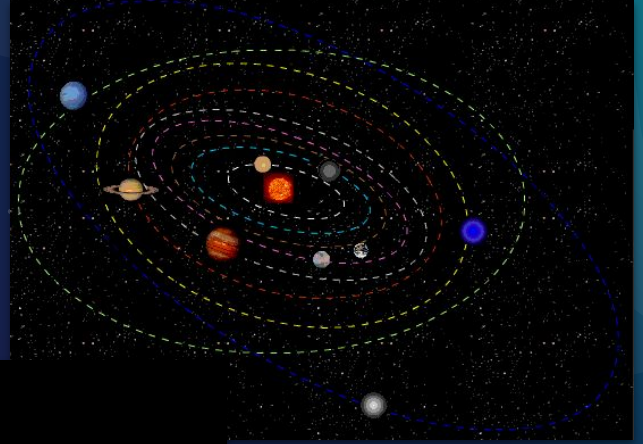
GRAVITY

Gravity is the force by which a planet or other body draws objects toward its center. The force of gravity keeps all of the planets in orbit around the sun.



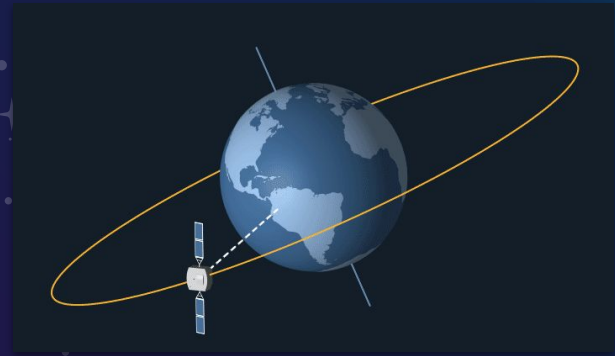
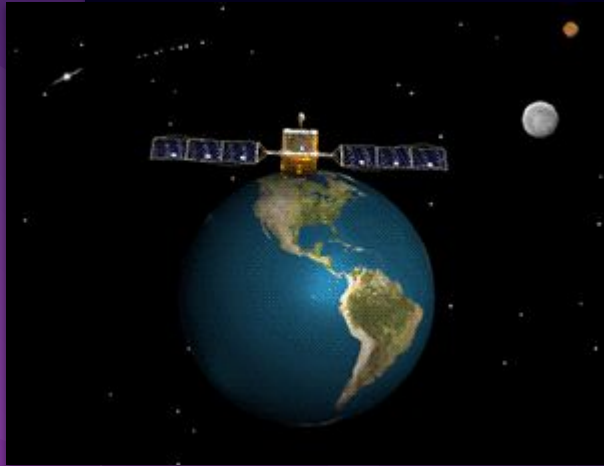
ORBITING

When we talk about how Earth and the other planets travel around the Sun, we say they orbit the Sun. Likewise, the moon orbits Earth. Many artificial satellites also orbit Earth.

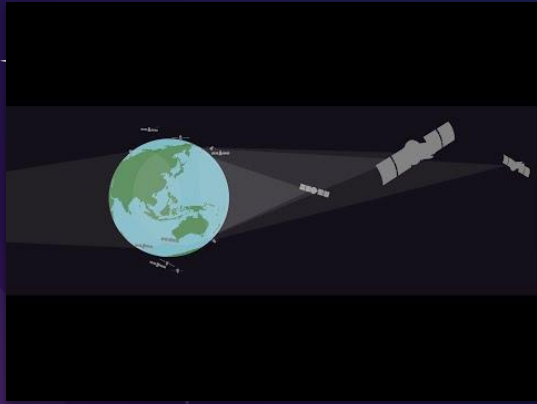


ORBITING

Satellites can orbit Earth's equator or go over Earth's North and South Poles . . . or anything in between. They orbit at a low altitude of just a few hundred miles above Earth's surface or thousands of miles out in space. The choice of orbit all depends on the satellite's job.

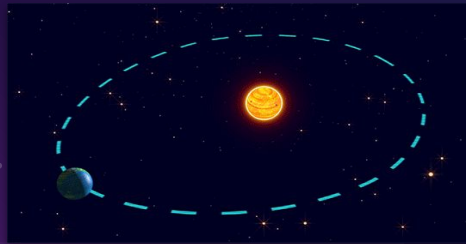
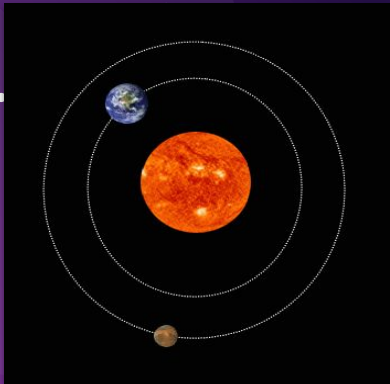


WHY DON'T SATELLITES FALL?



Things in orbit stay in orbit because of their velocity (or the speed it travels around the object) and the gravitational pull from the objects it's traveling around.

Learn more about how that's possible [HERE](#)



FALLING 101

Materials:

- Household objects
- Stopwatch

Test it out!

Gather items of differing weights and sizes, such as a ball, action figure or doll, and a balloon. Safely stand on top of a chair while holding the items. One at a time, Drop each item from the same height. Keep track of how long it takes each item to reach the ground. You may want the help of a parent/guardian/sibling!



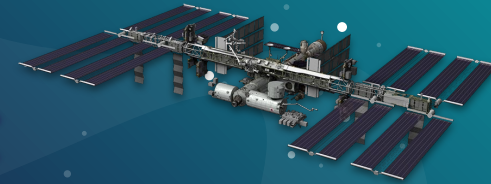
FALLING
101

ESCAPING THE PULL OF GRAVITY





WHAT IN THE WORLD IS THE INTERNATIONAL SPACE STATION (ISS)

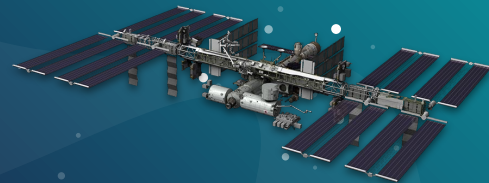


The International Space Station is a large spacecraft. It orbits around Earth. It is a home where astronauts live. The space station is also a science lab. Many countries worked together to build it. They also work together to use it. The space station is made of many pieces. The pieces were put together in space by astronauts. The space station's orbit is approximately 250 miles above Earth. NASA uses the station to learn about living and working in space. These lessons will help NASA explore space.

Learn More [HERE](#)



look up
at the
stars



INTERNATIONAL SPACE STATION (ISS) LIVE ✦



It is the third brightest object in the sky and easy to spot if you know when to look up.

Visible to the naked eye, it looks like a fast-moving plane only much higher and traveling thousands of miles an hour faster!

Learn how to spot the station [HERE](#)

WEIGHT VS MASS

If you weigh 100 lb on Earth, you'd weigh...

17 lb
on the
moon

38 lb
on
Mercury

91 lb
on
Venus

38 lb
on
Mars

253 lb
on Jupiter

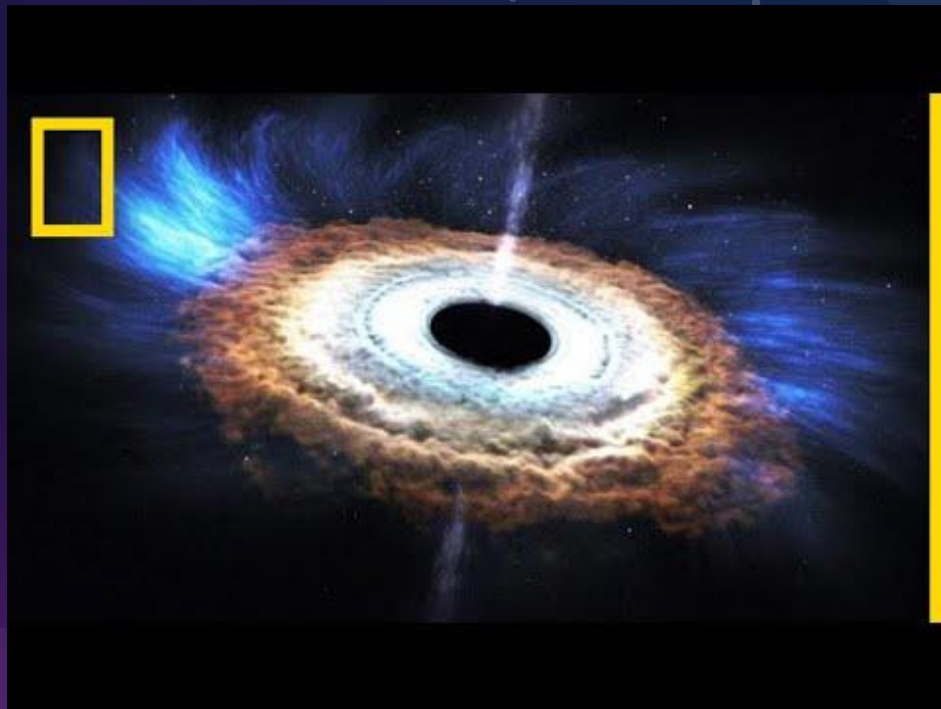
107 lb
on Saturn

91 lb
on
Uranus

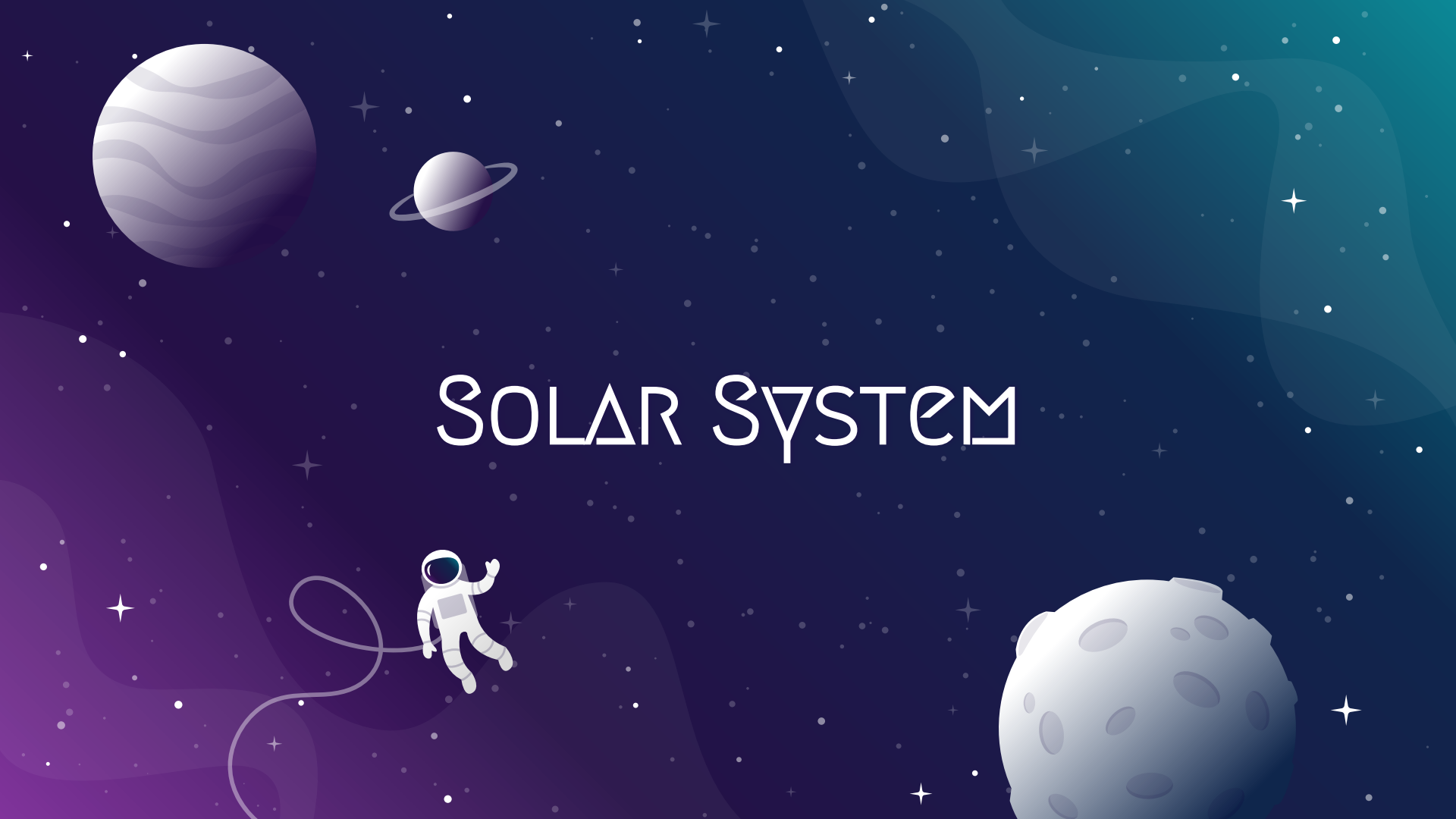
114 lb
on
Neptune



BLACK HOLES



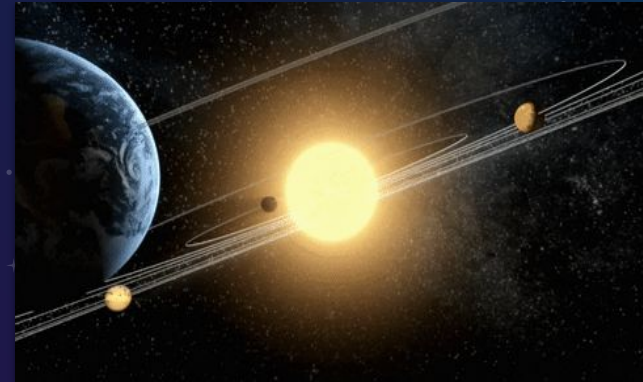
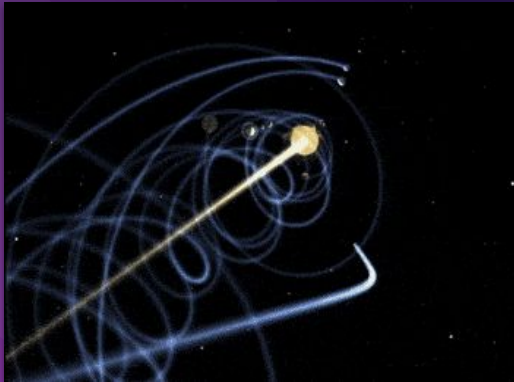
SOLAR SYSTEM



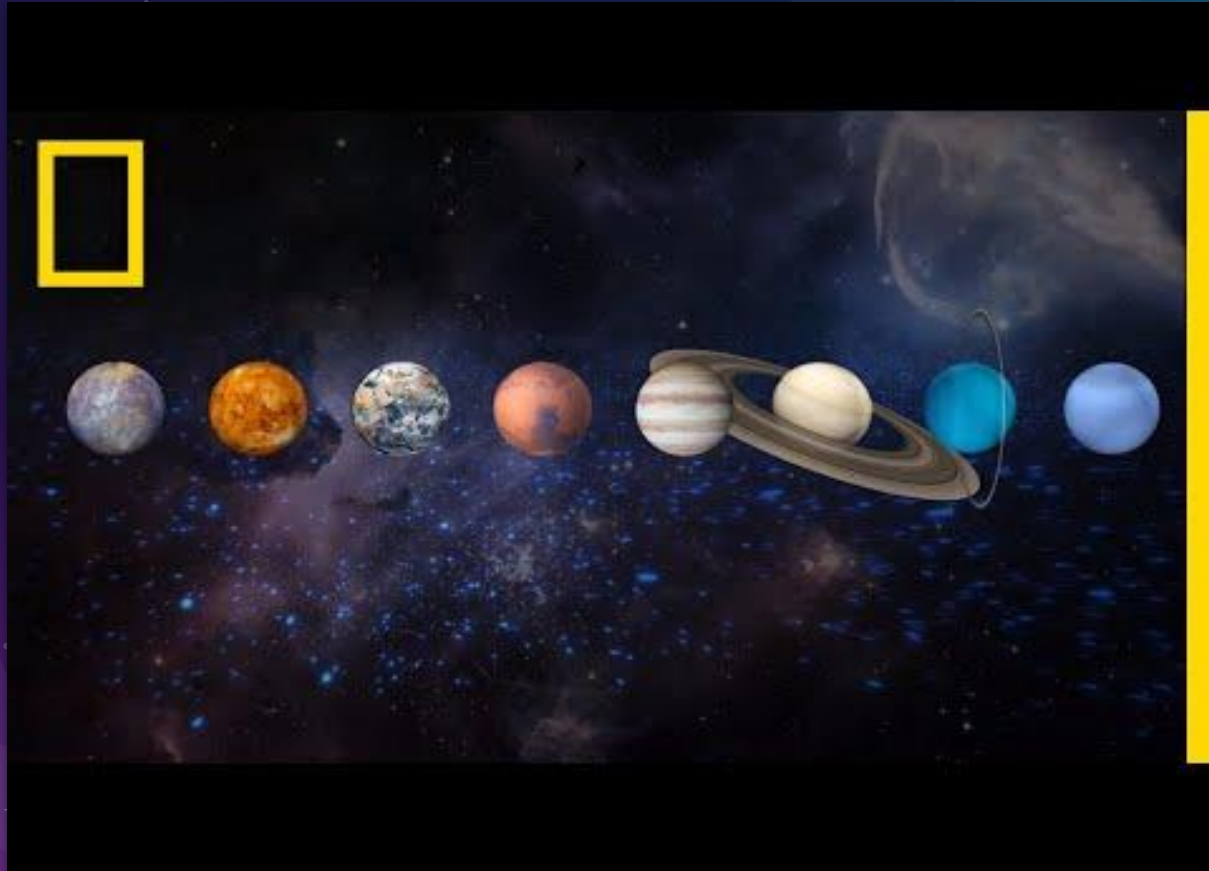
WHAT IS A SOLAR SYSTEM?

Our solar system is one specific planetary system. Our Milky Way Galaxy is just one of billions of galaxies in the universe. Within it, there are at least 100 billion stars, and on average, each star has at least one planet orbiting it. This means there are potentially thousands of planetary systems like our solar system within the galaxy!

Learn more about our solar system [HERE](#)



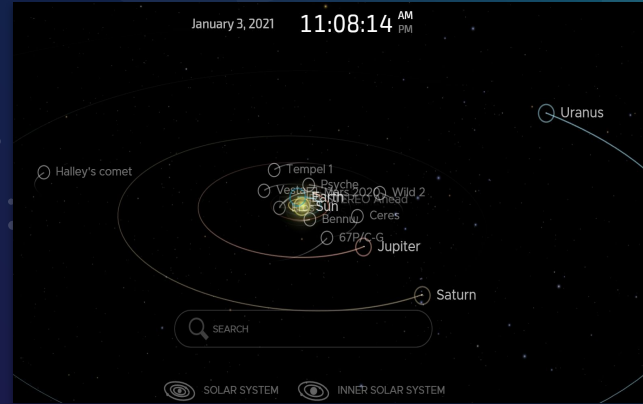
OUR SOLAR SYSTEM



EXPLORE OUR SOLAR SYSTEM PLANETS!

Click [HERE](#) to learn a more indepth review about our solar system.

Click [HERE](#) for a basic overview of our planets:



EARTH - OUR PLANET OUR HOME



Click HERE

Earth Basics

Click HERE

Atmosphere

Click HERE

More Earth

Click HERE

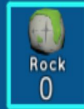
Water



OCEAN CURRENT GAME

Make a path to the key!

Click and drag these tools to make new currents.



Start

Reset

Next Level

Click [HERE](#) to play the game.

Water on the planet surface is a unique property to Earth!

Build your understanding and use your knowledge about ocean currents to unlock the prize.

WHY DO WE CARE ABOUT MARS?

- ★ Search for life
 - ★ Most similar to Earth in solar system
 - ★ Hints that it once was habitable
 - ★ Frozen water
- ★ Understanding the surface
 - ★ Hints to how it was formed
 - ★ Understand atmosphere
 - ★ Evidence of dried up lake beds, rivers, etc.
- ★ Human Exploration and Colonization
- ★ Learn more [HERE](#)





EXPLORE MARS LIKE A SCIENTIST!

Send sequences of commands to the Mars rover and collect as much data as possible in 8 expeditions!

START Go! START

Click [HERE](#) to play the game. Drive a rover around Mars and collect and analyze rocks for scientist to examine.

Try to get the highest score possible!

LEARN MORE ABOUT PLUTO



Click HERE
Pluto Basics

Click HERE
More Pluto

Try to write down at least 3 fun facts about Pluto and 2 reasons why Pluto is no longer considered a planet in our solar system.

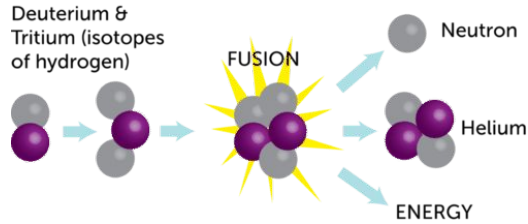
THE JOURNEY TO PLUTO
THE FARTHEST WORLD EVER EXPLORED



STARS

WHAT ARE STARS?

Nuclear Fusion



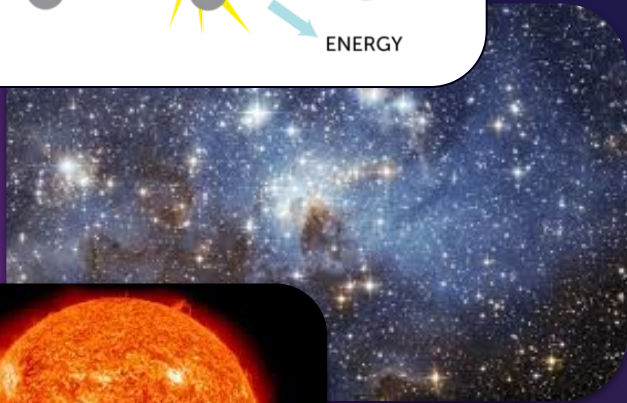
Stars are big balls of gas! Specifically hydrogen and helium, that are condensed together, through a process called nuclear fusion. This process creates light and heat from inside the stars nuclear core.

H¹

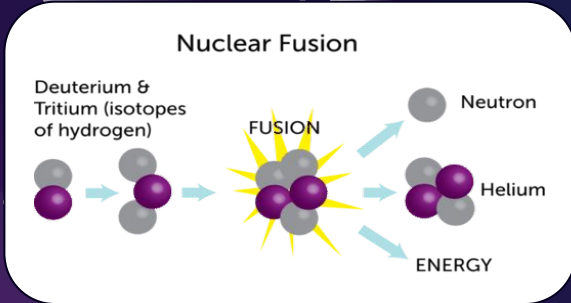
Hydrogen

He²

Helium



WHAT ARE STARS?



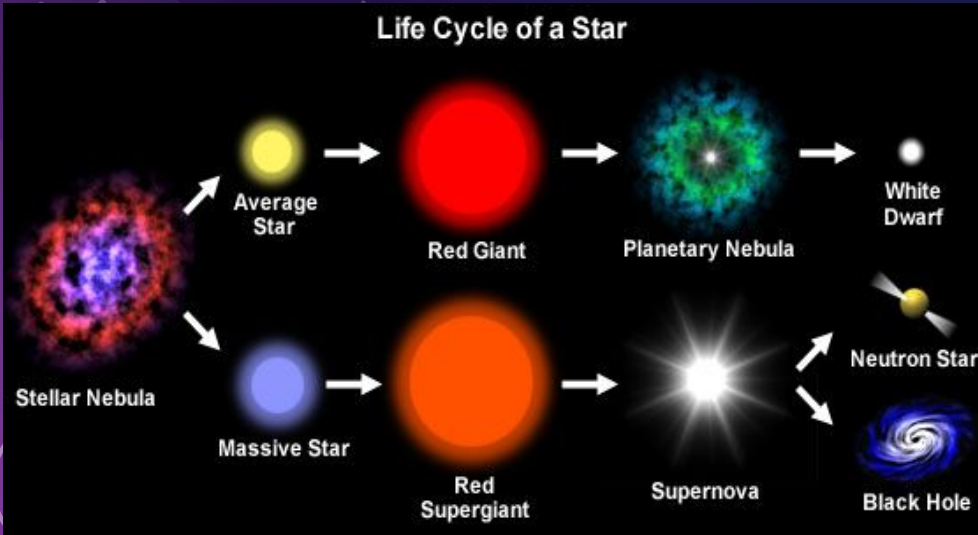
Stars are created from dust clouds containing hydrogen and the gravity causes the dust to be pulled together into a protostar. This protostar starts spinning faster and faster which increases the pressure and heat, this process can take millions of years.

When the core temperature finally reaches 27 million degrees Fahrenheit, nuclear fusion begins and the next, and longest, stage of a star's life begins called the main sequence. Most observed stars are in the main sequence portion of their life, including our Sun!

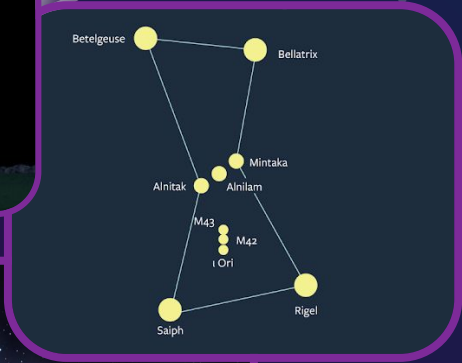
Learn more [HERE](#)

STAR LIFE CYCLE

Stars can go through many different phases of life. They all begin as a cloud of gas and then can either form into an average star or a massive star. The Sun is an average star. Average stars tend to last longer because they burn fuel much slower than a massive star. Stars progress in their life cycle as they burn fuel, when they run out of fuel to burn they start to cool off and become a white dwarf or a black hole.



WHAT ARE CONSTELLATIONS?



Constellations are groups of stars that appear to form patterns or shapes in the night sky. They have been used in many myths as well as navigation because of the recognizable patterns.

Today, constellations are less important but still fun to look at and they help keep track of what's in the night sky. Some famous ones are the Big Dipper, Ursa Major and Orion.

CONSTELLATIONS

Explore the Interactive Constellation Sky [HERE!](#)

Winter Sky

Aries	Leo
Cancer	Orion
Cassiopeia	Pegasus
Eridanus	Perseus
Gemini	Taurus
Hydra	Ursa Minor
	Ursa Major

Click on a constellation above to see its shape and location.

Click "learn about" to read about the selected constellation.

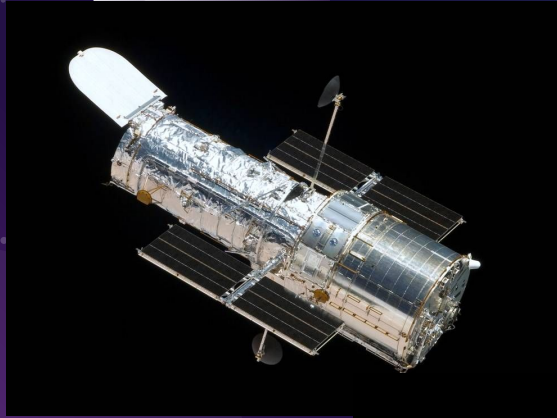
WHAT ARE NEBULAE?

Nebulae, plural form of nebula, are where a Star starts its life cycle.

Nebulae are clouds of dust and gases and some metals. They can span to be hundreds of light years in diameter and give off a very bright and distinct light. However some nebulae, called dark nebulae, absorb light and are only visible in contrast to the rest of the sky. You can learn more [HERE](#).



THE HUBBLE TELESCOPE



The [Hubble Telescope](#) was the first ever major optical telescope to be placed into space. Hubble's primary job is to observe the stars, galaxies, and planets in our solar system and collect data to send back to Earth by taking photographs. The Hubble telescope has made over 1.3 million observations since 1990 and has contributed to over 15,000 scientific papers.



THE HUBBLE TELESCOPE

Hubble is behind some key discoveries, including, tracking the growth of galaxies, discovering icy objects in the Kuiper Belt, providing key information about dark matter and black holes, studying planets and asteroids, exploring a stars life cycle, and much much much more.



See what Hubble saw on your birthday **HERE!**

