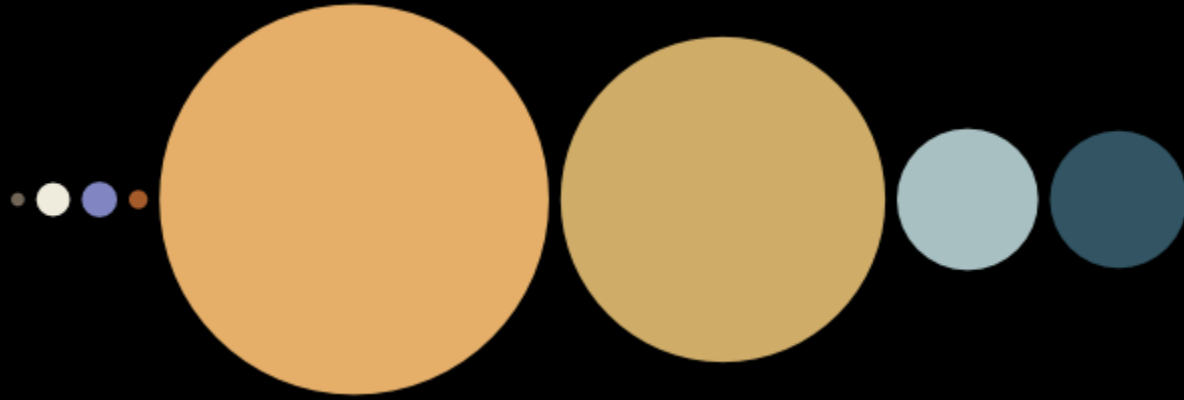


# Space Facts and Constellations

A Science Lab Practice Activity



SAILING THROUGH OUR

# **SOLAR SYSTEM**



Length of Day in  
Earth hours or days

**58 days/15 hrs**

Length of Year in  
Earth days or years

**88 days**

**Mercury** has very little atmosphere. While it doesn't take long to go around the Sun once, it does take a long time to rotate (one day). It has no moons, and has many craters.

It is the smallest planet.  
It is a terrestrial (rock)  
planet.



Length of Day in  
Earth hours or days

**243 days!**

Length of Year in  
Earth days or years

**224 days**

This is **Venus**. Sometimes it is called Earth's sister planet, but it is only like Earth in size.

Believe it or not, **Venus** is actually hotter than Mercury! This is because it is covered in a thick layer of clouds that hold in the heat! It also has a very slow day....243 Earth days! It is a terrestrial (rock) planet.



Length of Day in  
Earth hours or days

**23hrs, 56min**

Length of Year in  
Earth days or years

**365 days**

I think you will recognize  
**Earth!**

What is different about  
Earth compared to the other  
planets? Earth has liquid  
water. This is essential for  
sustaining life. Also, Earth is  
the only planet not named  
after a Greek or Roman God.  
Earth is a terrestrial (rock)  
planet.



Length of Day in  
Earth hours or days

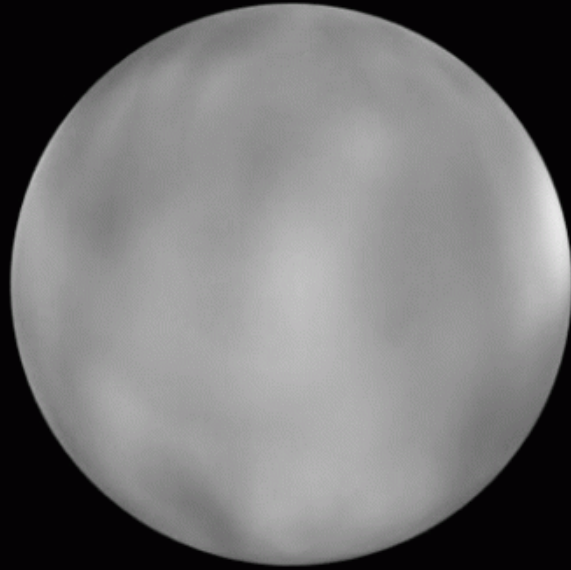
**24hrs/39min**

Length of Year in  
Earth days or years

**687 days**

Welcome to **Mars**.

Scientists think that liquid water once existed on Mars. What evidence do scientists see on Mars that gives them that theory? There are land formations that look like river beds. Mars is a terrestrial (or rock) planet. This is the planet that is most like Earth - not Venus!



**Ceres** is a dwarf planet. It is the only dwarf planet within the main 8 planets.

The area where Ceres is located is the Asteroid Belt. This is a ring of asteroids around the sun between Mars and Jupiter.



Length of Day in  
Earth hours or days

**9.9 hours**

Length of Year in  
Earth days or years

**12 years**

This is **Jupiter**, the largest planet in our solar system. Also shown is one of its moons, Ganymede, the largest moon in our solar system. The 4 largest moons of Jupiter can be seen with a telescope. They were discovered by Galileo, so they are often called the Galilean moons.

Ganymede, Europa, Io, and Callisto. Jupiter is a gas giant.





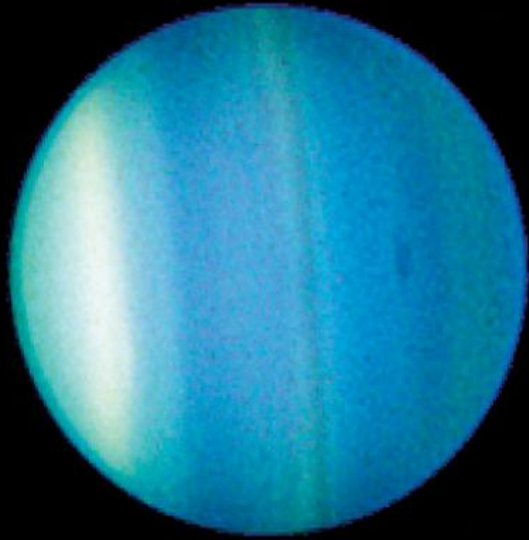
This is **Saturn**. Saturn is well known for its rings, which are made of ice and dust. They are only 20 meters thick. Saturn is also the flattest planet, meaning it is wider east to west, than it is north to south. Saturn is a gas giant.

Length of Day in  
Earth hours or days

**10hrs/39min**

Length of Year in  
Earth days or years

**29.46**



Length of Day in  
Earth hours or days

**17hrs/15min**

Length of Year in  
Earth days or years

**84 years**

**Uranus** is a unique planet. It is different than other planets because it is tipped on its side. Instead of rotating like a top, it appears to roll like a ball around its orbit. Scientists think it may have been hit by another planet or object and this caused it to tip on its side. It is a gas giant. It was also the first planet discovered using a telescope.



Length of Day in  
Earth hours or days

**16hrs/6min**

Length of Year in  
Earth days or years

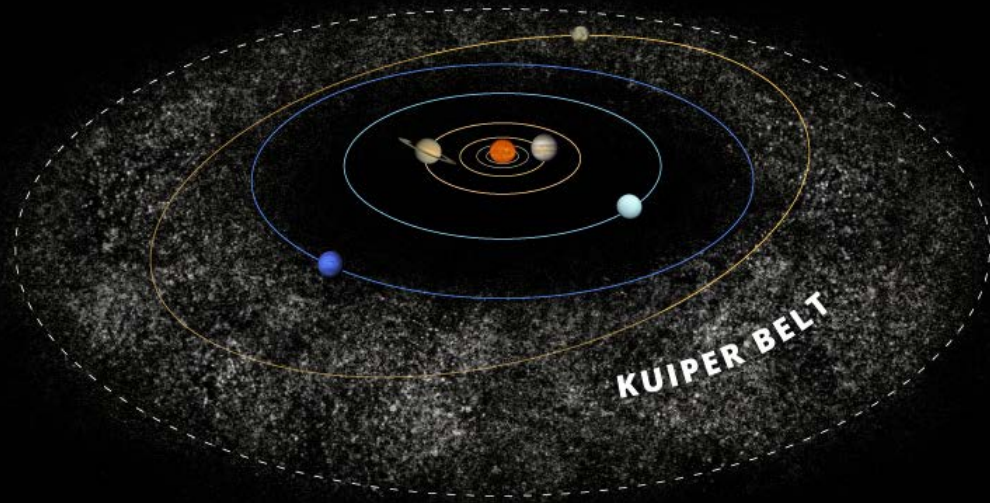
**165 years**

Finally, the last planet in the solar system, **Neptune**. It was the first planet that was predicted based on mathematical information and observations before it was actually seen with a telescope. It has strong storms and has a spot similar to Jupiter. It is a gas giant.



The illustration shows **Pluto** and 4 of its satellites - Charon, Hydra, and Nix.

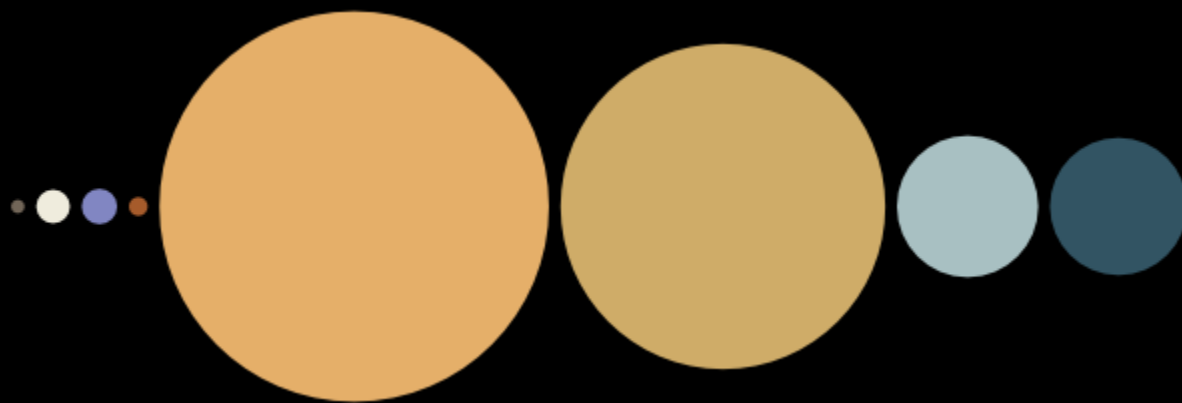
Pluto and its satellites are at the beginning of a large area outside of our main solar system, called the Kuiper Belt.



Space Facts / Laurine Moreau

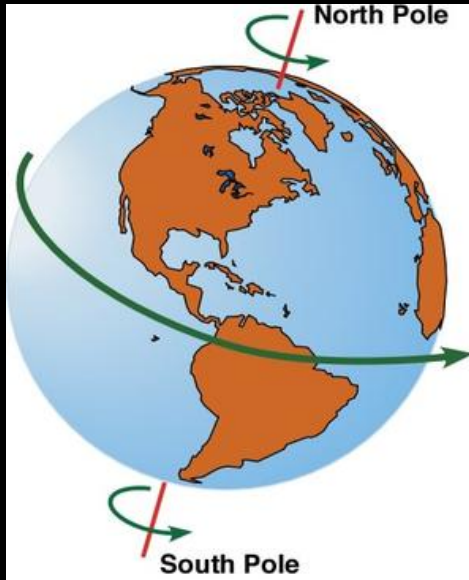
The **Kuiper Belt** is a large area made of mostly ice and dust.

The dwarf planets Pluto, Haumea, Makemake, and Eris are all in the Kuiper Belt. There are Trans-Neptunian Objects (TNOs - past Neptune) in the Kuiper Belt besides those listed - maybe some undiscovered objects!



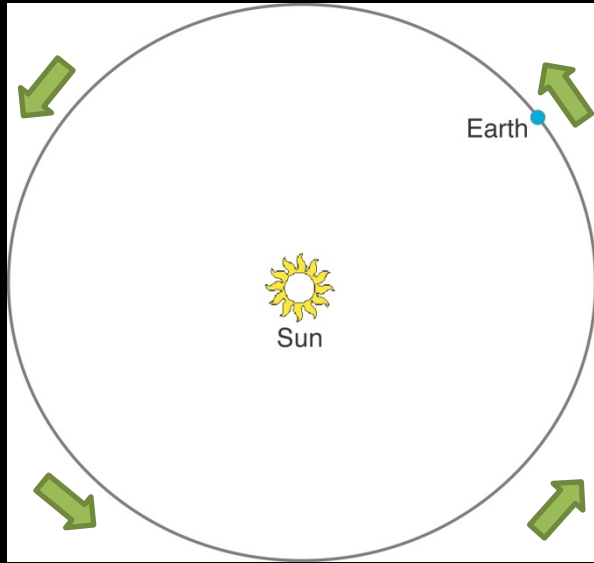
How Planets

**MOVE IN SPACE**



The movement of Earth and other planets spin on an **axis**. An axis is like an invisible line that the planet spins around. Even Uranus has an axis, even though it is sideways.

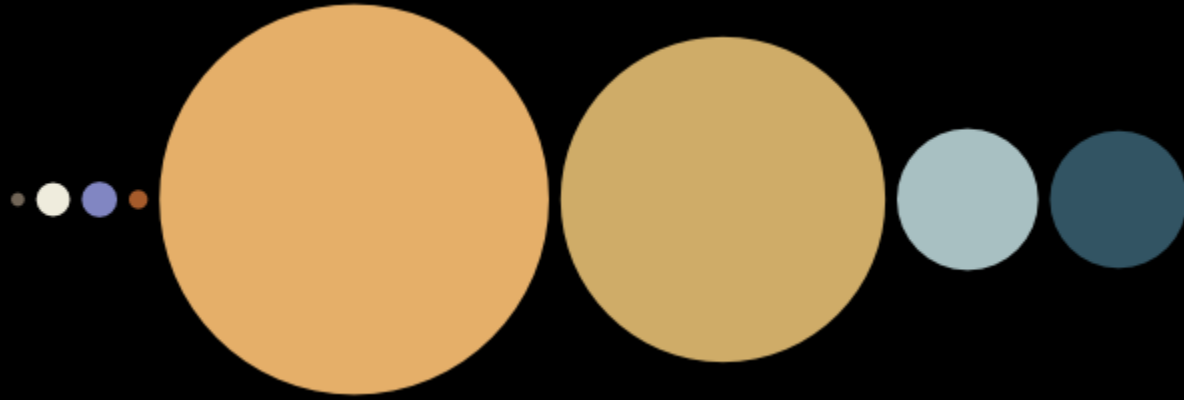
The movement of the planet around its axis is called **rotation**. The rotation of the planet in time is called a **day**. Earth's day is about 24 hours.



This is a diagram of Earth and the Sun, but could also be any of the other planets.

The movement of the planet around the Sun is called **revolution** (or revolve). The time it takes for a planet to revolve one time around the Sun is called a **year**.





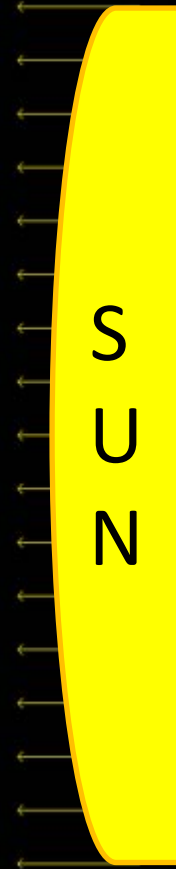
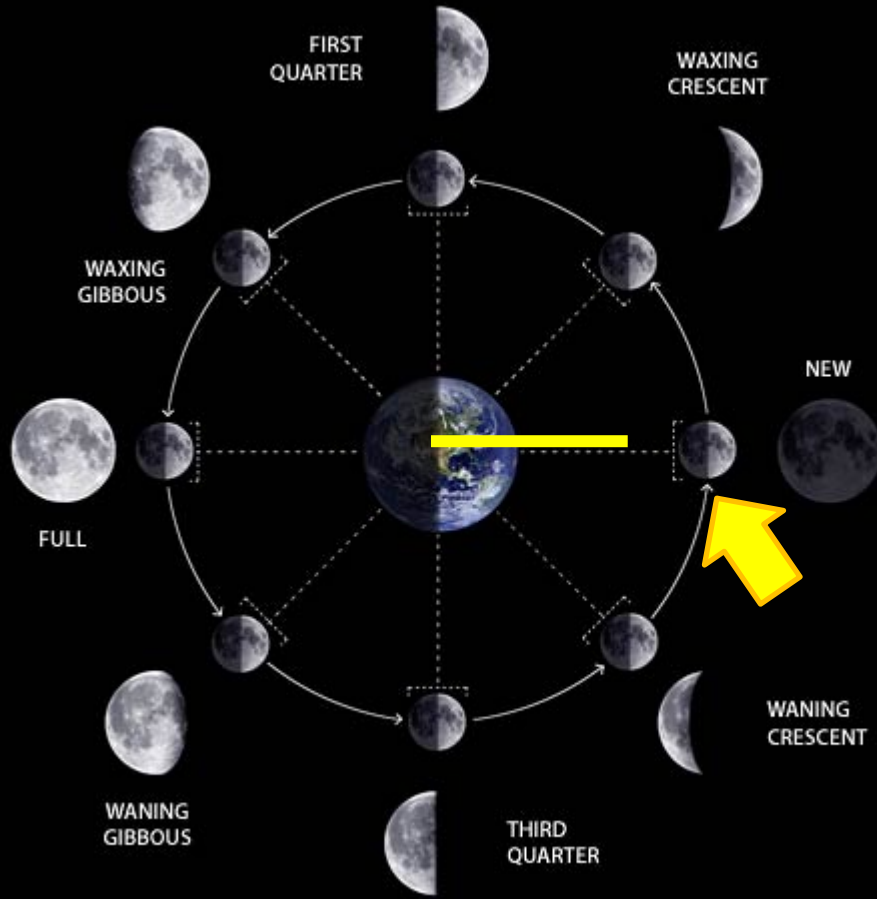
The Different

# MOON PHASES



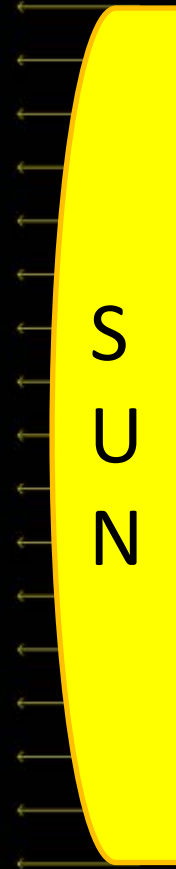
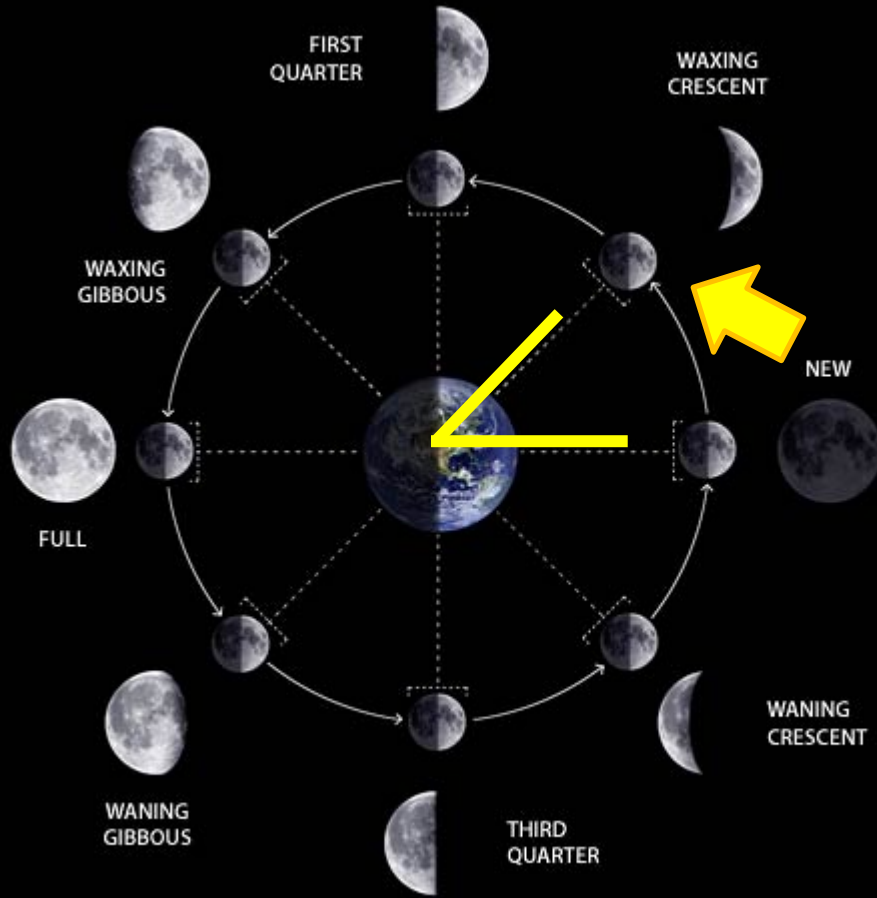
## Moon Phases

The Moon revolves around Earth. Because of its position in the sky compared to the Sun and Earth, the amount of light we see reflected changes.



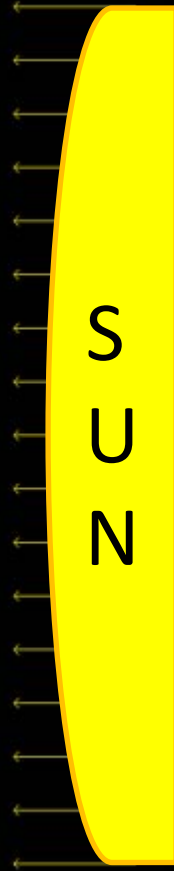
## Moon Phases

Since the Moon reflects the light of the Sun, we can't see any light when the Moon is between the Earth and the Sun. The light is all on the opposite side. This is called a **New Moon**.



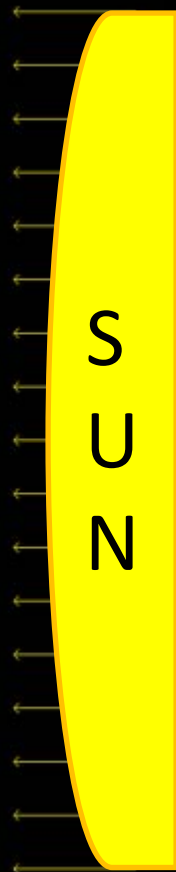
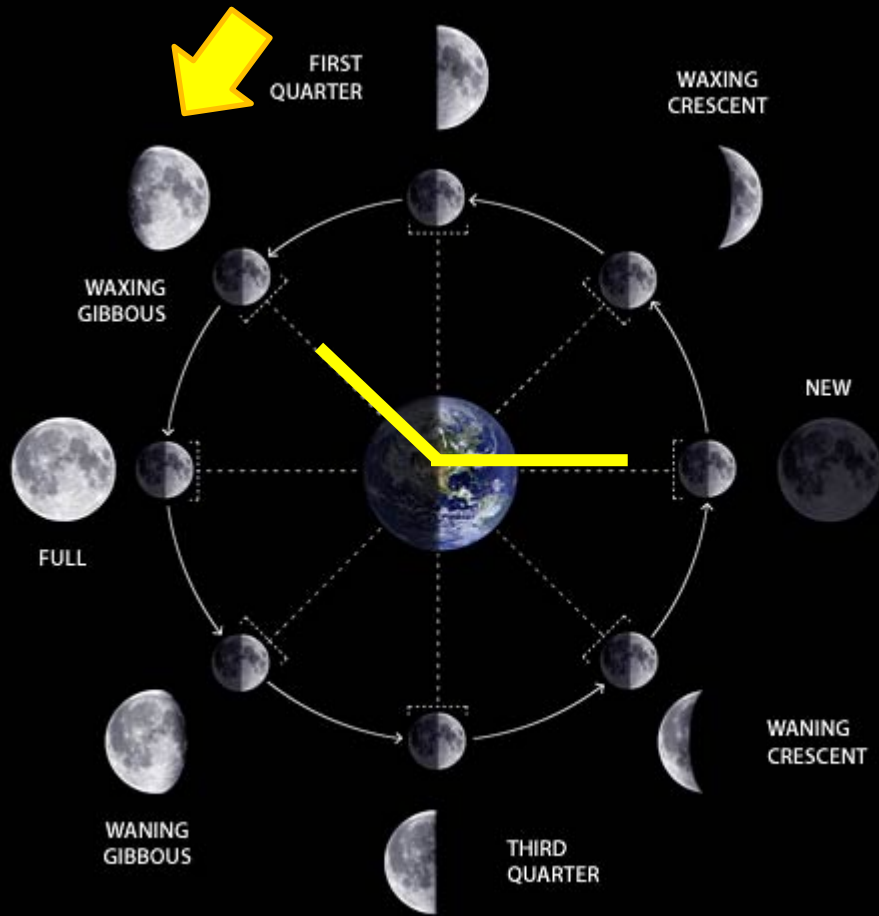
## Moon Phases

When the moon moves from **New Moon** phase we start to see a little bit of light on the right side of the moon. This phase is called a **Waxing Crescent**. Waxing means "getting bigger."



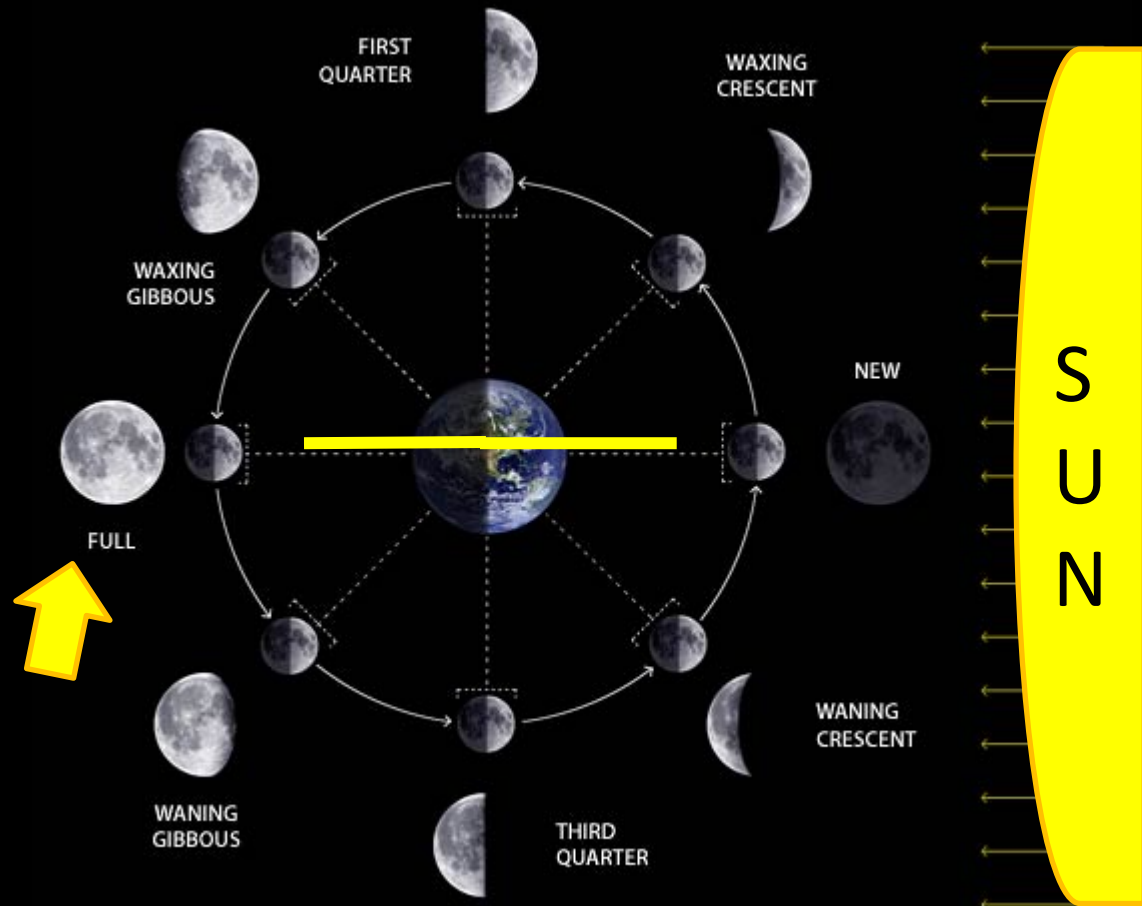
## Moon Phases

When the moon has traveled one quarter of its orbit around the Earth, we can see  $\frac{1}{2}$  of the moon reflecting light. This phase is called **First Quarter**. This is confusing because we actually see half - not a quarter.



## Moon Phases

As the moon travels more opposite from the Sun, we can then see more light reflected. The phase between first quarter and a full Moon is called a **Waxing Gibbous**.



## Moon Phases

A **Full Moon** is when we see the entire lit up side of the moon because it is exactly opposite of the Sun.

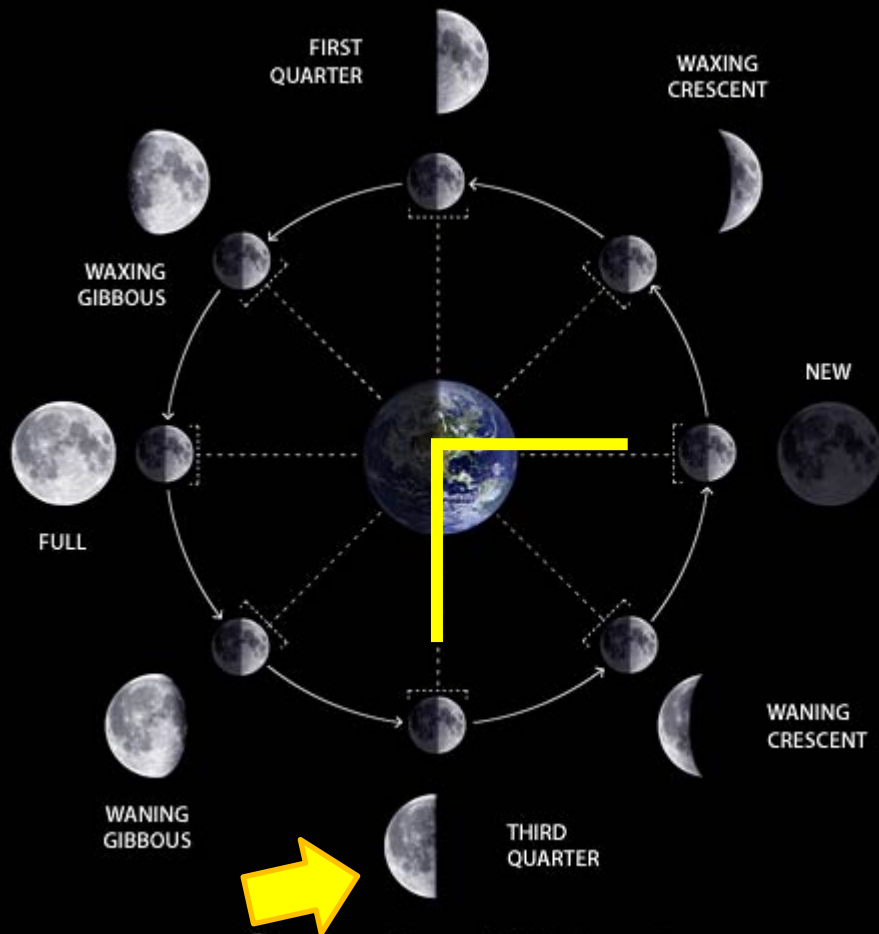


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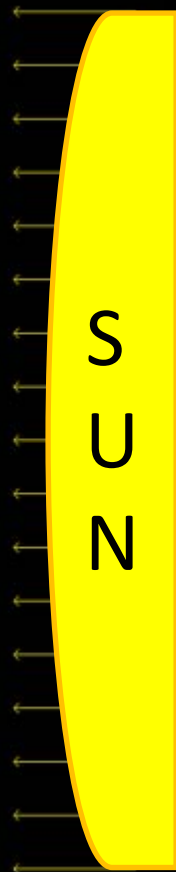
## Moon Phases

Now the moon starts going through the phases again, only backwards. When the light is getting smaller it is called "waning". So here is a **Waning Gibbous**.



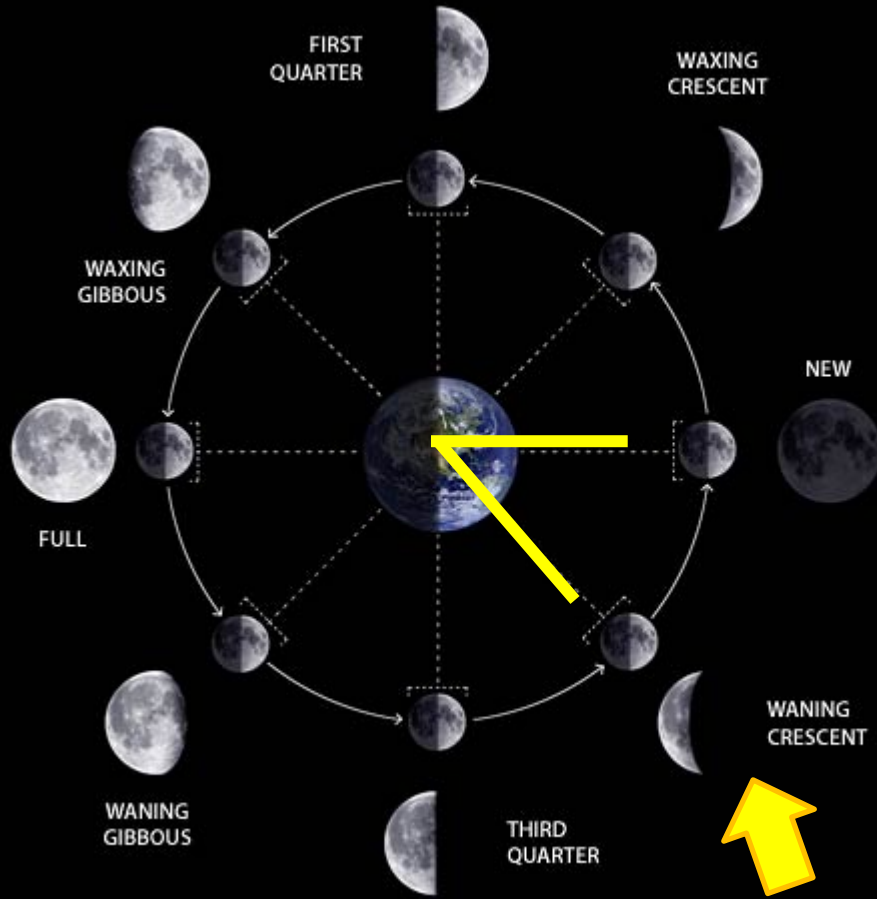


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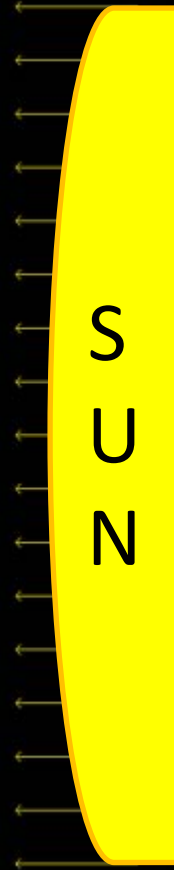
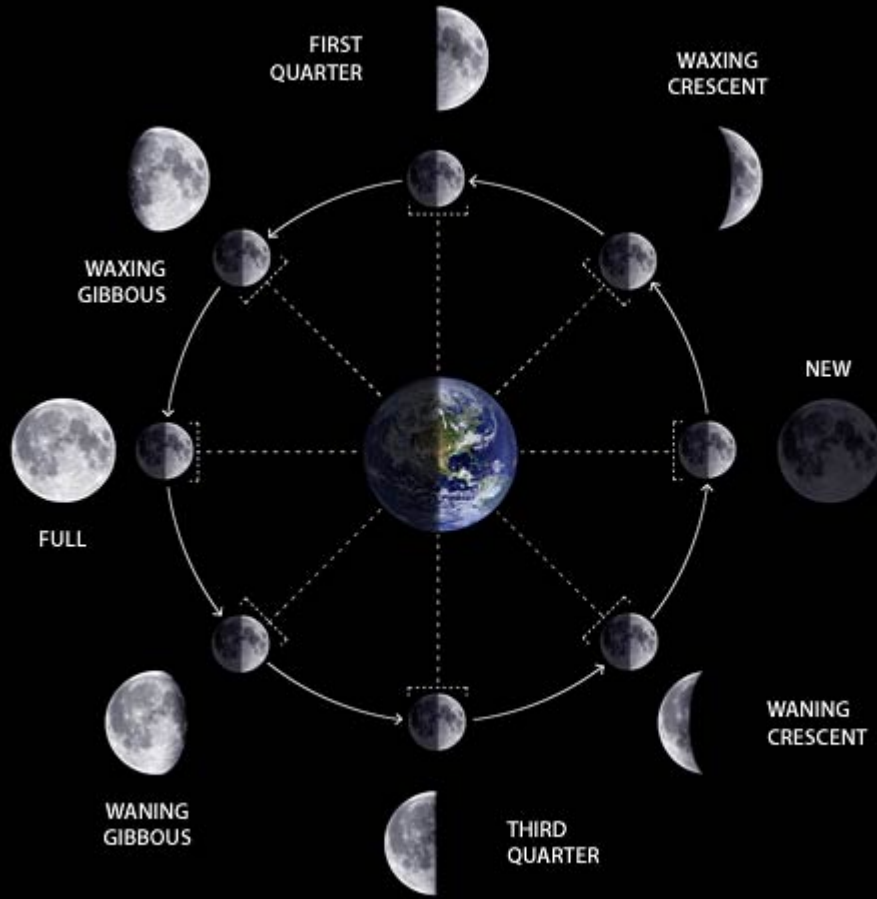
## Moon Phases

When we see a half again, only this time the light is on the left, this means the moon has traveled  $\frac{3}{4}$  of its orbit around the Earth. This is why it is called a **Third Quarter** moon.



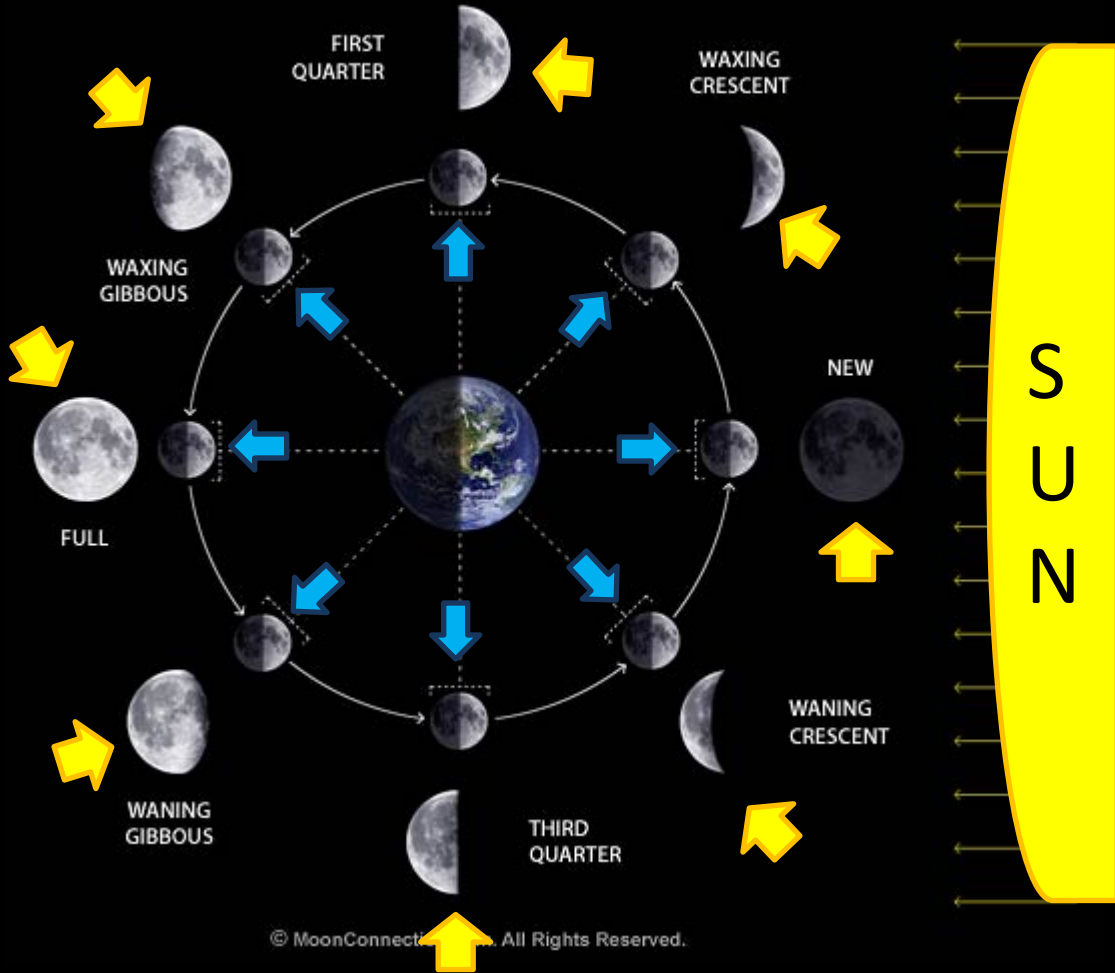
## Moon Phases

The light has been getting smaller. By now it is a crescent again, so we call this phase a **Waning Crescent** moon. Soon, the light will disappear as we go back to the New Moon phase.



## Moon Phases

Take a look at the moons on the inside ring in this diagram. How much of the moon is lit up? Yes, HALF. The moon always has half of it lit up - it is where it is around the Earth that changes what we see.



## Moon Phases

The blue arrows point to what the moon actually looks like from space.

The yellow arrows show what the moon looks like from Earth.

## Fact Check:

1. Which planets are the terrestrial planets?
2. Which planets are the gas giants?
3. What is the difference between rotation and revolution?
4. Which planet is tipped on its side?



## Fact Check:

5. Which planet has little or no atmosphere?
6. Which planet is the hottest and why?
7. Which planet is the only one with liquid water?
8. Which planet was discovered by using mathematical prediction?



## Fact Check:

9. Which planet has four large moons that were discovered by Galileo?
10. Which planet is most like Earth?
11. What is the area called where most of the dwarf planets are?
12. Where is the Asteroid Belt located?



## Fact Check:

13. What is a year?

14. What is a day?

15. Can you draw a diagram of where the Sun, the Earth, and the Moon are during a full moon?

16. How much of the moon is lit up by the Sun at all times?

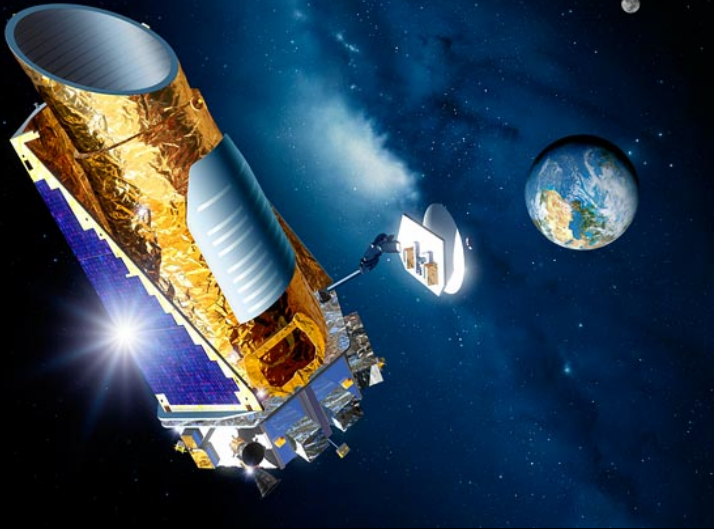


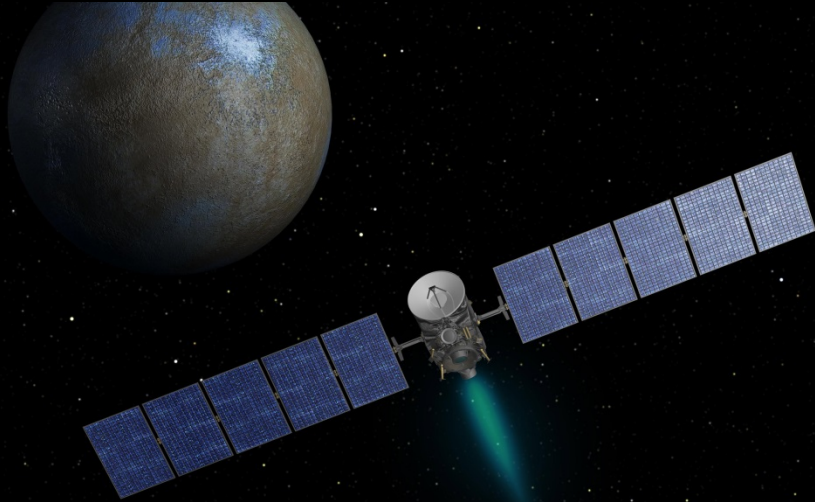


What is the latest in

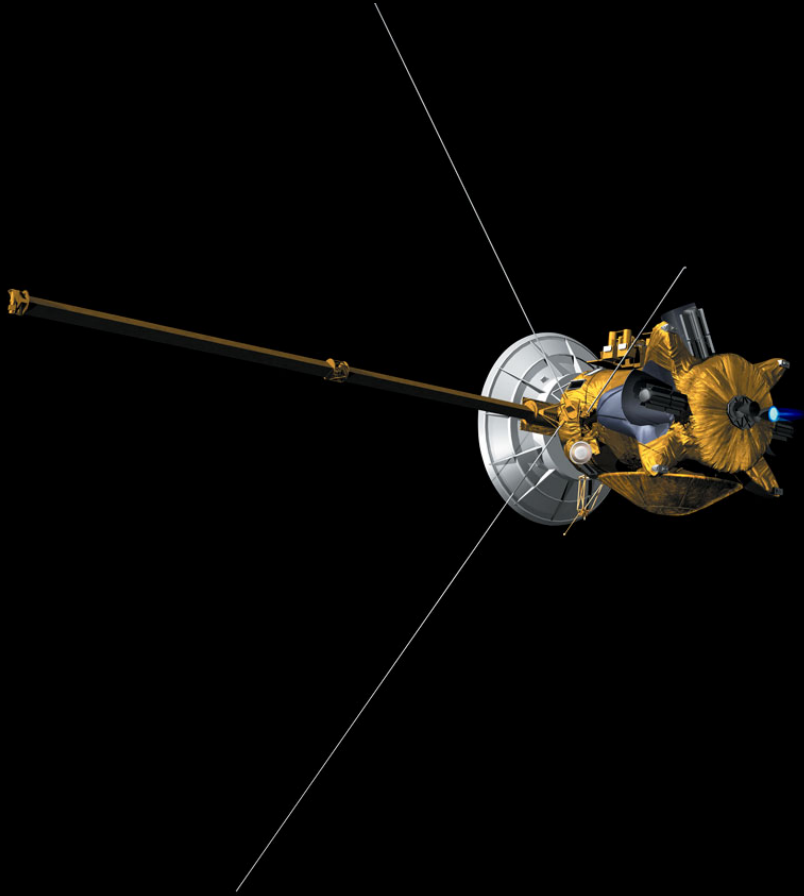
**NASA SPACE EXPLORATION?**

This is a picture of the **Kepler Spacecraft**. Its mission is to find exoplanets. Exoplanets means outside of our solar system.

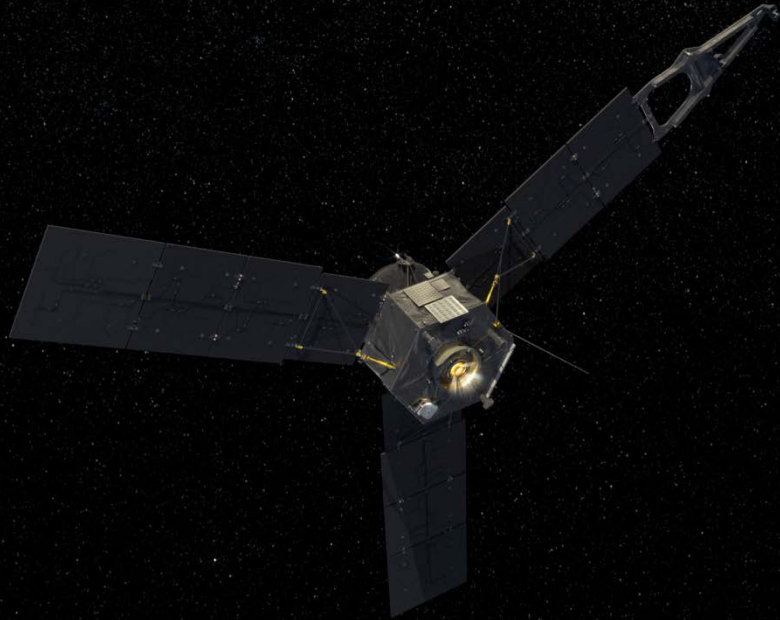




This is a picture of the **Dawn Spacecraft**. Its mission is to look for information and evidence about how the solar system was formed and evolved. It visited Vesta and is now orbiting the dwarf planet Ceres.



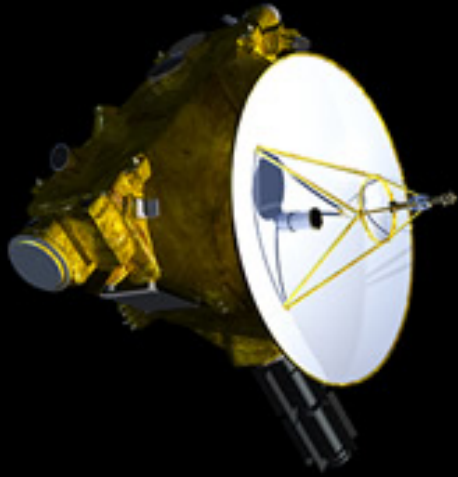
This is a picture of the **Cassini Spacecraft**. Its mission is to gather information on Saturn that will help us to understand it and other gas planets.



This is a picture of the **Juno Spacecraft**. Its mission is to gather information about Jupiter. It will be arriving at its destination in July 2016. The goal is to view under Jupiter's cloud cover and to learn more about its formation.



This is a picture of the **Neowise Spacecraft**. Its mission is look for asteroids and comets, including those that might be a threat to our planet.



This is a picture of the **New Horizons Spacecraft**. Its mission was to answer questions about Pluto, its moons, and Kuiper Belt objects.

In the past...

**ASTRONOMERS**





## Galileo Galilei

He did not invent the telescope, but heard about it, took the idea, and improved it considerably. He discovered these things and more:

- the four main moons of Jupiter
- that the Moon is not flat, but has craters, valleys, and mountains;
- he proved that Copernicus's theory was correct with evidence - that Earth goes around the Sun instead of the Sun going around Earth.
- sunspots
- the rings of Saturn



## Edwin Hubble

### Edwin Hubble:

- Discovered galaxies outside of our own Milky Way
- Showed that the galaxies were moving away from each other
- Hubble's discoveries helped to prove some of Einstein's original ideas!



## Johannes Kepler:

- Discovered the laws of planetary motion - how the planets moved and the shapes of their orbits.
- First to explain how moons influenced the tides.



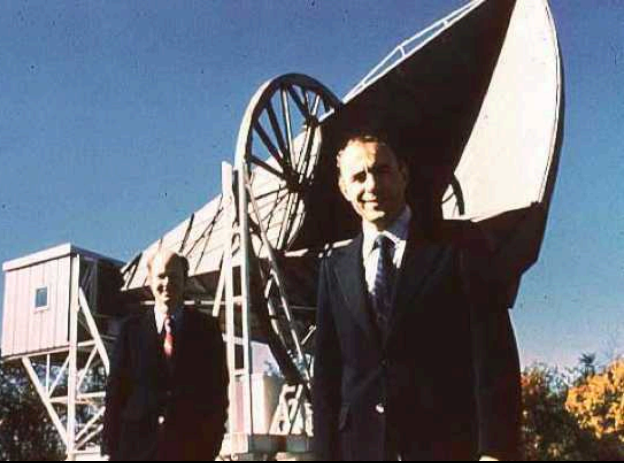
## William Herschel:

- Built his own reflecting telescopes.
- Discovered binary system stars (stars that (two stars that orbit around the same point of gravity).
- Discovered deep space objects which he called nebulae.
- Discovered Uranus!
- Discovered that the solar system was actually moving through space.
- Discovered infrared radiation



## Nicolaus Copernicus:

- First astronomer who supported the idea that the planets went around the Sun. Before that (and still for a long time after!) people thought that the planets AND the Sun went around Earth.



## Arno Penzias and Robert Wilson

- These two gentlemen are put together because their discovery was done together. They are credited with finding the evidence to the Big Bang.



## Ptolemy

- One of the first "astronomers".
- Catalogued and made charts of the stars and planets.
- The charts were used for over 1000 years after his death!

Beyond Earth and our Solar System

# **OUTER SPACE**

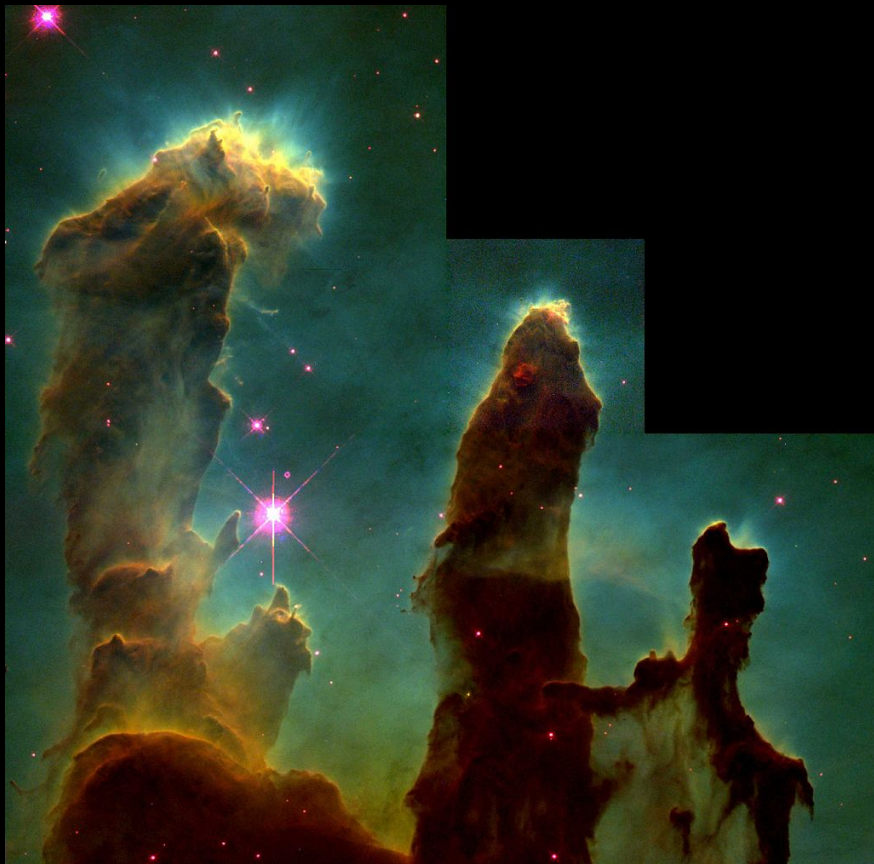




This image was taken by the Hubble telescope.

It shows a **Nebula**...a gas and dust formation where stars are created. There are many different ones in different shapes.

This one is called the Horsehead Nebula.



The Hubble telescope has taken really beautiful photos of many different nebulae (plural for nebula). This one is the Eagle Nebula.

Crab Nebula



Ring Nebula



Cat's Eye Nebula





This is a picture of the Milky Way Galaxy as seen from Earth above Devil's Tower. Our solar system is in the Milky Way Galaxy, but there are countless other galaxies in space.

Scientists think there is a **supermassive black hole** at the center of each galaxy.

# Types of Galaxies



Barred Spiral



Irregular



Spiral



Peculiar



Elliptical



Lenticular

There are different types or shapes of galaxies. The Milky Way is a spiral galaxy.

## Fact Check:

17. Which astronomer discovered Uranus?

18. What theory did Copernicus come up with?

19. Name at least two discoveries or inventions that were Galileo's.

20. Who discovered explained how the moon influences the tides?





## Fact Check:

21. Which astronomer made detailed charts of the stars and planets that were used for thousands of years?
22. What was the theory that Arno Penzias and Robert Wilson developed together?
23. What was Edwin Hubble known for?



## Fact Check:

24. What do astronomers believe is at the center of a galaxy, including the Milky Way?

25. What happens in a nebula?

