Satellites

1. What is a satellite? What is the difference between a natural satellite and artificial satellite?

2. Answer the following questions about a satellite's orbit:
   a. What is "orbit?"
   b. What types and shapes of orbits exist?
   c. What causes an object go into orbit?
   d. How fast must an object move to remain in earth's orbit?
   e. What is an orbital period?
   f. What is orbital decay or escape and what factors can cause them?
   g. What other factors can alter an object's orbit?

3. Present a short history on the discovery and study of natural satellites. Include people, events, and dates that were significant in this field of study.

4. How is a natural satellite created? How are artificial satellites created?

5. What effect do natural satellites have on the objects they orbit?

6. Create a or timeline of the history of artificial satellites.

7. Model or draw and label the four components that all artificial satellites have and their purpose.

8. List at least five purposes for artificial satellites, naming a satellite specifically designed for each purpose.

9. Define the following:
   a. Passive satellite
   b. Active satellite
   c. Satellite constellation
   d. Spacecraft
   e. Space Debris

10. Diagram or demonstrate the following types of earth orbits and the share the approximate orbital period for each:
    a. Low Earth Orbit (LEO)
    b. Medium Earth Orbit (MEO)
    c. Geosynchronous Orbit (GSO)
    d. Geostationary Orbit (GEO)
    e. High Earth Orbit

11. How many satellites are in earth's orbit? What happens to an artificial satellite when it no longer functions properly?

12. What international laws govern the ways satellites are used, and what organization is responsible for enforcing these laws?

13. Research the average cost to place an artificial satellite into orbit, and the cost to maintain the satellite throughout its lifespan.

14. Do two of the following:
    a. Using a telescope if necessary, observe and identify a natural satellite and at least three artificial satellites.
    b. Visit a planetarium or museum that teaches about satellites and make a presentation on what you learned.
    c. Build your own telescope from household objects or from a kit and use it while completing this honor.
    d. Watch a video or animation of how a satellite is sent into orbit. Write a 200-word report or give a 5-minute presentation on what you learned.
    e. Create a model of earth and at least ten satellites (including the moon) and represent their orbital patterns and distances from the earth.
    f. Interview someone who works in a profession that interacts with satellites. Ask them what their role is, and how they're work is affected by satellites.

15. Research what the Bible says about the moon and discuss the roles that the moon plays in Biblical teachings. Create and present a devotion on something that you learned during the study of natural and artificial satellites.

Satellites

Upper Columbia Conference Honor Pilot

One of the greatest accomplishments in space exploration is the ability to put equipment and scientific tools into Earth's orbit. Man-made satellites, known as artificial satellites, are useful for studying the universe, providing GPS coordinates, observing weather, and even providing internet connection! But did you know that the moon is a satellite too? Satellites come in all shapes and sizes, some artificial and others natural, but each one uses the same laws of physics to keep it orbiting Earth. Let's learn about them!

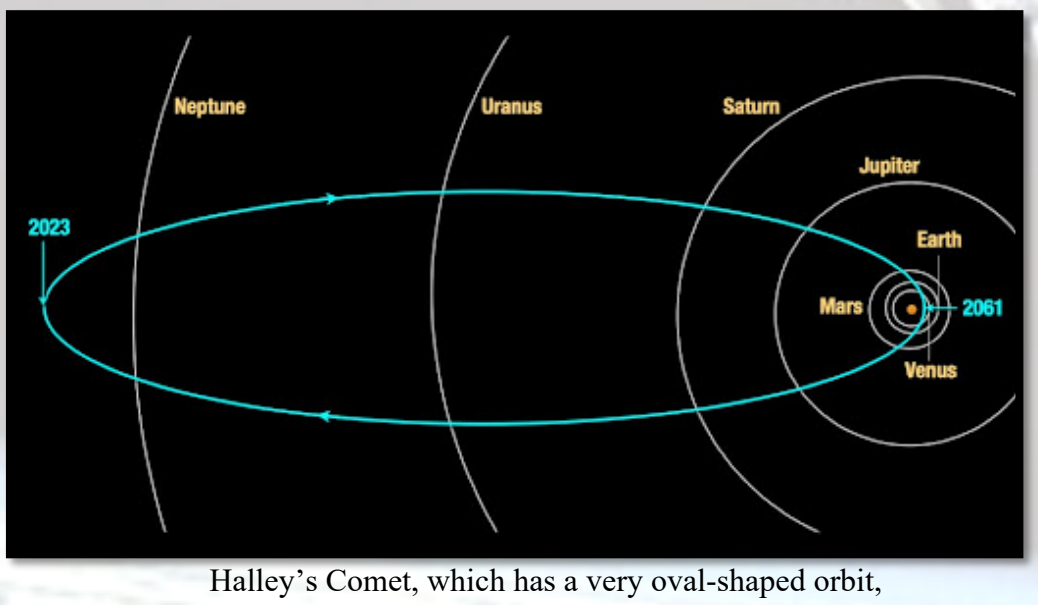
Placing satellites into orbit is one of the most important uses of space that we have developed so far!

Background: https://www.telescope.com/assets/images/articleimages/AEHF_1.jpg
(1) https://media.wired.com/photos/5b52582f59269e342890a45a/16:9/w_2400,h_1350,c_limit/Satellite_FHM56J.jpg

Orbit

To understand how satellites work, it is important to first understand what an orbit is. An orbit happens when an object such as a satellite circles around another object in a regular pattern. For example, the moon revolves around the earth in a similar way that the planets revolve around the sun. These are called orbits. All orbits have an "elliptical" or oval shape, ranging from the almost circular shape that the planets have around the sun, to the squashed ovals that comets have.

The Moon has a nearly-circular orbit around the earth.[1]



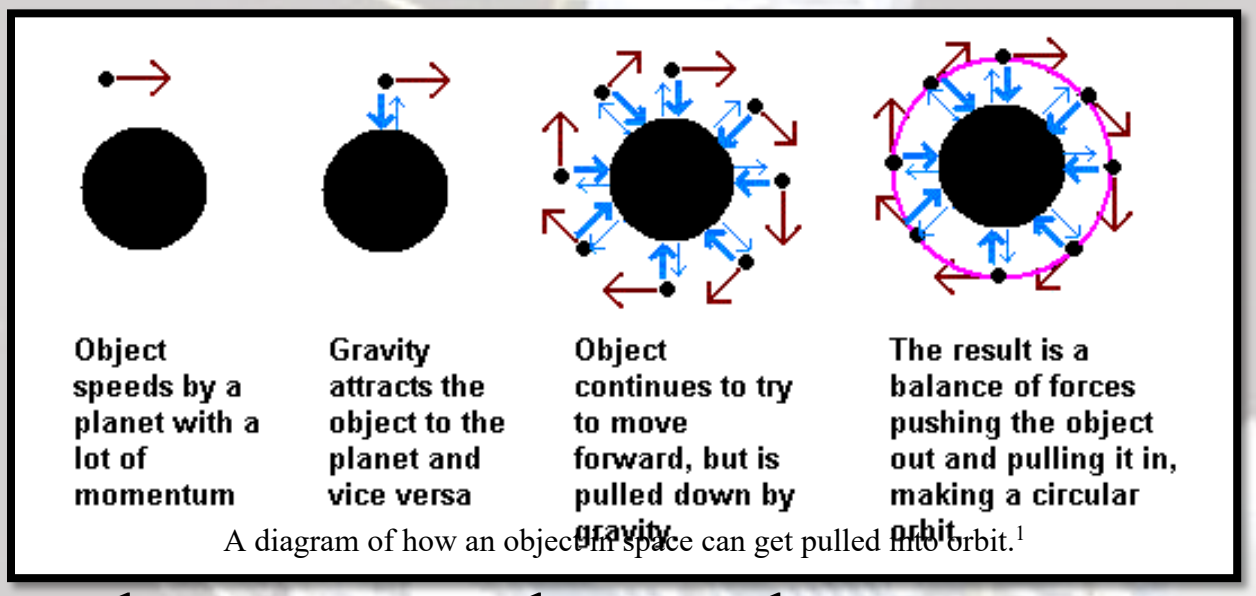
Halley's Comet, which has a very oval-shaped orbit, is scheduled to return into view in the year 2061.

Orbits are caused by gravity. Everything has gravity, from the smallest paperclip to the largest star. Gravity is the force that pulls other objects to itself. The bigger the object, the stronger the gravitational force. That's why people don't stick to each other!

(1) https://i.ytimg.com/vi/uMGSP0N4tlY/maxresdefault.jpg
(2) https://lh3.googleusercontent.com/proxy/w0wd9Jkq4S0ZQrWHIIEcU7TqwWsXzqBq3OLghfrbXVEqUpXeASP9hLKA7Y2F-8kbyKU5o-6pcVEa7GGaNM4RnVGLSTLltetxDlqGbnkzjqj5ismOfQ

Causing Orbit

Orbits can be caused in two ways. First, if an object is launched from Earth with enough speed (known as the object's velocity), it will reach a point when the earth's gravity is pulling it toward itself, but the object's speed is fast enough to spin it away. The object's centrifugal force, the same force that pulls you away from the center of a spinning marry-go-round, works against gravity. Neither force can win, so the object is stuck spinning around Earth!



A diagram of how an object in space can get pulled into orbit.[1]

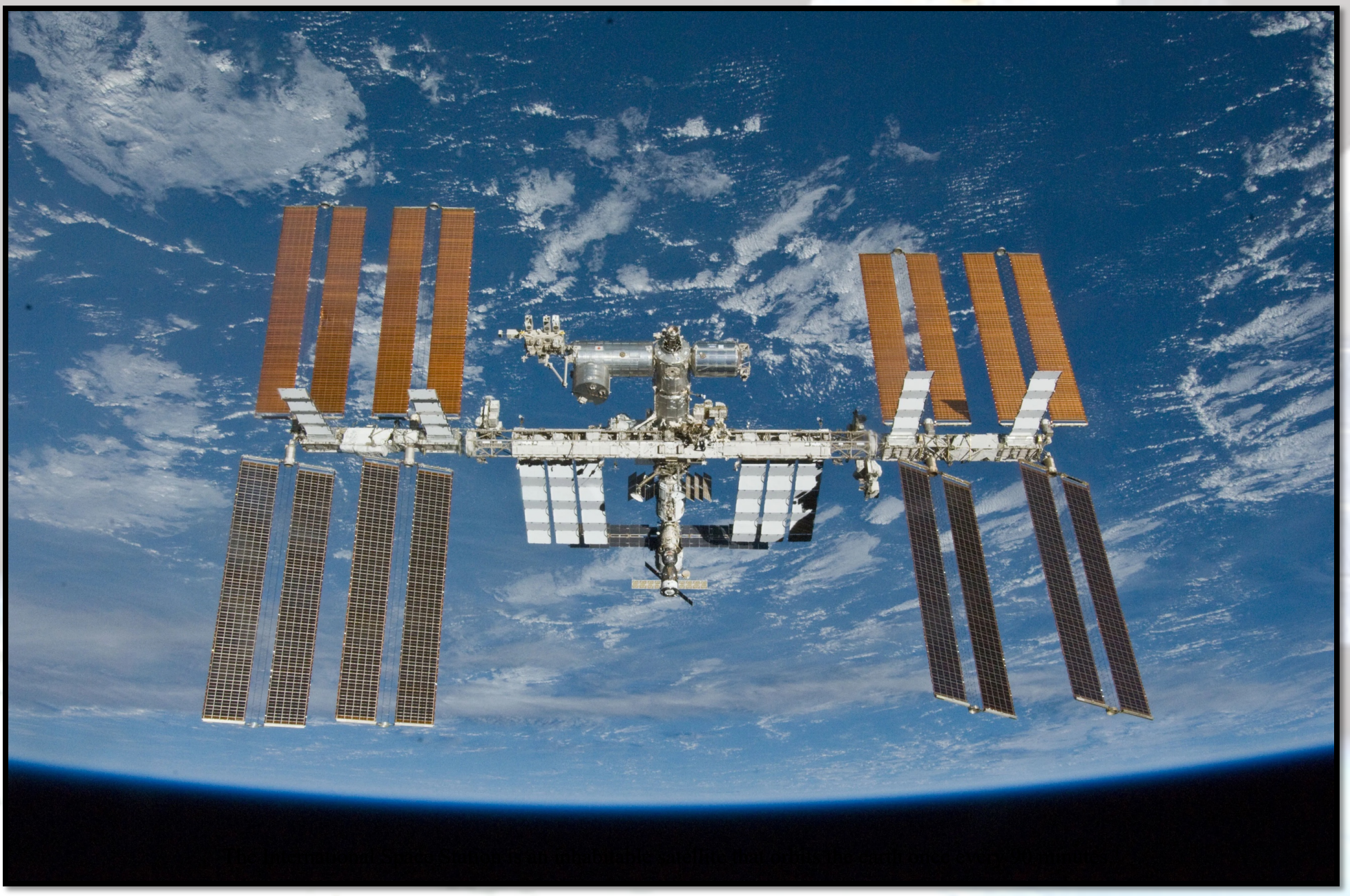
The other way that an object can start orbiting another object is when objects in outer space get just close enough to a larger object to be caught in the object's orbit. For example, if a small asteroid got close enough to Earth at just the right angle and with just enough speed, the asteroid would be pulled into orbit and circle the earth just like the moon does. If the asteroid approached Earth too fast, it would speed on by. If it approached too slowly or too directly, it would crash into Earth!

(1) https://www.qrg.northwestern.edu/projects/vss/docs/media/space-environment/tug-o-war.gif

Orbit Speed and Time

For an object to stay in orbit, it must be moving very fast to keep from falling back to Earth. At its slowest speed, a satellite needs to be traveling almost 8 kilometers (almost 5 miles) per second!

An orbital period is the time that it takes for a satellite to make one full path around the other object. For example, the International Space Station, a satellite that can be lived in, circles the earth once every 90 minutes. The orbital period of the earth occurs once about every 365.25 days!

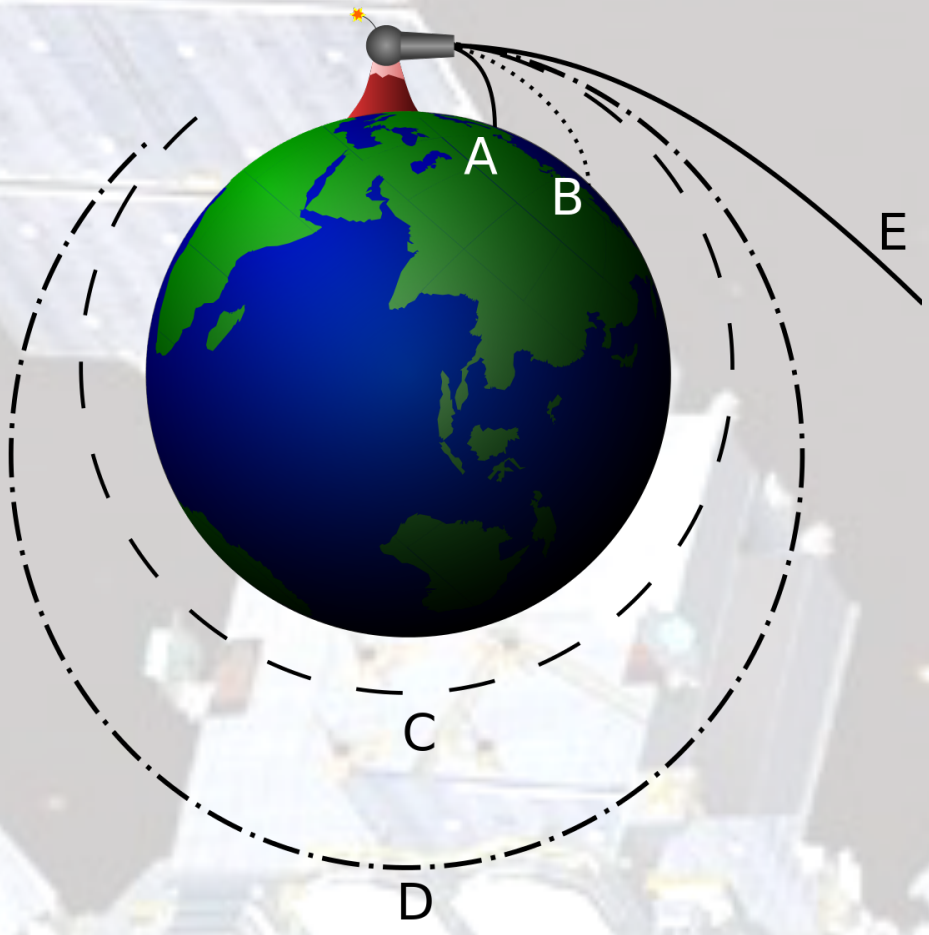


(1) https://www.nasa.gov/wp-content/uploads/2023/03/s132-e-012212.jpg

Changes in Orbit

An object that is in orbit can change, either escaping orbit or being pulled toward the larger object. For example, if a satellite that is orbiting Earth slows down too much, Earth's gravity will pull it toward itself, and it will either crash to the ground or burn up in Earth's atmosphere. This is called orbital decay.

On the other hand, when an object that is in orbit gets a boost of speed, it can break away from Earth's gravitational pull and travel off into space. For example, a spacecraft that is orbiting Earth can fire its rockets to get enough speed to launch itself away from Earth into outer space!



If an object is too slow (lines A and B), gravity will pull it back to Earth. If the object moves too fast, it will escae orbit altogether (line E).[1]

Other factors that can change an orbit could include being hit by another object, breaking up into smaller pieces, or atmospheric drag, which happens when air particles slow the object down just like putting your hand out a car's window.

(1) https://upload.wikimedia.org/wikipedia/commons/thumb/7/73/Newton_Cannon.svg/1200px-Newton_Cannon.svg.png

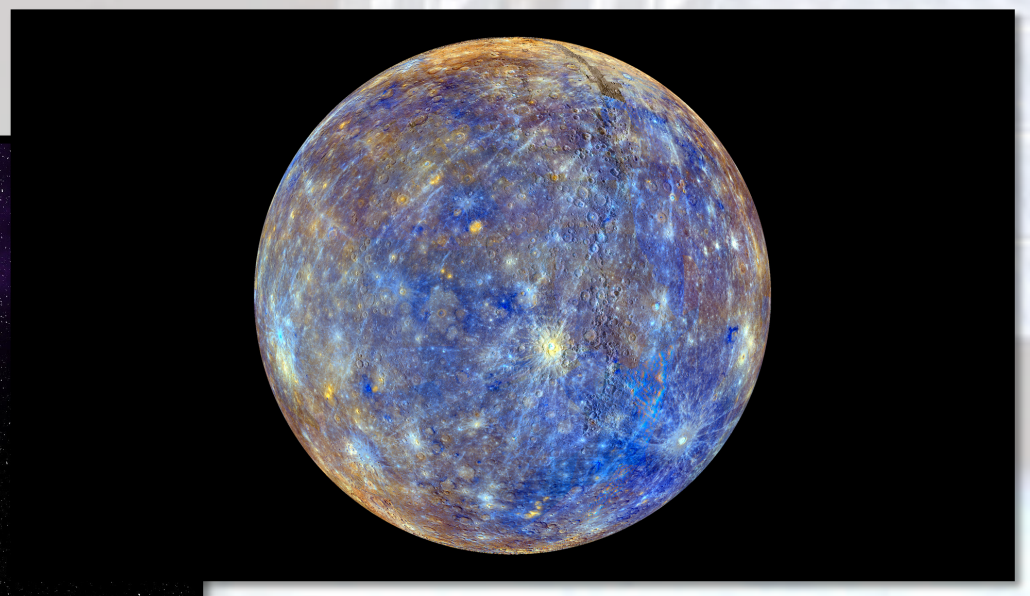
Natural Satellites

The most common satellites in the universe are natural satellites. Moons, planets, comets, and other objects in space are all satellites, each orbiting a larger object, usually a star. For example, all the planets in our Solar System are satellites of the Sun. All of the 290 moons we have discovered so far which orbit the planets (including our moon) are satellites of the planet they orbit. Comets and asteroids also orbit the Sun, making them natural satellites of the Sun.

The Moon is Earth's only natural satellite.[1]

Halley's Comet is a natural satellite of the Sun and one of the most [illegible], passing near Earth once every 75 years.[3]

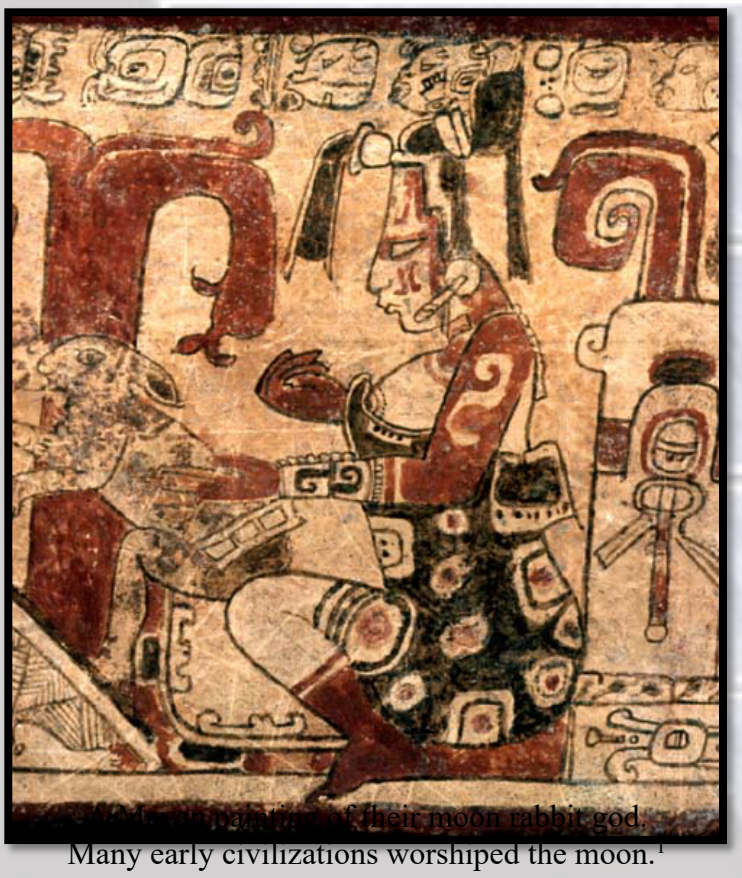
Asteroid 2011 MD, an asteroid that passed near Earth in February, 2024.[2]



The planet Mercury is a natural satellite of the Sun.[4]

(1) https://upload.wikimedia.org/wikipedia/commons/thumb/e/e1/FullMoon2010.jpg/1200px-FullMoon2010.jpg
(2) https://scx2.b-cdn.net/gfx/news/hires/2022/asteroid-1.jpg
(3) https://i.natgeofe.com/n/c9d43883-fe6b-4d75-9ca5-84249372969a/C0510947-Comet_Neowise_July_2020_4x3.jpg
(4) https://cdn.mos.cms.futurecdn.net/QHvQLhnFjrD6RgWgyZSHRn.jpg

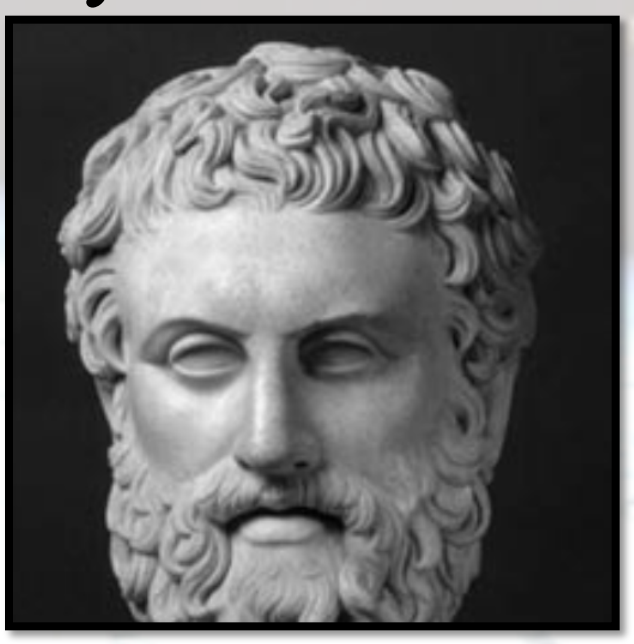
Studying Natural Satellites



Many early civilizations worshiped the moon.[1]

The Moon, the most visible satellite from Earth, has always been of great interest to humans. Early astronomers used the Moon to keep track of the seasons and often worshiped it! However, almost 500 years before Jesus was born, the Greek philosopher Anaxagoras theorized that the Sun and Moon were large space rocks, with the Moon reflecting light from the Sun. Three hundred years later (around 200 BC) Seleucus of Seleucia correctly noted that tides were connected to the Moon's orbit! Mathematician and astronomer Ptolemy calculated the Moon's approximate distance from Earth and diameter, coming very close to the actual distance and size!

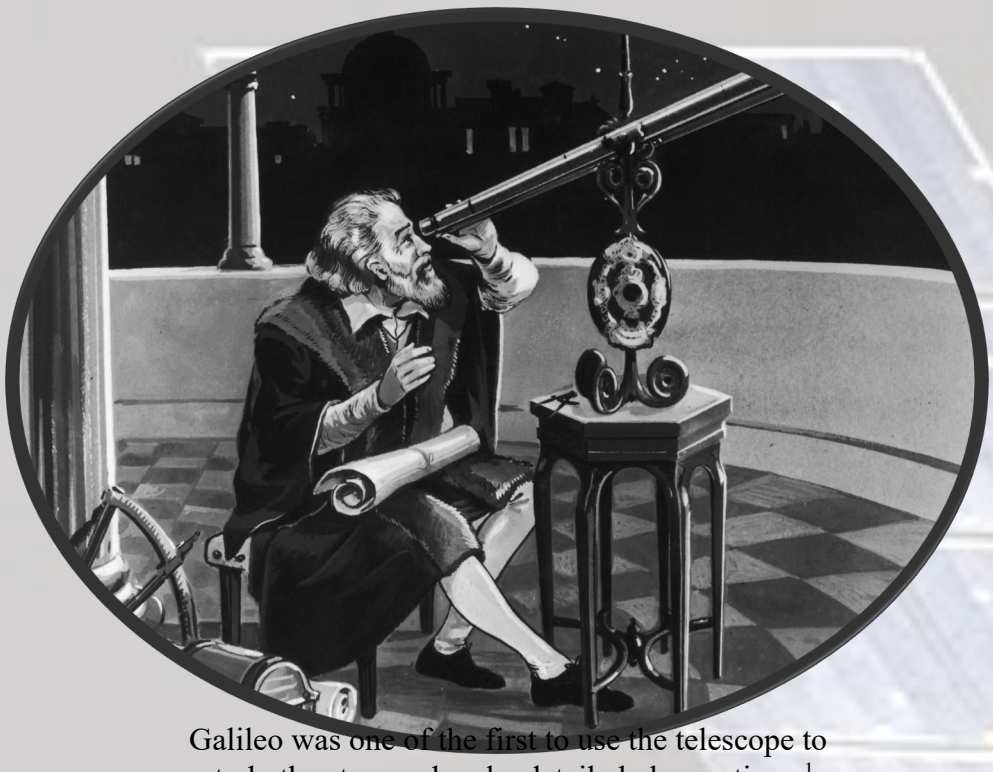
Seleucus of Seleucia, the first recorded astronomer to link Earth's tides with the Moon's orbit.[1]



Ptolemy used trigonometry to measure the distance between the earth and the Moon, math that can be done in many high school classrooms today![2]

(1) https://upload.wikimedia.org/wikipedia/commons/a/ad/Goddess_O_Ixchel.jpg
(2) https://time.graphics/uploadedFiles/500/0a/5b/0a5b9815b13b394e37e5df965830a782.jpg
(3) https://cdn.kastatic.org/ka-perseus-images/5f515d00d793167e4cae799bc77ff8601ac1798d.jpg

Studying Natural Satellites



Galileo was one of the first to use the telescope to study the stars and make detailed observations.[1]

Once the telescope was invented, Galileo Galilei observed the Moon and discovered that it was not flat, but covered in mountains and craters. Around the same time, he used his telescope to observe moons around the planet Jupiter, now known as the Galilean Moons. Using his Sun-centered model of the universe, he started to recognize that the Moon was not a planet as many people thought, but rather a satellite to Earth, just like Jupiter's moons. Even though he still called them planets since he didn't know of another term to call them, Johannes Kepler introduced the term "Satellite," which means "companion or guard" that same year!

Johannes Kepler, who first used the word *satellitibus* to describe natural satellites. The name stuck![2]

(1) https://hips.hearstapps.com/hmg-prod/images/-galileo-galilei-1564---1642-using-a-telescope-circa-1620-photo-by-hulton-archivegetty-images.jpg
(2) https://www.nmspacemuseum.org/wp-content/uploads/2019/03/Johannes_Kepler_1610.jpg

Creation of a Satellite

We have already talked about how natural satellites are made, being pulled into orbit by a larger object. But how are artificial satellites made? Building an artificial satellite is a complicated and expensive process. Most satellites are designed and built by companies that specialize in flight or spaceflight. In the United States, these companies include Boeing, Lockheed Martin, and Northrop Grumman. Once a satellite has been designed, built, and tested, it gets transported to a launch site and launched into orbit!

DID YOU KNOW: Scotland is the one of the world's leading manufacturers of satellites.

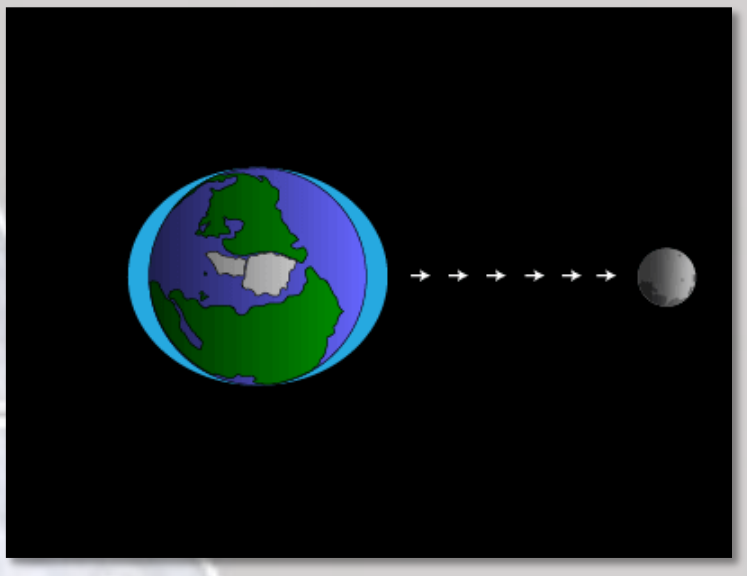
A satellite design and testing facility in California.[1]

Space shuttles were often used to carry satellites into space before the space shuttle program ended in 2011.[2]

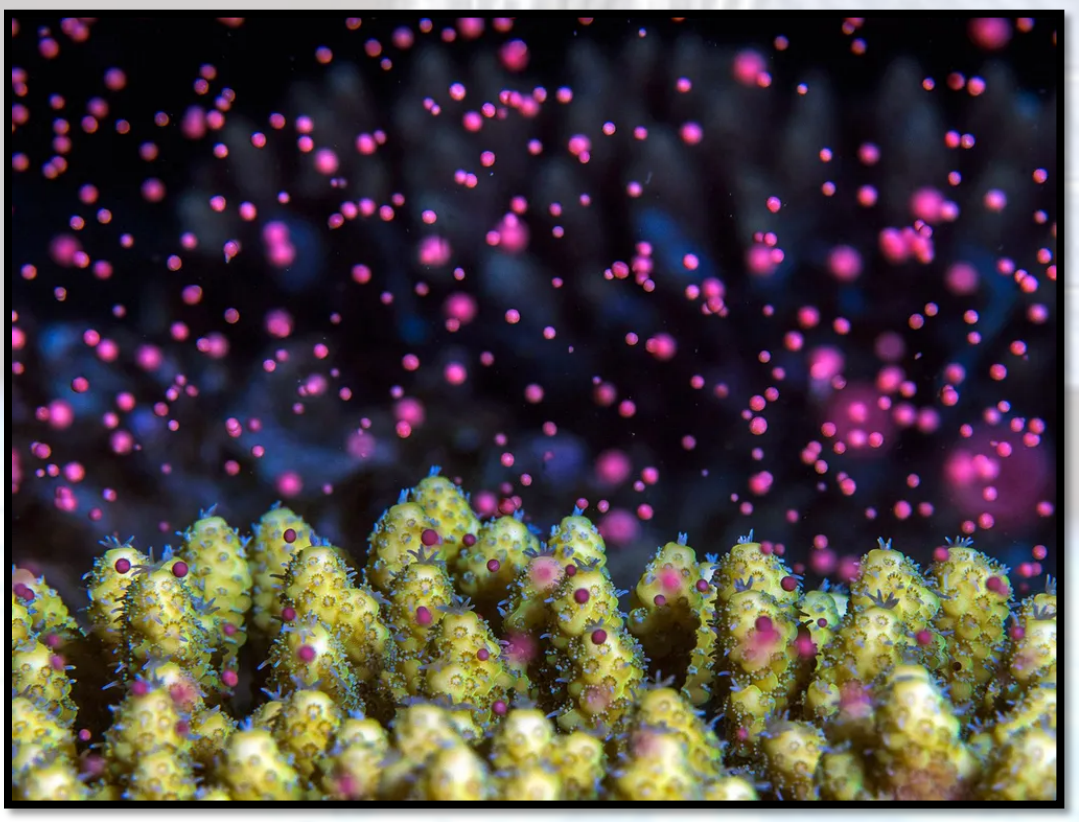
(1) https://api.coarchitects.com/wp-content/uploads/2022/07/19004_000_print.jpg
(2) https://ak.picdn.net/shutterstock/videos/12307550/thumb/1.jpg?ip=x480

Effects of Natural Satellites

If you thought that natural satellites such as the Moon have little effect on Earth, you'd be very wrong! Many things that happen on Earth happen because of the Moon! The most obvious is how it reflects light from the Sun to make the night brighter. It also influences tides by using its own gravity to pull water levels higher when it is overhead! It also can cause a solar eclipse when it passes between the Earth and Sun during the day, or a lunar eclipse, when it moves into Earth's shadow, something spectacular to see! The Moon's cycle is also what our month depends on. Some animals and fish even use it to determine when to breed and travel. In other words, natural satellites such as the Moon can have a big impact on the objects they are orbiting around.



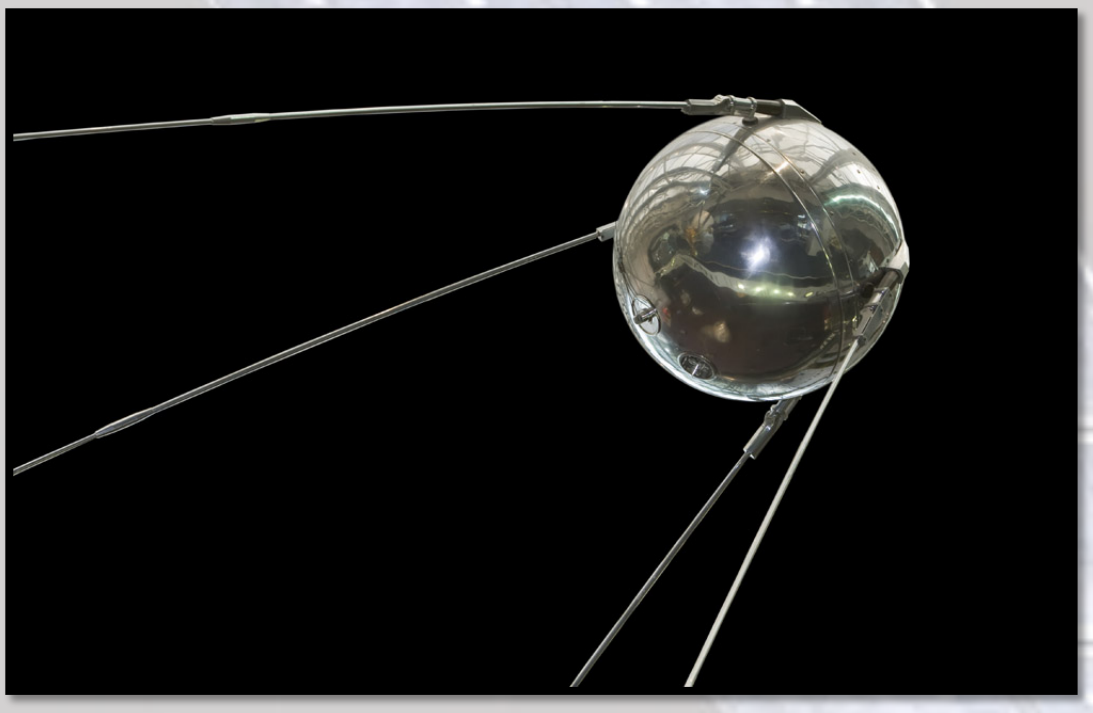
Tides are one of the biggest effects that the Moon has on Earth.[1]



Several species of coral use the moon's monthly cycle to determine the right time to spawn.[2]

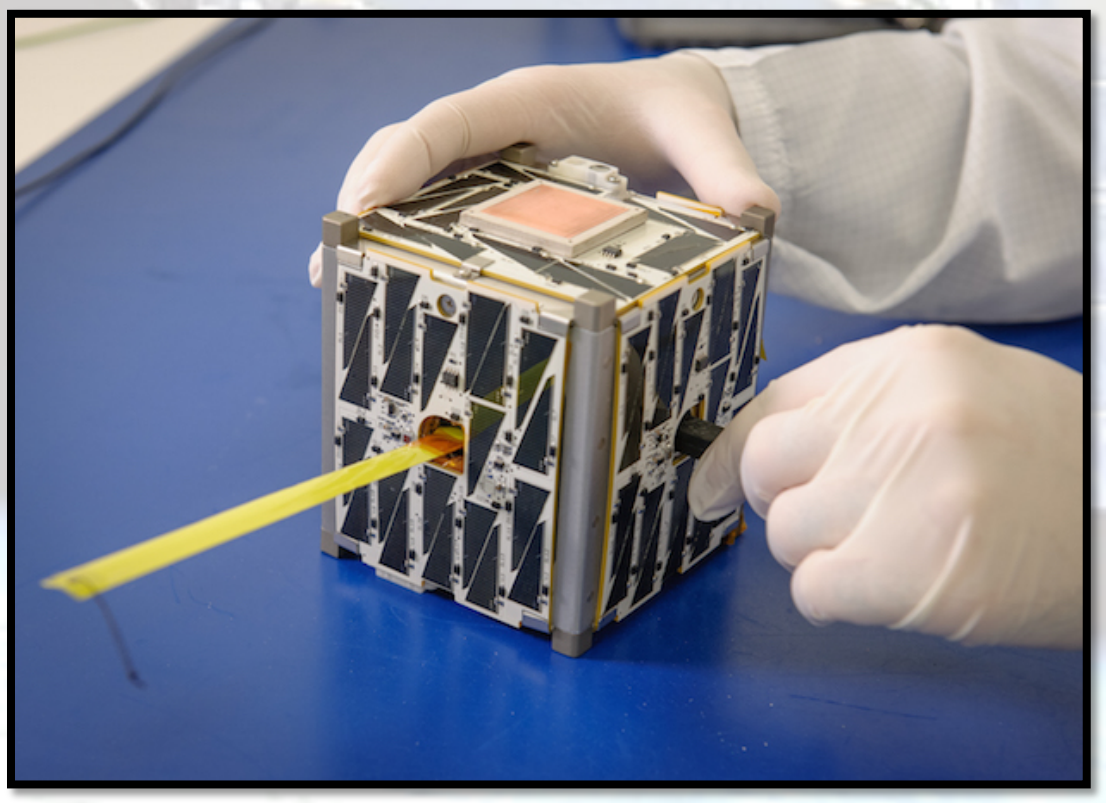
(1) https://scijinks.gov/tides/tides3.png
(2) https://www.smithsonianmag.com/science-nature/how-lunar-cycles-guide-the-spawning-of-sea-creatures-180981732/#:~:text=The%20role%20is%20a%20crucial,shorter%2Dduration%20illuminations%20as%20the

History of Artificial Satellites



Sputnik I, the first artificial satellite.[1]

The first artificial satellite was named Sputnik I, launched into orbit by the Soviet Union on October 4, 1957. This happened during the space race between the United States and the Soviet Union, with each superpower racing to dominate space exploration. Within 4 months, the United States had launched their first successful satellite, and within the next few years, dozens of satellites had been launched by both nations. Most satellites were built and launched by a country's government space program, but in 1962, the first satellites for commercial use were launched. As of January 2024, there were 8,377 that are currently active, with more added each year!

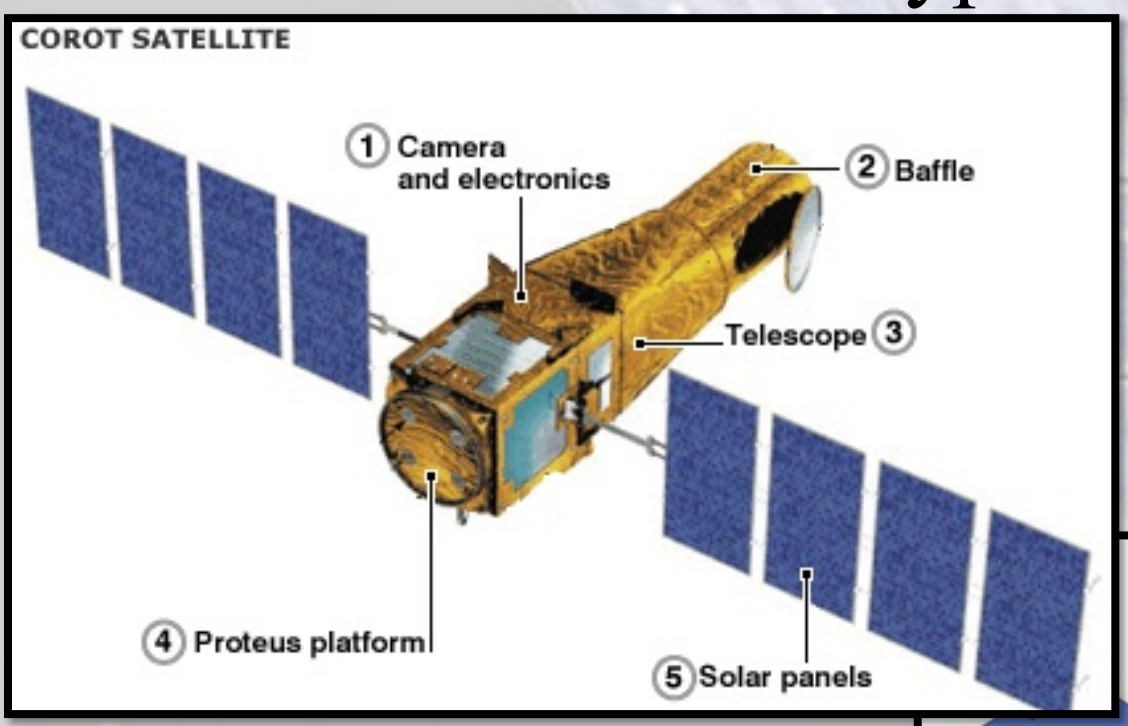


Modern satellites are getting smaller as the technology that they use becomes more powerful.[2]

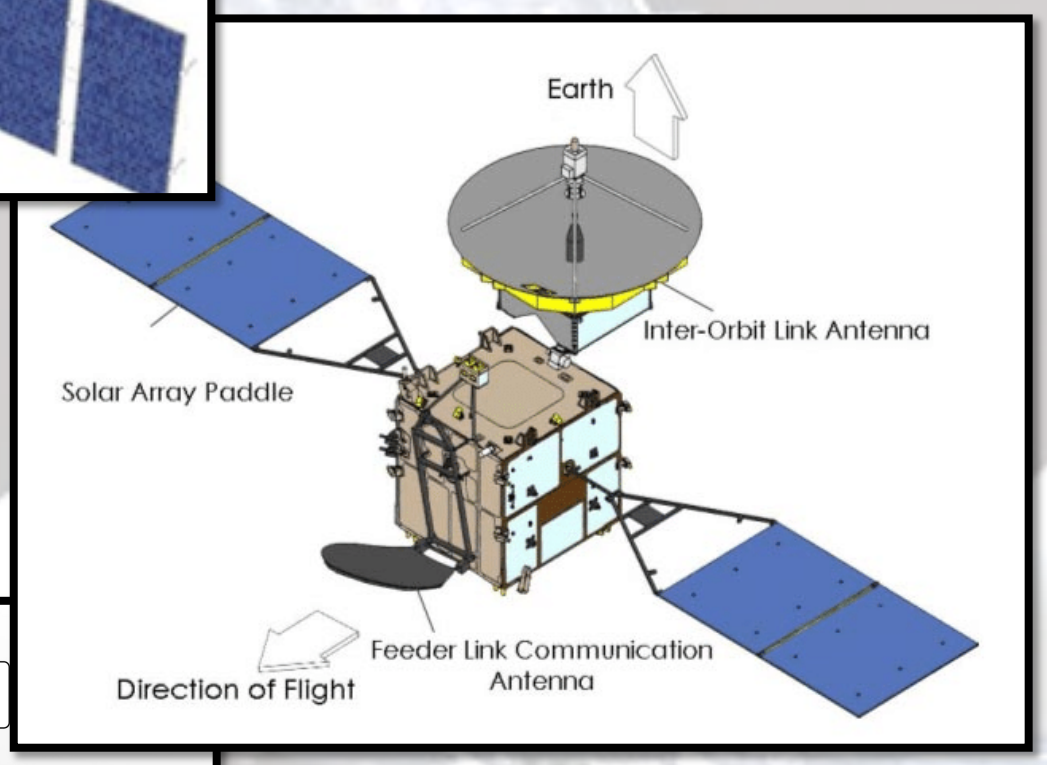
(1) https://images.nationalgeographic.org/image/upload/v1638890387/EducationHub/photos/sputnik.jpg
(2) https://earthobservatory.nasa.gov/blogs/earthmatters/wp-content/uploads/sites/5/2017/04/acd13-0175-016_1.jpg

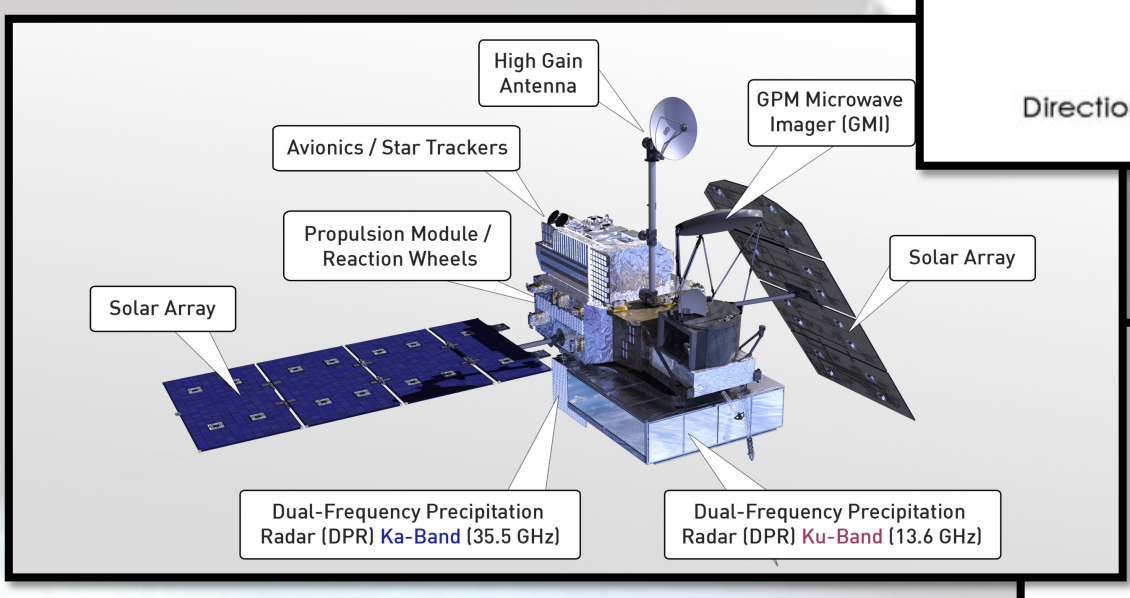
Parts of an Artificial Satellite

There is a variety of the types of satellites currently in orbit. Each type has a unique design depending on the type of work that it does. Here's some common types and their major parts:

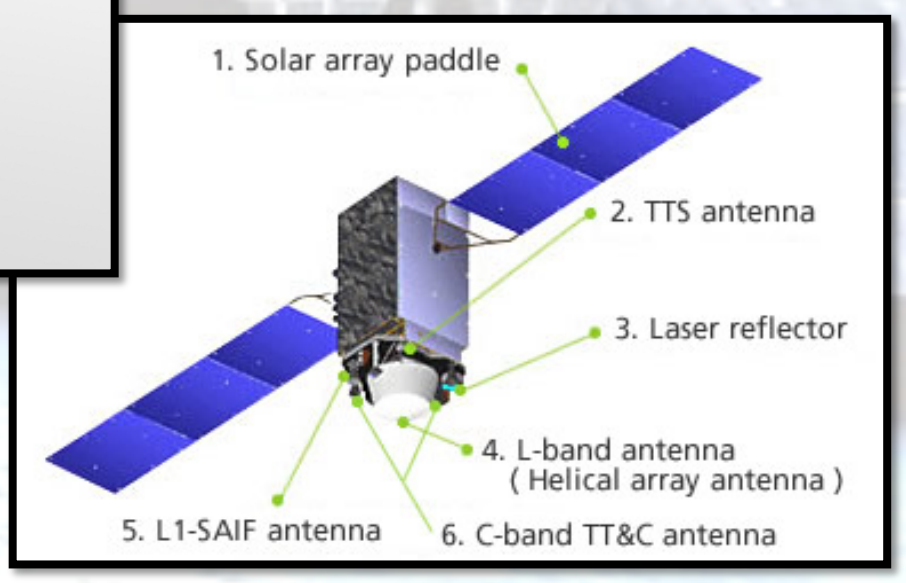


The DRTS Kodama satellite is a Data Relay and Tracking Satellite, an experimental design to test satellite connection speeds.[2]





The Global Precipitation Measurement Mission Core Observatory satellite helps measure rainfall throughout the world.[3]



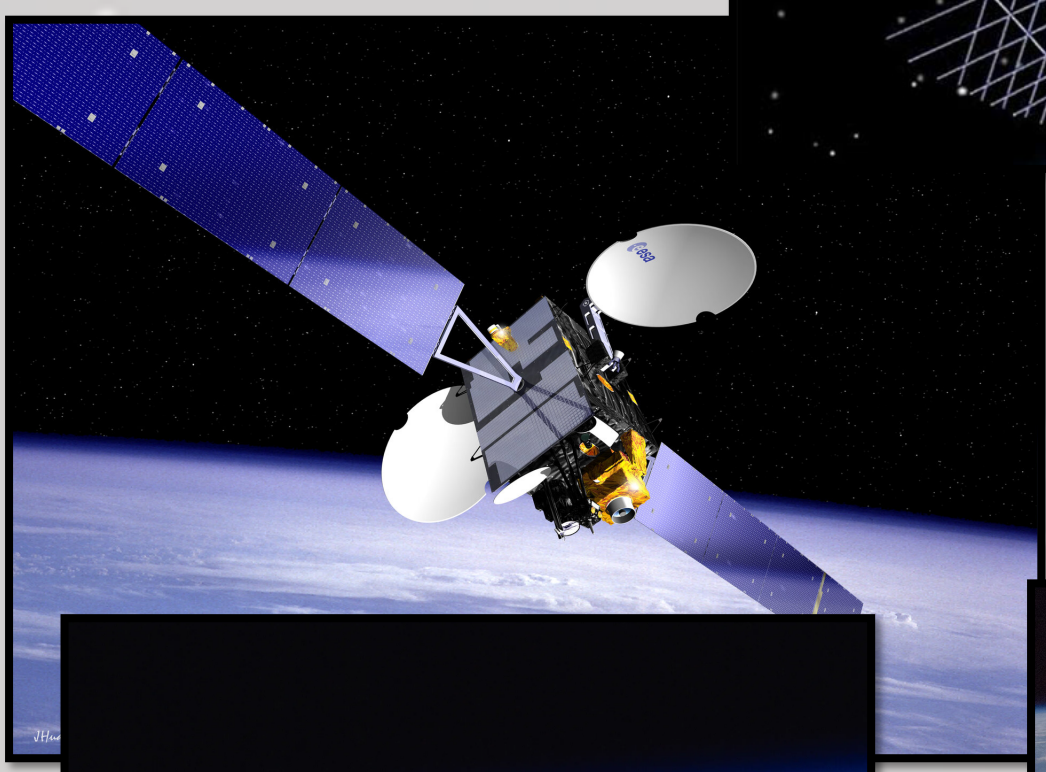
The MICHIBIKI, a Japanese GPS satellite.[4]

(1) https://www.brown.edu/Departments/Joukowsky_Institute/courses/13things/files/6162230.jpg
(2) https://www.researchgate.net/publication/315113839/figure/fig8/AS:472619947433992@1489692784523/Kodama-satellite-drawing-76.png
(3) https://servir.adpc.net/sites/default/files/public/inline-images/gpm-core-diagram-extended-final2.jpg
(4) https://global.jaxa.jp/countdown/f18/overview/img/pict_michibiki_e.jpg

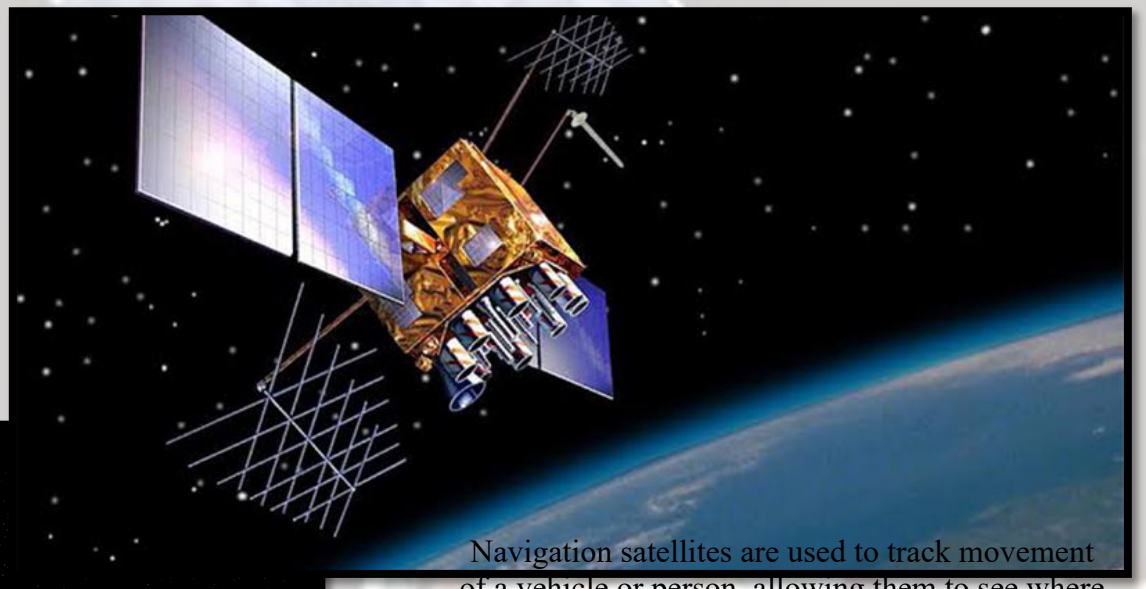
Why Satellites?

Artificial satellites serve many uses. Here are a few of the most common uses:

Earth observation satellites are made to collect data such as pollution, weather, damage to the environment, and the amounts of gas in the atmosphere



Communication satellites are used to transmit information back to Earth. Signals sent up to a satellite can be sent back down many miles away without interference of Earth features that could get in the way. Communication satellites are used for radio, television, telephone, and internet uses.[1]



Navigation satellites are used to track movement of a vehicle or person, allowing them to see where they are at in real time![2]

Experimental and scientific satellites are launched to do various tests and experiments in space. Some of them, such as the International Space Station, are designed to allow people to live in them temporarily.[3]

Space telescopes like the Hubble Telescope are satellites launched into orbit whose sole function is to serve as a telescope that does not have the same interference as other Earth-based telescopes.[4]

(1) https://www.esa.int/var/esa/storage/images/esa_multimedia/images/2003/01/artemis_satellite_artist_s_view/9518536-4-eng-GB/Artemis_satellite_artist_s_view_pillars.jpg
(2) https://www.manoramayearbook.in/content/dam/yearbook/learn/world/images/2021/august/navic-sat.jpg
(3) https://media.wired.com/photos/593297032a990b06268abbde/master/w_2560%2Cc_limit/Dragon-Grappled.jpg
(4) https://science.nasa.gov/wp-content/uploads/2023/07/hubble-space-telescope-hst-6.jpg?w=4096&format=jpeg

Active and Passive Satellites

Shuttle Endeavour placing passive satellite Starshine 2 into orbit in 2001.[1]

A passive satellite is a satellite that simply receives information and bounces it to another location. Basically, it is a mirror or reflector for a signal. Because it only reflects a signal, the received signal is weaker than the sent signal. Many of the earliest satellites were passive satellites.

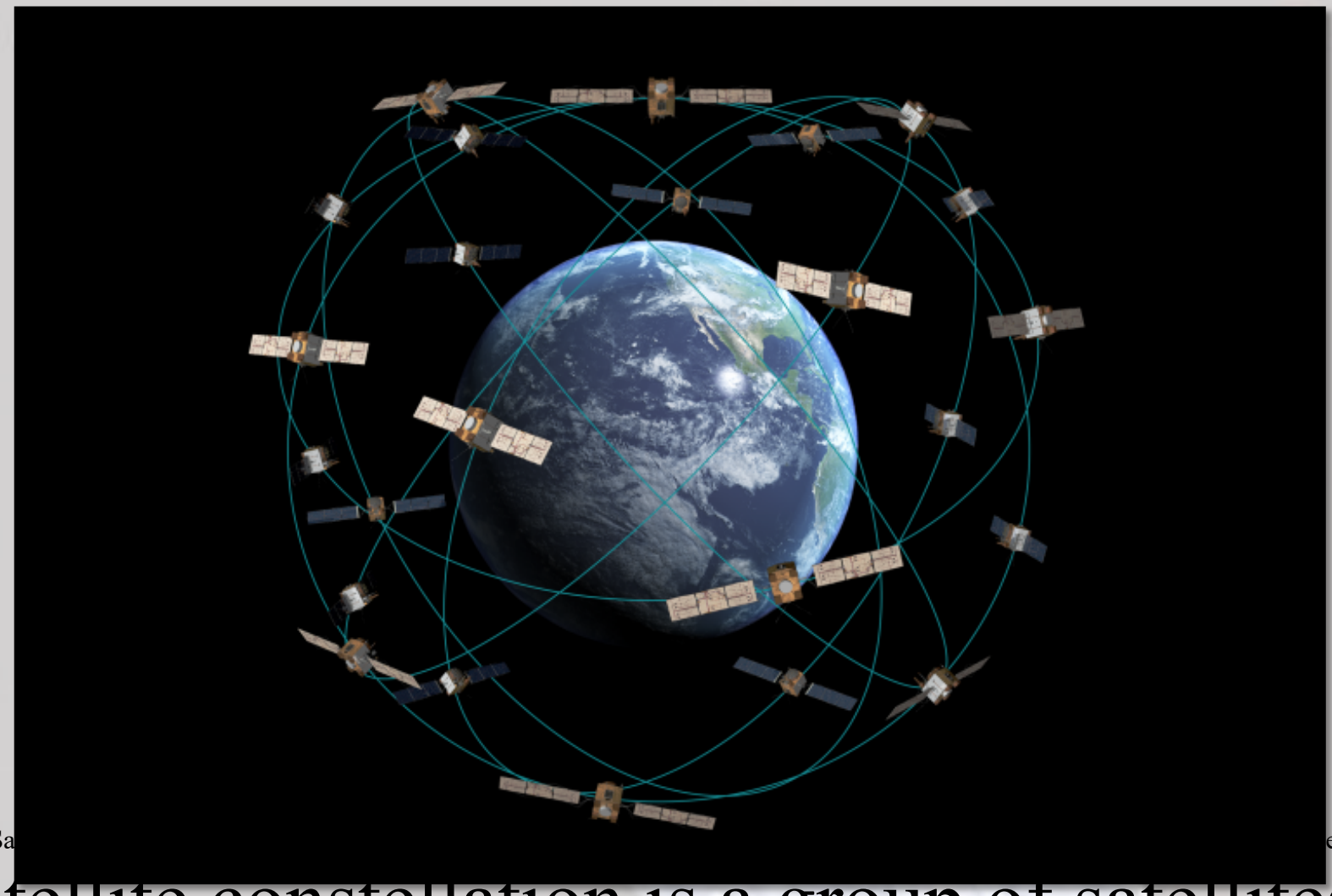
Satellite EOS-PM1 Aqua, one of NASA's active scientific research satellites used to measure climate changes.[2]

On the other hand, an active satellite can amplify a received signal, making the signal that is heard as strong or almost as strong as the signal that was sent. Most modern satellites are active satellites.

Unlike a satellite, a spacecraft is a vehicle that is designed to travel through space. It may orbit a planet or another object for a while like an active satellite, but it is not meant to orbit indefinitely.

(1) https://upload.wikimedia.org/wikipedia/commons/thumb/0/04/STS-108_STARSHINE_2.jpg/800px-STS-108_STARSHINE_2.jpg
(2) https://upload.wikimedia.org/wikipedia/commons/5/5d/Aqua_satellite_simulation.jpg

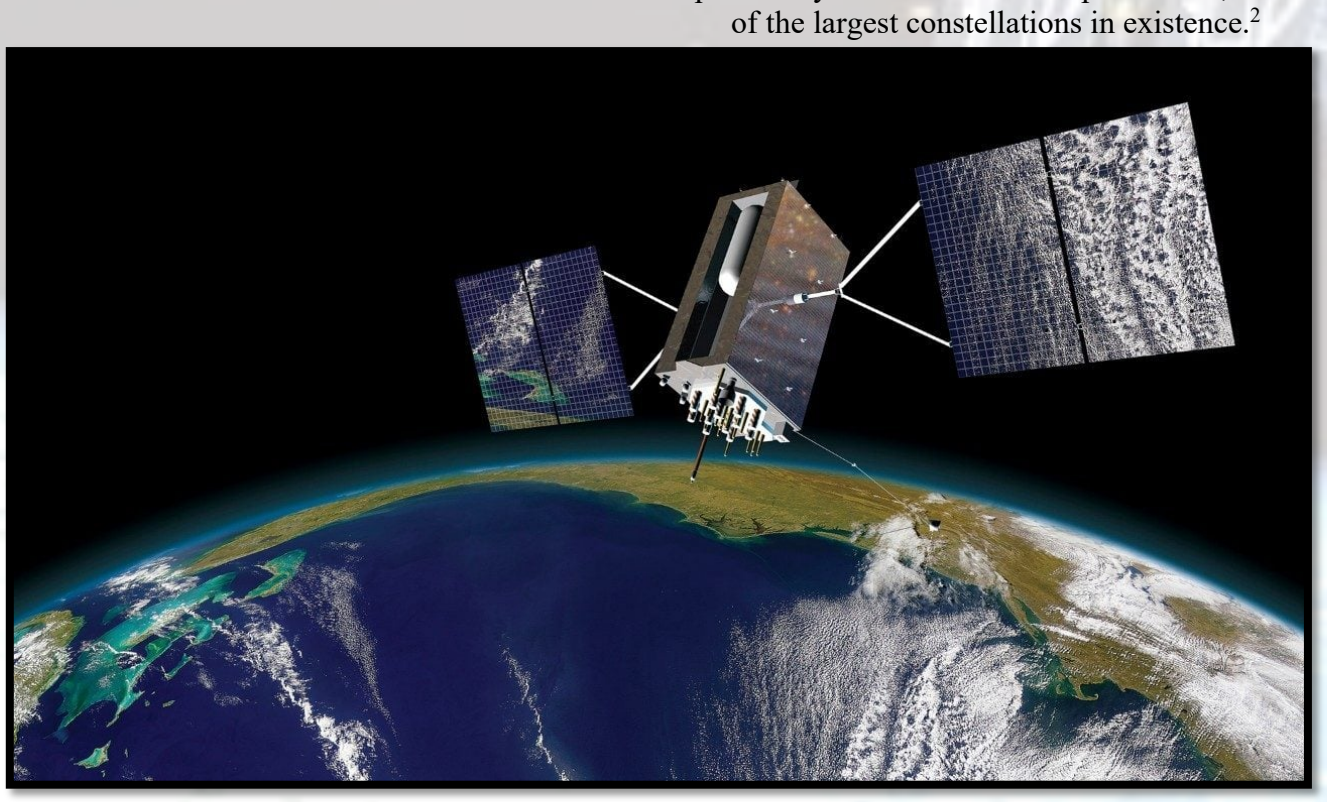
Satellite Constellations



Sa e.[1]

A satellite constellation is a group of satellites that are strategically placed into orbit to work together so that there is always at least one satellite in the sky at any given time. A good example of this is the GPS constellation of satellites. These satellites work together the ensure that each part of the world has a consistent satellite connection!

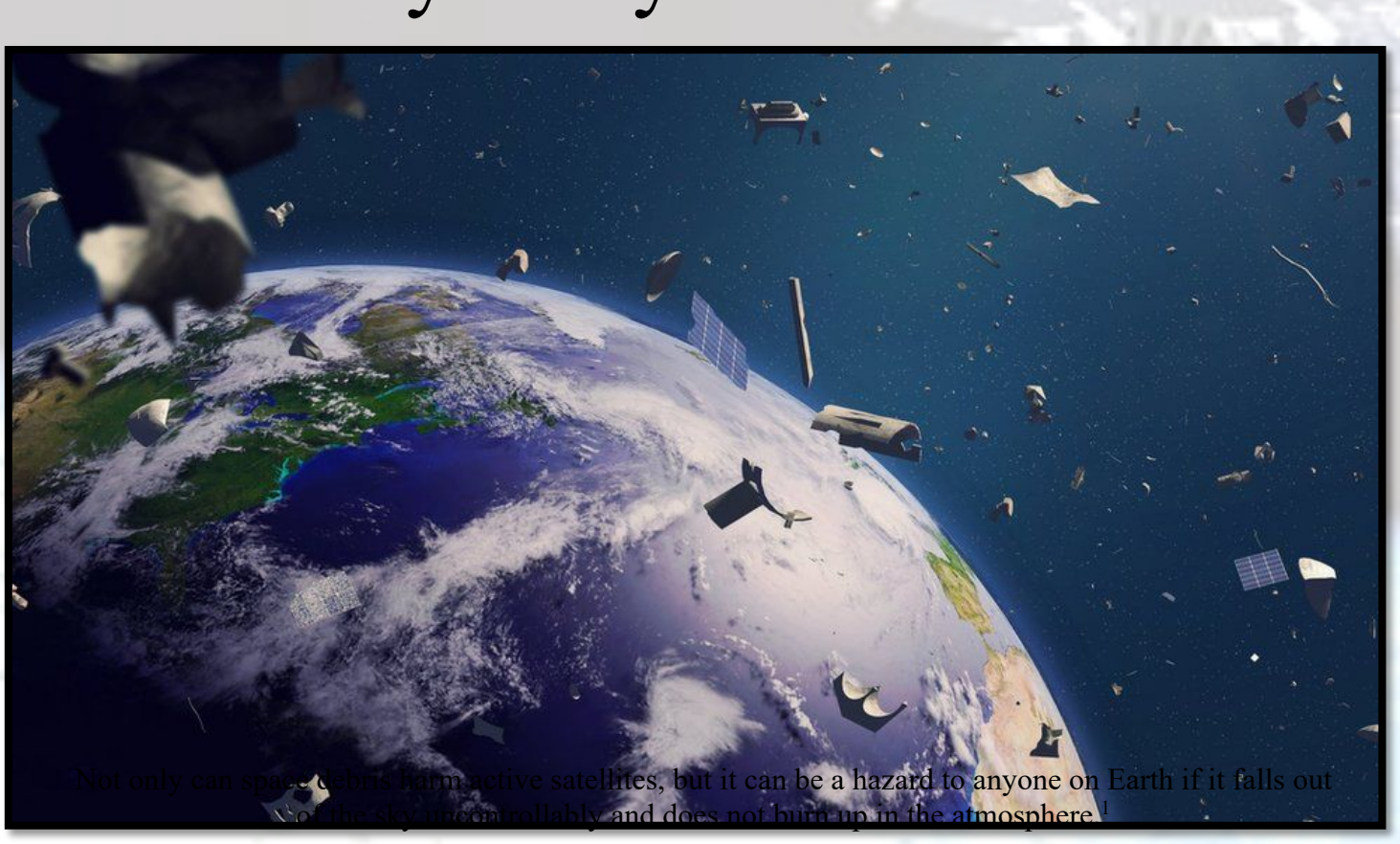
With 24 satellites, the GPS satellite constellation, operated by the United States Space Force, is one of the largest constellations in existence.[2]



(1) https://aerospace.org/sites/default/files/styles/hero_small/public/2019-01/GPS%20Constellation_hero.png?itok=1FwonPkb
(2) https://sites.breakingmedia.com/uploads/sites/3/2020/03/GPS-III-image-Lockheed-Martin-e1686759695703.jpeg

Space Junk

One of the greatest threats to satellites is space debris, also known as space junk. Space debris are bits of man-made material floating around in Earth's orbit. They can be as large as old satellites than were never destroyed, or they can be as small as flecks of paint that come off rockets. They are hazardous for several reasons. First, because they are in Earth's orbit, they are traveling at thousands of miles per hour, meaning that even a tiny piece of space trash could destroy a satellite or worse, a spacecraft. Also, if a piece of space debris damages a satellite, the pieces from the damaged satellite could shoot out in all directions, creating more space debris that could strike another satellite, starting a chain reaction that could destroy every satellite in orbit!

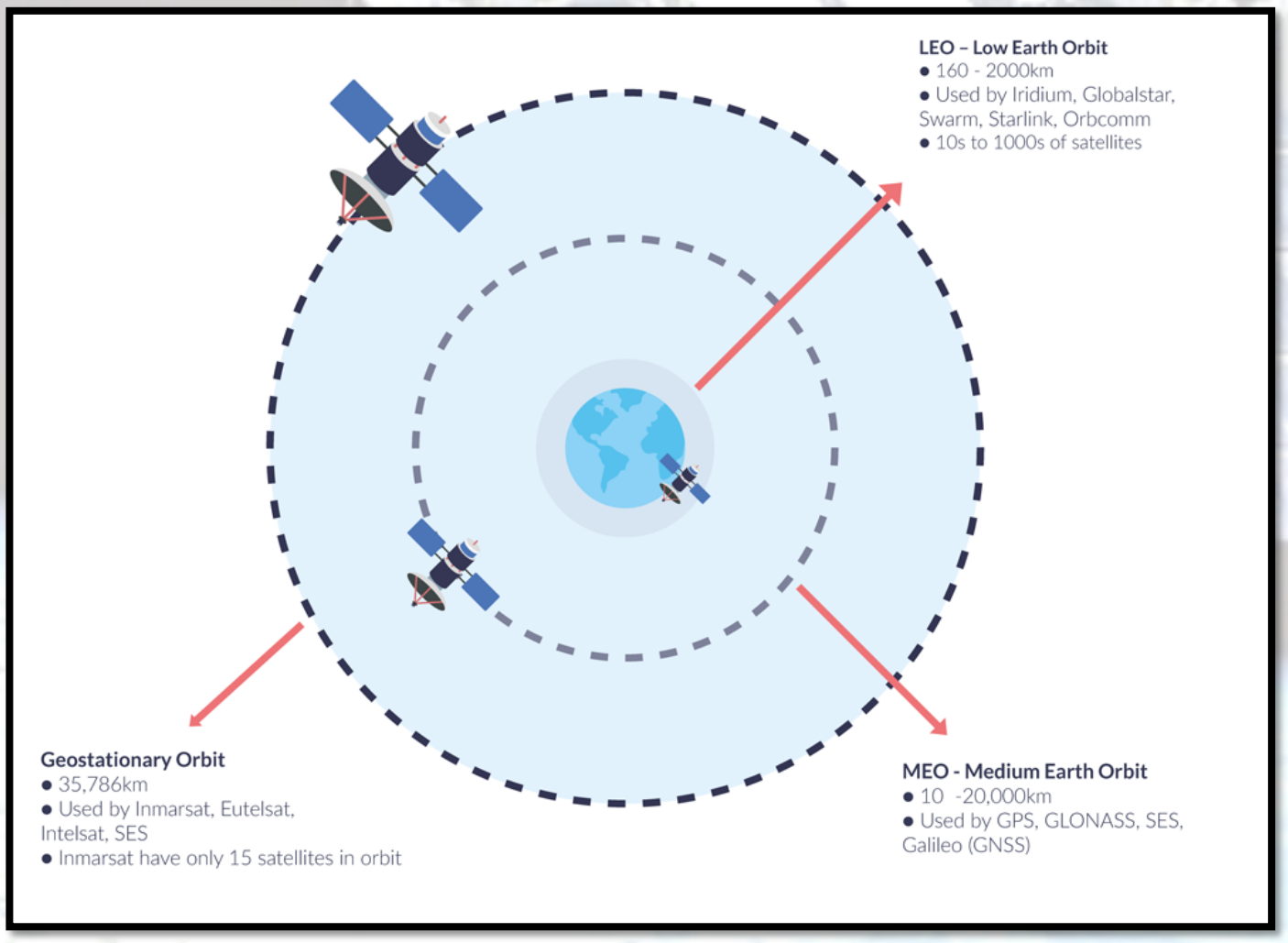


Not only can space debris harm active satellites, but it can be a hazard to anyone on Earth if it falls out of the sky uncontrollably and does not burn up in the atmosphere.[1]

(1) https://ichef.bbci.co.uk/news/976/cpsprodpb/13742/production/_118228697_gettyimages-953160162.jpg

LEO, GSO, and HEO

There are several different types of orbits that a satellite can be placed in, depending on its function. Low Earth Orbit (LEO), the space within 1,200 miles (2,000 km) from Earth, is the home of most satellites, as well as all manned spaceflights except the Apollo missions to the Moon. The orbits in LEO are fast, usually taking less than 2 hours to orbit the Earth once. High Earth Orbit (HEO) is the orbit of anything that is higher than 22,236 miles above the Earth. This seemingly random line is the point where a satellite goes into Geosynchronous Orbit (GSO). A satellite in GSO will take exactly the same amount of time (~24 hours) to circle the Earth once as the Earth takes to complete one orbit!

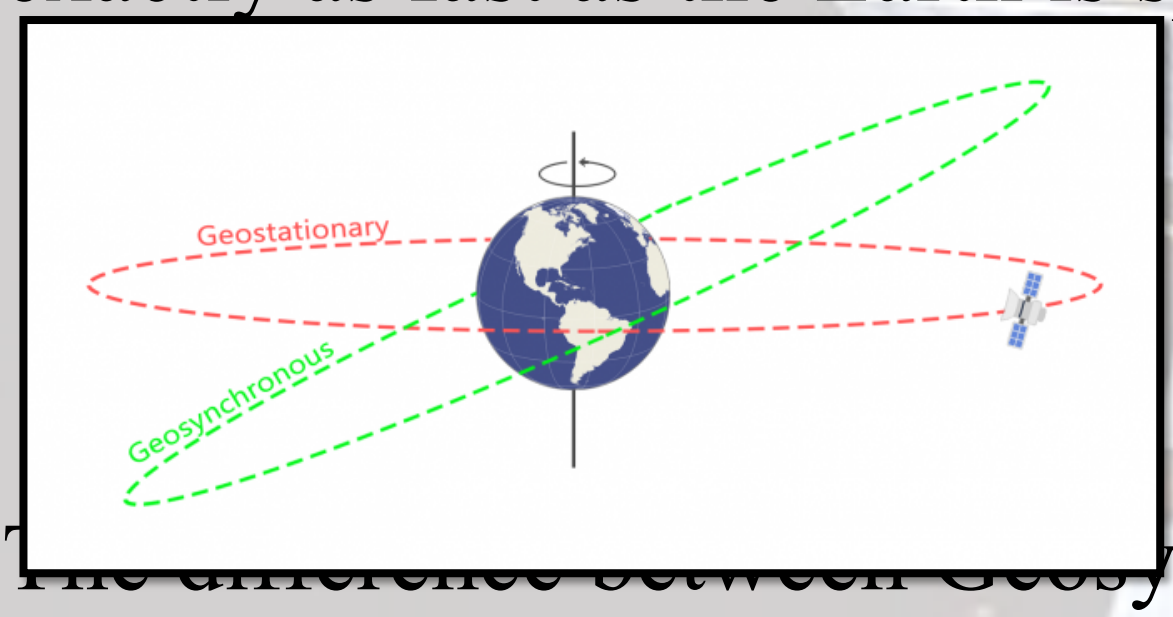


The line marked "Geostationary Orbit" is the line that separates Medium Earth Orbit from High Earth Orbit. Geostationary and Geosynchronous orbits occur at the same line.[1]

(1) https://i0.wp.com/technobyte.org/wp-content/uploads/2017/05/Low-Medium-and-High-Earth-orbits-Types-of-orbits-small.jpg?fit=800%2C533&ssl=1

GEO and MEO

If a satellite is placed into orbit at 22,236 miles above the Earth in such a way that it orbits the Earth in the exact direction that Earth spins, it will stay positioned over the exact same spot on Earth. This is known as Geostationary Orbit (GEO). From the ground, it will look like the satellite is not moving, but it is actually moving exactly as fast as the Earth is spinning!



A satellite in Geostationary Orbit (GEO) will stay above the exact same spot on Earth, while a satellite in Geosynchronous Orbit (GSO travels at the same speed as Earth's spin, but not necessarily in the same direction.[1]

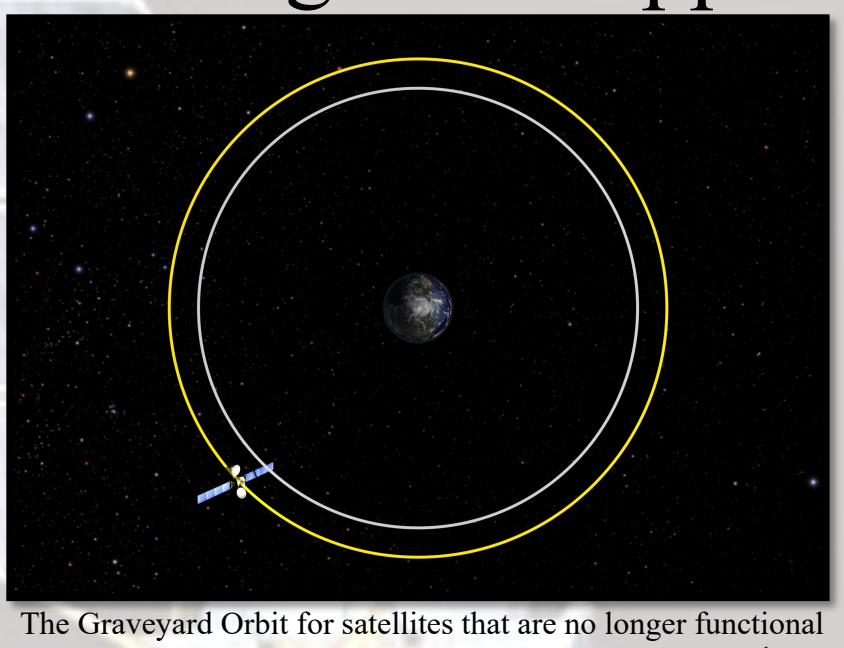
The difference between Geosynchronous Orbit and Geostationary Orbit is that a Geostationary Orbit has to travel in the same direction that the Earth's spin, but a Geosynchronous Orbit could travel in whatever direction it wants to. Both will take exactly 24 hours to orbit the earth though.

Medium Earth Orbit (MEO) is the area from the line 2000 miles from earth that marks the end of Low Earth Orbit to the lower levels of High Earth Orbit, that line 22,236 miles from Earth.

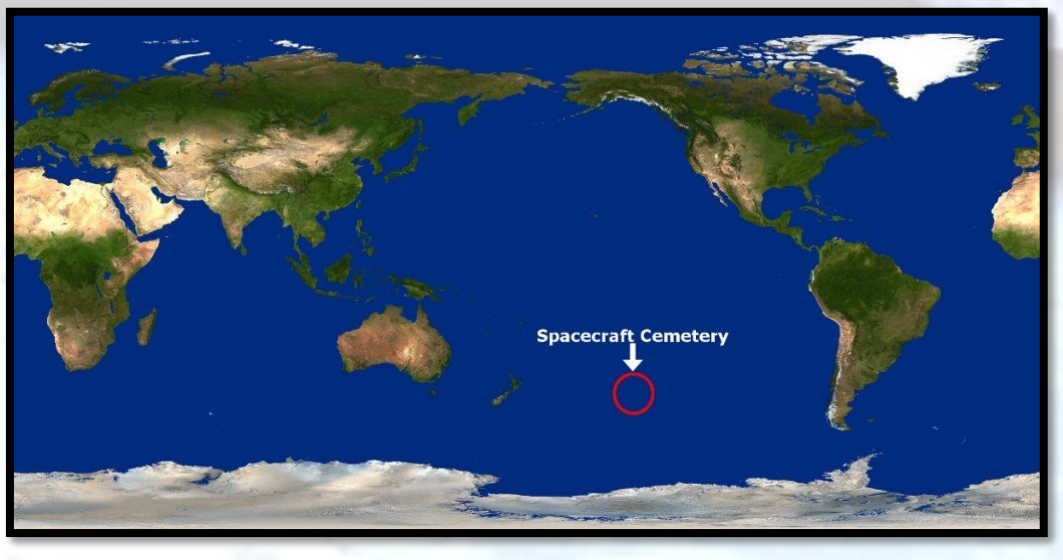
(1) https://gisgeography.com/wp-content/uploads/2016/12/Geosynchronous-vs-Geostationary-Feature2-678x328.png

Death of a Satellite

When a satellite is no longer working properly, many times they can be fixed during a space mission. However, when they can't be fixed, they are considered "dead." Several things can happen to dead satellites. They can be left to orbit in space, circling the planet in a very high earth orbit past all other functional satellites. However, often times the last of the satellite's fuel is used to slow it down, causing it to fall back to Earth. Oftentimes the friction caused by flying through the atmosphere at thousands of miles per hour is enough to burn the satellite up, but if they don't burn up, it is obviously very dangerous to have satellites falling out of the sky and crashing to the ground. They are aimed to crash in a small area in the Pacific Ocean known as the Spacecraft Cemetery, far from any people to sink to the bottom of the ocean.



The Graveyard Orbit for satellites that are no longer functional is 300 kilometers past the line of Geostationary Orbit.[1]



Point Nemo, also known as the Spacecraft Cemetery, is the final resting spot of almost 300 spacecraft and satellites. The International Space Station will also be sent here when it is retired from use.[2]

(1) https://www.esa.int/var/esa/storage/images/esa_multimedia/images/2008/03/mitigation_scenarios_graveyard_orbit_300_km_above_geo/9276728-5-eng-GB/Mitigation_scenarios_Graveyard_orbit_300_km_above_GEO.jpg
(2) https://www.scienceabc.com/wp-content/uploads/2017/04/Sapacecraft-Cemetery.jpg

Laws and Regulations

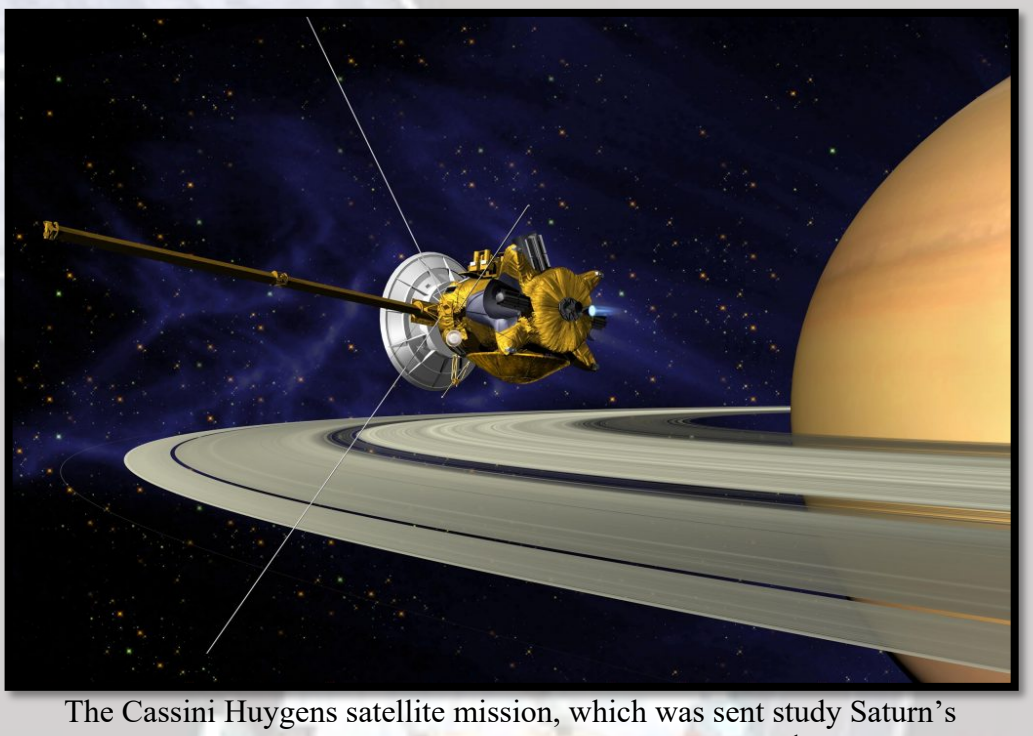
The United Nations oversees "space law" with its Committee on the Peaceful Uses of Outer Space (COPUOS). Several international treaties have been made about the use of outer space, including the treaty to not test nuclear weapons in space, in the atmosphere, and under water (Partial Test Ban Treaty, 1963), the rules to follow when exploring other planets and the Moon (Outer Space Treaty, 1967), the agreement to work together to rescue stranded astronauts (Rescue Agreement, 1967), agreements to take responsibility for damage done to another country by space objects (Liability Convention, 1972), the agreement to register everything launched into space (Registration Convention, 1974), and the rules governing what activities can take place on the Moon (Moon Treaty, 1979).

The headquarters of the United Nation's Committee on the Peaceful Uses of Outer Space (COPUOS) is located in Vienna, Austria.[1]

(1) https://www.unoosa.org/images/COPUOS/Photo_16_VIC_UNOOSA_NRodrigues_cropped.jpg

The Money Questions

Building and launching satellites is expensive! In the past, it could cost hundreds of millions to build and launch a new satellite into orbit, depending on how complicated its design was. Even now, the cost to design and launch even the smallest satellites into space (called microsatellites, as small as 50 pounds) is still around 2.5 million dollars!



The Cassini Huygens satellite mission, which was sent study Saturn's Rings, cost an estimated 3.26 billion dollars![1]

Not only are satellites expensive to make, but they can be expensive to maintain, some satellites costing several million dollars a year to maintain. However, as satellites are getting smaller and easier to manufacture, the cost to launch and maintain them is getting lower!

The most recent satellites, known as CubeSats, can cost as little as $100,000 to build and launch![2]

(1) https://www.secretsofuniverse.in/wp-content/uploads/2020/03/cassini-huygens-2048x1366.jpg
(2) https://www.nasa.gov/wp-content/uploads/2015/08/15-168_cubesats_image_1.jpg?w=2048

The Moon and the Bible

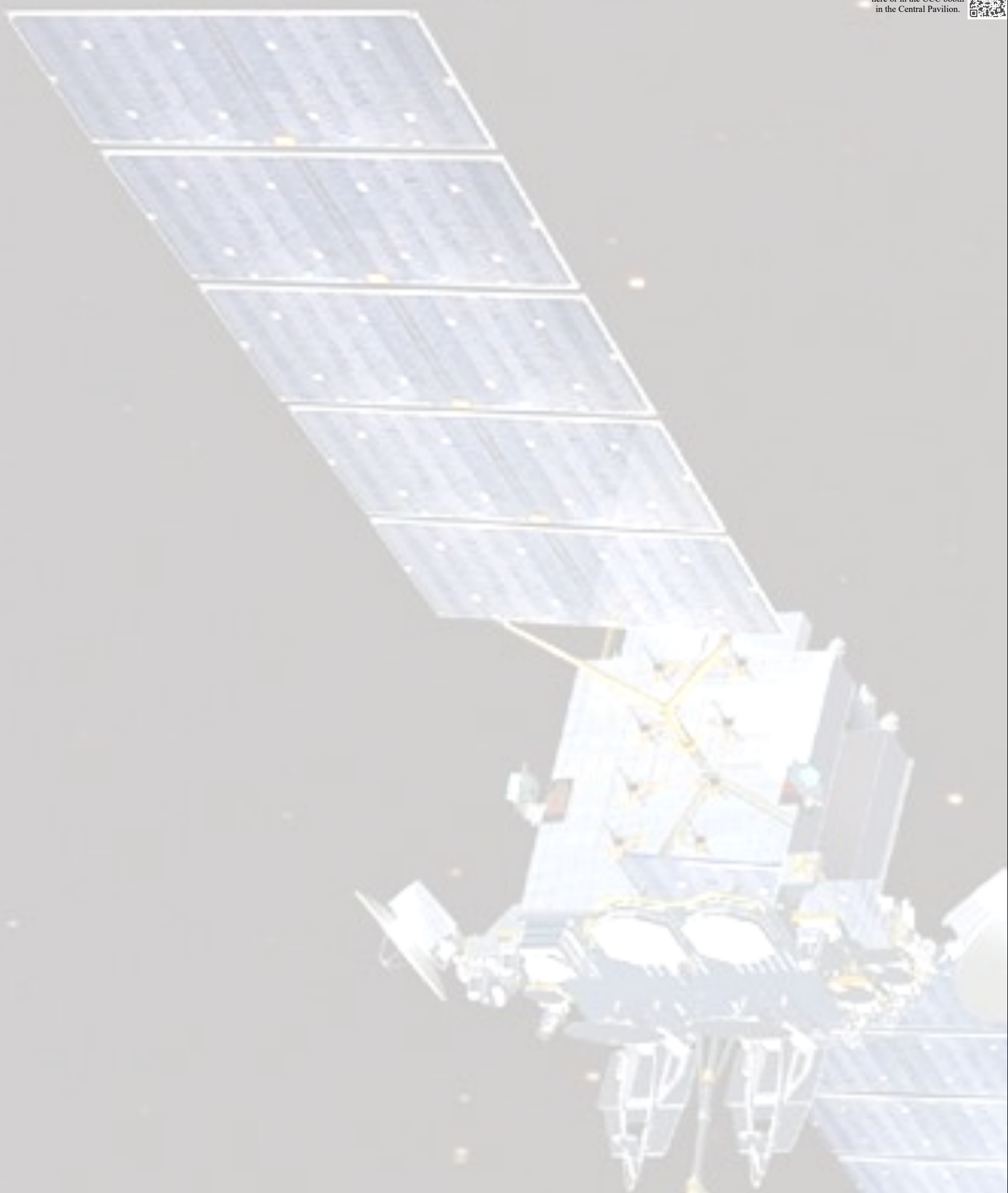
In Bible times, there were no artificial satellites. The only satellite that Biblical writers knew about was Moon. There are over 50 passages in the Bible that talk about the Moon, including how it was created by God during creation (Gen. 1:16), how He warned His people against worshiping it (Deut. 4:19; Jer. 8:2), and how it testifies to God's greatness (Psa. 136:9).

Just like Earth's gravity keeps objects in orbit around it, God's love pulls us close to Him. Just like natural and artificial satellites can have an effect on Earth, the influences that we surround ourselves with can have an effect on us too. We can learn many spiritual lessons from satellites!

(1) https://www.tomorrowsworld.org/sites/default/files/other_publications/featured_image/god_made_the_moon_1.jpg

Can you think of any others?

Purchase your patches here or in the UCC booth in the Central Pavilion.



(1) https://www.tomorrowsworld.org/sites/default/files/other_publications/featured_image/god_made_the_moon_1.jpg

Name(s): _____ Date: _____

Satellites

1. Match the following orbit acronyms with their descriptions:

_____ MEO

_____ GEO

_____ GSO

_____ LEO

_____ HEO

a. The lowest orbit possible for a satellite. Most satellites are located in this area.
b. The orbit of a satellite that takes exactly 24 hours to circle the earth.
c. The orbit of a satellite that stays over the exact spot on Earth.
d. Satellites that take longer than 24 hours to circle Earth are in this orbit.
e. The types of orbits between 2,000 and 22,236 miles from Earth.

2. Fill in the blanks with the proper terminology

Broken pieces satellites and other man-made material flowing in orbit is called _____ _____.

The philosopher _____ thought that the Sun and Moon were large space rocks.

The Bible mentions a natural satellite (the Moon) over _____ times.

_____ is the acronym for the United Nation's committee that oversees and regulates satellites.

Dying satellites can be sent 300 kilometers past the start of HEO into a _____ _____.

The word "satellite" comes from a Latin word which means "_____" or "_____."

3. Answer the following by circling True or False for each statement:

True ***False*** Point Dory is the place in the Pacific Ocea where dead satellites are sent to crash.

True ***False*** The line between LEO and MEO is 2,000 kilometers from Earth's surface.

True ***False*** The first satellite was launched on October 4, 1957.

True ***False*** Astronomer Galileo was the first person to recognize that the Moon causes Earth's tides.

True ***False*** The GPS constellation of satellites is operated by the US military's Space Force.

4. Draw or write a spiritual lesson you learned while earning about astronomy: