

# Satellites & its Applications

Prepared By:



Sai Ganesh P  
Niranjana Prashant

# What is a Satellite?

A satellite is an object in space that orbits or circles around a bigger object.

There are two kinds of satellites:  
natural (such as the moon orbiting  
the Earth) or

artificial (such as the International  
Space Station orbiting the Earth).



Q1.

Which planet has the most  
number of natural satellites?

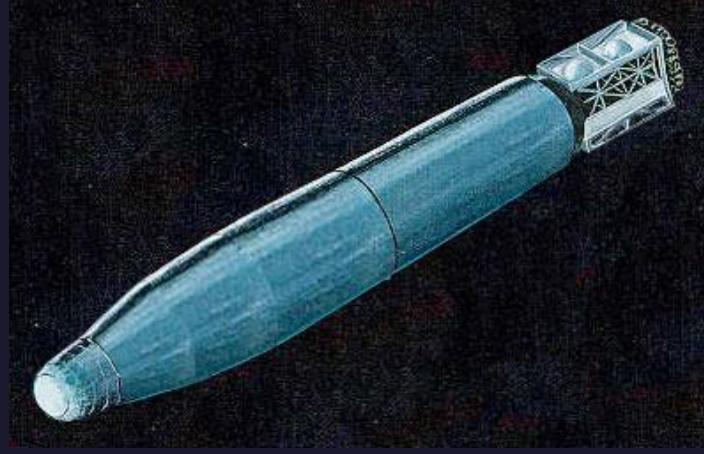


# Examples:



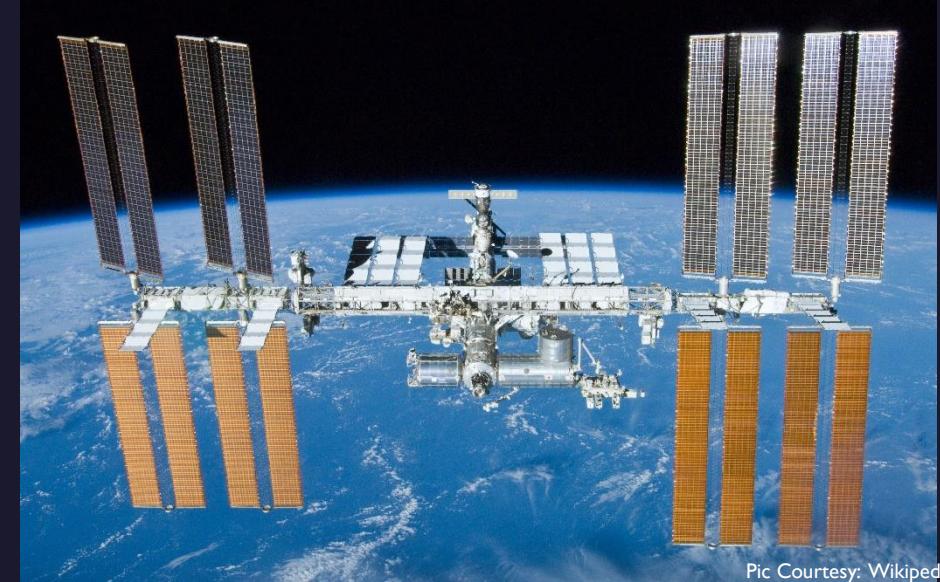
Pic Courtesy: Wikipedia

1. Aryabhata



Pic Courtesy: Wikipedia

2. Corona

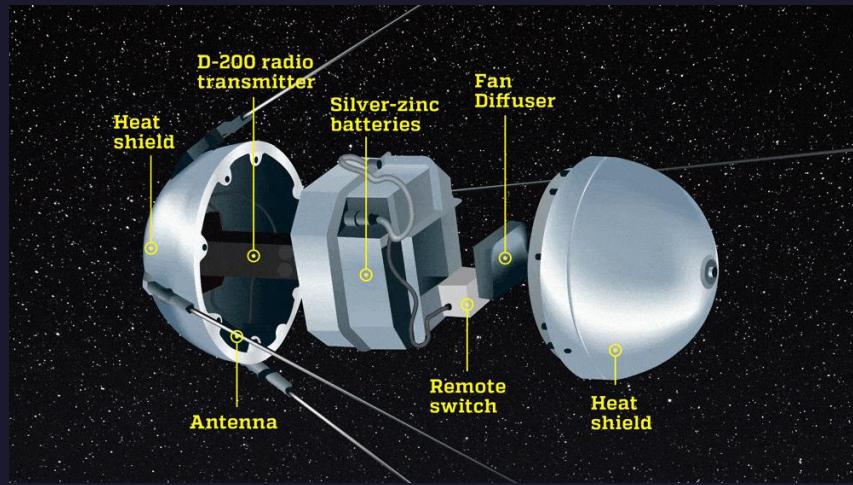


Pic Courtesy: Wikipedia

3. International Space  
Station (ISS)

Fun Fact 1:

There are about 2,666 satellites  
active as of April 1, 2020



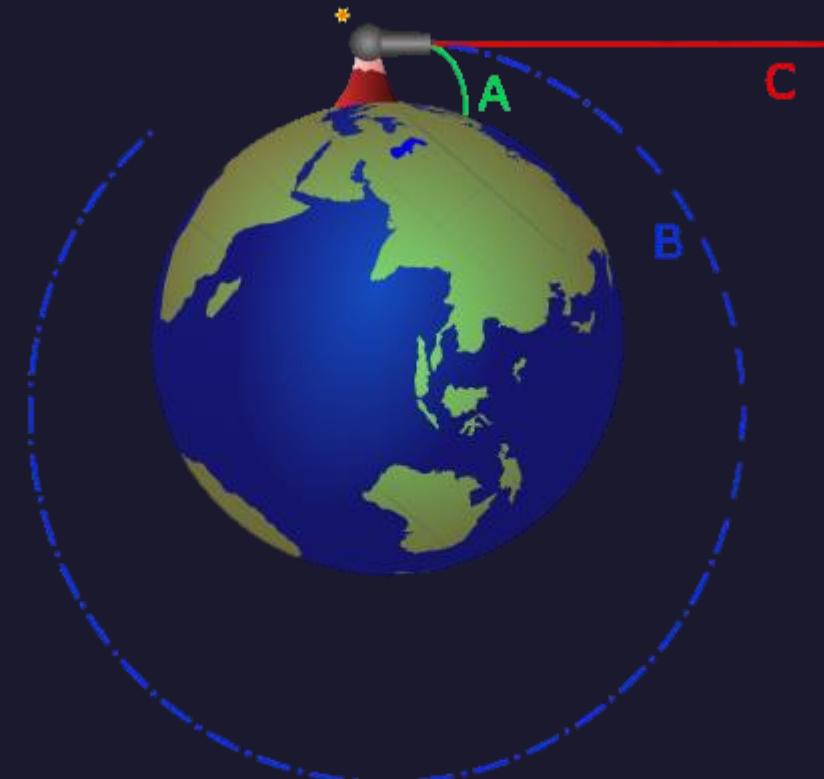
# 1st artificial satellite



Fun Fact 2:  
Sputnik 1 was just about  
the size of a beach ball.



# Idea of Satellite !





When the velocity  
is less than both  
orbital and  
escape velocity

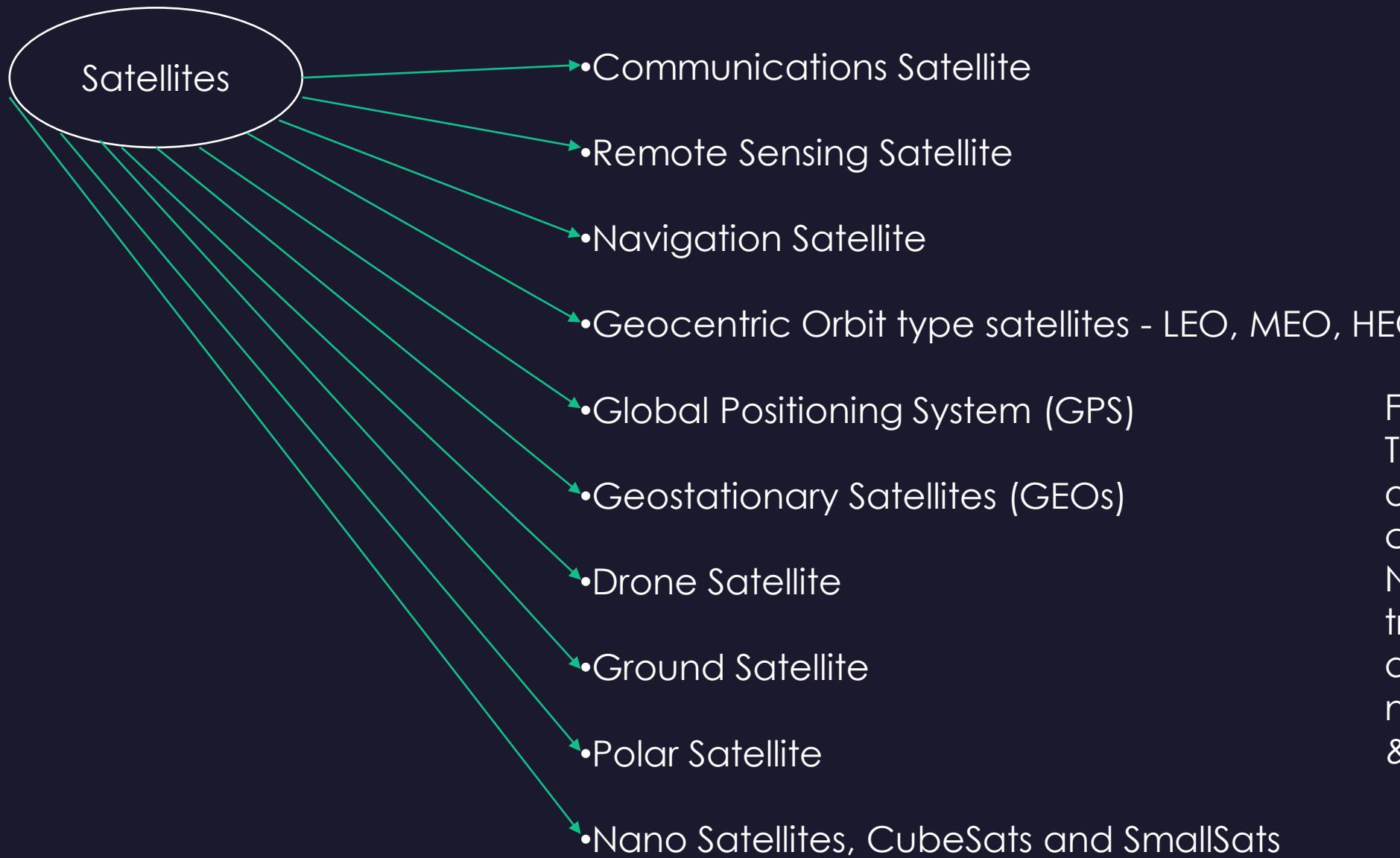


When the velocity  
is greater than  
both orbital and  
escape velocity

When the  
velocity is equal  
to orbital  
velocity but is still  
less than escape  
velocity



# classifications



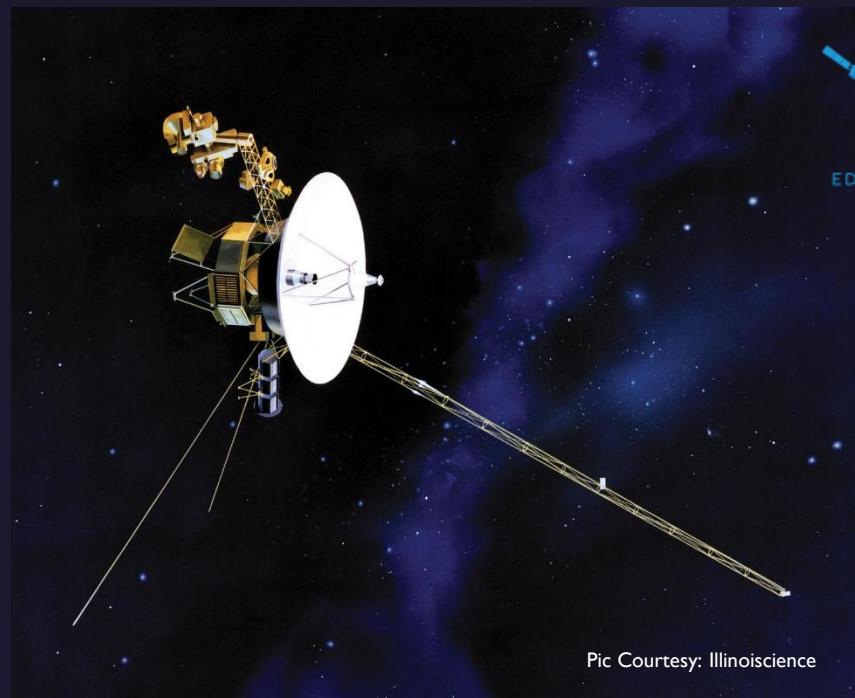
Fun Fact 3:  
There are 2 satellites in orbit around the earth chasing each other.  
NASA has them tracking gravitational anomalies. NASA nicknamed them Tom & Jerry.

# Satellites of all kinds:

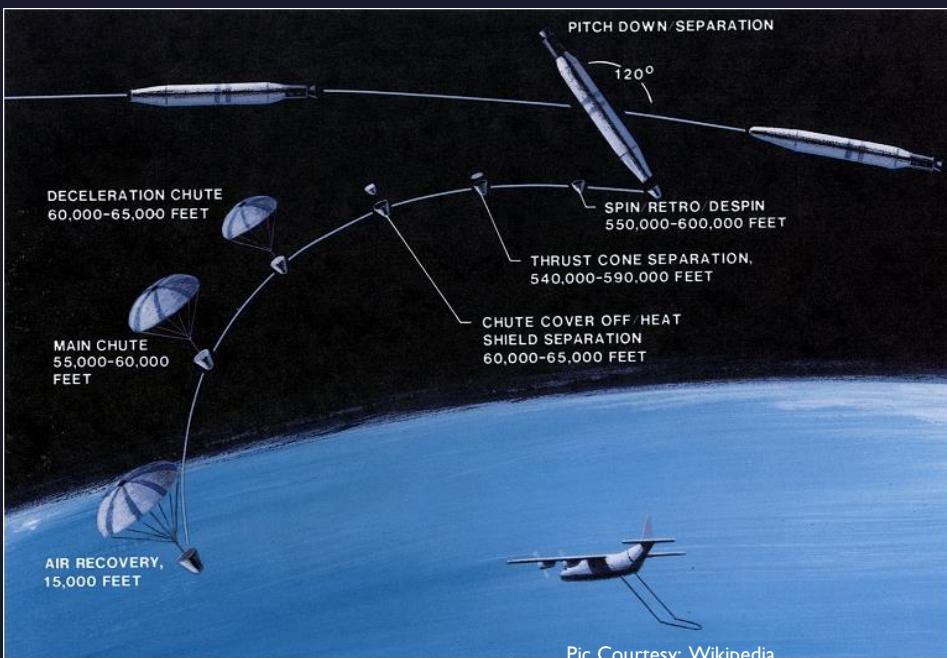


**Activity 1:**  
Draw a funny comic strip or dialogues, explaining what your interaction with a alien would be like.

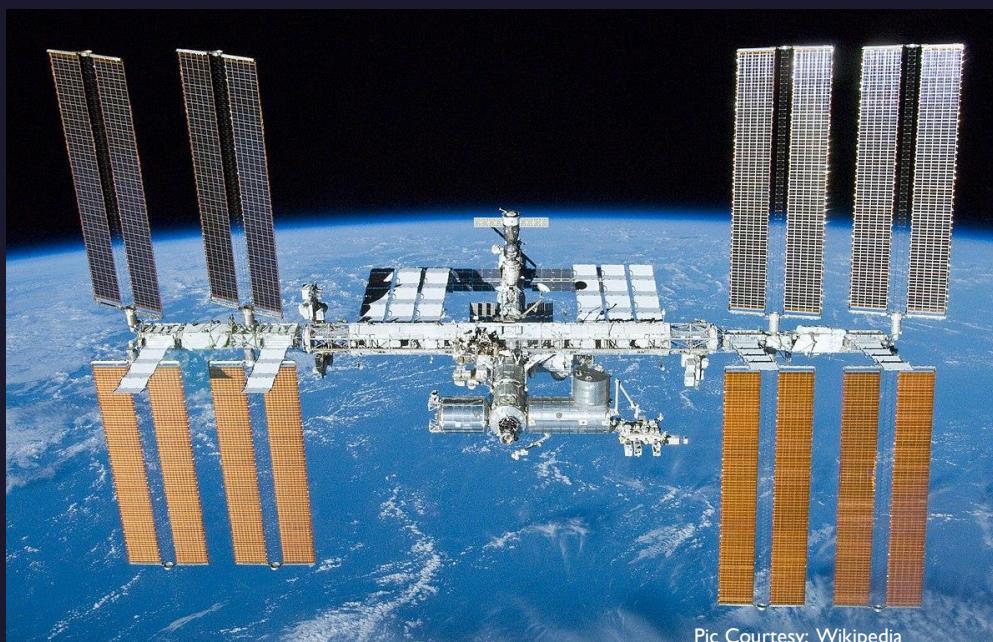
Pic Courtesy: Wikipedia



Pic Courtesy: Illinoiscience

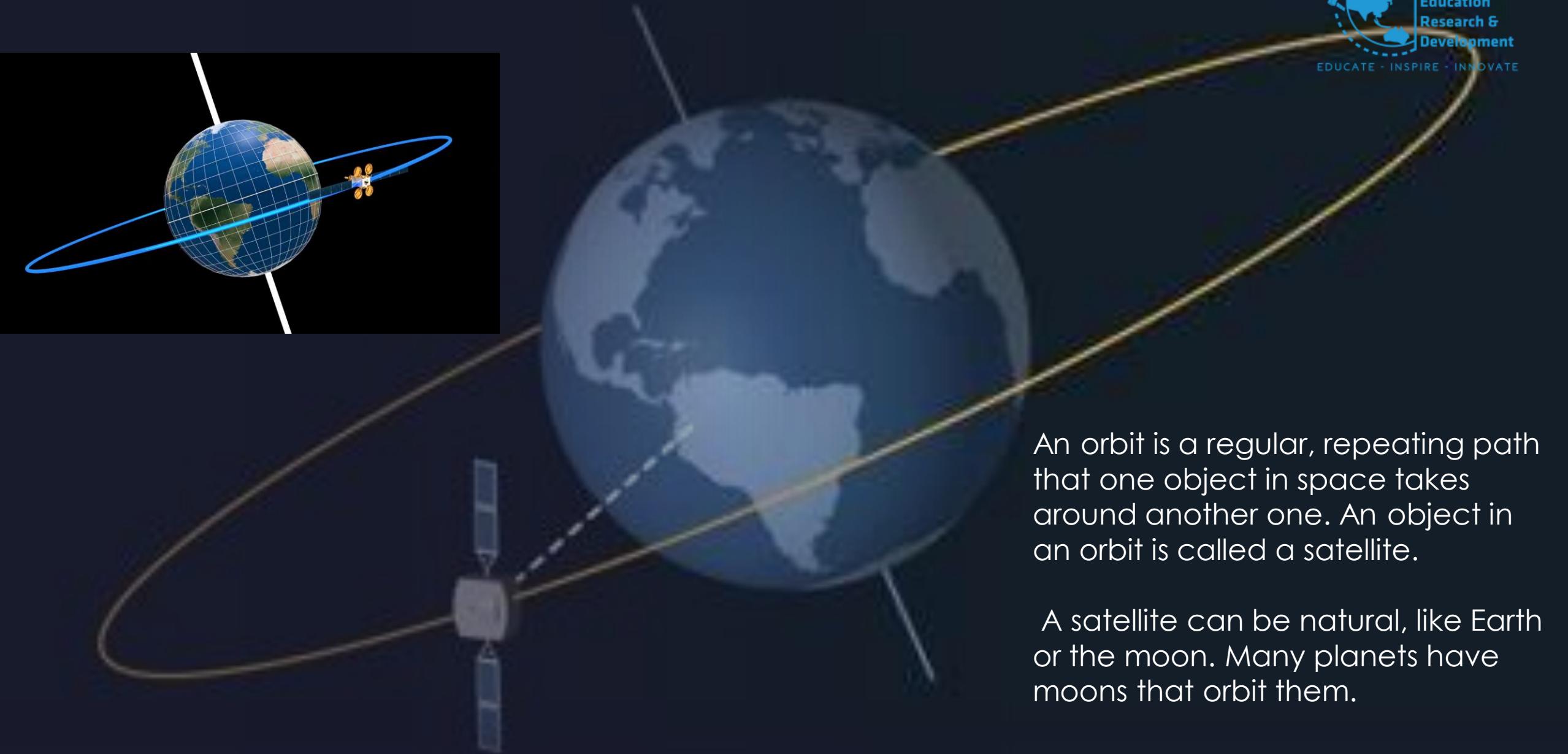


Pic Courtesy: Wikipedia



Pic Courtesy: Wikipedia

# Orbits ?



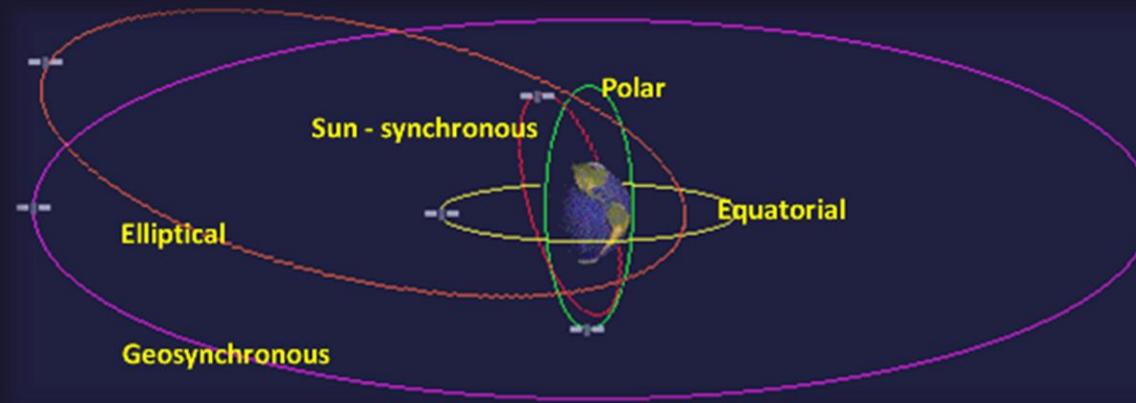
An orbit is a regular, repeating path that one object in space takes around another one. An object in an orbit is called a satellite.

A satellite can be natural, like Earth or the moon. Many planets have moons that orbit them.

# Orbits

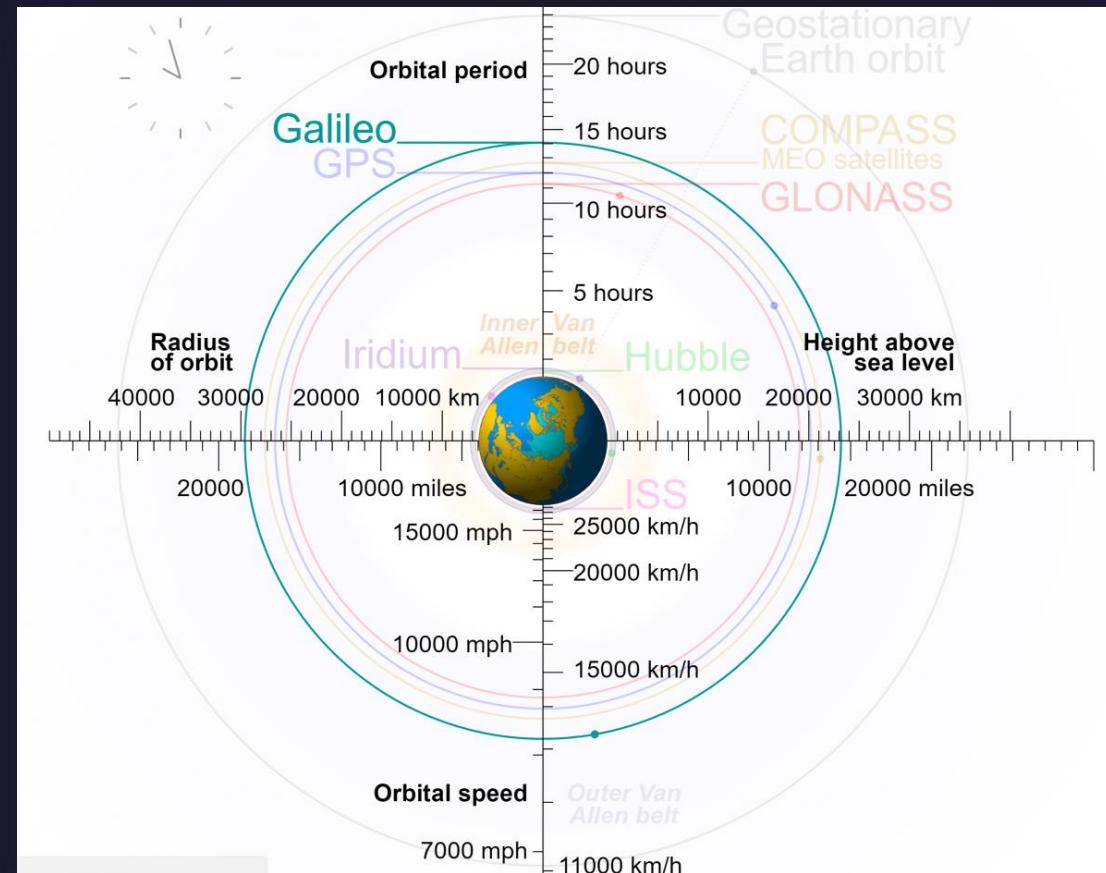
Based on height:

1. Low Earth Orbit (LEO)
2. Medium Earth Orbit(MEO)
3. Geostationary Earth Orbit (GEO)
4. Graveyard Orbit



Special Orbits :

1. Geo-Stationary/Synchronous Transfer Orbit
2. Lunar Transfer Orbit
3. Mars Transfer Orbit
4. Lagrange Points



Q2.

How fast does a (artificial)Satellite travel? Do ALL satellites have to fly at the same speed so not to leave their orbit?

### **Low Earth Orbit (LEO):**

LEO is commonly used for communication and remote sensing satellite systems, as well as the International Space Station (ISS) and Hubble Space Telescope. (160 to 2000 km)

### **Medium Earth Orbit (MEO):**

MEO is commonly used for navigation systems, including the U.S. Global Positioning System (GPS).  
(2000 to 35,700 km)

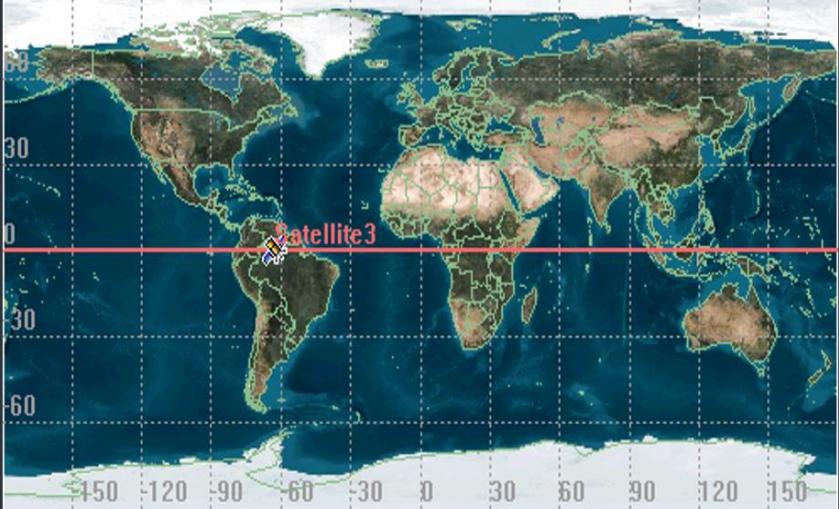
### **Geosynchronous Orbit (GSO) & Geostationary Orbit (GEO):**

Objects in GSO have an orbital speed that matches the Earth's rotation, yielding a consistent position over a single longitude. GEO is a kind of GSO. It matches the planet's rotation, but GEO objects only orbit Earth's equator, and from the ground perspective, they appear in a fixed position in the sky. GSO and GEO are used for telecommunications and Earth observation, each satellite in GEO covers 1/3 of the Earth. (35,786 km)

### **Graveyard Orbit :**

Also called a junk orbit or disposal orbit, it lies away from the basic operational orbits. Satellites are typically moved into such an orbit at the end of their operational lifetime, to reduce the probability of colliding with operational spacecrafts and creating space-debris.

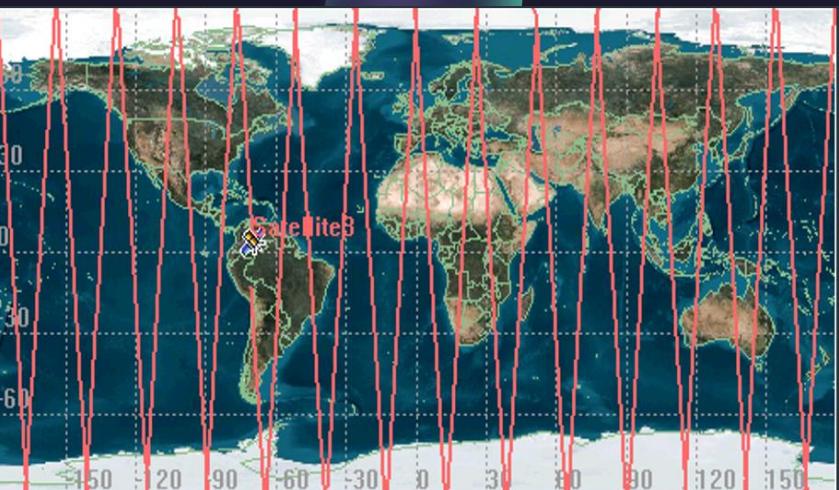




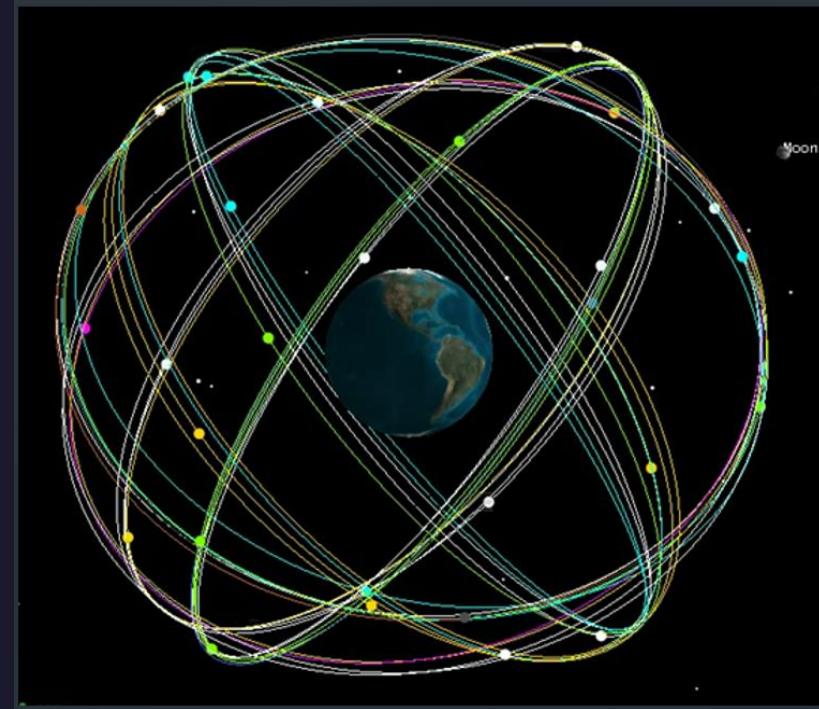
A satellite in an equatorial orbit will pass directly over the equator



When a single satellite is insufficient to perform any task, it's grouped with many other such satellites to help. Such a grouping is termed as a "Constellation"  
Ex: for GPS



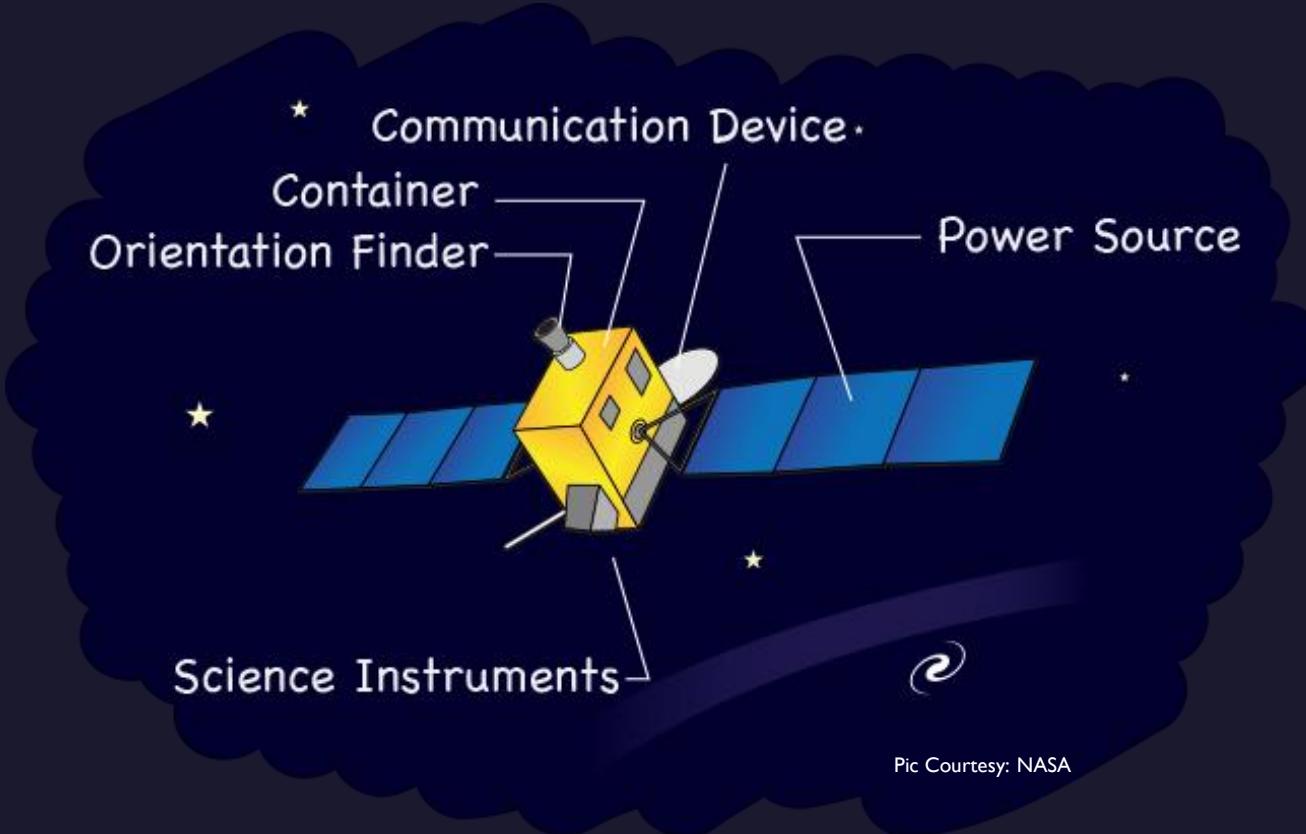
A satellite in a polar orbit will pass over the entirety of the Earth



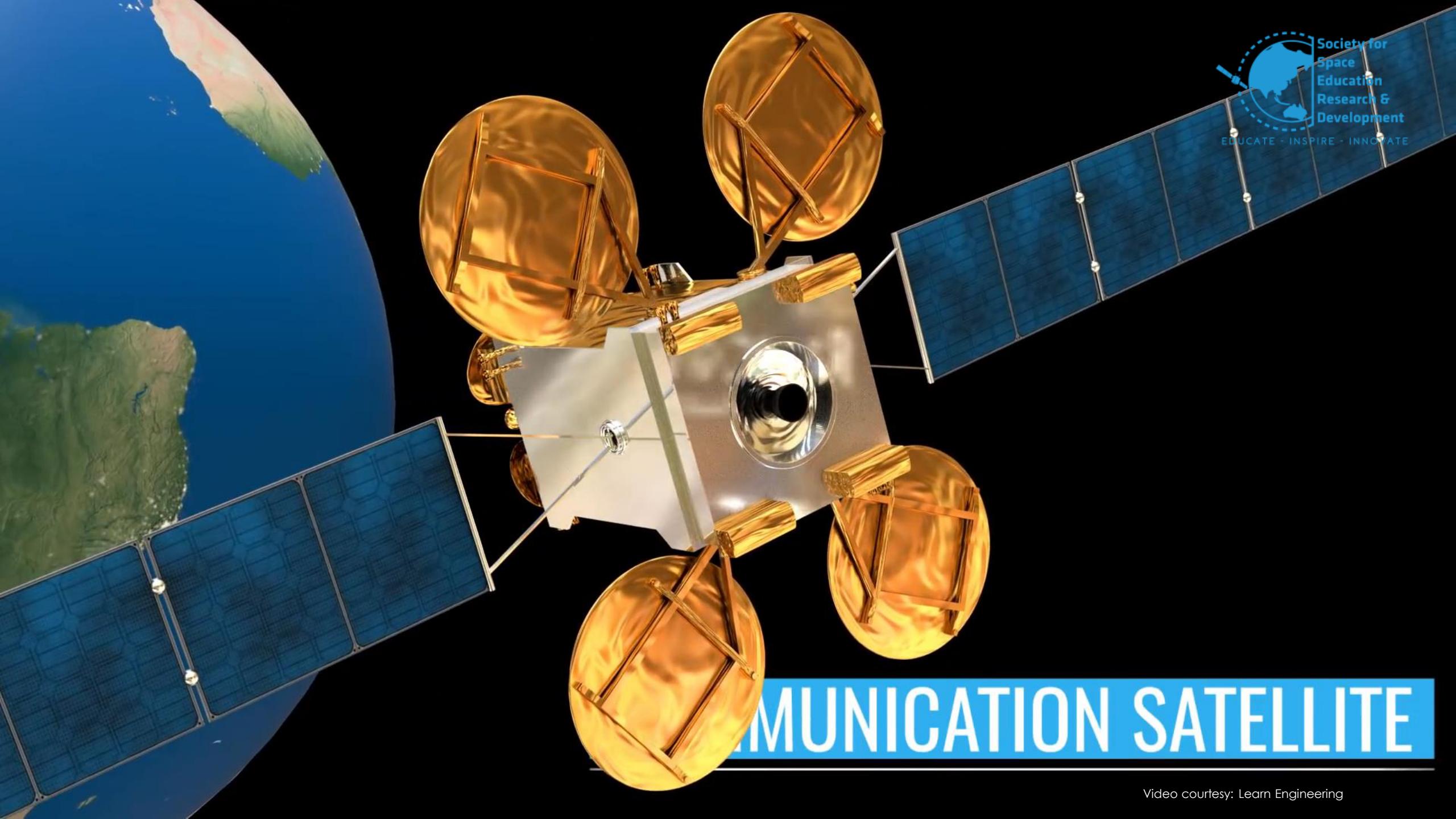
Fun Fact 3:  
Satellites have better fuel efficiency than some of the smallest and most efficient cars on earth.

# Parts (Sub systems)

Activity 2:  
Design your own  
satellite using the  
things available at  
home and send us a  
picture of it.



1. Transponder
2. Battery and Solar panel
3. Sun Sensor
4. Thruster
5. Fuel Tank



Video courtesy: Learn Engineering

# Applications



1. Astronomical Satellites
2. Bio-satellites
3. Communication Satellites
4. Earth Observation Satellites
5. Navigational Satellites
6. Killer Satellites
7. Spaceships
8. Miniaturized Satellites
9. Reconnaissance Satellites
10. Recovery Satellites
11. Space Based Solar Power Satellites
12. Space Stations
13. Tether Satellites
14. Weather Satellites

## Fun Fact 4:

A satellite orbiting the earth is expected to re-enter earth's atmosphere in 8.4 million years, carrying messages to humans of the future.

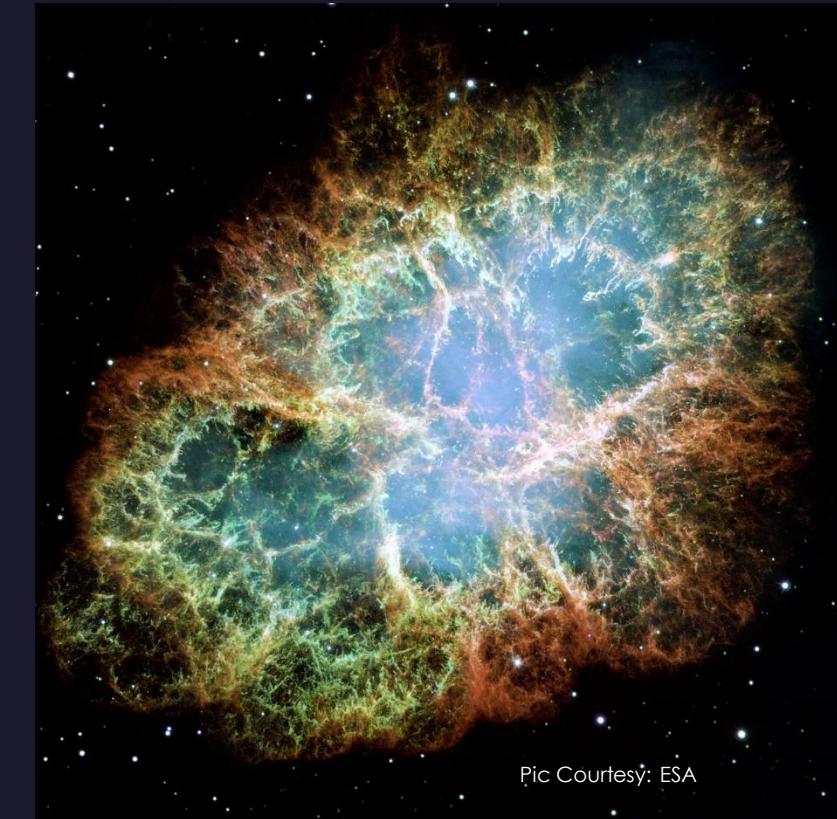
# Hubble Space Telescope



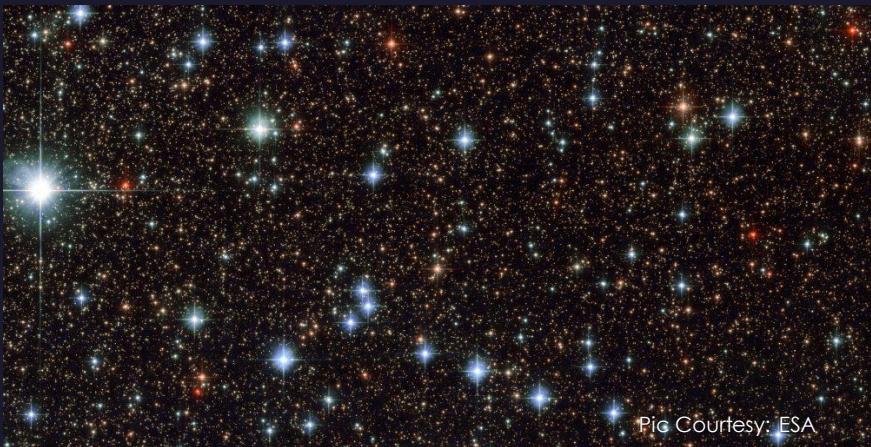
Pic Courtesy: ESA



Pic Courtesy: Wikipedia

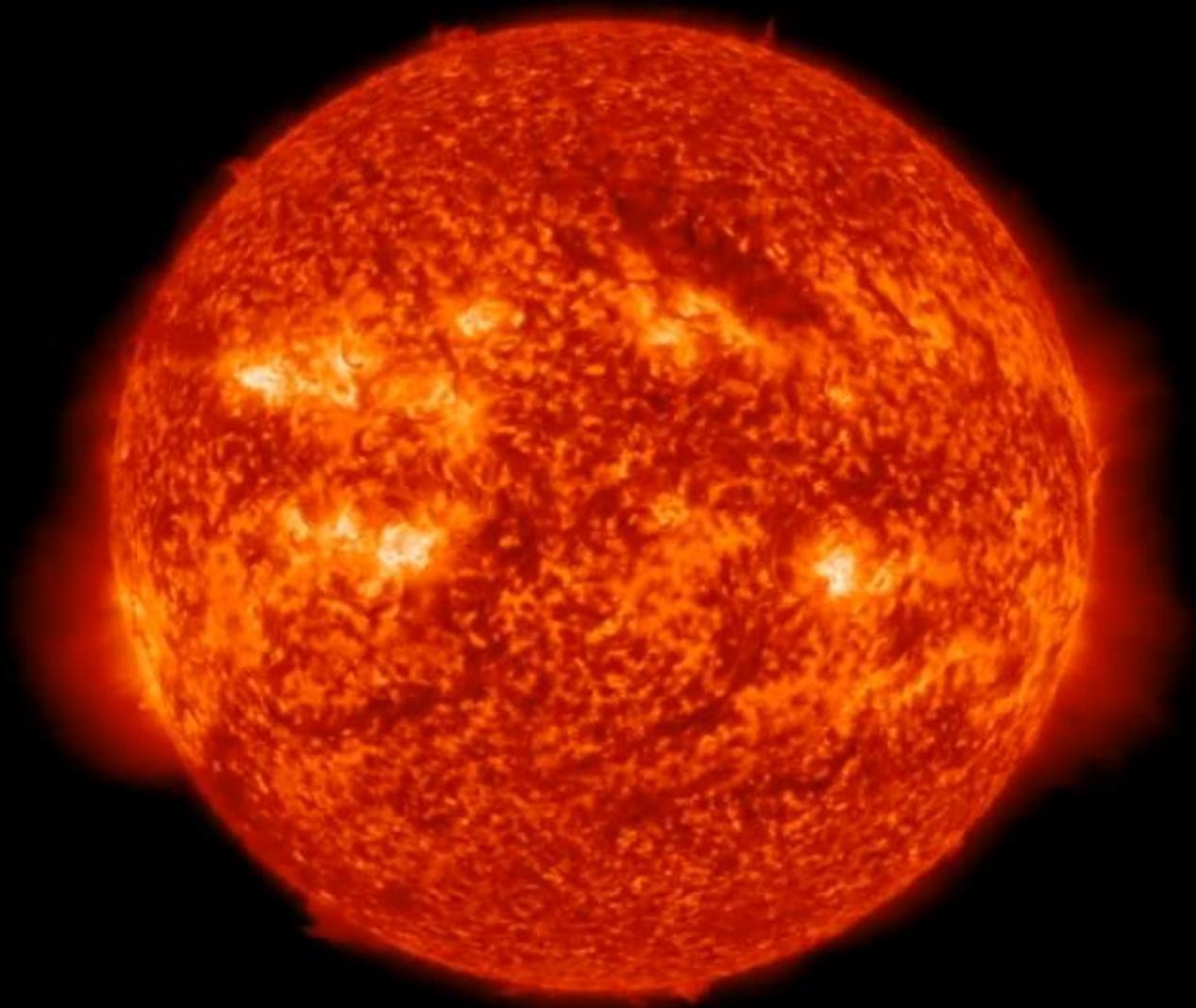


Pic Courtesy: ESA

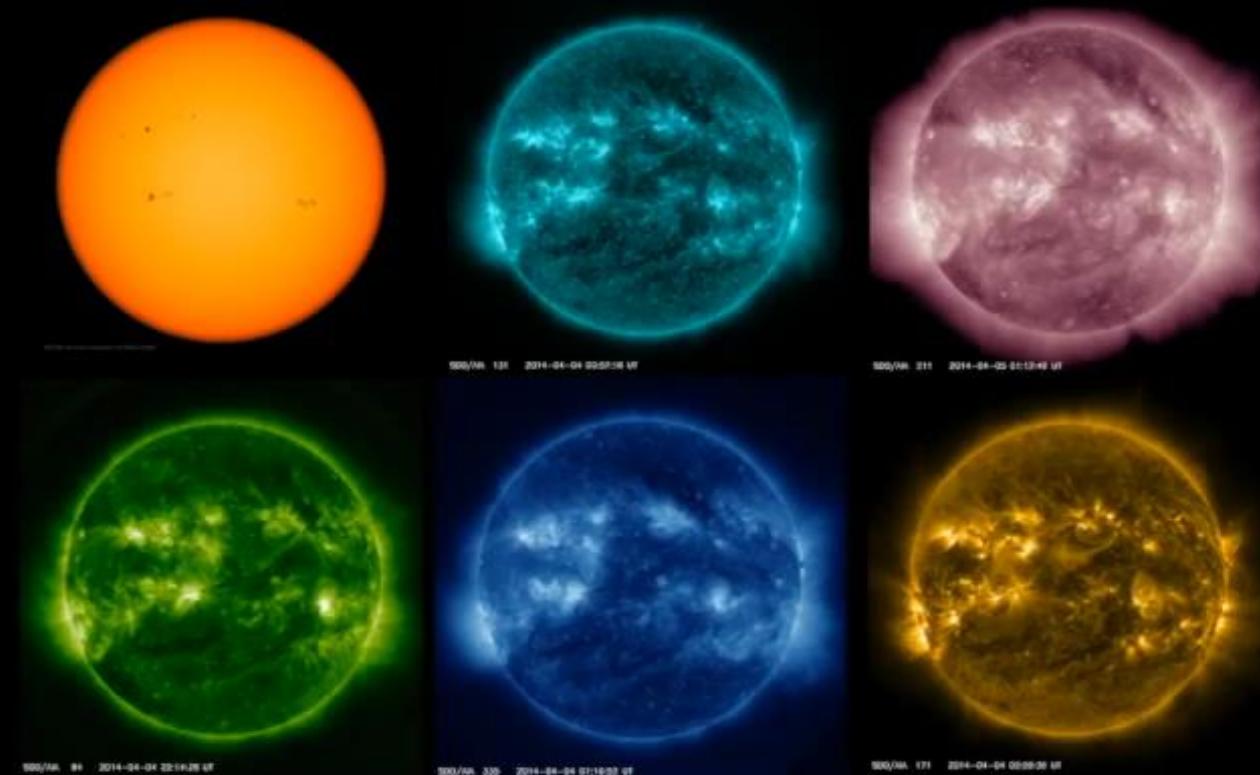


Pic Courtesy: ESA





SDO/AIA 304 2014-04-04 01:09:08 UT



# Space Probes



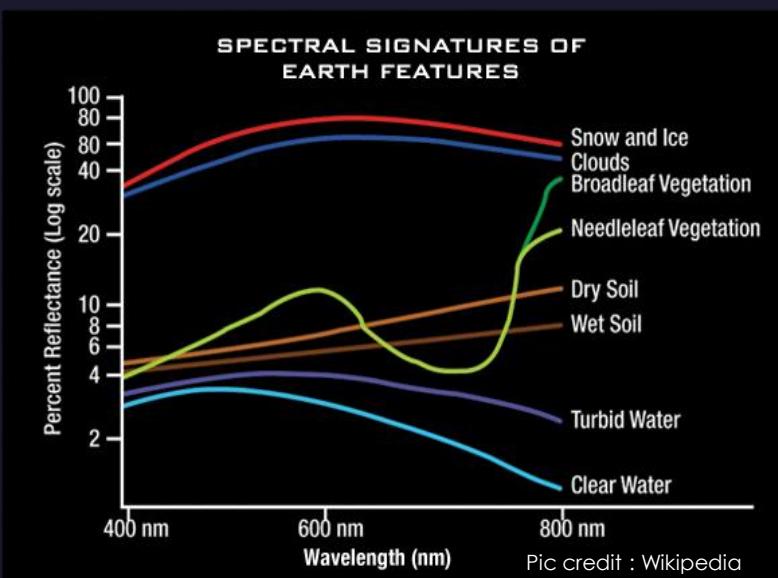
Pic credit : NASA



Video credit : YouTube/JAXA

- A space probe is an unpiloted, unmanned device sent to explore space and gather scientific information.
- A space probe is launched from Earth with a set of scientific instruments and tools used to study the atmosphere and composition of space and other planets, moons, or celestial bodies

# Remote Sensing Satellites



Some more uses:

- To measure temperature changes of oceans
- Locate and map forest fires
- Or look at places not accessible to us easily
- And even track weather and sand storms



Pic credit : Wikipedia

# International Space Station (ISS)



- It is the largest artificial object in space and the largest satellite in low Earth orbit, regularly visible to the naked eye from Earth's surface.
- There are three people permanently on the station, the crew that rotates out periodically. When the shuttle goes up, it carries up to seven additional people so we can have as many as ten at a time when the shuttle is there.

Fun Fact 5:  
In 24 hours, the space station makes 16 orbits of Earth, traveling through 16 sunrises and sunsets

# Weather Satellites

The **weather satellite** is a type of satellite that is primarily used to monitor the weather and climate of the Earth.

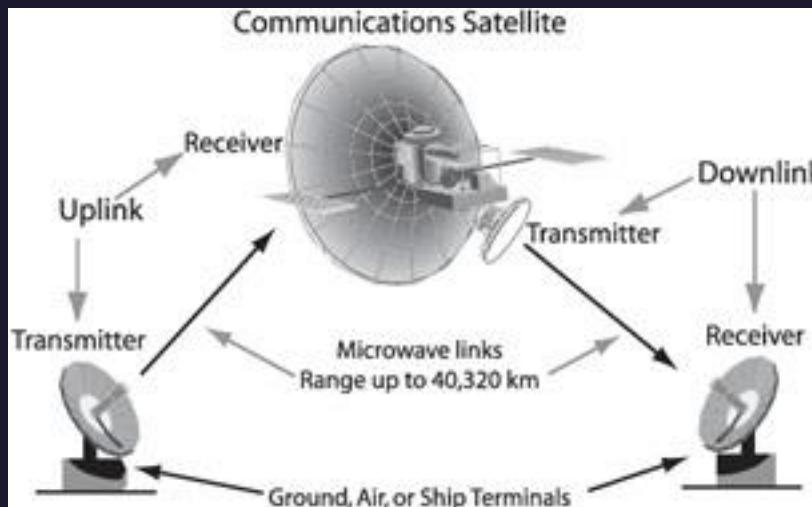
**Meteorological satellites** see more than clouds: city lights, fires, effects of pollution, auroras, sand and dust storms, snow cover, ice mapping, boundaries of ocean currents, energy flows, etc.



# Communication Satellites

- Satellite communication, in telecommunications, the use of artificial satellites to provide communication links between various points on Earth. Satellite communications play a vital role in the global telecommunications system.

- Approximately 2,000 artificial satellites orbiting Earth relay analog and digital signals carrying voice, video, and data to and from one or many locations worldwide.



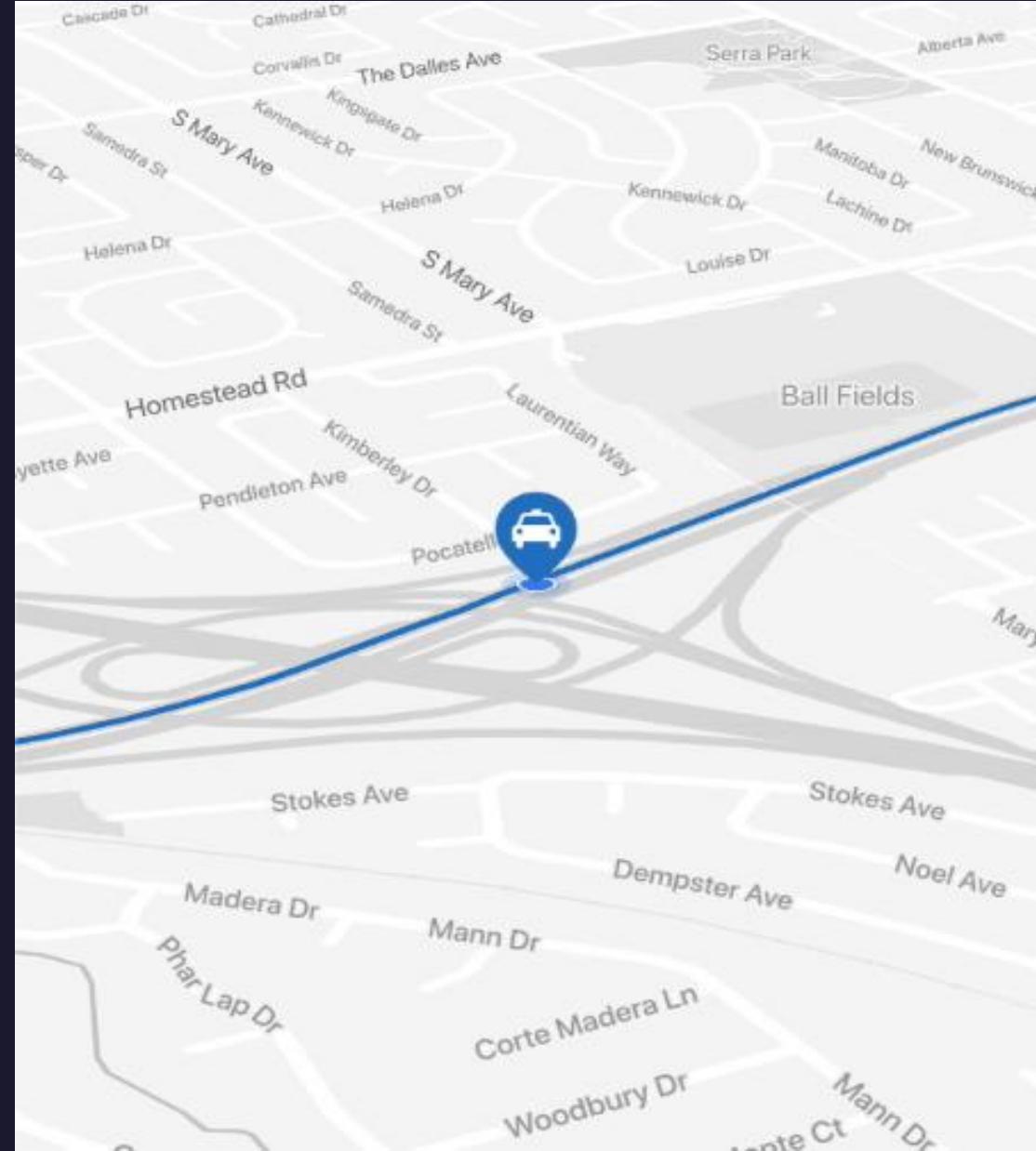
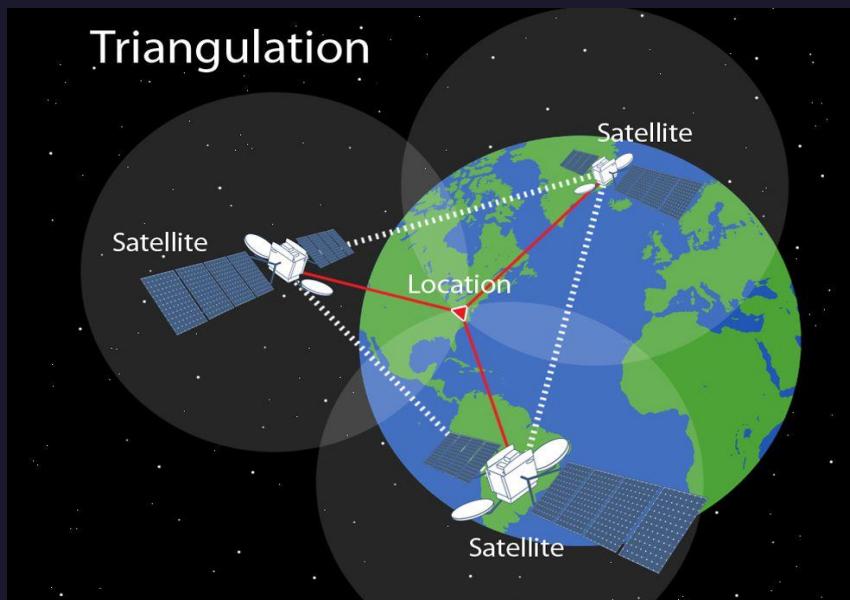
## Fun Fact 6:

If two pieces of the same type of metal touch in space they will permanently bond.



# Navigational Satellites

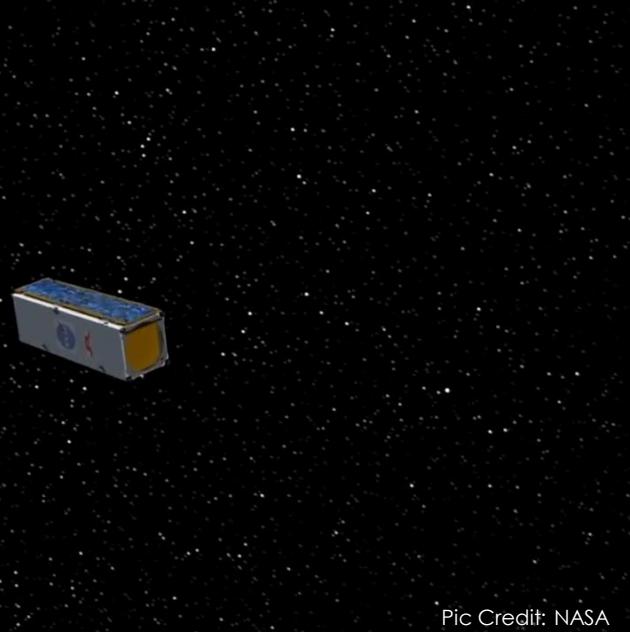
Artificial satellites can provide the basis for all-weather, long-term navigation systems to determine with accuracy geodetic position, speed, and direction of a surface vehicle or aircraft, north reference, and vertical reference.



# CubeSats



Pic Credit: NASA



Fun Facts 7:  
There may be a  
planet made out of  
diamonds.



# Spaceships

A spacecraft is a vehicle or machine designed to fly in outer space. A type of artificial satellite, spacecraft are used for a variety of purposes, including communications, Earth observation, meteorology, navigation, space colonization, planetary exploration, and transportation of humans and cargo



Pic Credit: Boeing



Pic Credit: SpaceX

Pic Credit: MARVEL

# Space Debris

esa



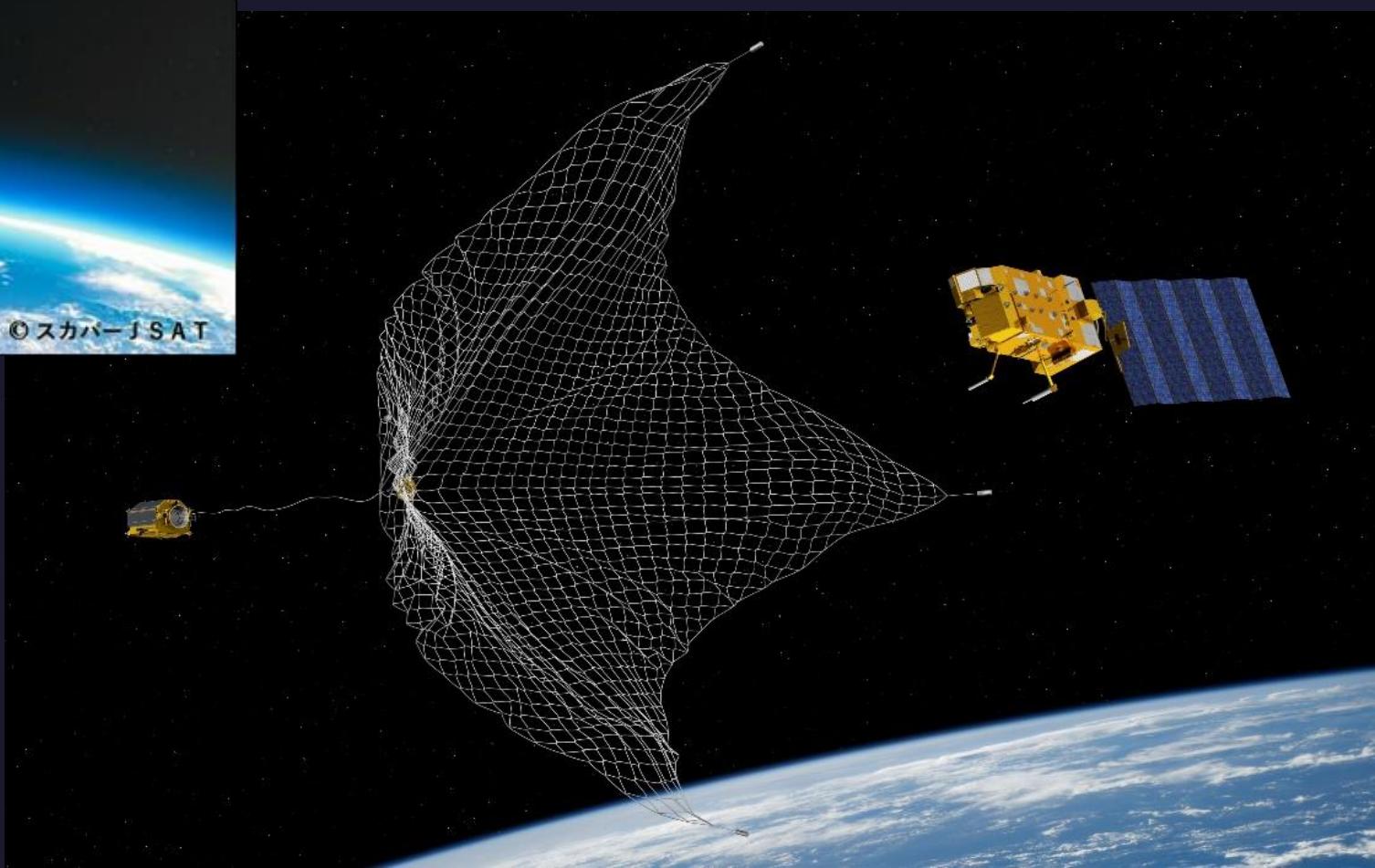
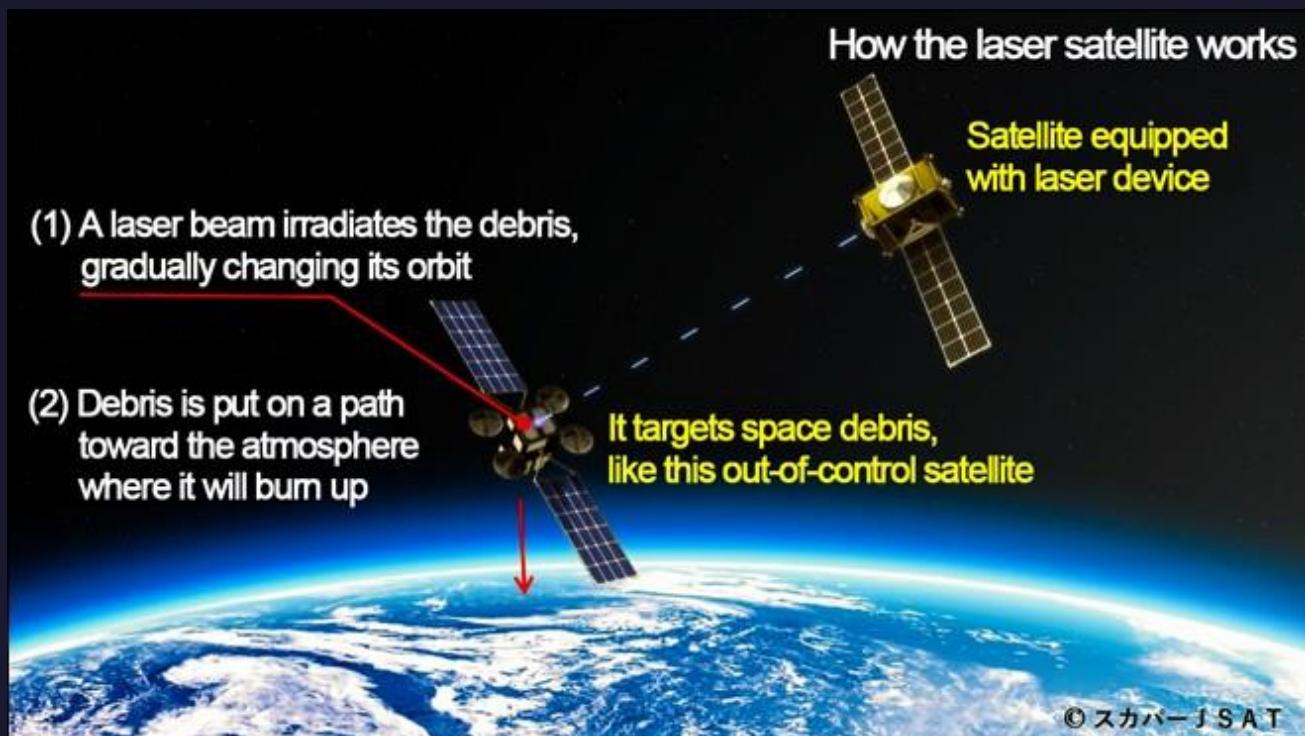
# How can it be dangerous?



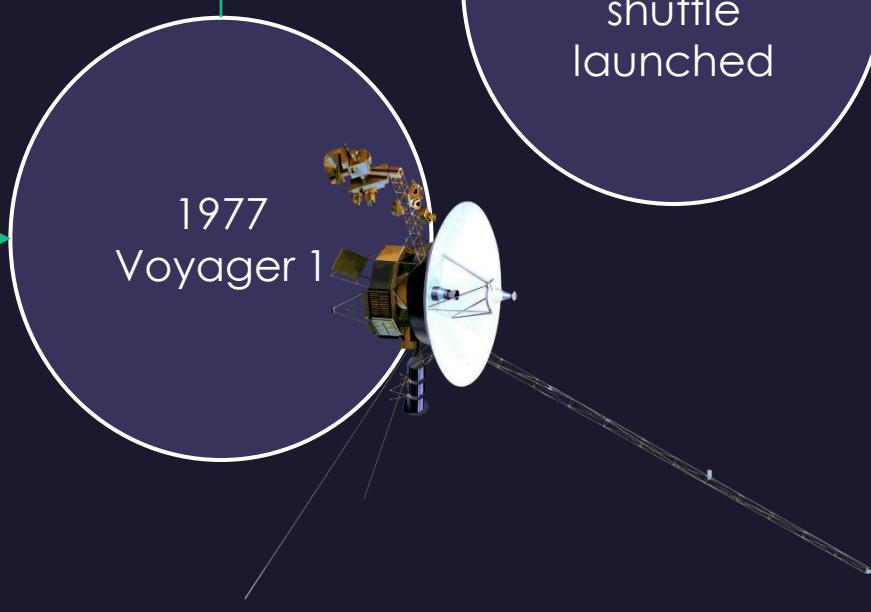
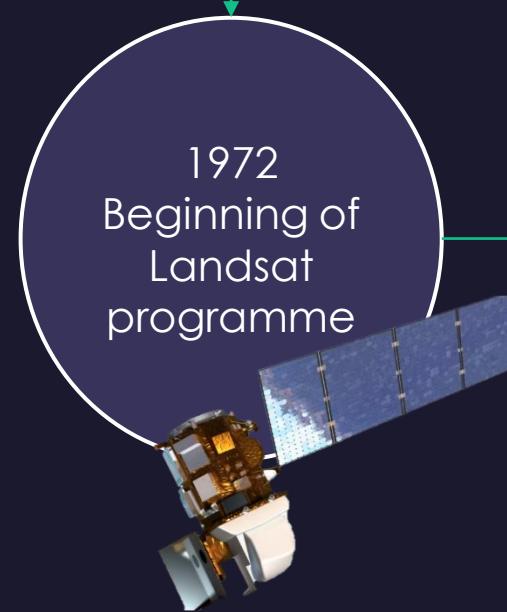
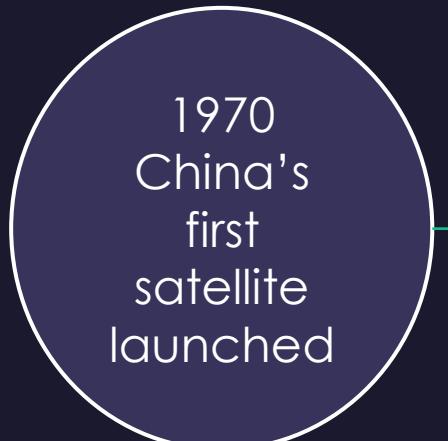
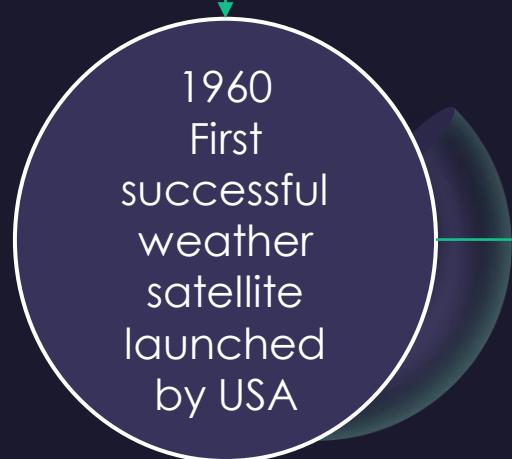


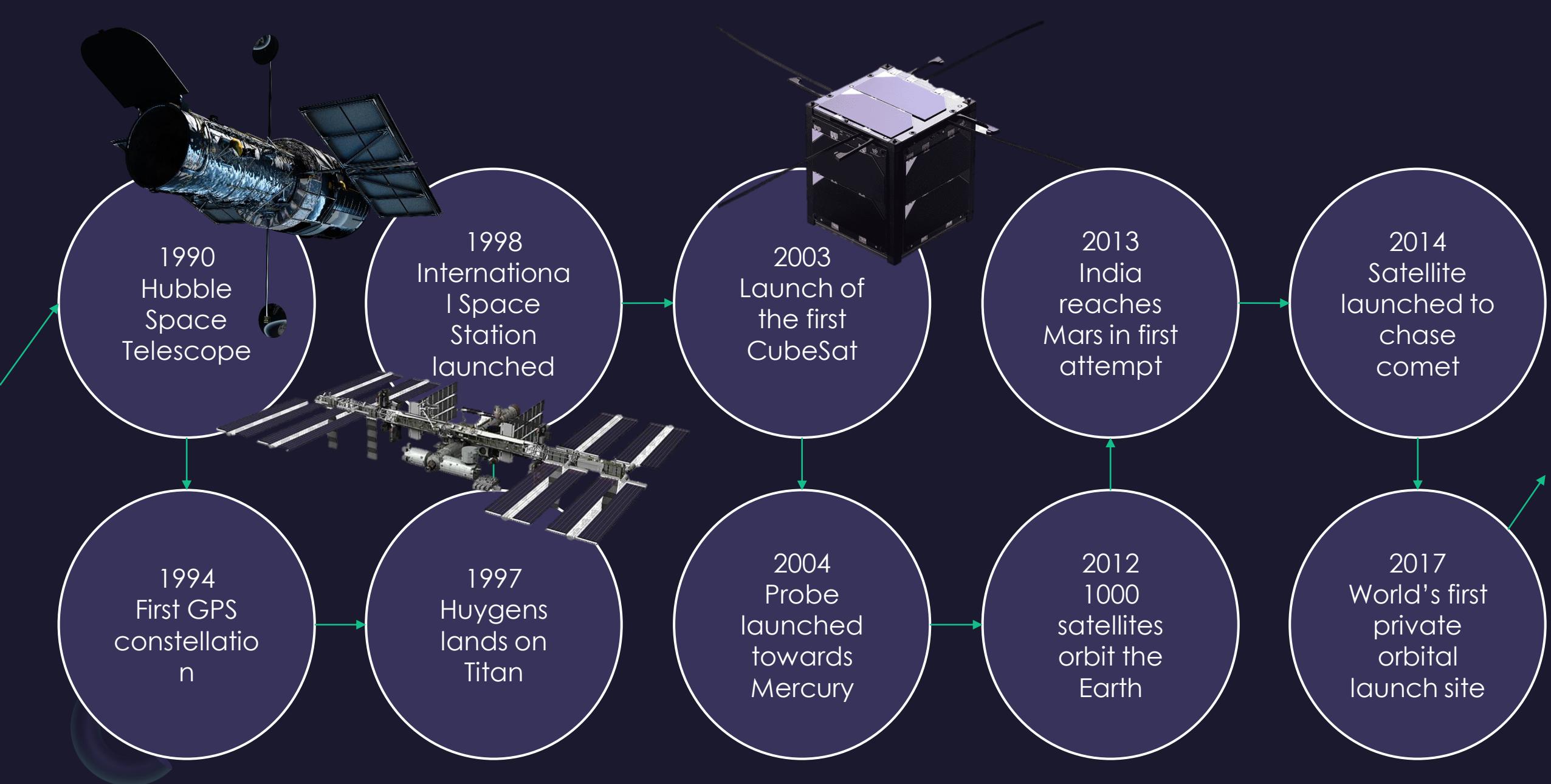


# How to deal with it?



# Evolution of satellites





2018  
Hayabusa-2  
will reach  
asteroid  
Ryugu

2020  
Mars 2020  
Rover  
launched



It's been 63 massive  
years since the launch  
of the first ever satellite  
by us.

And quite the  
development has been  
achieved and our path  
forward looks very  
bright!

# Assignments

Activity 1:

Draw a funny comic strip or dialogues, explaining what your interaction with a alien would be like.

Activity 2:

Design your own satellite using the things available at home and send us a picture of it.



# Questions and facts

Q1. Which planet has the most number of natural satellites?

Q2. How fast does a (artificial)Satellite travel? Do ALL satellites have to fly at the same speed so not to leave their orbit?

1. There are about 2,666 satellites active as of April 1, 2020
2. There are 2 satellites in orbit around the earth chasing each other. NASA has them tracking gravitational anomalies. NASA nicknamed them Tom & Jerry.
3. Satellites have better fuel efficiency than some of the smallest and most efficient cars on earth.
4. A satellite orbiting the earth is expected to re-enter earth's atmosphere in 8.4 million years, carrying messages to humans of the future.
5. In 24 hours, the space station makes 16 orbits of Earth, traveling through 16 sunrises and sunsets.
6. If two pieces of the same type of metal touch in space they will permanently bond.
7. There may be a planet made out of diamonds.



# Questions?



Thanks !  
Hope you enjoyed  
the session.

For any queries contact:

[ganesh.sai2000@gmail.com](mailto:ganesh.sai2000@gmail.com)  
<https://www.linkedin.com/in/sai-ganesh-p/>

[www.sserd.org](http://www.sserd.org)