

# NASA and Space Exploration: A Journey through the Solar System



# Today's Topic: Earth Orbit and the Space Race



# What is space?

- Space is the area between all objects (such as planets, moons, and stars)
- It is nearly “empty” but on average, there are 6 atoms per cubic meter in space
- The density of air on Earth is 100,000,000,000,000,000,000,000,000 times more density than space

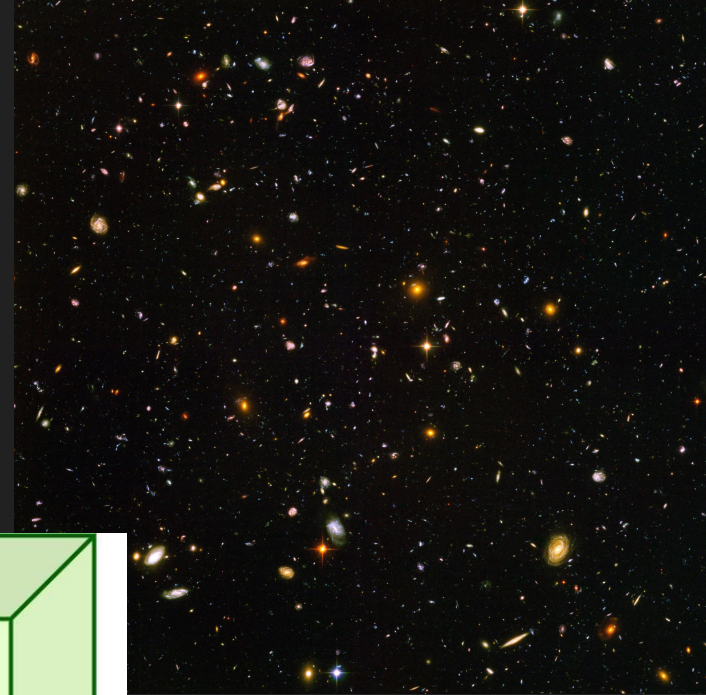
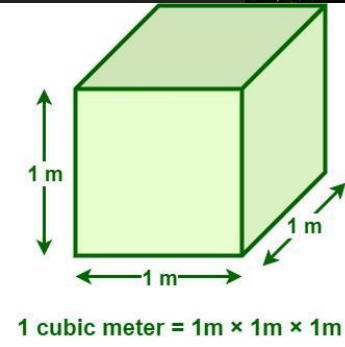


Image credit: NASA/HST



# Where does space begin?

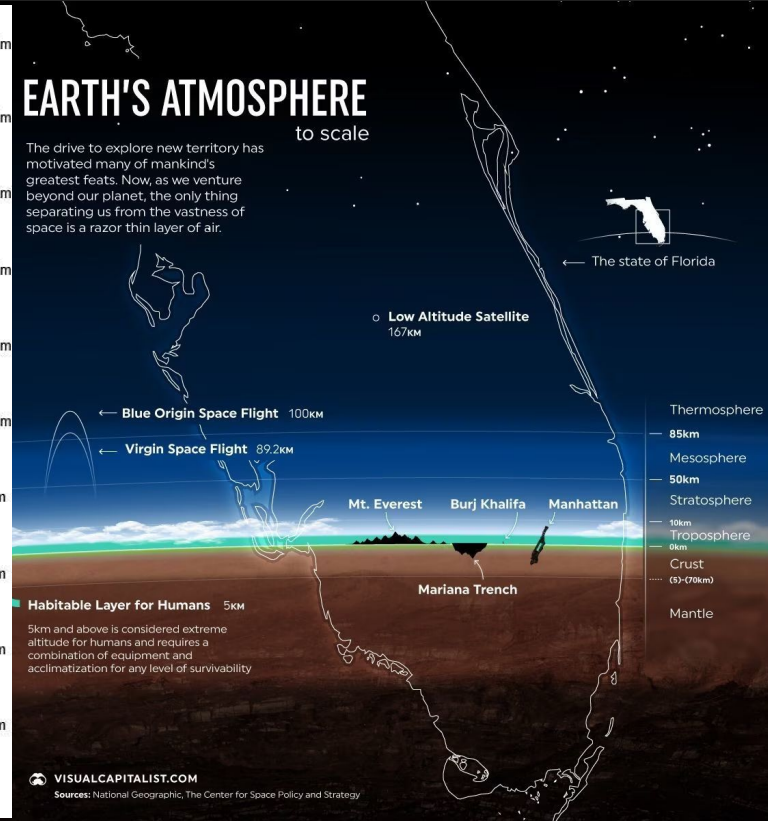
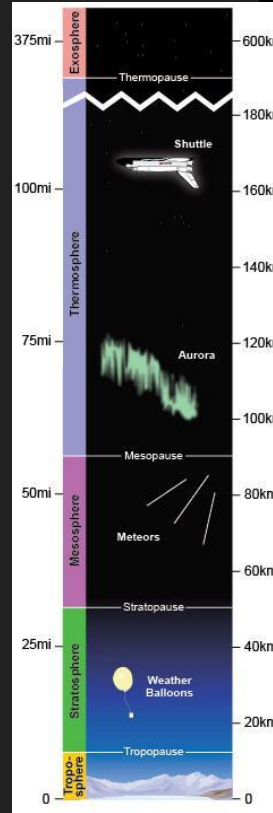
- Space begins where our atmosphere ends
- Other objects have atmospheres too (even the Sun), and space will begin where their atmospheres end too
- Where does the atmosphere end in this picture?



Image credit: NASA

# Earth's Atmosphere

- Earth's atmosphere has 5 layers:
  - They protect life from radiation
  - Burn up meteors
  - Determine all weather on Earth
- But the height of the atmosphere is very small!
- How can we get off Earth and out of the atmosphere?
  - A rocket ship!



# What is a rocket?

- Rockets are objects that turn fuel into gas and release that gas in order to move
- Rockets move because of Newton's third law of motion:
- For every action there is an equal and opposite reaction
- The gas made from the fuel is pushed out the back of the rocket which makes the rocket move up!



Image credit: NASA

# STEMonstrations



**NEWTON'S 3RD LAW**



# The Space Race

- The Soviet Union was a country that comprised of what are today Russia, many Eastern European, and many Central Asian countries.
- It was a global power that competed with the United States in many areas after World War II
- One big area for competition was weapons and flight technology
- Space exploration became the topic to demonstrate the power of each country

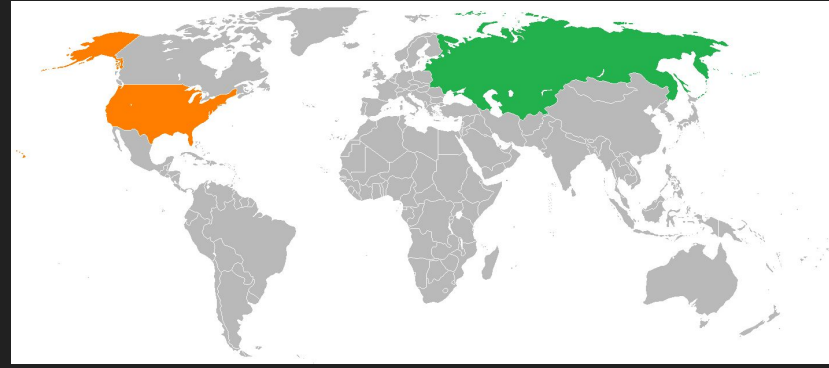


Image credit: Philipp Stevens

# Sputnik 1: First Manmade Object to Orbit Earth

- The Soviet Union launched the first satellite into Earth orbit on October 4, 1957
- Sputnik 1 had four radio antennas that were used to track its orbit and study the Earth's atmosphere
- It orbited Earth 1,440 times before falling back to the surface

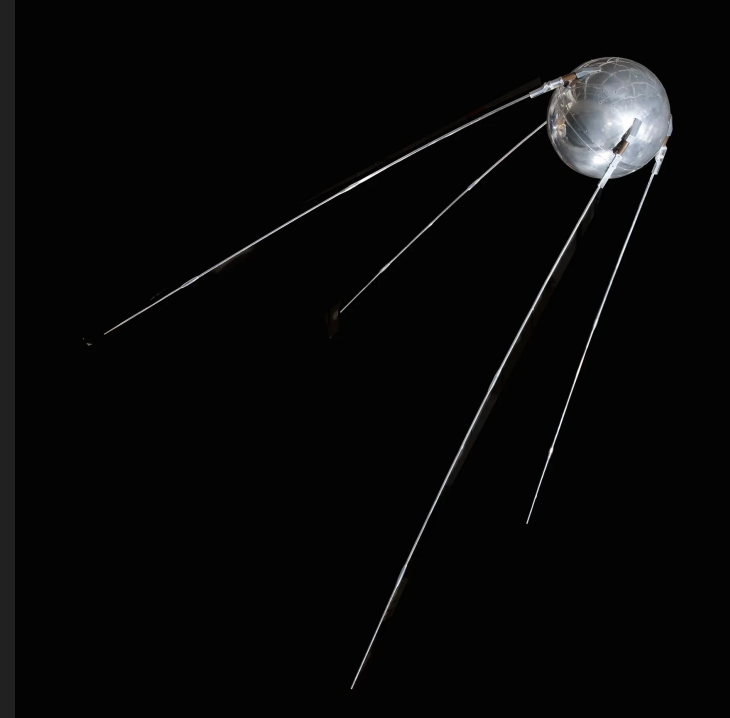


Image credit: Smithsonian Institution

# Sputnik 1: First Manmade Object to Orbit Earth

- Many were afraid that this meant the Soviet Union could launch missiles at any part of the world and that no one else has this ability
- Others were excited about the new ability of humans to send objects to space

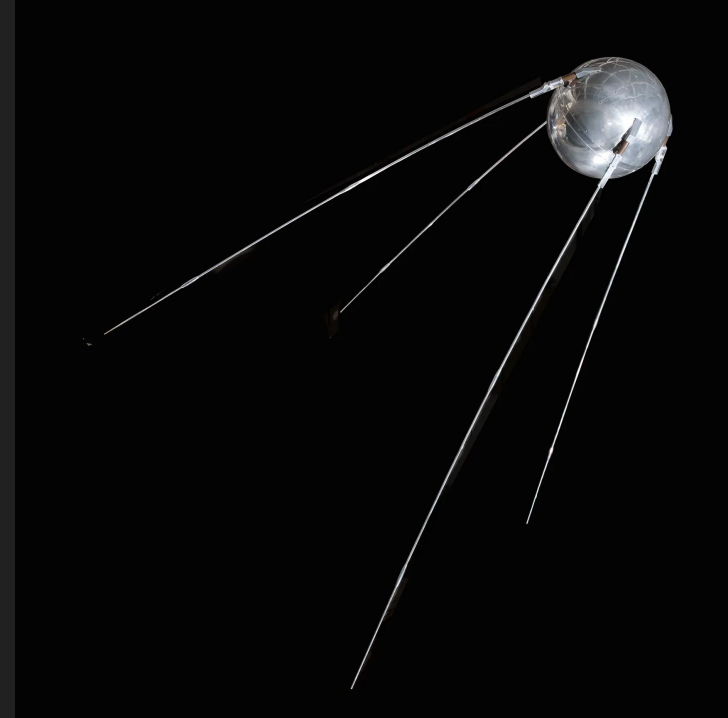


Image credit: Smithsonian Institution

# Sputnik 2: Laika is the First Living Being to Orbit Earth

- 1 month later, the Soviet Union launched Sputnik 2 into orbit
- It carried a dog named Laika who became the first living being to orbit Earth



Image credit: Sputnik / Alamy

# Explorer 1: First American Object to Orbit Earth

- At the same time, US military programs were also experimenting with space flight
- 4 months after the success of Sputnik 1, the US successfully launched Explorer 1 into orbit
- It transmitted data for four months, even giving information to help us learn about the atmosphere and the Van Allen radiation belt



Image credit: NASA

# Explorer 1: First American Object to Orbit Earth

- Explorer 1 stayed in orbit for 12 years before falling back down to Earth
- Later that year in 1958, NASA was established by Congress



Image credit: NASA

# Yuri Gagarin: First Human in Space

- In 1961, Yuri Gagarin became the first human in space and in Earth orbit
- He orbited for 108 minutes and landed using a parachute

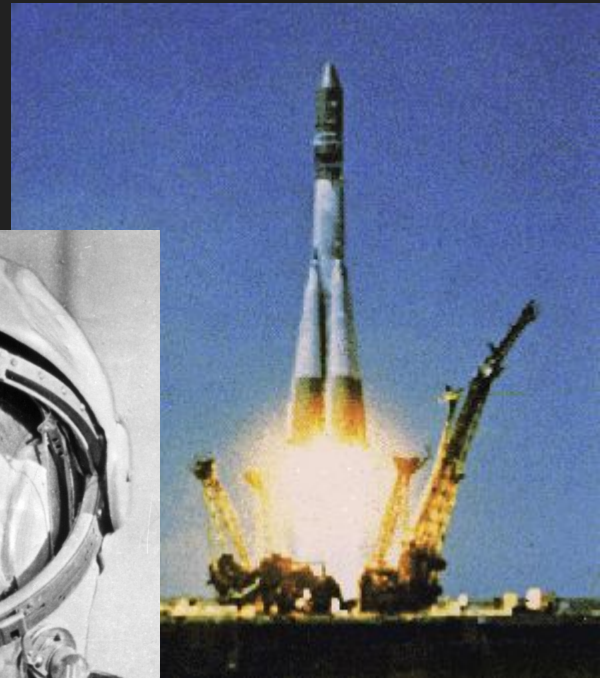
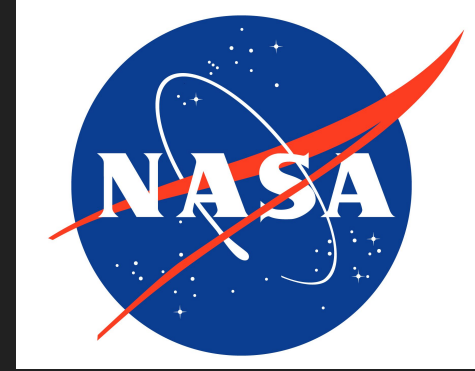


Image credit: Sovfoto/Universal Images  
Group via Getty Images



# NASA's Mission to Space: Project Mercury

- NASA was founded in 1958, taking over all space flight operations from the military to combat Soviet success
- Project Mercury was the first US human spaceflight program
  - It recruited 7 military test pilots who became known as the Mercury 7 and they were the first astronauts
  - They completed 20 unmanned flights and 6 manned flights



# NASA's Mission to Space: Project Mercury

- The first astronaut, Alan Shepard, accomplished the first US suborbital flight which lasted 15 minutes
- John Glenn completed the first US orbital flight that lasted 5 hours and orbited the Earth 3 times
- Gus Grissom, Malcolm Carpenter, Wally Schirra, and Gordon Cooper completed other suborbital and orbital space flights as a part of the Mercury program from 1961 to 1963
- They even tested flights with a chimpanzee named Ham



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Freedom 7



Liberty Bell 7



Friendship 7



Aurora 7



Sigma 7



Faith 7



# NASA's Mission to Space: Project Gemini



- Gemini was the second stage of NASA's human spaceflight program
- Each flight included two astronauts
- They completed ten missions
- They completed missions such as:
  - The first American space walk (beaten by USSR by four months)
  - Gemini IV
  - A two week flight and a space rendezvous Gemini VI and VII
  - First docking mission with another vehicle (resulted in first emergency landing)
  - Gemini VIII







# Next Week: To the Moon

We go through the missions and technology  
that got us to the Moon

