Science & Technology Facilities Council

THE MOON

The Moon is the Earth's largest natural satellite and is the brightest object in the night sky after the Sun. It is the only place in the Solar System, other than Earth, that humans have visited.

The anatomy of the Moon

The Moon is about one quarter the diameter of the Earth. This makes it one of the biggest moons in the Solar System and the biggest compared to its host planet.

The Moon is about 384,000 km from the Earth and is slowly moving further away (about 3.8 cm a year). When it was first formed it was only 23,000 km away.

Although it is difficult to see when you look up at the Moon, the lunar surface is actually full of interesting features. It is covered with craters created by millions of years of impacts with meteorites, asteroids and comets.

The lighter coloured areas are the lunar highlands, called terrae (which means 'land' in latin) and the dark areas are relatively flat plains, called maria (which means 'sea'), that are actually ancient flows of lava.

The Moon does have an atmosphere but it is very thin – more than a million million times less dense than the Earth's. This means that the footprints left behind by the Apollo astronauts could last for millions of years!

The Moon only has about 1% of the Earth's mass and its gravity is only 0.17G (Earth's is 1G). This means that astronauts weigh a lot less on the Moon than they do on Earth.

Apollo landing sites

Moon images: NASA

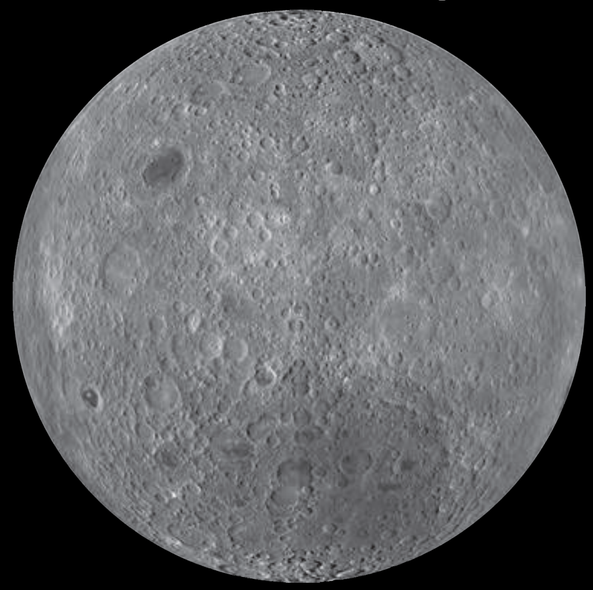
After billions of years of being pummeled by meteorites and asteroids, the lunar surface is covered in a fine-grained layer of dust called regolith, which can be up to 20 metres thick.

The highest mountain on the Moon, Mons Huygens, is 5.5km high!

Lunar phases

The hidden side of the Moon

The Moon takes 27.3 days to revolve once – the same amount of time it takes for the Moon to orbit the Earth. This is why we only ever see one side of the Moon. Spacecraft have seen its hidden side and it looks very different to the Moon we are used to seeing!



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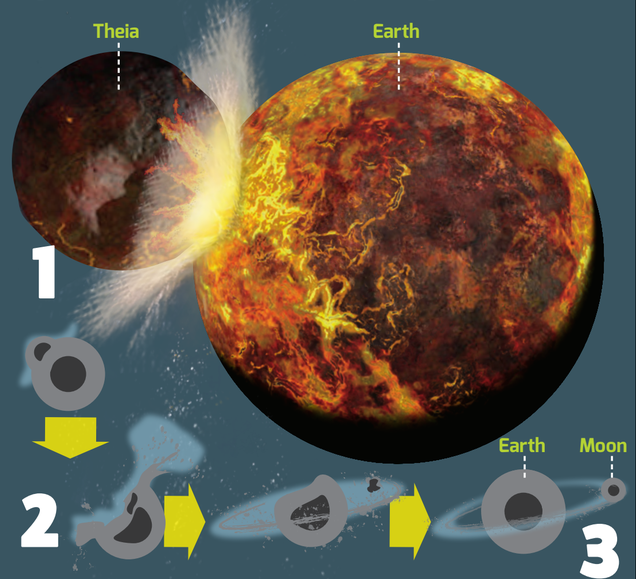
How the Moon was formed

Scientists think that the Moon was formed during a giant collision about 4.5 billion years ago.

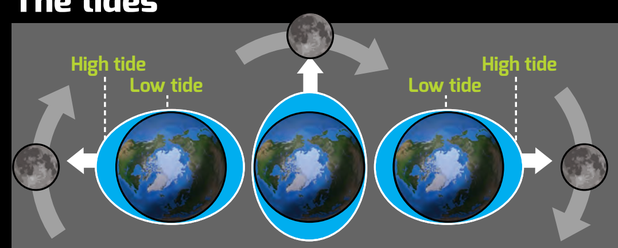


1. About 4.5 billion years ago (when the Earth was just 100 million years old), a protoplanet the size of Mars, known as Theia, smashed into the Earth.

2. The collision threw lots of rock from both the Earth and Theia into space.

3. Over time, the orbiting material came together to form the Moon.

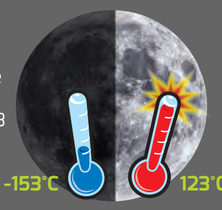
The tides



As the Moon orbits the Earth, its gravity causes the Earth's oceans to bulge toward it. This is what we call the tides.

Extreme temperatures

The moon takes 27 days to rotate once on its axis. So most places on the surface of experiences about 13 days of sunlight, 13 days of darkness and one day of twilight.

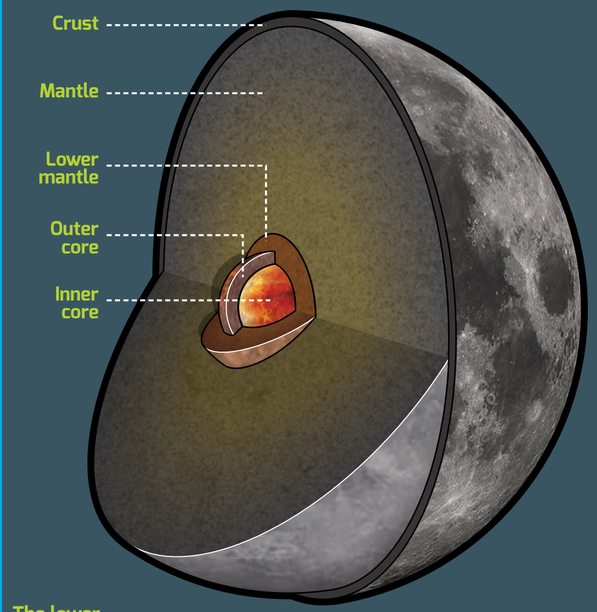


Its thin atmosphere means that temperatures vary wildly between the dark and light sides.

What is inside the Moon?

The crust is about 50 km thick *(in some places it is much thinner, or thicker)* and is made up of a mixture of oxygen, silicon, magnesium, iron, and other minerals.

The mantle is made of solid rock and is about 1,400 km thick.



The lower mantle is partly melted and is about 150 km thick.

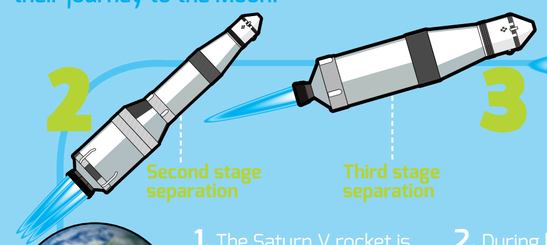
The outer core is liquid and made of mostly iron. It is about 650 km in diameter.

The inner core is a solid ball of iron about 480 km wide. Its temperature is about 1400°C.

Visiting the Moon

Only 12 people have walked on the Moon.

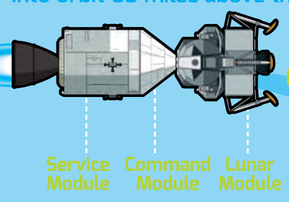
On July 16, 1969 a giant Saturn V rocket blasted off – carrying Apollo 11 and three astronauts on their journey to the Moon.



1. The Saturn V rocket is still the biggest and most powerful rocket ever built. It was 111 metres tall (taller than a 30-storey building). It had three rocket stages.

2. During launch, it jettisoned each stage to shed weight. Each stage pushed the rocket further into space.

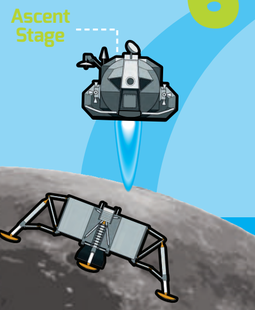
Three days later, the Apollo 11 Service Module, Command Module and Lunar Module (lander) went into orbit 65 miles above the surface of the Moon.



3. The third stage put the rocket into orbit around the Earth and then pushed it towards the Moon.

4. A rocket in the Service Module put the craft into orbit around the Moon.

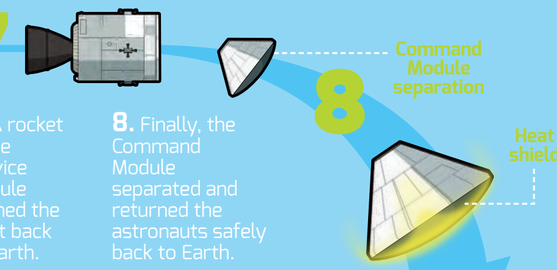
The next day, astronaut Neil Armstrong piloted the Lunar Module onto the lunar surface. He and Edwin "Buzz" Aldrin became the first people to set foot on another world.



5. The Lunar Module carried two astronauts onto the Moon's surface. One astronaut stayed behind in the Command Module.

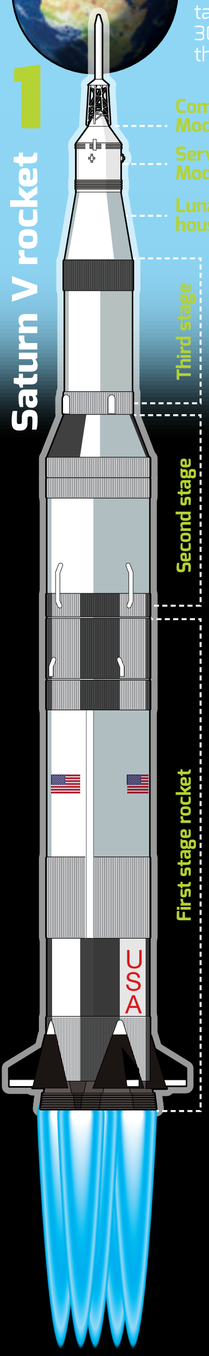
6. At the end of the mission, the Ascent stage separated and rocketed the astronauts back into Lunar orbit.

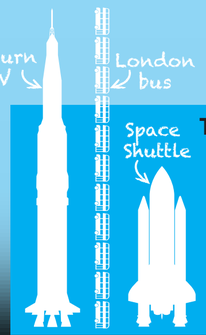
Between 1968 and 1972, nine Apollo missions visited the Moon. Six of those missions landed – performing experiments and collected samples of lunar material.



7. A rocket in the Service Module pushed the craft back to Earth.

8. Finally, the Command Module separated and returned the astronauts safely back to Earth.

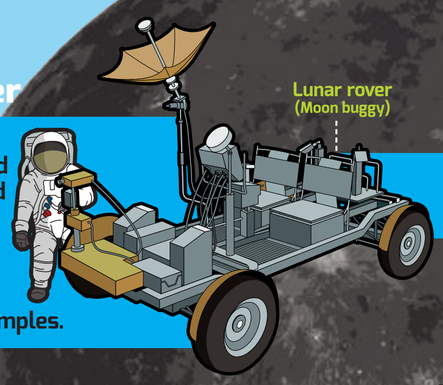




The Saturn V rocket was twice as tall as the Space Shuttle.

Lunar rover

Apollo 15, 16, and 17 astronauts used a battery-powered rover to explore the surface. It could carry two astronauts, their equipment and samples.



In total, the rovers travelled 90 km across the lunar surface.

The flags planted on the Moon by Apollo astronauts have probably been bleached white by the Sun's radiation.

The Moon visits us

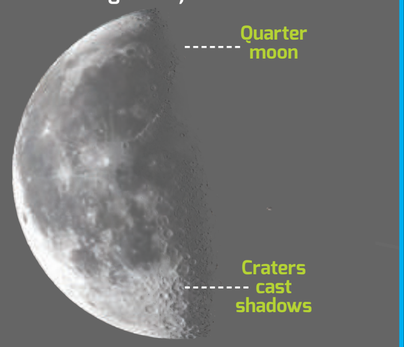
The Apollo missions brought back 382 kilograms of lunar rocks, core samples, pebbles, sand and dust from the lunar surface.

The samples have been used to study the early history of the Moon, the Earth, and the inner Solar System.

The STFC runs the UK's only 'Lunar Loans' scheme, which allows schools and scientific organisations to borrow samples of the Lunar material brought back by the Apollo astronauts.

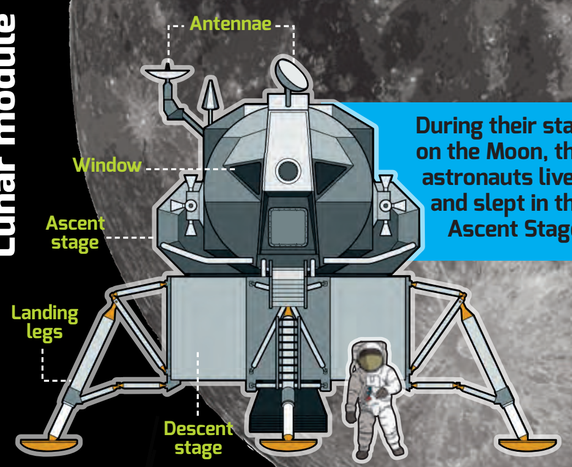
Look at the Moon

You don't need to visit the Moon to enjoy it and you don't need a telescope either!
You can see lots of interesting features with the naked eye or a pair of binoculars. You can easily see the dark and light patches, which are the lunar 'seas' and highlands. You might even be able to see the giant Tycho crater.



The worst time to look at the Moon is during a full Moon when sunlight hits the surface straight on, which bleaches out the features. The best time is during the first or last quarter when sunlight hits the surface from the side, which casts shadows that highlight the Moon's features.

Lunar module



During their stay on the Moon, the astronauts lived and slept in the Ascent Stage.

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Lunar spacesuit

This picture of "Buzz" Aldrin was taken by Neil Armstrong (if you look carefully, you can see Neil's reflection in Buzz's visor)

Will we go back?

The last time a human set foot on the Moon was in 1972. Today, a number of countries have plans to not only send astronauts back to the Moon but also set up permanent bases in next few of decades.

Here, astronauts will be able to live, conduct scientific research and even mine for minerals and raw materials for space exploration and industry back on Earth.

It is hoped that these lunar settlements will be able to test the technology that will eventually allow us to set up a permanent manned colony on Mars!

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