One giant leap for mankind

First steps on the Moon
Next 21st July, at 4:56 am Central European Time, it will be exactly 50 years since the first, momentous, landing of human beings on the Moon. Let's go back to 1969 to relive those moments together. It was 9:32 am on 16th July 1969 when the 5 engines of the Saturn V rocket were ignited at the Kennedy Space Center. The launch vehicle lifted off from the launch pad and after 11 minutes and 49 seconds it reached its “parking” orbit 185 km above the Earth’s surface. The voyage that was to take Neil Armstrong, commander of the mission, Michael Collins, pilot of the Columbia Command and Service Module, and Edwin “Buzz” Aldrin, pilot of the Eagle lunar module, to the Moon.

![Image of the Apollo 11 crew](image)

The members of the Apollo 11 crew. From the left: Neil Armstrong, Michael Collins and Edwin “Buzz” Aldrin. Credits: NASA

After remaining in the parking orbit for 2 hours, 44 minutes and 16 seconds to check that all on board systems were operating correctly, the manoeuvre to enter the trajectory towards the moon began. The voyage to reach the Moon took just over 3 days: on 20th July 1969, Apollo 11 entered its orbit. After the moon landing, on 21st July at 02:39:33 UTC, the Lunar Module’s hatch was opened: Neil Armstrong stepped outside and at 02:56:15 UTC (04:56 CET) the first historical contact with the Moon’s surface took place.
Astronaut Edwin E. Aldrin Jr. slowly descends the steps of the "Eagle" Lunar Module and prepares to walk on the Moon. Credits: NASA

Shortly after Armstrong had disembarked, Edwin "Buzz" Aldrin also stepped onto the Moon and they both laboriously drove the United States flag into the surface. They took photographs, shot films and collected samples of approximately 22 kilos of rock and dust. They returned to the Lunar Module after 2 hours and 31 minutes and, after 21 hours and 36 minutes, Armstrong and Aldrin lifted off in the separable upper section of the lunar module, equipped with engines, to return to Michael Collins, who was waiting for them in orbit.

Image of astronaut Buzz Aldrin's footprint on the moon's surface. Credits: NASA

The commander of the Apollo 11 space mission was the first human being to set foot on the Moon. How long must he have pondered the words to say on such a solemn and memorable occasion! Armstrong, who was a pilot and engineer,
certainly not greatly inclined towards poetical inspiration, expressed himself with the enthusiasm of an explorer: "That's one small step for [a] man, one giant leap for mankind!". That night, 600 million people watched the worldwide live TV transmission with bated breath. In the United States, Monday 21st July 1969 was transformed from Monday to Moonday, the day on which a human being set foot for the first time on another celestial body.

Thanks to the apolloinrealttime.org project, we will be able to relive the 9 days of the Apollo 11 mission minute by minute, as if from Mission Control with the possibility of moving from one control post to another. Additionally, it will be possible to find images, films, television transmissions and much more. In the days of the anniversary, starting from 16th July, by clicking on the start button, we will be taken back in time to 1969, to relive those historical moments from 50 years ago.

Conquering the Moon II
Six more missions followed Apollo 11, even though Apollo 13 did not allow the astronauts to land on the Moon due to an explosion on board the command module's service module. Apollo 17, the last lunar mission, left the Moon in 1972. Since then, no man has set foot on our satellite, but new missions are planned over the coming years, including a return of manned missions to the Moon. In fact, NASA is planning a mission to take human beings back to the Moon by 2024. This mission is called the Lunar Orbital Platform-Gateway (LOP-G), or more briefly Lunar Gateway, a modular space station that will orbit around the Earth's satellite. Like the International Space Station, the Lunar Gateway will be built and used by more than one nation, an authentic partnership at global level which will make it possible to divide the enormous costs as well as sharing knowledge and means in the aerospace sector. It is a collective effort required to conquer such an arduous goal: the first human outpost outside the Earth’s orbit.

Margaret Hamilton and the computer that took us to the Moon
When talking about the Apollo 11 mission, great importance is given to the technology used to accomplish a feat of this magnitude. Computers, both on board the space vehicle and on the Earth, effectively played an essential role in the moon landing. The software employed in the Apollo Guidance Computer (AGC), the famous computer used both in the Command Module and in the LEM (Lunar Excursion Module), the two separate parts of Apollo 11, attracted much less attention. It was written by a team at the Massachusetts Institute of Technology (MIT) Instrumentation Lab (now the Draper Laboratory), headed by Margaret Hamilton.

In the photo - the most famous one portraying Margaret – shows her standing next to a pile of volumes as tall as she is: they were the printed listings of each individual line of the software. In those years, software was frequently developed by women, since it was a specialisation thought to be less important. Yet without the meticulous work of this woman scientist, the mission might have ended very differently. Just a few minutes prior to touchdown by the lander, in fact, several alarms were triggered due to the unexpected (and at that time unnecessary) activation of the radar for rendezvous of the LEM with the command module. The radar began sending the computer an enormous quantity of data, overloading it and preventing the calculations required to guarantee the moon landing. Fortunately, Margaret Hamilton had foreseen this possibility by programming the software so as to make it able to "sort" and organise the tasks assigned: the most important processes, essential for the Moon landing, were able to interrupt any unnecessary ones.

On 16th November 2016, the then outgoing President of the United States, Barack Obama awarded Margaret the Presidential Medal of Freedom, one of the highest civilian honours in the United States. The honour is given to those who have made "an especially meritorious contribution to the security or national interests of the United States, world peace, cultural or other significant public or private endeavors".

Curious lunar facts

- The Apollo Guidance Computer (AGC) already seemed outdated 10 years later. In fact, a 1981 IBM 8088 PC had a memory 8 times larger, with no less than 16 Kbytes against the 2 Kbytes available to the AGC. At the ground control, calculations were entrusted to an IBM System/360 Model 75s, as large as an automobile and costing an exorbitant amount, no less than 3.5 million dollars. Nowadays, an iPhone Xs is around 200 million times faster.

- Developing computers and software like those that took men onto the Moon was particularly laborious. It is enough to think that the on-board computer used what was called Core Rope Memory, a kind of ROM (Read Only Memory), composed of plaited cables with particular components in metal that memorised the binary code. If the cable went through the metal component, it represented a "1"; if, on the contrary, it went around the metal, it represented a "0". The extraordinary fact is that this system was assembled manually by women nicknamed "Little Old Ladies".
• On the Moon, the temperature in the sunlight at midday is around 120°C, while during the lunar night it can be as low as -170°C. However, the Apollo 11 astronauts experienced temperatures between 5°C and -100°C.

• To leave behind the Earth’s gravitational field, it was necessary to reach a speed of 39 thousand Kmh.

• In most of the photos taken during the moon landing, no stars can be seen in the dark sky of the Moon because of problems caused by exposition required to take the photos.

• The astronauts’ moon suits were made up of a series of layers of differing materials. The principle materials were: a layer of nylon, one of neoprene (a material used for underwater wetsuits) and lastly another layer of nylon. These were covered by five layers of aluminised Mylar and four of Dacron, as well as two layers of Kapton and two of Teflon.

• When the Apollo 11 mission returned to Earth, the three astronauts were put into quarantine for three weeks to make sure that they had not been "contaminated" by alien bacteria.

The crew of Apollo 11 in quarantine meet President Richard Nixon on board the USS Hornet. Credits: NASA

• On the Moon, Armstrong and Aldrin ate hot dogs, bacon, canned peaches, biscuits and hot coffee. The astronauts, to urinate, had a little hose that sucked up the liquid and released it into space. For faeces, on the contrary, they used a kind of cylindrical bag taped to their buttocks.

• The late Michael Jackson’s famous walk is known as the “Moonwalk”, because it consists of moving backwards while giving the impression of walking forward as if in absence of gravity.

"Here man completed his first explorations of the Moon, December 1972, A.D. May the spirit of peace in which we came be reflected in the lives of all mankind."
Commander Eugene Cernan, 1972

By Benedetta Palazzo