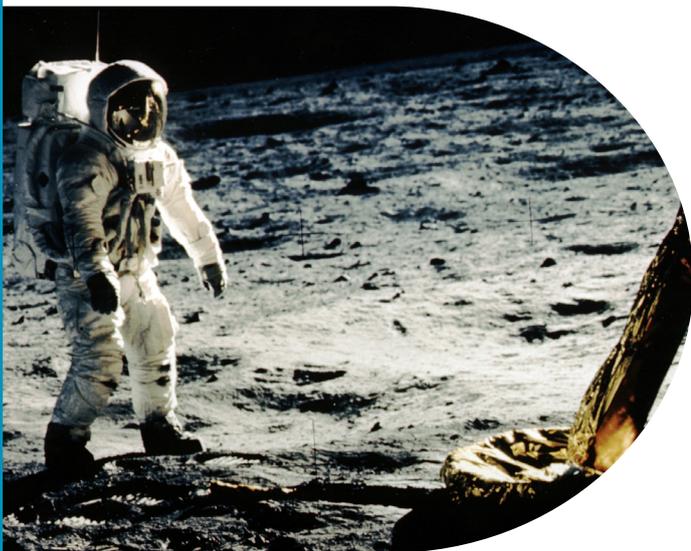


*The first moon landing, 20 July 1969 (credit: NASA)*



## TO BOLDLY GO

Platinum was part of the pioneering technology that paved the way for the first moon landings

This year is the 50th anniversary of the first manned mission to land on the moon. On 20 July 1969, Neil Armstrong and Edwin 'Buzz' Aldrin became the first humans to walk on the moon as part of NASA's Apollo 11 mission.

The success of Apollo 11 was the result of many years of intense effort by NASA to fulfil the ambition of US President John F. Kennedy - stated in 1961 - to put a man on the moon by 'the end of the decade'.

In the early 1960s, NASA had only limited experience of space, so it developed the Gemini spaceflight programme to help it prepare for the moonlandings.

The two-astronaut Gemini spacecraft flew ten missions between 1965 and 1966, pioneering key technology and procedures that were essential in order for Kennedy's goal to be achieved.

As a result of the Gemini missions, NASA accomplished feats such as how to dock a spacecraft in space and a spacewalk, whereby an astronaut was capable of actually venturing out of a spacecraft using a specially-designed space suit.

### Fuel cell technology and beyond

A key part of the new technology developed by the Gemini programme was the use of fuel cells as a power source.

The Gemini fuel cell used liquid oxygen and liquid hydrogen to generate electricity, with heat and drinkable water as by-products that provided critical additional benefits.

Molecules of hydrogen and oxygen reacted and combined using a proton exchange membrane (PEM) which was coated with a platinum catalyst - the same technology that is used in today's platinum PEM fuel cells.



*Fuel cells from space shuttle Atlantis (credit: NASA/Jim Grossmann)*

Platinum is especially suited as a fuel cell catalyst as it enables the hydrogen and oxygen reactions to take place at an optimal rate, and it is stable enough to withstand the complex chemical environment within a fuel cell, performing efficiently over the long-term.

Although platinum was not used in the type of fuel cell used during the Apollo missions (the lower-efficiency nickel unit was lighter), its role in space travel extended beyond the Gemini missions.

Due to its purity, and to minimise the risk of contamination, platinum foil was used during the Apollo missions as a device to collect samples of particles in the solar wind, which were then brought back to earth for analysis.

A platinum catalyst was also used later in the Space Shuttle, the first-ever reusable spacecraft that NASA developed and operated between 1972 and 2011. Here it powered the orbiter's three fuel cells.

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