MOONS OF THE SOLAR SYSTEM
The Moon

Narrator
Earth's Moon is the largest object in our night sky. It seems so close, but landing on it required a fantastic feat of technology.

Dr Emily Baldwin
I wasn't alive during the Apollo era, but I still find it really inspirational that we managed to get men to the Moon in such a short timeframe

Dr Phil Bland
We would have really great difficulty doing that today, so to make that happen in the sixties was astonishing.

Dr Mahesh Anand
This was the first time that actually human beings went outside the Earth's gravitational field, landed onto another alien land, and not only they landed, actually they successfully returned to the Earth, which makes it all so remarkable.

Narrator
Apart from being the greatest show on Earth, the Apollo missions also became the most important scientific field trips in history.

Narrator
The astronauts brought back nearly 400 kilograms of moon rocks, which are still being analysed by scientists today.

Dr Mahesh Anand
It's absolutely fantastic to be able to work on the samples that were collected by Apollo astronauts some forty odd years ago. I'm so privileged to be able to study these samples and to be able to understand the science about the Moon and use that to understand the science about our own Earth.

Dr Ian Crawford
Our knowledge of the early history of the Moon, the origin of the Moon, even the early history of the Solar system, would be incomparably poorer had the Apollo missions not taken place and had we not had these samples to study.

Dr Emily Baldwin
At a very basic level, the types of rocks the Apollo astronauts picked up were extremely old, much older than the rocks that we had on the surface of Earth. In sort of two broad categories of rock really there's the sort of basaltic lava type rocks, which correspond to the grey mare regions that you see on the Moon and then the lighter highlands correspond to another type of rock which were much older, around 4.6 billion years old. That's around the same age as the Solar system itself, and so we're sampling first hand the very sort of first breaths of the Solar system, if you like.

Dr Ian Crawford
The Moon is as old as the Earth but it being a smaller planetary body its own internal geological activity shut down billions of years ago and scientifically this is its great importance because it preserves a record of the activities early on in Solar system history.

Narrator
Apollo samples helped to solve one of the biggest questions in science….. How did the moon come into existence??

Dr Mahesh Anand
One striking observation was made that rocks from the Moon and the Earth shared many common features and those common chemical signatures could only be explained if the Earth and the Moon actually shared a common genetic history.

Dr Phil Bland
Prior to Apollo there were half a dozen different theories about how the Moon had formed. The samples that the astronauts brought back really binned ninety percent of those, so we are able to focus on just one idea.

Dr Emily Baldwin
Very early on in the history of the Solar system, probably when the Earth wasn't even quite formed itself an object about the size of Mars is thought to have slammed into the Earth, sending out all this debris into near Earth orbit, and over time, a very short period of time, these blocks of the Earth and the original impactor coalesced together to form the Moon that we know today.

Dr Ian Crawford
The origin of the Moon is clearly tied in to the origin of the Earth and the Earth is a planet we live on, so really the Earth Moon system has to be seen as a unit and our understanding of the origin of the Earth Moon system as a kind of double planet will also add to our understanding of the earliest history of the Earth and the habitability of the Earth.

Narrator
Disappointingly though, early studies of the samples showed one distinct difference between the Earth and its satellite.

Dr Phil Bland
Basically every rock on Earth, even rocks that have been melted, contain quite a lot of water and the Moon rocks didn't, so this led to the idea that essentially the Moon was bone dry and that that maybe happened during this giant impact, that all the water got cooked off.

Dr Mahesh Anand
The majority of the scientists working on this topic came to the conclusion that the lunar surface was completely dry, was devoid of any water and was too hostile to support any life.

Dr Phil Bland
One of the great benefits of having samples on Earth is that we've got that material here in labs and we can analyse it continuously and the technology that we have got available now is far far in advance of what was available when those rocks were first brought back.

Dr Mahesh Anand
My work is to actually look at these volcanic rocks from the Moon and try to assess if they contain any significant quantities of water and then try to figure out how much water is present and then find out where this water has come from.

Dr Emily Baldwin
Scientists who have examined tiny melt inclusions, trapped inside these basaltic rocks that have been erupted to the surface of the Moon, are actually telling us that the Moon's interior had a particularly wet past.

Dr Phil Bland
You've got lunar volcanic rocks that contain significant amounts of water inside and that tells us that deep, deep down the Moon has still got quite a lot of water in it, so it must have been preserved even after the impact and that got wrapped up in the Moon's interior.
Clip

Narrator
Apollo left the Moon's surface in December 1972, since then no human has returned.

Dr Ian Crawford
The Moon has the surface area of the continent of Africa, actually a bit more than that, so the question is, would you say you'd explored the continent of Africa if you'd had six teams, of two people each, with a tent each and you parachuted them in to six parts of the Continent of Africa and the longest they'd stayed hanging around their tent was three days . . . and the answer is no.
You wouldn't have scraped the surface of exploring Africa and so that's the situation we're in with the Moon.

Dr Mahesh Anand
We have to explore other areas of the Moon in order to fully understand its own origin and we shouldn't forget that understanding the Moon itself is going to tell us a lot about our own Earth and then we can extrapolate from that information the entire history of the Solar system