How we reached the Moon Mankind's incredible achievement

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4 June 2009

We have watched the Moon for thousands of years. We have watched it through telescopes for 400 years. We have explored it with spacecraft for a bit over forty years, and for four short years, from December 1968 to December 1972, we explored it in person. Apollo 11 landed on a Sunday evening, July 20th 1969, and today I am going to tell the story of how we reached the Moon.

What is difficult about this is knowing where to start, so the point that I have chosen is the launch of the world's first liquid fuelled rocket, which took place on March 16th, 1926, in Massachusetts, when Robert Goddard launched his rocket. The flight lasted just a few seconds, but the rocket travelled 184 feet. You may not that is a terribly great distance, but it is 50% greater than the distance achieved by the Wright Brothers on their first flight, so it is quite respectable. Therefore, as well as Baikonur, Woomera, Cape Canaveral, Vandenberg and Kourou, we should also list in our collection of famous rocket launching places the site of Robert Goddard's Aunt Effie's strawberry farm in Auburn, Massachusetts.

After the War, America had several captured V2 rockets, as well as several captured V2 scientists, including Wernher von Braun, and they were set to work in teaching Americans all about rocketry.

Ultimately, what America wanted to do was to put a satellite into orbit, but they were beaten by the Russians. On October 4th, 1957, the Russians launched Sputnik 1, weighing 184 pounds, compared to the 23 pounds of the planned American satellite. This was a monster and showed a major lead in booster technology.

But if 184 pounds was impressive, America was stunned by the next launch, because Sputnik 2 weighed a quarter of a ton. The reason for its heavy weight was that it carried the first living being in space, Laika, a dog. The name actually translates from the Russian as 'barker' because that was exactly what she was, she picked up off the streets of Moscow a couple of weeks before the flight.

Meanwhile, America was planning their launch on a Vanguard rocket. They launched it in front of a live TV audience of millions in December 1957, but it rather backfired on them when it crashed ingloriously.

In April 1961, Russia surged ahead again, with the launch of the first man into space, Yuri Alekseyevich Gagarin, and again, America was stunned. But they were doing things themselves. They had their team of astronauts, the original seven, as they will forever be known. They were planning to fly in the one-man Mercury spacecraft, but they did not, at that time, have a rocket that would put their astronauts into orbit. The Atlas rocket was still a year away from flying the Mercury spacecraft. In the meantime, they had the Redstone, a direct descendent of the VS. On the 5th May, 1961, with the Mercury spacecraft on top, it made Alan Shepherd the first American in space, but, as I said, it did not orbit the Earth. His craft simply went up into space and came down again on a ballistic trajectory, splashing down in the Atlantic. Another difference between this flight and Gagarin's was that this was shown live on TV, and it even had the likes of President Kennedy and his wife watching it on TV in the White House, along with Lyndon Johnson and Bobby Kennedy.

As a result of the success of this, Kennedy wrote to Johnson, who was nominally in charge of the space programme, asking what could be achieved that would show them clearly to be ahead of the Russians. He asked if they could send a man around the Moon, if they could put up a space station, and if they could land a man on the Moon. The reply back from the studies was that a target which would be achievable within a reasonably short timescale would in fact be to put a man on the Moon, and this is the challenge that Kennedy laid down before Congress twenty days later with the following words: 'achieving the goal,

before this decade is out, of landing a man on the Moon and returning him safely to the Earth. No single space project in this period will be more impressive to mankind or more important for the long range exploration of space.'

Nearly a year later, at the dedication of the manned space centre in Houston, Kennedy expanded on the theme, responding to the question of why America should go to the Moon:

'We choose to go to the Moon in this decade and do the other things, not because they are easy but because they are hard, because that goal will serve to organise and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone, and one we intend to win - and the others too.'

So they would go to the Moon, he said, not because it was easy, but because it was hard, because we would learn things in carrying out this project.

The next stage was the launch into orbit using the more powerful Atlas rocket. On February 20th 1962, John Glenn became the first American to orbit the Earth. The Mercury programme was designed to show that man can function in space and can also steer a spacecraft.

Having decided to go to the Moon, the next step was a new project called Gemini, named after the heavenly twins, because this spacecraft would carry two astronauts, and the tasks of the Gemini programme were to carry out various actions that would be needed on a Moon mission, including EVA, extra-vehicular activity, working outside the spacecraft, rendezvousing with another craft in space, and docking two crafts together.

At the end of ten manned flights, America was ready to move on to Apollo, but tragedy struck. The first Apollo crew included the commander, Gus Grissom, who had flown the second Mercury flight, and was commander of the first Gemini flight - he would become the first man to fly in space three times on this mission; Ed White, who had made America's first walk in space; and Roger Chaffee, who was going to be making his first flight. On 27th January 1967, the three of them were inside their spacecraft on top of the booster, on the launch pad, carrying out a simulated countdown test, when a fire broke out inside the spacecraft. In the pure oxygen atmosphere inside the craft, the fire took hold in seconds, and within just 15 seconds, the three men were dead from asphyxiation.

This resulted in the complete redesign of Apollo. Anything that could possibly be replaced by something that would not burn was replaced. This even went down to the astronauts' playing cards, which were subsequently made from metal. The result was a much improved and a much safer spacecraft, with a hatch that could be opened in seconds, rather than the original one which took over two minutes.

But another question had to be answered, which was exactly how to get to the Moon. The problem was that, as all the science-fiction stories said, a monster rocket going up from Earth and landing on the Moon and coming back, would require a booster even bigger than the Saturn V which they had planned. This booster called Nova simply would not be ready in time to meet Kennedy's challenge of landing a man on the Moon within the decade.

Another option was Earth Orbit Rendezvous. Two separate parts of the craft would be launched, docked together in Earth orbit, and then sent on to the Moon, but this would require two Saturn V rockets.

Then John Houbolt came up with a third option, called Lunar Orbit Rendezvous, LOR. With this you, effectively, drop off every part of the rocket that you no longer need as you go through the journey. Only part of it goes down to the Moon. Only part of it returns, and that part gets left behind as just the command module returns to Earth. With this, you could do the whole trip just with a single Saturn V rocket. They would launch, and after a parking orbit around the Earth while they checked out the spacecraft, they would carry out the trans-lunar injection, firing an engine to send them off towards the Moon, where they would break to go into orbit around the Moon, and then two of the crew would descend in the lunar module down to the surface, explore the Moon, whilst the third crew member remained in the command module, circling overhead. Then the two men would lift off from the Moon, rejoin the command module, and the three of them would come back to Earth and splash down.

So there was the command module in which the three astronauts fly to and from the Moon. Behind that was the service module, providing power, oxygen, water and so forth, and at the back was the service propulsion system engine, which would break to get them into lunar orbit and also fire to bring them back home. Separately from that is the lunar module, in two sections: the ascent stage includes the cabin where the two astronauts stay, and a hatch at the front for them to crawl out, to climb down the ladder of the

descent stage, to descend to the surface of the Moon.

Inside the spacecraft, the three men sat side-by-side in front of the control panel. Apollo had 566 switches, 71 indicator lights, 15 miles of wiring, which is the equivalent of about 50 houses. This was stacked on top of the lunar module, which was inside four protective booster panels. The Saturn V rocket was 33 feet wide, bigger than a house, and 138 feet tall, as tall as the cross on the top of the dome of St Paul's Cathedral, about 60 feet taller than Big Ben.

From the vehicle assembly building, it was lifted to a vertical position and put onto a mobile launch pad. The second stage was then lowered into place on top. These two had to be transported by huge trailers and by ocean-going barge. The third stage was small enough to be carried by air, but it still needed the largest cargo aircraft in the world.

It would take too long to stack the spacecraft out at the launch pad, with the Florida weather, and so it was put together inside the vehicle assembly building and then driven to the launch pad on the crawler transporter, the world's largest land vehicle. It was made in caterpillar-like parts, each weighing a ton. It has a top speed of one mile an hour, unladen. Fully laden, it can do 0.5 mile an hour, but they actually travel a bit slower than that, just to be on the safe side. It has a 39 page start-up manual, and the process takes 90 minutes. As the craft moves up the slope to the launch pad, the levelling system ensures that the top of the launch escape system is never more than two inches away from the vertical.

Having deposited the Saturn V, the crawler moves back and brings in a mobile service tower, which allows technicians to swarm all over the rocket to check it out prior to launch. At the top of the launch umbilical tower is swing arm number 9 which has at the end what is called the White Room, which is where the crew access the spacecraft.

Saturn V was essentially the brainchild of Wernher von Braun, and despite all that he did for the space programme, there were still people who questioned him. One elderly woman berated him once, saying, 'We should not tamper with the universe!' which is an odd thing to say - it is rather as though she was afraid we were going to break it - but she went on to say, 'We should stay at home, mind our own business, and watch TV, as god intended!'

In the early days of the space programme, von Braun used to say, 'At the moment, all we can tell you about space is that it is bigger than Alaska.' He was a great jokester. One time, he was addressing a conference of bankers in Alabama, and he started off by saying, 'I cannot tell you how grateful I am to be standing here before you today, because in all previous conversations with bankers, I've been on my knees!' His display of rockets inevitably included a figure for scale. Von Braun would tell visitors: 'this is the most important component - the taxpayer, who makes the whole thing possible.'

After Apollo 7, which re-tested the redesigned Apollo spacecraft in orbit around the Earth, the next step in the plan was to try out the lunar module, but the lunar module was not ready, and would not be ready for several months. NASA did not want a hiatus in the programme. There was no point in simply repeating what Apollo 7 had done. So what else could they do?

Well, one of the mission plans included what was labelled as a Deep Space Mission, where, instead of going around the Earth at an altitude of about 150 miles, they would go out 4,000 miles, which seems a huge amount, until you consider that the Earth is 8,000 miles across, and the distance to the Moon is 240,000 miles. So it is not really very far at all.

But George Muller, the Assistant Administrator for Manned Space Flight, came up with a daring plan. Instead of going out 4,000 miles, why not send the next mission all the way to the Moon? This would mean that they could check out the deep space tracking network and their deep space navigation procedures for getting to the Moon and back. They would have close-up views of the proposed landing sites. There would be no delay in the programme and they would learn an awful lot by doing it, and so the decision was made: Apollo 8 would fly to the Moon.

But in order to get there, at the time when the lighting on the lunar surface would give them the best views of the proposed landing sites, that meant that they had to launch at a specific time, allowing for the time taken to fly to the Moon, to arrive there when it was at the right phase. As a result, Apollo 8 took off towards the end of December 1968. Frank Borman, Jim Lovell and Bill Anders arrived at the Moon and circled it ten times on Christmas Eve, and became the first people to see with their own eyes the far side of the Moon, and as they came around and re-acquired contact with Earth, they could see the Earth rising above the lunar horizon.

The flight was a tremendous success, and the next step, with Apollo 9, was to fly the lunar module. This was the first spacecraft that would be flown without any streamlining, because it was not designed to fly within an atmosphere. As a result, the astronauts inside it would have no way to return to Earth if they were unable to re-dock with the command module.

At the bottom of three of the four legs of the lunar module there is a probe. These are designed to touch the surface of the Moon and cause a light to come on on the control panel inside, indicating surface contact, at which point the astronauts would cut the engine. Originally, there were to be four probes, but the one on the front leg was removed so that it would not bend upwards on landing and potentially foul the exit down the ladder for the astronauts.

The lunar module had the one hatchway through which the astronauts would get down on their hands and knees and back out, crawling backwards, onto the ladder. There were the two triangular windows where the astronauts look out from their standing positions down onto the Moon. Originally, there were going to be seats, but to save weight, they were taken out. In fact, it was realised that by standing up, the astronauts would be much closer to the controls, and it would also allow them to look down because the windows are actually canted forward, so they would be able to see the surface. The lunar module was contained within four panels which had explosive bolts that would open them outwards once they were out in space on the way to the Moon.

So, in March 1969, Apollo 9 took off, and now they needed two spacecraft names, because once the craft had separated, if mission control called to Apollo 9, it was not clear whether they meant the command module or the lunar module. So the astronauts gave the crafts two names: the spidery looking lunar module was naturally called Spider; and the command module came to be known as Gumdrop.

Once in space, they flew the lunar module, firing the engines to simulate the landing on the Moon and flying 100 miles away from the command module. Then, they separated the two parts, firing the ascent engine stage, simulating the lift-off from the Moon, and came back to rejoin Gumdrop. It was pretty much a perfect mission.

The next thing was to do the same thing, but in orbit around the Moon and not the Earth. This was the mission for Apollo 10, which was crewed by Gene Cernan, who would later command Apollo 17 and become the last man to walk on the Moon, Tom Stafford, and John Young, who would go on to command Apollo 16 and then fly four space shuttle missions.

As they were going to swoop down close to the surface of the Moon, they decided to call their lunar module Snoopy - it was going to snoop around the surface - which meant of course that the command module had to be Charlie Brown. This was actually quite an appropriate choice, because Snoopy was the space programme's safety mascot, and Snoopy was there to greet the astronauts as they went on their way out to launch.

'So, why didn't they land?' you may asked. Well, the simple answer was that actually that lunar module weighed too much to safely land on the Moon. But why didn't they just swap them over? Well, they could have done. They could have rolled the Saturn V back into the assembly building, taken off the lunar module and replaced it with a lighter one, but that would have meant a delay to the mission, and in any case, there were various things that NASA wanted to have refined before they went for a landing.

One of them was the so-called the Mas Concentrations. As Apollo 8 orbited the Moon, it was found that its orbit was being perturbed; it was not following the flight plan exactly, and it was realised that this was due to great concentrations of mass below the lunar surface that was affecting its orbit. They needed more information about this before they would go for a landing, and that is what one of the objects of Apollo 10, which splashed down in May 1969, leaving everything ready for Apollo 11.

Most people haven't seen the original version of the Apollo 11 patch, which had an eagle carrying a olive branch in its beak. The Eagle was traced by Mike Collins, who was the command module pilot, from a page of National Geographic, and he showed it carrying an olive branch in its beak down to the surface of the Moon. It did not have the crew's names as it was a deliberate decision by them as it showed that Apollo 11 was the whole of NASA and, in a sense, the whole of mankind going to the Moon, and not just three men. So the design went off to Washington for approval, but it was rejected. The eagle, they said, looked far too menacing with its outstretched claws, so Mike Collins simply moved the olive branch from the beak to the claws, and the eagle carried the olive branch down to the Moon. NASA were happy with that, Mike Collins was not. He certainly did not want to be involved in any craft that was coming down with its landing gear fouled up, but this was the patch that was worn.

The crew of Apollo 11 were: Neil Armstrong, the commander, a civilian; Edwin Aldrin, known as Buzz, because when he was young, his younger sister referred to him as her 'buzzer' instead of her 'brother' - later on, he legally changed his name to Buzz; and Michael Collins, the command module pilot, who, whilst the other two were down on the surface of the Moon, as he went around the far side of the Moon, he would become the first person to be totally alone out of sight of the Earth.

At a press conference a few days before the launch, they had a air-conditioning unit around them which is blowing air from behind them forward towards the audience of journalists. The idea of this was that this would prevent them receiving any potential germs that the journalists might have that would infect them and cause them to fall ill during the mission. The astronauts' doctor even turned down a request for a meal at the White House for them. He said, 'If either of them just so much as sneezed on the Moon, everyone would say it was because they had dinner with the President.'

The Apollo 11 was power by the F1 engines of the Saturn V, each of which is 14 feet across, which is bigger than the command module itself. They burn two tons of fuel every second, each. Charles Lindberg calculated that, in the first few seconds of flight, they will burn more fuel than he used in getting all the way across the Atlantic. Apollo 11 has over two million working parts in the command module alone. In the firing room when the mission left on July 16th 1969, there are 456 monitoring positions, and a further 5,000 people were needed in order to get Saturn V off the ground. As it lifted off accelerating to a velocity of 2,195 feet per second, the people at the viewing stance, 3.5 miles away, initially heard nothing. It takes 15 seconds for the sound of the engines to reach you that far away, so the thing is off the ground and already flying before anyone actually heard the roar from the engines.

After about two minutes, the first stage has used up its fuel, it separates, and falls away. Then the engines on the second stage ignite, but unlike the huge flames from the first stage, the flame from the second and third stages cannot be seen. The engines burn liquid oxygen and liquid hydrogen, with a flame so pure that it is invisible.

Then, finally, inter-stage falls away and the third stage fires again to send the spacecraft out to the Moon. Once on route, they jettison the panels surrounding the lunar module, turn the command module round, and dock and pull it clear. They back off and continue to go off for the next 2.5 days, away from Earth, to the Moon.

Firing the engines of the service module, they slow down to go into orbit, 69 miles above the surface of the Moon. The joke in the simulator was 'Watch out for the 70 mile high mountain on the far side!'

There were five possible landing sites that had been picked out by NASA. Apollo 11 was due to land at Landing Site Number 2, in the Sea of Tranquillity. In order to find out more about the landing sites, they had sent unmanned spacecraft to photograph them in detail. For this purpose, the Ranger 7 spacecraft was designed to crash into the Moon, taking photographs all the way down to the surface. Through these pictures, we found, as we got closer to the Moon, that we did not run out of craters. We just managed to see smaller and smaller craters, right down to the surface.

Well, with the eagle on the mission patch, the crew had named their lunar module Eagle, and the command module was named Columbia, the symbol of America. As they fire the engine on the lunar module, the command module slowed down and eventually will tilt the spacecraft over so that it is travelling almost horizontally and just above the surface. In all of the rehearsals, in all of the simulations, every time they touched down on the Moon, they still had at least two minutes' fuel remaining in the craft, but when they did it actually on the moon they landed with only about twenty seconds of fuel left.

Now, according to the flight plan, once Eagle was on the Moon, what they are supposed to do is carry out their checks for a 'stay, no stay' - in other words, they were going to check to see if they should remain there or whether they needed to perform an emergency lift-off. The next thing they were supposed to do is go to sleep, and carry out the EVA sometime the following day, but the two astronauts were just too worked up to go to sleep, so they asked permission to go out early, which is just as well because otherwise I had have missed it as I would have been in the middle of History at school!

So in order to go outside, we had yet another spacecraft, the one-man portable spacecraft that was the EVA suits. On the back of it was the portable life support system, which provided oxygen to the astronauts and took away the carbon dioxide, it included the radio and so forth, and it also included a water circulation unit. The water was pumped round plastic tubes, around an undergarment, and by controlling the temperature of the water, the astronauts could remain comfortable, whether they were in bright sunshine or in the shade.

Apart from not sending a massive spacecraft to the Moon, another thing that the science-fiction writers did not think of was the fact that we would all be watching it live. A dish at Parkes in Australia received the TV transmissions from the Moon. Journalists all the way around the world were covering this, including the BBC's Reg Turnill, who is 94 years old this year.

When Neil Armstrong came out of the Lunar Module, with his EVA suit on, at 3.56 in the morning of July 21st, he gave his famous words: 'that's one small step for man; one giant leap for mankind.' Those of you who have been paying attention to the news will have seen that it has now been accepted that he did accidentally say, 'One small step for man.' What he meant to say was, 'One small step for a man,' a single person, contrasted with a 'giant leap for mankind'. In fact, interestingly, the footprints he left on the Moon, without any wind or rain to disturb them, could last for millions of years.

Later that day, bookmaker William Hill paid out £10,000 to a man who had made a bet years before that man would land on the Moon before the end of 1969.

Inside the Lunar Module, fixed on a bracket looking out of one of the windows was a 16mm film camera, taking one picture every second, and one of the frames shows Armstrong on the surface of the Moon. You can see in the picture that fixed to the chest of his spacesuit is a camera, or I should say 'the' camera, because Armstrong and Aldrin only had one camera on the surface between them. When they were asked about this at a press conference following the flight, Armstrong replied, 'Pretty cheap tourists!'

So the pictures we see is not, as has sometimes been mistakenly reported, the first man descending onto the Moon, because the question is then of who took the photo. In fact, such photographs could only be of the second man descending the ladder. Now, as a word of caution, should you ever have the good fortune to meet Buzz Aldrin, do not make the mistake of saying to him, 'Oh, so you were the second man on the Moon,' because he may well say, as he had done in the past, quite accurately, 'I believe we landed at the same time.' If you press him on the issue about being second to walk on the Moon, you may get the same response that he gave to Bart Sibrel, who questioned whether he had actually done it at all - he punched him!

Another picture you will see quite often, taken by Neil, was of Buzz by the flag they'd put up. You will see in this photo that the flag appears to be waving. However, in fact the flag is not waving at all. Knowing that there is no air on the Moon, and that a flag simply fixed to the flagpole would hang limply down and not look very good on TV and in the pictures, they decided to include a wire stiffener, which would stick out at right angles, and the flag would hang down from that. When they pulled the flag along the stiffener to open it out, they could not actually get it to go the entire distance, and so it gave it its wrinkled look. The astronauts decided it actually looked better like that, and it stayed that way. This is why other pictures, for instance of Armstrong saluting the flag, you will see that the flag is in exactly the same position.

They also left a plaque fixed to the ladder of the Lunar Module, and as they unveiled this, they said the following words: 'Here men from the planet Earth first set foot upon the Moon. July 1969 AD. We came in peace for all mankind.' That last sentence is very important, because they did not claim the Moon; in fact, that is not allowed under the United Nations Treaty on the peaceful uses of outer space - no nation can claim any celestial body.

Then came something which was unexpected: they got a telephone call from the White House. The White House log from that day says the President went to the office with his assistant, H.R. Halderman, and then, 'the President held an interplanetary conversation with Apollo 11 astronauts Neil Armstrong and Edwin Aldrin on the Moon.' Isn't that an amazing thing to put in your diary!'

The surface of the moon was a bit different from what we had imagined it might be. We had assumed that there would be craggy, sharp mountains on the moon because there is no air or wind to wear the mountains down. What we had overlooked was billions of years of micro meteorite impact which had worn the mountains down.

On the moon, they set up a solar wind experiment. The idea of this was to track particles blown out by the Sun, which obviously you could not do on Earth because they would be stopped by the Earth's atmosphere. They also set up a seismometer to check for Moon quakes, and a laser reflector. Even today, the McDonald Observatory in Texas beams lasers to the Moon, bounces them off the reflectors left there by the astronauts, and by measuring the time taken for the beam to get to the Moon and back again, we can tell how far away the Moon is, and from these measurements, we have discovered that it is slowly retreating from the Earth.

I said that Armstrong had the camera on his chest, but during one part, towards the end of the EVA, as per the flight plan, he gave the camera to Aldrin, who took a 360 degree panorama, whilst Armstrong was filling the sample boxes with the rocks and soil that they had collected. As Aldrin turned in his 360 degrees, this sequence of images included one which shows Neil Armstrong on the Moon, the only 70mm frames to do so.

The lift-off from the Moon was televised on later missions by a camera left on the lunar rover which the astronauts took with them, so we could see the ascent stage separate and fly off up into orbit. But this was not the case with Apollo 11, so people on earth could not watch as Armstrong and Aldrin rejoined Mike Collins, taking with them the rock boxes. Then they fired the engines to bring them on the trans-Earth injection back to their home planet.

As they approached the Earth, they separated from the service module and turned the commanding module round so its heat shield was facing forward. This would protect them from the friction caused by the re-entry through the Earth's atmosphere. Temperatures on the outside would get to over 5,000 degrees, as hot as the surface of the Sun. Inside, they never got above a comfortable 70 Fahrenheit.

But they had to be accurate. If their path was too shallow, they would bounce off the Earth's atmosphere and out into space again and would never be able to get back; if they came in too steep, they would burn up. The accuracy was of hitting a corridor 40 miles wide and 7 miles high, the equivalent, it has been said, to throwing a razor blade and splitting a human hair forty feet away. But everything went well: they splashed down and were picked up by the Navy. Back in Mission Control, up went the sign 'task accomplished.'

As soon as the crew got back, they went into quarantine because there was the possibility that there might be some small micro-organism on the Moon which may cause infection on Earth, but after the tests, it was decided that there was no such risk. But before that, when they got to Hawaii, they had to fill in a customs declaration, which gave the names of the crew and gave their cargo as 'Moon rocks and samples.'

When we examined the rocks, we found that they had similar components to Earth rocks, but in different ratios. One particular type of rock came to be called Armalcolite, after the initial letters of the names Armstrong, Aldrin and Collins. This type of rock does not exist anywhere on Earth. If anyone thinks that we never went to the Moon, just ask any geologist about Armalcolite and he will tell you that's unmistakably Moon rock.

So, it only took 66 years from the first powered flight to the first flight to the Moon, within the space of a single lifetime. Since then, we have moved into a different era, with the space shuttle, which is now drawing to its close. Around the year 2020, we expect to return to the Moon, but the next time that you see the Moon above you, as you look up at it, just pause for a minute to think that there are six sites on the Moon where the footprints of 12 men mark the surface.

So, there, in just the space of one hour, is the story of how we reached the Moon. It is the most incredible achievement, and when future generations look back at the 20th Century, it will probably stand out as the greatest event of that period. I consider myself to be extremely privileged to have been around to have watched it happen, and I am looking forward to it happening again.