JFK's 1961 speech led space exploration to new heights

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President John F. Kennedy addresses a joint session of Congress on May 25, 1961 about the decision to go to the moon. Credit: NASA

Fifty years ago, on May 25, 1961, President John F. Kennedy told a joint session of Congress that "this nation should commit itself to achieving the goal, before this decade is out, of landing a man on the moon and returning him safely to the earth."

His vision became NASA's Apollo program, which conducted six successful manned lunar landings during 1969-72 and brought the crews and the moon rocks that they collected safely home. As Kennedy intended, the Apollo program established the nation's preeminence in spaceflight, but it also produced a revolution in scientific understanding of the moon, sparking a debate that continues today about the relative

merits of manned and robotic exploration.

Kennedy's call to action was viewed as a largely geopolitical maneuver, intended to achieve U.S. supremacy in rocketry and space travel at a time when the Soviet Union had gained a huge head start by launching Sputnik 1, the first artificial satellite, and Yuri Gagarin -- the first man to orbit Earth. There were defense implications: rockets that launch manned capsules into orbit could also propel nuclear weapons across intercontinental distances.

Whether Apollo had a strong scientific purpose at first or not, the president's speech "was tremendously influential," said retired astronomer William E. Howard, who served in military, academic, and intelligence organizations. "[It] inspired a lot of people to go into science."

Richard Vondrak was a high school senior in 1961. Now a NASA physicist, Vondrak said that the excitement kindled by the new space program led him to a research career. Donald Bogard was a college student when Kennedy spoke. He said that by 1969, when the first rocks from the moon arrived, he was a scientist "behind the quarantine barrier in the lunar receiving lab" at NASA's Manned Spacecraft Center (now the Johnson Space Center) in Houston. Bogard retired last year as chief scientist for astromaterials at the center, and recently said that "Apollo science set the stage for the golden era of planetary exploration." Since Apollo, robotic spacecraft have been the main sources of new information on the moon and planets.

Scientific objectives were established at the outset for the Apollo Project, although many scientists doubted that the missions would be worth the expense. The late Robert Jastrow, a nuclear physicist who led early NASA lunar science planning, wrote in his book "Journey to the Stars" that "My fellow scientists never liked the Apollo Project." He

added that they "much preferred sending instruments into orbit" than people. Humans are expensive to keep alive in space, and their movements onboard a spacecraft can disturb delicate scientific equipment.

Prior to Apollo, scientists were divided about the nature of the moon, said G. Jeffrey Taylor, a planetary geosciences professor at the University of Hawaii in Honolulu. Some experts claimed the lunar surface was formed by volcanism, others thought it was molded by the impacts of thousands of meteoroids, and some, like physicist Harold Urey, a Nobel laureate, contended that the moon was a cold, dead world with a surface of primordial materials from the era when the solar system formed, about 4.5 billion years ago.

Urey's view was adopted by NASA's Jastrow, who contended that the lunar surface should be explored as the "Rosetta Stone of the solar system." If the moon had formed cold as Urey claimed, there were no volcanoes to erupt and disturb the surface, no forces to fold the crust and throw up mountains, and, since there is no liquid water nor any wind, no erosion to alter the landscape. All of those effects obliterated the original surface of the Earth over geologic time, leaving no trace of its original condition. So if Apollo could collect rocks from the lunar surface, they supposedly would reveal the nature of moon when it formed, and perhaps what the newborn Earth was like as well.

But Urey and Jastrow were wrong. Lunar soil gathered by the first men on the moon, Neil Armstrong and Edwin "Buzz" Aldrin of the Apollo 11 mission, hinted that the moon was anything but a primordial body, a conclusion confirmed from later samples and studies. In the soil, composed largely of broken shards of dark rock, there were white fragments of a different substance that hinted at the real history of the moon. The white rock -- which is also less dense than the dark material -- is now understood as evidence that soon after the moon formed,

something melted the whole lunar surface. A brief era of very intense bombardment by asteroids and meteoroids may have done the trick.

The molten rock layer extended down at least 60 miles, perhaps a great deal deeper. In this "magma ocean" layer, the original moon rock was destroyed and new minerals crystallized as magma cooled. This created the light, white rock, which rose to the top as denser rock sank into the depths of the moon. Any trace of the primordial lunar surface was destroyed. Later, large asteroids collided with the moon at intervals, creating huge impact basins and weakening the crust where, even later, dark lava would well up from the still hot lunar interior. This made the dark, flat lunar maria or seas such as the Sea of Tranquility, where Apollo 11 landed. Rough terrains of the white crustal rock, called lunar highlands, remain and are the likely sources of white rock chips at Tranquility Base and elsewhere.

Taylor said that Apollo solved the mystery of how the moon's surface formed and "revolutionized our whole view of the solar system."

A half century after Kennedy initiated the Apollo program, scientists are still studying the moon, currently with robotic spacecraft. During Apollo, astronauts circling the moon in a command module discovered a puzzling sight, moon dust rising well above the lunar surface, although there is no wind to loft it. Vondrak, now the project scientist for NASA's lunar reconnaissance orbiter, said that the orbiter will gather new data on the strange dust phenomenon this summer.

Meanwhile, politicians, engineers, scientists and astronauts disagree about what NASA should do next for human spaceflight.

"We should use the moon of Mars, Phobos to assemble a base," said Aldrin, pausing in a busy week of appearances at events marking the anniversary. That base could be installed afterward on the surface of

Mars.

Some experts favor returning to the moon as a stepping stone for a human voyage to Mars and back, but those plans have bogged down due to inadequate funding. Others call for a journey to an asteroid.

Many scientists, as in Jastrow's day, prefer for NASA to concentrate on robotic exploration.

John C. Brandt, a retired NASA division chief who worked on the Hubble Space Telescope, said he thinks the expense of manned missions makes robotic missions superior, but acknowledges that "I was the principal investigator of a Hubble instrument that was rescued by astronauts."

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