

LUNAR LEGACY

Celebrating the 40th anniversary of *Apollo 11*'s mission to the moon BY DAYTON FANDRAY

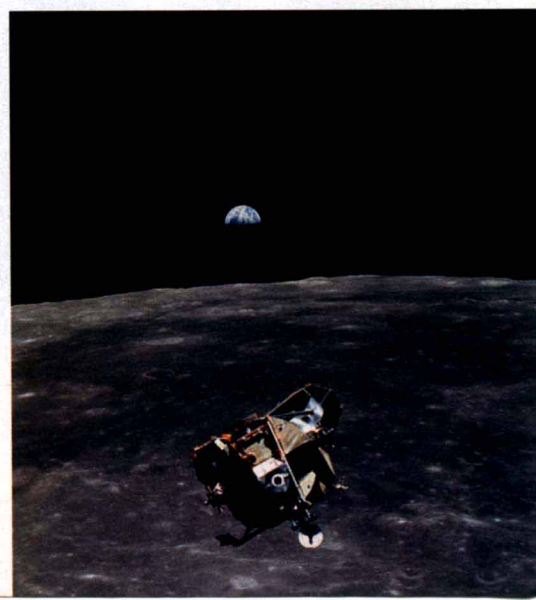
On the afternoon of July 20, 1969, two men from the planet Earth hovered precariously above the surface of the moon. The computer in their fragile spacecraft—the computer that was to control their descent to the lunar surface—was flashing codes that indicated what appeared to be a critical memory overload. And as the pilot of this spacecraft peered out the window, he saw that the landing site chosen months ago by mission managers on Earth was not, in fact, the smooth plain they had assumed it to be. It was covered with boulders—boulders big enough to topple his ship if it chanced to come down atop one of them.

The commander, a soft-spoken man from Wapakoneta, Ohio, was no stranger to tough situations. He was a skilled test pilot who had flown repeatedly to the edge of space in the X-15 rocket plane. And when the *Gemini VIII* spacecraft he was piloting had begun to spin dangerously out of control just three years before this current mission, he had isolated the problem, reestablished control and piloted the ship safely back to Earth. According to his colleagues, Neil Armstrong was virtually unflappable. So it surprised no one that even now, with his fuel running low, Armstrong flew on, calmly searching for a level patch of lunar soil free of obstructions. The mission, after all, was to land a spacecraft on the moon. If such a thing was humanly possible, Neil Armstrong was the man you wanted at the controls.

Buzz Aldrin, standing next to Armstrong in the cramped cockpit of the lunar landing module, *Eagle*, called out altitude readings and kept a nervous eye on the fuel gauge. Charlie Duke at Mission Control in Houston was watching the same readouts. While Armstrong searched for an acceptable landing site, Duke's voice crackled across 240,000 miles of empty space, keeping Armstrong and Aldrin apprised of how much time they had left before they'd have to abort the landing altogether. If that happened, they'd shoot back into orbit where they would rendezvous with Michael Collins in the Apollo command module and begin a long, dispiriting journey back to Earth.

Astronaut Buzz Aldrin explores the moon's Sea of Tranquility on July 20, 1969. At right, the lunar module approaches for docking with the command module in lunar orbit.

COURTESY: NASA (2)





"Sixty seconds," Duke warned.

"Thirty seconds."

And suddenly, with only 20 seconds worth of fuel left, there was silence.

Duke broke the silence, stating matter-of-factly, "We copy you down, *Eagle*."

To which Armstrong replied, "Houston, Tranquility Base here. The *Eagle* has landed."

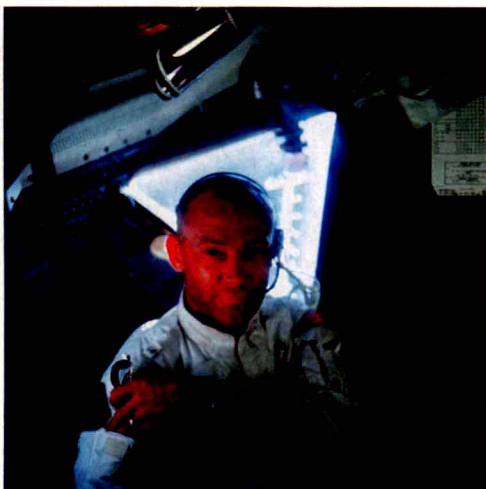
Men from Earth had landed on the moon.

That tense afternoon in July 1969 was indeed one of the most memorable moments in the history of the human race. But looking back now from the perspective of 40 years, I see quite vividly that the summer of 1969 was in fact a remarkable season all around. Yes, it was the summer of *Apollo 11* and mankind's first tentative steps on another planet. But it was also the summer of Woodstock. It was the summer the New York Mets began their improbable march to a World Series victory.

At 17, I was at an age when Woodstock and girls might well have dominated my attention that summer. But I lived in a small town in northwest Ohio, and word traveled slowly in those days: I didn't even know about Woodstock until I saw the headlines in the local newspa-



Top left: The crew of *Apollo 11* move to their spacecraft during the prelaunch countdown. Top right: An astronaut's boot leaves a footprint in the lunar soil. Right: *Apollo 11* lifts off from Kennedy Space Center in Florida at 9:32 A.M., beginning its 240,000-mile journey to the moon.



Astronaut Buzz Aldrin has written a just-published memoir about the *Apollo 11* mission.

time following the space program with the same rapt attention that my friends lavished on the Cincinnati Reds and the Cleveland Indians. The race to the moon fired my imagination from that fateful day in May 1961 when President John F. Kennedy committed the United States to a moon landing by the end of the decade, through six manned Mercury launches and 12 increasingly complex Gemini missions, all the way through to the *Apollo 1* launch-pad fire that killed astronauts Virgil "Gus" Grissom, Ed White and

per. And the girl of my dreams, being a year older than me, was getting ready to go off to college, so she didn't have much time for me. Almost by default, then, I got caught up in the wave of excitement that attended the launch of *Apollo 11*.

It wasn't much of a stretch, really. Back in the days before I discovered girls and rock 'n' roll, I spent most of my spare

Roger Chaffee. When NASA recovered from that tragedy and announced an ambitious launch schedule that didn't preclude the possibility of a moon landing by the end of the decade, I came to believe that putting a man on the moon was destiny.

I was far from alone. Rod Pyle, a Pasadena-based filmmaker and author of *Missions to the Moon* (Carlton/Sterling, 2009), is five years my junior. At age 12, he had yet to drift away as I had into more adolescent pursuits. But as he describes his reaction to the flight of *Apollo 11*, he might well be speaking for both of us.

"I had grown up reading Wernher von Braun, and watching the great Disney educational films about space travel, and reading Robert Heinlein and other authors. So I thought this was the capstone achievement of our century," he recalls. "It was a tremendous undertaking. And it's astonishing that they managed to pull it off. You've got the guidance computers that, depending on which version you're looking at, had either 36K or 72K of memory. That's like a 10th the capacity of a floppy disk. Yet there they were, navigating to the moon and back.

"Looking at it with hindsight, we realize that this was serious, brute-force technology that made

this work,” Pyle says. “But it worked brilliantly.”

It worked so remarkably, in fact, that from the perspective of 2009 it is easy to forget just how uncertain the fate of the *Apollo 11* mission really was.

The mission began on July 16, 1969, when three astronauts—Armstrong, Aldrin and Collins—rode a *Saturn V* rocket into the skies above Kennedy Space Center in Florida. At 363 feet tall and generating some 7.5 million pounds of thrust, the *Saturn V* was the most powerful rocket ever built. Millions around the world watched on television as the spacecraft arced out over the Atlantic Ocean, and there was a collective sigh of relief when word came in that *Apollo 11* had reached Earth orbit and preparations were under way for a rocket burn that would send the craft on its 240,000-mile journey to the moon.

Seventy-five hours and 50 minutes into their journey, the crew reached lunar orbit and began preparations for the descent to the lunar surface. The landing took place at 4:17 P.M. EDT on July 20, and a little more than six hours later, Mission Commander Armstrong stepped onto the surface of the moon, uttering the words that so many of us, watching the grainy images that were beamed into our living rooms, will never forget: “That’s one small step for ... man, one giant leap for mankind.”

Peter Smith, a senior research scientist at the University of Arizona’s Department of Planetary Sciences, served as the principal investigator for NASA’s recently completed Phoenix mission to Mars. A senior at the University of California, Berkeley in the summer of 1969, Smith has vivid memories of that first fateful step on the Earth’s nearest celestial neighbor.

“It was just an amazing event,” he recalls. “The idea of looking at your TV screen and seeing people walking on the moon—there was an abstraction there that was hard to get your hands around. And you’d look at the moon, which was just outside your window, and you’d think, ‘Oh my gosh, are they really up there?’ It was astounding. I thought it was a tremendous tour de force.”

Ronald D. Moore, a writer and producer for *Star Trek: The Next Generation*, and the driving force behind the Sci-Fi Channel's critically acclaimed reinvention of *Battlestar Galactica*, was only 5 years old at the time, but his memories of the moon landing are equally vivid.

"Our family was living in San Clemente, California, at the time. My younger brother was almost a year old, and we were all in the living room watching TV, watching the landing. It was a black-and-white set. I remember Armstrong coming down the ladder and stepping off onto the lunar surface, and Mom and Dad applauding. Then my brother took his first step that night. It's one of those great pieces of family lore, my brother taking his first step that night.

"After that," Moore continues, "I remember being really struck by the idea that there were people up on the moon. I remember being in the backyard and looking up at the moon, trying to see if I could see where they were, and asking to use the binoculars and trying to look to see if I could see their ship or something."

That, of course, was impossible. But two men could see the lunar module. And the shadow of that fragile ship loomed over them ominously that day, for their journey was only half complete.

After the astronauts spent two hours and 31 minutes walking and working on the moon—and a total of 21 hours on the lunar surface—they fired the lunar module's engine as planned. Following the drama of the landing, the remainder of the mission was almost anticlimactic. The rendezvous with Collins in the command module *Columbia*, the firing of the rocket that boosted the crew on a trajectory back to Earth, and the landing itself had all been rehearsed in earlier Apollo missions. And although—as *Apollo 13* later demonstrated—every mission into space is fraught with danger, the remainder of *Apollo 11*'s flight followed Mission Control's playbook. NASA had fulfilled President Kennedy's brash pledge to put an American flag on the moon before the end of the decade.

Forty years after their landing on the moon,
it's safe to say that Armstrong and Aldrin

have secured permanent slots in the pantheon of American heroes. But in many senses, these two men seem as remote today as they did during their stay on the lunar surface. Armstrong has remained willfully elusive over the years. Although he has appeared at various anniversary events celebrating his “one small step,” we know very little about what that step meant to him.

Aldrin, on the other hand, has been almost ubiquitous. He has, in fact, just published a thick memoir titled *Magnificent Desolation: The Long Journey Home from the Moon* (Crown, 2009). In the book he discusses the Apollo mission at length, but it remains difficult to get a real sense of what this pivotal experience meant to him personally.

Aldrin admits that sometimes when he looks up at a full moon above him in the night sky, he pauses for a moment and thinks about having actually been there. But more than anything else, Aldrin is an engineer, a rocket scientist and a space futurist. In the summer of 1969, he had problems to solve and a mission to accomplish. His background seems to influence his current feelings about that one special moment in history.

“It has taken years to really appreciate the advanced nature of the pioneering effort of Mercury, Gemini and Apollo, and how advanced and how far ahead of their times they were,” he says. “That resulted in an unsustainable situation on the moon. But that wasn’t the president’s intention anyway. It was to do something to rally the American people behind our position in the world relative to the Soviet Union.”

But wasn’t the moon landing, as many of us believe, one of the biggest events in human history?

“Well,” he says, “I’m sort of biased, but I would welcome that assessment, keeping in mind that Columbus certainly led an important foray to a new world. But it took the settlements later to really capitalize on that. A brief sampling of the moon, six times, is hardly comparable to establishing a historic permanent settlement on another planet with much

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FROM PAGE 42 more promise, such as Mars. I think if that's done in the 21st century—which I certainly expect that it will be done—that hundreds of years in the future we'll think that achievement is far more important than a squabble between two nations obsessed with mutual assured destruction.”

The commitment to land Americans on the moon before the end of the 1960s was certainly motivated in large part by geopolitical concerns. If not for the shocks delivered by the launch of *Sputnik* in 1957 and Yuri Gagarin's flight into space in 1961, one might well argue that President Kennedy would never have set such a dramatic goal.

Still, the Apollo program yielded returns that certainly transcended narrow national interests. One of these returns—and one that often gets lost in the shuffle, it seems—was scientific. Even beyond the obvious advances achieved in medicine and computer and materials technology, planetary scientists reaped a treasure trove of knowledge from *Apollo 11* and the five missions that followed it to the moon.

“We're still studying the lunar rocks and dust that were brought back from the six Apollo missions,” says Peter Smith. “In preparation for the landings, there were many different opinions as to strength of the lunar surface; some people thought maybe the spacecraft would sink into 10 meters of loose soil and be buried. Yet the truth was known the instant we landed safely. So just the action of going there and interacting with the lunar surface was scientific. Bringing back samples enabled the laboratory analyses that have changed the way we think about the moon. Apollo has given us a huge scientific return.”

Even more than delivering a decisive technological victory over the Soviet Union and 48 pounds of moon rocks, the moon landing inspired us. At the end of the 1960s—a decade during which people around the world were wondering if mankind had somehow exhausted its possibilities—NASA's engineers gave us all a renewed sense of hope.

Over time, the phrase, "If we can send a man to the moon, why can't we ..." has become a cliché.

"Apollo represented the idea of doing something impossible," explains Michael Belfiore, author of *Rocketeers: How a Visionary Band of Business Leaders, Engineers, and Pilots Is Boldly Privatizing Space* (Smithsonian Books, 2007).

"To actually hit the moon was symbolic of this great capability we have as human beings to do what seems to be impossible," he says.

Despite *Battlestar Galactica* and *Star Trek*, despite a bounty of excellent documentaries on the Apollo program, and despite shelves full of books that appraise the history of mankind's leap into space from every conceivable angle, the fact remains that the last human being to set foot on the moon did so a full 37 years ago, in 1972.

There have been, of course, numerous missions to near-Earth orbit, and even as recently as May, the space shuttle *Atlantis* conducted a rather dramatic mission to repair the Hubble Space Telescope. But as Moore notes, when you get right down to it, the space shuttle is basically a "space truck." When it first became operational in 1981, we thought of it as an important stepping-stone back to the moon, and beyond. Instead, it has become an end in itself.

Roger Launius is a senior curator in the Division of Space History at the Smithsonian National Air and Space Museum and co-author—with Andrew K. Johnston—of *The Smithsonian Atlas of Space Exploration* (Harper, 2009). He describes himself as being more disappointed than bewildered by the fact that mankind's experience of the moon consists of six successful missions that spanned a mere four-year period of exploration.

Having served for 12 years as NASA's chief historian, Launius now takes the long view. He understands that inspiration alone has never been a sufficient foundation for any great—and very, very expensive—endeavor. The fact that our first six forays on the lunar surface yielded information that was of value mainly to a small

group of geologists argued persuasively against NASA's hope to return and establish a human presence on the moon. That's just not the way the world works.

"I was 15 at the time," Launius recalls. "I thought it was cool. And I pretty much bought the standard NASA line that we're going to create a moon base; we're going to go to Mars—all this is going to happen certainly within my lifetime if not before the end of the [20th] century."

In 1989, at a ceremony celebrating the 20th anniversary of the *Apollo 11* mission, President George H.W. Bush famously committed the United States to a program that would not only return American astronauts to the moon but would later send them on to a manned landing on Mars. And in 2004, President George W. Bush announced his own intention to launch a mission to Mars by 2034, with a moon landing scheduled for sometime around 2020.

In response to this latest presidential challenge, NASA has announced plans to launch a variety of unmanned probes to both the moon and Mars. Just last month the Lunar Reconnaissance Orbiter was sent into lunar orbit, where it has begun a one-year mission to systematically map and image the surface of the moon. The data will be used to locate potential resources and scout likely sites for permanent outposts when manned flights to the moon resume.

Farther out in the solar system, the Mars Science Laboratory, a mobile rover designed to collect and analyze soil and rock samples, and to perform a number of meteorological experiments, is currently scheduled to land on the surface of Mars in 2012. In the meantime, the Mars Reconnaissance Orbiter, which was launched in 2005, continues to orbit the Red Planet, sending back a variety of data and high-resolution images.

Although 2020 has been set as the target date for America's return to the moon, a daunting array of technical and political factors will play a big part in determining when such a manned mission actually takes place. The space agency is currently scheduled to retire the aging shuttle fleet in

2010, and replace it with a launch system that has been dubbed “Constellation.” Constellation will employ a new generation of rocket booster—the Ares—to lob an Orion spacecraft into space. Depending on the configuration used, the Orion could perform the missions currently being accomplished by the shuttles. Or, if paired with the powerful—and still largely hypothetical—Ares V, the Orion could be sent to the moon and beyond.

It is, in a sense, a case of having déjà vu all over again. The Orion bears an uncanny resemblance to the familiar Apollo spacecraft. And the Altair Lunar Lander, which will carry Americans back to the moon’s surface, resembles nothing so much as the iconic lunar module that carried Armstrong and Aldrin to their rendezvous with destiny.

This lends credence to Aldrin’s assertion that nobody at the time truly realized how advanced the technology behind the Mercury, Gemini and Apollo programs really was.

The conquest of outer space is almost by definition a hopeful undertaking. It is, dare we say it, fun.

“I’d love to see us go back there,” says historian Launius. “But that’s a very personal thing. I’m in my mid-50s. I want to see this happen, just because it was fun last time and I’d like to see it done again.”

The decision to return to the moon is ultimately a question of political will. We might decide that it is beyond our means, that it is not worth the price. But when contemplating our goals for the next 40 years, we might do well to look back to that one amazing night in the summer of 1969. For a brief moment in history, people around the world thought in terms of “we,” in a context that transcended national borders. Like three days of peace, love and music on a farm in upstate New York, like a budding teenage romance, it’s good to be reminded that some things are worth doing simply because they are inherently good for the soul. ▲

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