Why America needs to explore space

Apollo 11 takes off for its historic trip to the moon in 1969.

By Neil deGrasse Tyson

While China has announced an initiative to land humans on the moon by 2020, experts say that the limited funding of NASA will make it difficult for the U.S. to return to the moon by then. We asked the nationally renowned astrophysicist Neil deGrasse Tyson what this might mean for our nation.

FOR MILLENNIA, PEOPLE HAVE looked up to the night sky and wondered about our place in the universe. But not until the 17th century was any serious thought given to the prospect of traveling there. One English science buff, John Wilkins, speculated in 1638 that the moon would be habitable one day and imagined "a flying chariot in which a man may sit."

Three hundred thirty-one years later, humans did indeed land on the moon, aboard a chariot called *Apollo 11*, as part of an ambitious investment in science and technology conducted by a relatively young country called the United States of America. That enterprise drove a half-century of unprecedented wealth and prosperity that today we take for granted. Now, as our interest in science wanes, America is poised to fall behind the rest of the industrialized world in every measure of technological proficiency.

For the last 30 years, more and more students in America's science and engineering graduate schools have been foreign-born. They would come to the U.S., earn their degrees and stay, directly entering the high-tech workforce. Today, with emerging economic opportunities back in India, China and Eastern Europe, many graduates simply return home.

Science and technology are the greatest engines of economic growth the world has ever seen. Without regenerating homegrown interest in these fields, the comfortable lifestyle to which Americans have become accustomed will draw to a rapid close.

Though recent stories about China have focused on concerns such as tainted drugs and food, China's growth as a major world player demands our attention. During a recent trip to Beijing, I expected to see wide boulevards dense with bicycles as a primary means of transportation. Instead, I was surprised to see those boulevards filled with top-end luxury cars, while cranes knit a new skyline of high-rise buildings. The controversial Three Gorges Dam on the Yangtze River, the largest engineering project in the world, is six times the size of the Hoover Dam. And China also is building the world's largest airport.

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In October 2003, China became the third space-faring nation (after the U.S. and Russia) as it launched its first "Taikonaut" into orbit. Next step, the moon. Meanwhile, Europe and India are redoubling their efforts to conduct robotic science on space-borne platforms. There's also a growing interest in space exploration from a dozen other countries around the world, including Kenya, whose equatorial location on the west coast of Africa makes it geographically ideal for space launches—even better than Cape Canaveral is for the U.S. This emerging community of nations is hungry for their slice of the aerospace universe. In America, contrary to our self-image, we are no longer leaders but simply players. We've moved backward just by standing still.

But there remains hope for us. You can learn something deep about a nation when you look at what it accomplishes as a culture. Do you know the most popular museum in the world over the

The Quest for Space

Here are some key events in space history. For more, go to *Parade.com*.

Oct. 4, 1957
USSR launches *Sputnik*—and the race to space is on.

April 12, 1961
First man in space, Soviet Cosmonaut Yuri Gagarin.

PHOTOS BY NASA (COVER, ALDRIN IN 1969, *APOLLO 11*, GLENN, *APOLLO 11* CREW), DEITCH/PBS/NOVA (TYSON), AP (*SPUTNIK*) AND NICHOLSON/REUTERS/CORBIS (ALDRIN TODAY)

past decade? It's not the Metropolitan Museum of Art in New York, the Uffizi in Florence or the Louvre in Paris. At a running average of nearly 9 million visitors per year, it's the National Air and Space Museum in Washington, D.C., which contains everything from the Wright Brothers' original 1903 airplane to the *Apollo 11* command module. Visitors value the air and space artifacts this museum contains. Why? It's an American legacy to the world. But, more important, it represents the urge to dream and the will to enable it. These traits are fundamental to being human and have coincided with what it is to be American.

When you go to countries without such ambitions working within their culture, you feel the absence of hope. Due to all manner of politics, economics and geography, people are reduced to worrying only about that day's shelter or the next day's meal. It's a shame, even a tragedy, how many people don't get to think about the future. Technology coupled with wise leadership not only solves these problems but also enables dreams of tomorrow.

From the Man On the Moon

I COULD HARDLY BELIEVE IT WHEN I TOOK my first step onto the moon's surface. Everyone has dreams. I am remarkably grateful that mine came true. Most people never believed in the real possibility of going to the moon. That we met the challenge is the quintessential demonstration of a pioneering human endeavor. We must now let new generations know what manned space travel means for them, for our country and for the world.

I want kids to know that whatever the moon happens to be for them, they can strive for it. I believe we should never stop dreaming of what is beyond.

I'd like to see a broader availability of space adventure through the private sector. Space travel should be accessible to more people. The next step after the moon is going to Mars. We must think about sustaining missions rather than a "quick fix" state of mind. Long-term thinking could ensure the survivability of the human race. We need to have inspiration and goals, not be satisfied with just maintaining what we have. ***—Buzz Aldrin***

Astronaut Buzz Aldrin walked on the moon in 1969. Here, he reflects on space and the future.

YOU KNOW YOU'RE IN AMERICA WHEN every generation believes it's going to live differently from the previous one. Americans have come to expect something new in their lives with every passing moment—something to look forward to that will make life a little more fun to live and a little more enlightening to behold. Exploration accomplishes this naturally.

The greatest explorer today is not even human. It's the Hubble Space Telescope, which for nearly two decades has offered us all a mind-expanding window to the cosmos. But when the Hubble was launched in 1990, a blunder in the design of its optics generated hopelessly blurred images. Corrective optics were installed during the telescope's first servicing mission in 1993, which enabled the sharp images that we now take for granted. But for three years the images were simply fuzzy. What to do? We kept taking data, hoping some useful science would nonetheless come of it. Eager astrophysicists at Baltimore's Space Telescope Science Institute, the research headquarters for the Hubble, wrote suites of advanced image-processing software to help identify and isolate stars in otherwise crowded, unfocused fields. These novel techniques allowed some science to get done while the repair mission was planned.

Meanwhile, medical researchers at the Lombardi Cancer Research Center at the Georgetown University Medical Center in Washington, D.C., recognized that the challenge faced by astrophysicists was similar to that faced by doctors in their visual search for tumors in mammograms. Using funds granted by the National Science Foundation, the medical community adopted the new techniques being used for the Hubble to assist their early detection of breast cancer. Countless women are alive today because of ideas stimulated by a design flaw in the Hubble Space Telescope.

YOU CANNOT SCRIPT these kinds of outcomes, yet they occur daily. The cross-pollination of disciplines almost always creates innovation and discovery. And nothing accomplishes this like space exploration, which draws from the ranks of astrophysicists, biologists, physiologists, chemists, engineers and planetary geologists. Their collective efforts have the capacity to improve and enhance all that we have come to value as a modern society.

How many times have we heard the mantra: "Why are we spending billions of dollars up there in space when we have pressing problems down here on Earth?" Let's re-ask the question in an illuminating way: "What is the total cost in taxes of all space-borne telescopes, planetary probes, the rovers on Mars, the space station and shuttle, telescopes yet

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Feb.20, 1962 — First American to orbit Earth, John H. Glenn.

Feb. 3, 1966 — First spacecraft lands on moon, Soviet *Luna 9*.

July 20, 1969 — *Apollo 11* lands on moon with (l-r) Neil Armstrong, Michael Collins, Buzz Aldrin.

May 14, 1973 — First U.S. space station, *Skylab*.

Sept. 1, 1979 — *Pioneer 11* reaches Saturn.

April 25, 1990 — Hubble Space Telescope is launched.

July 26, 2005 — Space shuttle *Discovery* returns to flight.

Oct. 15, 2003 — China launches its first manned space mission.

Is It Worth The Cost?

Do you think the U.S. should spend more or less money in space? Tell us at *Parade.com*.

Neil deGrasse Tyson with teens at the opening of the Rose Center for Earth and Space in New York City.

to orbit and missions yet to fly?" Answer: less than 1% on the tax dollar—7/10ths of a penny, to be exact. I'd prefer that it were more, perhaps 2 cents on the dollar. Even during the storied *Apollo* era, peak NASA spending amounted to no more than 4 cents on the tax dollar. At that level, NASA's current space-exploration program would reclaim our pre-eminence in a field we pioneered. Right now, the program paddles along slowly, with barely enough support to ever lead the journey.

SO, WITH 99 OUT OF 100 cents going to fund the rest of our nation's priorities, the space program is not now (nor has it ever really been) in anybody's way. Instead, America's former investments in aerospace have shaped our discovery-infused culture in ways that are obvious to the rest of the world. But we are a sufficiently wealthy nation to embrace this investment for tomorrow—to drive our economy, our ambitions and, above all, our dreams.

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