Sputnik + 50: Remembering the Dawn of the Space Age
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SPUTNIK + 50

Remembering the dawn of the space age

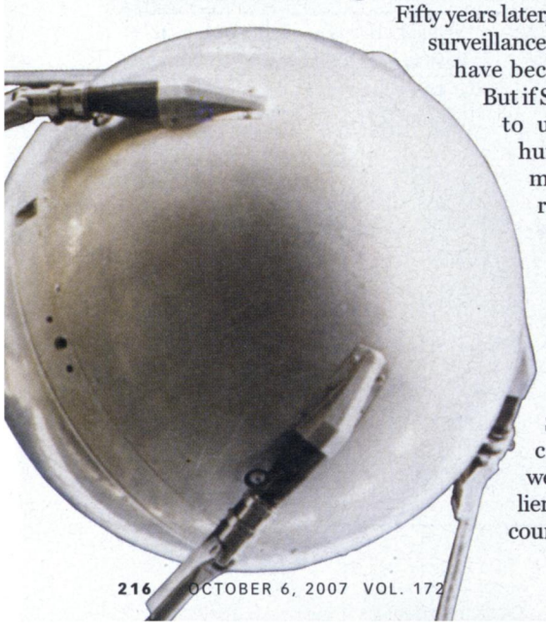
BY RON COWEN

Well, I say the fun has just begun
We're on Sputnik Number One
A'flying through outer space
At a rockin' rollin' pace
Oh! We're gonna get our kicks
On a little ole thing called a Sputnik
—Sputnik (Satellite Girl)

In the fall of 1957, pitcher Lew Burdette's fastball gave the Milwaukee Braves a surprise World Series win over the New York Yankees. In Little Rock, Ark., white mobs rioted after nine black students dared to attend Central High School. On television, *Leave It to Beaver* made its debut. But for many people across the globe, the most riveting show was playing out overhead.

Reaching an altitude as high as 940 kilometers, a shiny aluminum sphere was circling Earth 14 times a day. Scientists tracked its orbit, while ham radio operators tuned in to its alien "beep-beep"—a sound that radio and television stations around the globe rebroadcast to millions. Some feared that the beeps were a sinister code that would help the Russians drop a nuclear bomb. Others simply marveled at how a 184-pound hunk of metal could rocket into the sky and stay there.

The space age began on Oct. 4, 1957, when the Soviets launched Sputnik, the first artificial satellite to orbit Earth. "Soviet Fires Earth Satellite Into Space," blared the New York Times headline. "Myth has become reality: Earth's gravity conquered," read the banner of France's Le Figaro.



Fifty years later, satellites for science, surveillance, and communication have become commonplace. But if Sputnik was supposed to usher in an era of human colonies on the moon and astronauts rocketing off to other planets, that part of the story seems to have sputtered.

FIRST STAGE If the U.S. public was caught off guard by Sputnik's launch, the country's scientists were not. Two years earlier, they and their Soviet counterparts had agreed to launch satellites carrying scientific instruments during the International Geophysical Year, beginning in July 1957, during which the sun would reach the peak of its 11-year activity cycle.

In the United States, the Army, Navy, and Air Force argued over which of them should build a rocket that could put a satellite into Earth orbit. The Soviets, meanwhile, forged ahead. During the summer of 1957, they even announced the two radio frequencies at which their satellite would broadcast—but not when it would launch.

To make sure of beating the Americans to the punch, the Russians shelved plans for a scientifically sophisticated satellite and went with a far simpler model, building the device in just a month without the help of blueprints.

On the evening of Oct. 4, New York Times reporter Walter Sullivan was at the Russian embassy in Washington, D.C., attending a reception for scientists, when he received an urgent telephone call from his Washington bureau chief. Tass, the Russian press agency, had just announced the launch of Sputnik—Russian for "traveling companion." Sullivan shared the news with the U.S. scientists at the gathering, who made an impromptu speech congratulating their Russian colleagues. The party then repaired to the embassy's rooftop so that everyone could try to catch a glimpse of the satellite.

In fact, Sputnik was visible, but just barely. It was a mere 23-inch-diameter sphere with four swept-back antennas that, up close, gave the satellite a sleek, sci-fi look. It had but a single watt of power to transmit its radio signals. The duration of the beeps indicated the temperature and pressure, and that the craft had not been punctured by a meteorite.

That night, 22-year-old engineering student Sergei Khrushchev was with his father, Nikita, in Kiev. The Soviet leader was meeting with Ukrainian officials when he got a phone call and returned to the room smiling. "He told me a great thing has happened," Sergei Khrushchev now recalls.

"We had entered a new age," Khrushchev says, but at first "we didn't understand all the significance." The next day's edition of Pravda, the official Russian newspaper, carried just a brief mention of the launch. "It was a shock to the West," he says. U.S. scientists and leaders thought that "the Soviet Union was far behind them. We didn't think we were far behind."

Sputnik "changed the dynamics on Earth of what our society [was] going to be like," says historian Roger Launius of the Smithsonian Institution's National Air and Space Museum in Washington, D.C. "The ability to fly in space has utterly transformed our lives. Sputnik marks the beginning."

Despite the Cold War, fear wasn't the first reaction of most Americans, Launius says. By coincidence, anthropologist Margaret Mead and a coworker were doing a survey about spaceflight just as Sputnik launched. What they found, says Launius, was "overwhelmingly a sense of excitement."

And there were some light-hearted responses. Jerry Englerth, who worked at Eastman Kodak and called his band Jerry Engler and the Four Ekkos, penned a rockabilly tune about Sputnik and went on tour with Buddy Holly. A bartender invented the Sput-

nik cocktail, a blend of vodka and grape juice—from sour grapes, of course. Sputnik burgers included Russian dressing and a satellite olive on a toothpick.

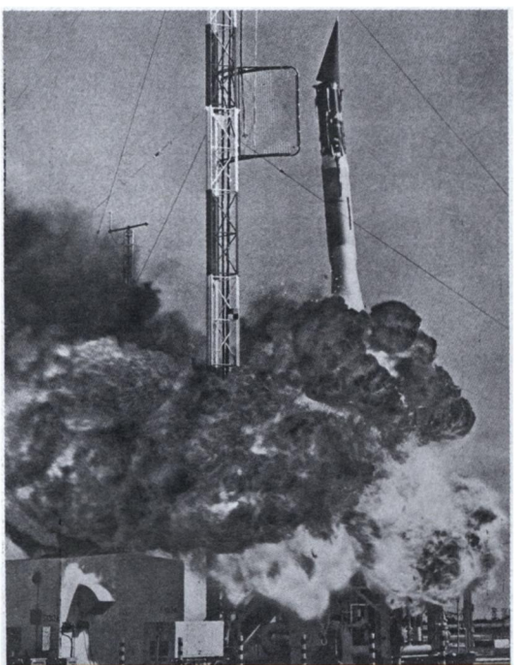
In rural Indiana, 7-year-old Steve Dick got a new puppy, which his family promptly named Sputnik. "I don't remember being scared at all ... it was just an awesome thing that people watched as it went overhead," recalls Dick, now NASA's space historian in Washington, D.C.

But before long, fear took hold. "I think it was the result of a concerted effort on the part of several groups," says Launius. The Democrats, including presidential hopeful Lyndon Baines Johnson, realized that they could turn the Russian feat into a critique of President Dwight D. Eisenhower's administration. Many other groups—national-security personnel, aerospace-industry executives, space scientists who suddenly had access to the White House, and space-exploration enthusiasts who had been tagged "space cadets" and largely dismissed as kooks—saw a chance to push their views on a fascinated but anxious public, says Launius.

In response, Eisenhower tried to dismiss Sputnik, noting its lack of data-gathering equipment. Members of his administration called Sputnik "a silly bauble."

But there was also a growing rhetoric, like this verse by G. Mennen Williams, the Democratic governor of Michigan:

O little Sputnik, flying high
With made-in-Moscow beep,
You tell the world it's a Commie sky
And Uncle Sam's asleep.



DUDNIK — With news cameras ready to record the liftoff of the first U.S. satellite and this country's answer to Sputnik, the rocket launching Vanguard TV-3 exploded at an altitude of 4 feet on Dec. 6, 1957.

SMITHSONIAN

SECOND SURPRISE The anxiety and recriminations may have abated, but less than a month later, on Nov. 3—just in time to celebrate the 40th anniversary of the Bolshevik revolution—the Soviets launched Sputnik 2. Ten times as heavy as Sputnik 1, the satellite carried into orbit the first live cargo, a dog named Laika—which made a strictly one-way journey. The U.S. press promptly dubbed the dog Muttnik.

At Red Square in Moscow, throngs cheered chief Sputnik engineer Sergei Korolev as well as Nikita Khrushchev. "A birthday flexing of Red biceps," *Life* magazine called it.

The second Russian launch further agitated the Eisenhower administration. "The thing to remember is that anything put on a rocket [was] also only a shadow away from putting a nuclear weapon on top of an intercontinental ballistic missile," notes Air and Space cultural historian Margaret Weitekamp. "There were peaceful purposes [for the satellites], but they were also a demonstration to the world of the capability of the Russian [military presence in space.]"

On Dec. 6, the press was invited to Cape Canaveral, Fla., to witness the U.S. response to Sputnik. Newsreel cameras rolled as a modified Navy Vanguard rocket carrying a small satellite lifted off the launch pad. It rose just 4 feet before erupting in a fireball, sending the grapefruit-size satellite in its nose cone hurtling across the sands. The next day's headlines provided the postmortem: "Flopnik," "Dudnik," "Kaputnik."

Wernher von Braun, whose earlier plan to adapt an Army rocket had been ditched in favor of the Navy's project, was now brought back into the game. On Jan. 31, 1958—with no press in attendance—von Braun's Jupiter-C rocket successfully launched the first U.S. satellite, Explorer I. A Geiger counter on the satellite recorded the first evidence of what are now known as the Van Allen radiation belts, bands of energetic charged particles trapped by Earth's magnetic field.

In March, President Eisenhower founded NASA, the National Aeronautics and Space Administration, a civilian agency devoted to space exploration. Spurred by what would soon become a well-worn phrase—"Soviet children are playing chess while American children are playing checkers"—politicians poured money into math and science education. Educators revised the K-12 science curriculum and introduced the baby-boom generation to "new math." Every classroom, it seemed, got an overhead projector as its new, high-tech weapon against the Russians.

Nevertheless, "there were 5 to 6 years of almost unparalleled Soviet dominance" in space, notes Launius. The highlight may have come on April 12, 1961, when Yuri Gagarin became the first person to orbit Earth, circling once in a Vostok spacecraft.

Eisenhower always maintained that there was no space race, but he couldn't really afford to say otherwise, says Weitekamp. "Because if we were in a race, the Soviets [had] beaten the pants off the Americans. They had the first satellites, the first man in space, the first woman, the first time to have two capsules [in space together], the first rendezvous."

Jolted into action, Eisenhower's successor, John F. Kennedy, decided that the United States should embark on a major project that would eclipse Russian superiority. After consulting his advisors, including LBJ, Kennedy spoke before a joint session of Congress on May 25, 1961, and announced "the goal, before this decade is out, of landing a man on the moon and returning him safely to Earth."

Through 1972, NASA focused almost exclusively on that goal with the Apollo missions, which put 12 men on the lunar surface, beginning with Neil Armstrong's "one small step" on July 20, 1969. But after Apollo, just as the country was undergoing a cultural upheaval, NASA found itself without a clear-cut goal. "I kind of imagine all these military-buzz-cut engineers who pop their heads up and suddenly they're in an environment of stagflation, their budget shrinking instead of exploding, and it's a whole other ball game," says Weitekamp.

Says space-policy analyst John Logsdon of the George Washington (D.C.) University, "Kennedy decided to go to the moon to be there first. Period. And we got there first and then stopped."

LASTING LESSONS "What we've learned from Sputnik is that a shock can get you started ... but you'd better have a good, sustainable science initiative to [keep] going," says Logsdon. "We haven't done a very good job of providing goals for ourselves in space." For the first decade after Sputnik, "we had this competition with the Soviet Union and then we chose what turned out to be a dead-end—space shuttle and space station."

The shuttle ended up being an unwieldy, costly, and ultimately dangerous way to take astronauts into space—especially after 3 decades of use. The space station has been roundly criticized by scientists for draining NASA's budget while having limited research value.

Plans for a human presence beyond Earth's orbit seemed to get

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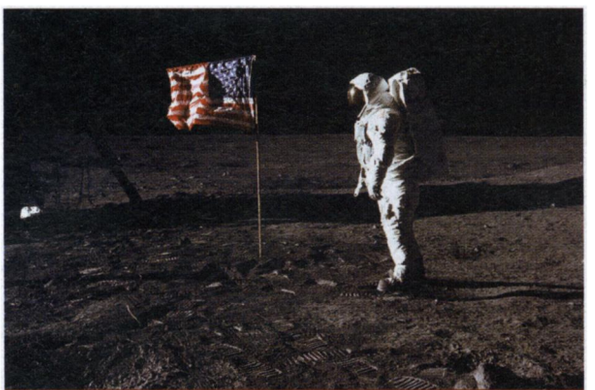
a boost with President George W. Bush's 2004 announcement that NASA would return people to the moon and then go on to Mars. But those plans lack the financial support that Kennedy and LBJ garnered, notes Logsdon. They also appear to lack broad support from politicians and the public.

In many ways, the visions of space exploration that flowered soon after Sputnik, including complex space colonies, didn't materialize. Von Braun envisioned human flights to Mars, using a nuclear-powered rocket, by 1984.

But in other respects, Sputnik's legacy has endured. Among the remarkable accomplishments over the past 50 years, says Logsdon, is that "we've revolutionized our knowledge of the solar system and the universe, primarily through robotic missions." In addition, "satellites are now managing the world," he adds. With some 850 operational devices now circling Earth, satellites are at the core of worldwide communications, the Global Positioning System, and data gathering on topics as vital as global warming.

Today, it's taken for granted that "every local news station has access to [regional] satellite views" to forecast storms, notes space historian David DeVorkin of the National Air and Space Museum.

Most satellites are now launched by private industry. "There are more launches on a regular basis than people realize," says DeVorkin. "There's a booming business in launching satellites and a whole space industry."



NASA

LUNAR LEGACY — Astronaut Buzz Aldrin, pilot of the first lunar lander, poses for a photograph beside the U.S. flag during the Apollo 11 mission on July 20, 1969, the first time people set foot on the moon. The lunar module is at left, and the footprints of the astronauts are visible in the soil.

The race among entrepreneurs into space exploration is heating up. As a follow-on to the $10 million Ansari X prize, awarded in 2004 to the first private company to fly a piloted craft twice into space within a 2-week period, the Internet company Google last month announced a new space competition: the $30 million Lunar X prize to the first company to land a robotic rover on the moon and beam pictures back to Earth.

Does the United States need another Sputnik to spur space exploration? Competition pushes progress, says Launius. "Mickey Mantle and Roger Maris were both great home run hitters, but neither of them did as well as when they competed with each other."

For DeVorkin, the new Sputnik—the crisis at hand begging for a U.S. response—is global warming. "U.S. space technology is extraordinarily good at understanding global systems and the Earth-sun connection," he says. A fleet of data-gathering satellites could be used by climate scientists needing to better understand and address global warming.

"It's a question of personal moral responsibility," says DeVorkin. "We don't deserve to go [further] into space" unless this problem is solved. A program devoted to the study of global warming would involve international collaboration more than competition. Scientists—and society—still have the chance to build on Sputnik's legacy, DeVorkin says, by using the technology developed during the space race to "galvanize and really focus on self-preservation" of the planet. ■

OF NOTE

PLANETARY SCIENCE

Neptune's balmy south pole

The first temperature map of Neptune's lower atmosphere shows that the planet's south pole is about 10°C warmer than any other place on the planet. The average temperature of the atmosphere's lower depths is −200°C. The south pole is warm enough for gaseous methane to rise into the upper atmosphere, says study coauthor Glenn Orton of NASA's Jet Propulsion Laboratory in Pasadena, Calif.

The escaping methane could explain a long-standing puzzle—the presence of methane in Neptune's stratosphere.

Neptune's tilt means that its south pole is heated by continuous sunlight. That's been the case for the past 40 years of Neptune's 165-year orbit around the sun. Eighty years from now, when it's summer at the north pole, methane may escape from that region instead, says Orton.

Large temperature differences between the south pole and adjacent regions may stir up gases and generate 2,000-kilometer-per-hour winds, the strongest planetary winds in the solar system.

The study, which used the European Southern Observatory's Very Large Telescope in Paranal, Chile, appears in the Sept. 18 *Astronomy & Astrophysics*. —R. C.

PHYSICS

Hot stuff

Researchers have used a plasma to ramp up a laser's intensity by an unprecedented 20,000 times.

Standard lasers produce orderly streams of light by pumping energy into a medium—usually a gas, liquid, or crystal—and then coaxing the medium's atoms to release the energy in the form of synchronized electromagnetic waves.

A laser can also be used to amplify the output of another laser. But amplifying an already highly concentrated pulse requires expensive optical components that spread the pulse's energy over a longer time and then recompress it after amplification. Without such equipment, the concentrated beam would damage the lasing medium. Such complex lasers can cost tens of millions of dollars, says Szymon Suckewer of Princeton University.

To create a lower-cost alternative, Suckewer and his team replaced the lasing medium with a plasma, the hot state of matter in which electrons and atoms move separately. A plasma can in principle withstand unlimited laser intensities. "You cannot break the plasma," Suckewer says.

In the team's device, which cost less than $1 million, an ultrashort pulse from an ordinary laser traveled into the plasma. Standing waves in the plasma, excited by another laser, transferred energy into the