Featured Stories

Closeup of Apollo 11 Lunar Module footpad on the Moon's surface. "Stick" object is a sensing probe. Taken with a 70 mm lunar surface camera during activity by Neil Armstrong and Edwin Aldrin on July 20, 1969.

The JPL Apollo Connection

By Jane Platt

That "giant leap" from 50 years ago--when Neil Armstrong became the first human to step onto the surface of the Moon--is imprinted on several generations. Some savor that day as a vivid and treasured memory, while for others, it's an interesting chapter in history books.

And for JPLers at the time? The Lab's scientists and engineers helped make lunar exploration history in three ways.

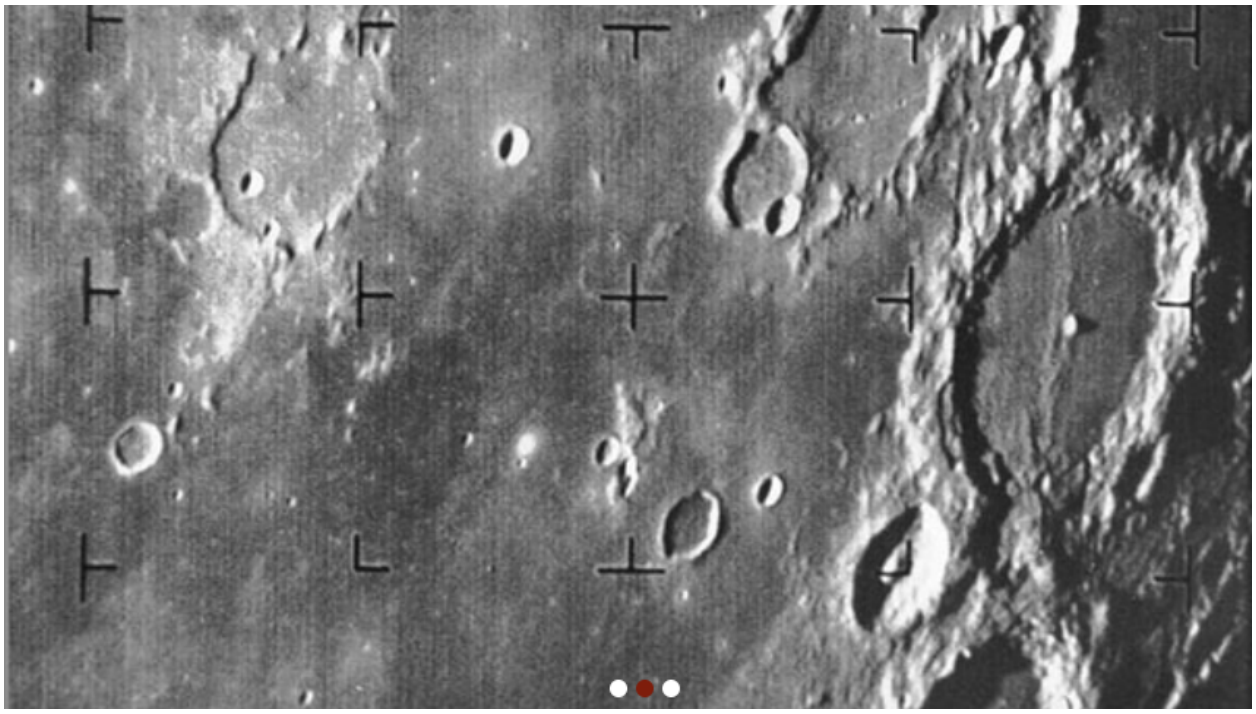
Hard landings

JPL was tasked with designing and building a series of probes, called Rangers, designed to fly to the Moon and crash into it. The Lab's successful Mariner 2 mission to Venus was a modified Ranger spacecraft, but when it came to the Moon, "The Rangers ran into lots of trouble, with several failed missions," said JPL Historian Erik Conway.

Ranger 7 became the lucky number for the program, working like a charm when it collided with the Moon on July 31, 1964. In a lighthearted moment, team members credited the success to the fact that someone in Mission Control was eating peanuts. Since then, JPL teams break out peanuts for luck during milestone events, such as Mars landings and spacecraft orbit insertions.

After Ranger 7, Rangers 8 and 9 were also successful. The program ended in 1965.

One lesson learned from the Ranger missions was that the Moon has rocks--lots of them--a reality that would prove challenging for future missions to land astronauts on the surface.



Portion of first Moon photo by a U.S. spacecraft, Ranger 7, on July 31, 1964, about 17 minutes before it successfully collided with the lunar surface. The Ranger missions helped with Apollo landing-site selection.

A softer approach

Instead of building in-house, JPL developed the next-generation of lunar spacecraft, the Surveyors, under a systems management contract with Hughes Aircraft.

"These were intended to land a very large, broad variety of scientific instruments," Conway said.

The wrinkle was that Surveyor development began before the upper Centaur stage of the launch vehicle was ready--so engineers didn't know how much payload it could hoist. Because of that, Surveyor 1 carried only a TV camera--no instruments. And its requirements were simple by today's standards, according to Conway: "They had to survive the mid-course correction, land and send back good engineering data." A third goal--not a requirement--was to send back television pictures.

Surveyor 1 succeeded on all three counts, landing successfully on June 2, 1966, and beaming back thousands of pictures.

Once the engineers learned the capabilities and capacity of the launch vehicle, they added some instruments to subsequent landers. Five of the seven Surveyors were successful.

The missions answered a key question that would face the Apollo program.

"How strong is the lunar surface? There had been some fear that the landers would merely sink into dust, and that would be bad," Conway said. He added that while a Soviet probe had already demonstrated that the fear was probably--unlike the lunar surface--groundless, the Surveyor series used engineering instruments that "really nailed that down."

In the lull between the Surveyors and the Apollo program, there was a plan to have a version of a Surveyor tote a lunar rover, but the Surveyor program was cancelled before that rover flew. The rover hung around JPL for a long time, eventually becoming a prototype for the Mars rover program.

Surveyor 1's shadow against the Moon's surface in late lunar afternoon; horizon at upper right. The spacecraft made a successful soft landing on the Moon on June 2, 1966.

A parallel network for space talk

The previous Mercury and Gemini programs used a ground-based tracking and communication system run by Goddard Space Flight Center called, at the time, the Manned Space Flight Network. It could not be adapted for use outside Earth orbit, so Conway said, "They decided to make a clone of [JPL's] Deep Space Network."

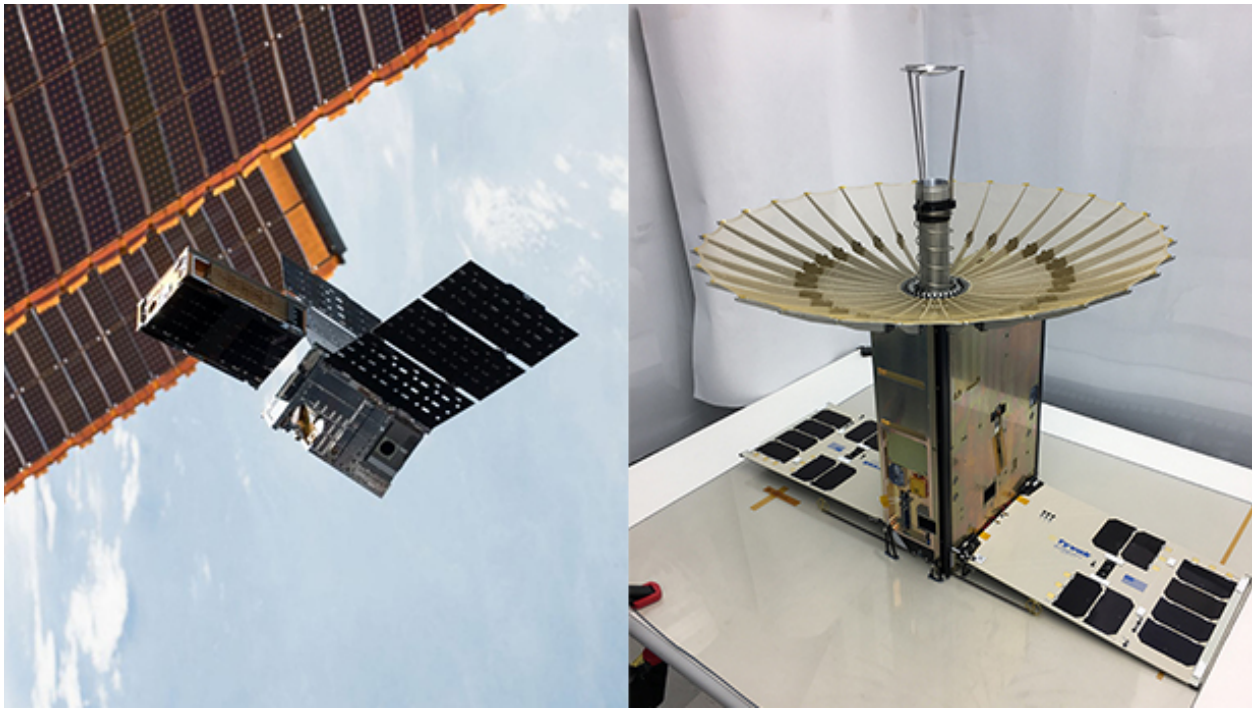
The Apollo program needed full-time communications support, and JPL had its own missions, so the DSN's engineers helped design and operate a "parallel network." After the Apollo program ended, DSN inherited the equipment.

Other than the three main connections/pathways to Apollo, was JPL anxious to hop aboard the Apollo human-flight bandwagon?

"Our decision to be lunar and planetary and robotic was already made, and JPL had done robotic probes consistently, and I'm not aware that there was any effort by the Lab management to play a greater role in Apollo," Conway said. "Frankly, a lot of the American scientific community didn't want much to do with the Apollo program, because they didn't see it as producing valuable science, and that would include many people at Caltech."

The human spaceflight program originated at NASA's Langley Research Center in Virginia, via an organization they called the Space Task Group, set up before Apollo for the Mercury program. They then moved to what is now Johnson Space Center in Houston.

As you celebrate the 50th anniversary of the Apollo moon landing on July 20, keep in mind that JPL helped clear a path for the mission to happen.



CubeRRT and Tempest-D being deployed from the ISS on July 13, 2018 (left); RainCube at JPL prior to launch, showing its deployable radar antenna and solar array.

Tiny CubeSats Pave the Way for Future JPL Missions

By Taylor Hill

Six years ago, the Lab's chief technologist for Earth Science and Technology, Jason Hyon, put out a call to the directorate's technology groups to shrink their science instruments and reduce mission costs. But how much were they to shrink them, exactly?

"If I tell people to just miniaturize their instrument, it's too vague," Hyon said. "Nobody knew how much to miniaturize, everybody has a different concept of miniaturizing."

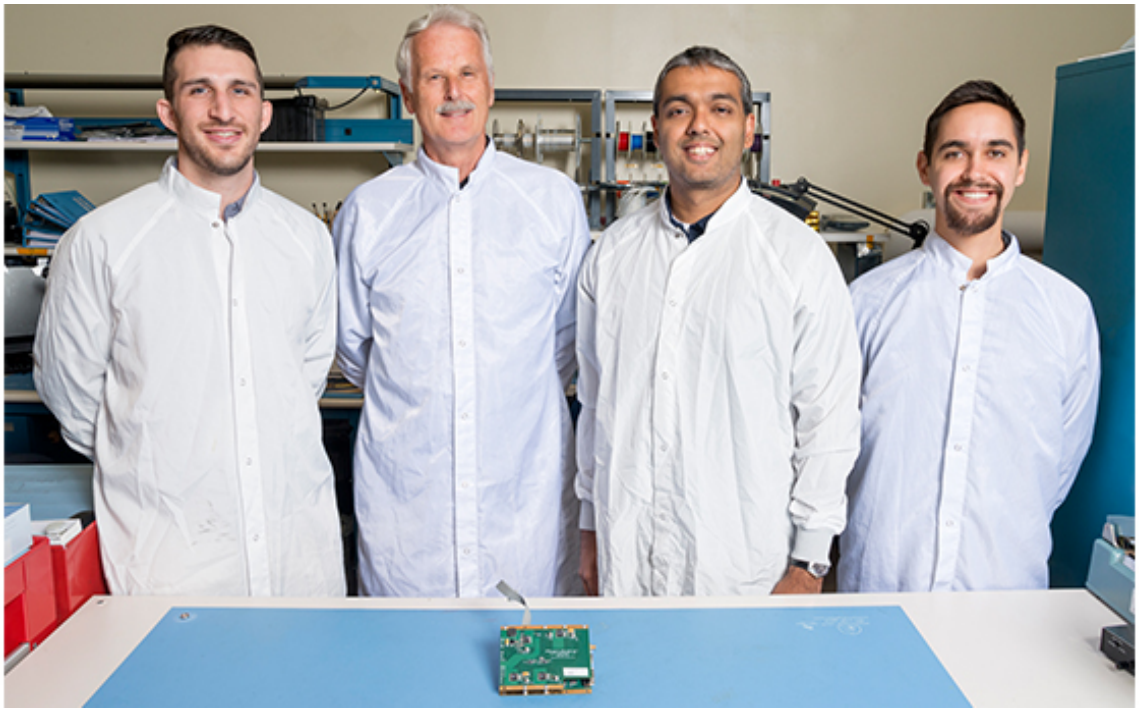
So Hyon took advantage of recent developments in CubeSat technology and its standardized form, deciding to see what the groups could come up with while fitting within the constraints of a 6U CubeSat form. A 1U CubeSat, or one unit, is 10 centimeters x 10 centimeters x 10 centimeters. Hyon was calling for satellites that would fit in the dimensions about the size of a cereal box. At the time, there was some skepticism on the capability of tiny satellites: what can you do with a 10-centimeter spacecraft, and could its data be relevant for scientific measurements expected of NASA missions?

"As soon as we specified a form factor, everybody knew what it would take to shrink their instrument, and what technologies were needed to fit into that specific frame," Hyon said. "It's not just 'shrink it and make it cheaper'. We picked a size and now the groups knew exactly how to shrink and what they need to do to fit it into this form factor."

In 2013, JPL started awarding Research and Technology Development (RTD) funds, investing in TEMPEST-D/MASC—a miniaturized microwave radiometer capable of seeing within a storm and measuring precipitation; and RainCube—a Ka-band radar and deployable antenna for better precipitation profiling.

In 2014, NASA's Earth Sciences Technology Office selected TEMPEST-D as part of the Earth Venture Program, and in 2015, awarded INVEST (In-Space Validation of Earth Science Technologies) funds to RainCube, and CubeRRT—a radiometer partially developed at JPL. CubeRRT was programmed to scan all radio frequency signals and process radio frequency interference on-board and in real-time.

All three missions were aboard Orbital ATK's OA-9 Cygnus resupply mission that launched from NASA's Wallops Flight Facility in Virginia on May 21, 2018. All three were flown as tech demonstrations, with the goal of verifying that the instruments could measure science-quality data. And so far, all three tiny missions are meeting this outsized goal. It has been quite a ride for early career engineers who got to witness their instruments being launched and start collecting data in less than two years of development.



CubeRRT team members including Rudi Bendig, Robert Jarnot, Sidharth Misra, and Carl Felten (left to right).

CubeRRT cleans up the radio frequency mess

The CubeSat Radiometer Radio Frequency Interference Technology Validation mission--known as CubeRRT for short--was borne out of necessity. Under normal circumstances, radiometers can be used to measure natural microwave emissions from Earth and get readings on soil-moisture, sea-surface salinity, wind speed and wind direction, atmospheric water-vapor, precipitation levels and more. But increasingly, man-made radio frequency interference corrupts the signals radiometers receive, and could hinder data retrieval from future science missions.

Instead of measuring certain scientific phenomena, CubeRRT was developed to survey signals generated by man-made radio frequencies—ranging from digital and analog TV transmitters to cell towers—that can interfere with bandwidth that scientific instruments and satellites need. The CubeSat consists of an Ohio State-built antenna, a NASA Goddard-built radiometer, and a JPL-built additional Radiometer Digital Back-end. The back-end is where JPL developed an algorithm capable of processing out radio frequency interference (RFI), essentially cleaning the data before transmitting it back to Earth. Early results show the instrument performing well.

“We were over the Pacific when we saw an RFI-corrupted signal, and CubeRRT was able to clean up the signal on board before downlink,” said Sidharth Misra, CubeRRT project manager and microwave systems technologist. “To verify we did it properly, we actually downlinked everything, and did the same cleanup on the ground, and graphed them. They were basically identical.”

The findings so far indicate that CubeRRT’s technology could be utilized on future radiometer missions Misra says, and it should be easy to implement thanks to its small size, low power needs, and lower data requirements.

As for the experience of being on a CubeSat program, Misra says the cost constraints can be challenging.

“We have these big missions at JPL that have large teams and large budgets and extreme levels of rigor involved in the testing,’ Misra said. “For CubeSats, you’re still building a flight instrument, but you have to do more with less.” Most of the time, the CubeRRT team consisted of four members.

“A main goal of CubeSats is to reduce costs, so it makes sense,” Misra said. “JPL has recognized they can’t put the same rigor to CubeSats they do for large-scale missions, but there is still a higher standard here. It’s a fine line.”

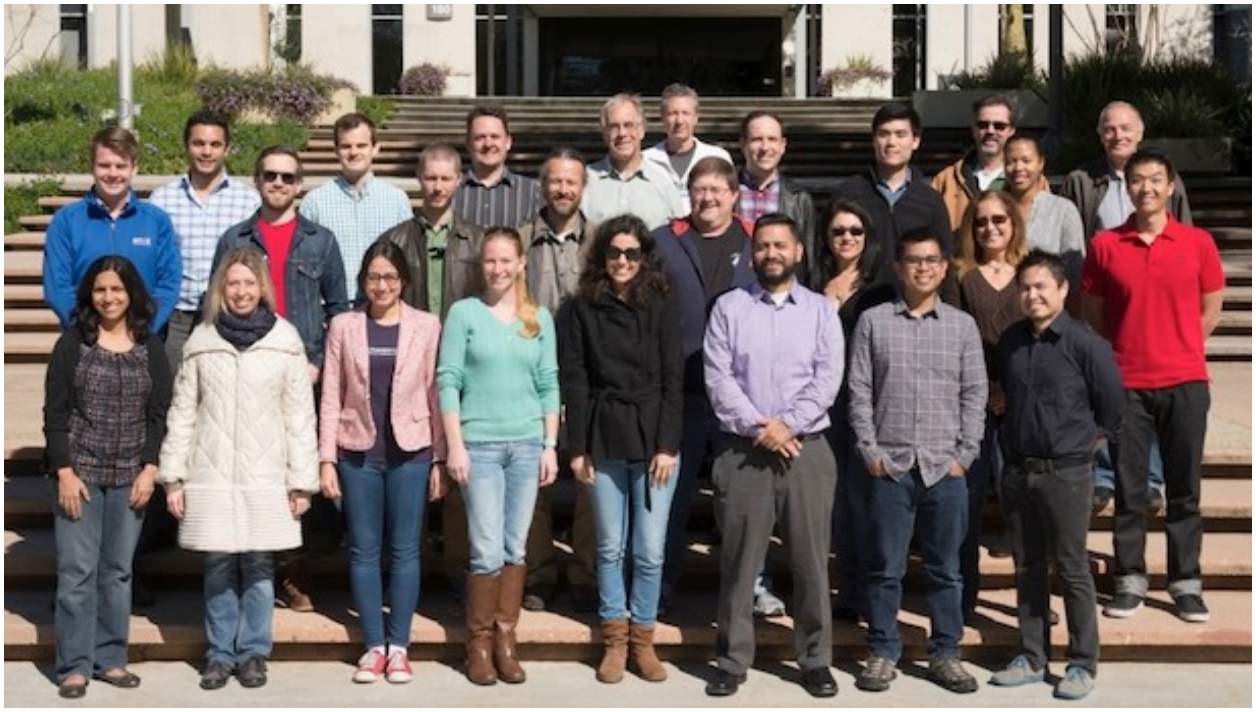
TEMPEST-D team members including Todd Gaier, Heather Lim, Alan Tanner, Sharmila Padmanabhan, Rudi Bendig and Boon Lim (left to right).

Sister missions, complementary measurements

RainCube (Radar in a CubeSat) and TEMPEST-D (Temporal Experiment for Storms and Tropical Systems Demonstration) were deployed into low-Earth orbit from the International Space Station in July 2018, just five minutes apart from one another.

RainCube demonstrates two key technologies: a miniaturized Ka-band precipitation radar and a high-gain deployable antenna—all packed into a 6U CubeSat form. “RainCube provides a vertical profile of the precipitation, penetrating deep into the layers of the storm,” said Eva Peral, principal investigator for RainCube.

While RainCube cuts deep into precipitation layers, TEMPEST-D goes wide, using its miniaturized microwave radiometer to identify precipitating and non-precipitating clouds across large swaths of ocean or land.



RainCube team members: (First row) Chaitali Parashare, Alessandra Babuscia, Shivani Joshi, Shannon Statham, Eva Peral, Elvis Merida, Marvin Cruz, Carlo Abesamis. (Second row): Travis Imken, Macon Vining, Joseph Zitkus, Simone Tanelli, Richard Rebele, Mary Soria, Arlene Baiza. (Third row): Nacer Chahat, Jonathan Sauder, Stuart Gibson, Greg Cardell, Brad Ortloff, Brandon Wang, Taryn Bailey, Dominic Chi. (Fourth row): Brian Custodero, Doug Price, John Kanis.

In September of last year, the two missions combined their complementary precipitation-measuring capabilities to get a 3D view of Typhoon Trami.

“We did a little comparison, and the results were spectacular,” said TEMPEST-D project manager Shannon Brown. “RainCube is showing a reflectivity of where the precipitation is, and Tempest D is showing a swath of the storm. They’re giving high-resolution vertical information, and we are filling that in with what the entire storm looks like, but in a two-dimensional map. A combination of the two gives us this 3-dimensional image of what’s going on. So, for a really low cost, you’re getting a lot of information on this storm.”

The two sensors working together show how powerful CubeSats can be, Brown said. “Imagine you put a number of radars and radiometers together that are passing by the same storm and now you’re seeing these cloud processes evolve—you’re able to look at the environment as they’re evolving and really start to understand the basic fundamental physics of how these storms are developing over the ocean and land,” Brown said. “Add time to that dimension, and that’s a really powerful thing.”

That’s the end goal, according to Hyon. Missions like RainCube and TEMPEST-D will enable a low-cost constellation or swarm of satellites that could pave the way toward a new method of observing weather systems and improve global forecasting models. Both instruments have already been submitted as Earth Ventures Instrument Announcement of Opportunity waiting for a decision this summer. With the evolution of smallsats, the next generation instruments such as CloudCube and a distributed hybrid radar/radiometer are being developed in order to enable Earth system science.

“By building these lower-cost instruments, you could do concurrent science—get measurements of multiple species, and profile together,” Hyon said. “You want to quantify types of processes, whether it's chemistry mixing, or physical clouds and aerosol interaction, anything that requires concurrent measurements, and we just can’t do it with traditional instruments because of the cost limits. Now with miniaturized instruments, we can observe those multiple processes being mixed, and be able to quantify those processes at the same time.”

A Young Engineer Steps Into the Light

By Celeste Hoang
Photo by Joshua Krohn

In high school, Janelle Wellons excelled in her courses, especially math, and quickly climbed to the top of her class. By the spring of her senior year, she had an acceptance letter to her dream school, the Massachusetts Institute of Technology, in hand. But while that should have been a joyous time, an incident with a high school classmate cast a long shadow.

“One of my classmates approached me in front of a group of friends and said, ‘We all know the reason you got accepted into MIT is because you’re black,’” she recalls. “No one standing there said anything, and the fact that no one stood up for me spoke volumes.”

Today, Wellons shows no hint of how close she came to giving up—not from the sting of one comment that broke the surface, but from the doubts and questions that worked invisibly over the course of her formative years.

Bright-eyed and warm, with an ebullient personality and hearty laugh, she works at JPL as an engineer operating the Lunar Reconnaissance Orbiter’s Diviner instrument—a radiometer that measures the surface temperature of the Moon. She is also developing the system that will command the MAIA instrument (Multi-Angle Imager for Aerosols), which will launch around 2021 to study how Earth’s pollutants affect people’s health on a global scale.

Just three years out of college, she is one of the youngest staffers on a Moon mission and an Earth mission. But while her progress has been quick, it was not easy.

A gray summit

Wellons grew up in South Jersey, the eldest of two siblings. Her mother was an administrative assistant at an oil and gas corporation and her father worked in warehouses. When she was about 6 years old, she joined her mother for a bring-your-child-to-work day, spending the morning surrounded by engineers doing demonstrations for the kids that day.

“It opened my eyes to realize: an engineer makes things!” she says. “I got that into my mind.”

But as she grew older, Wellons realized that reaching her goals would sometimes come alongside prejudice.

The acceptance letter incident wasn’t her only brush with racism. Wellons felt racial tension throughout her high school years, especially since she was often one of the few black students in her advanced placement classes.

“It kind of defined me. It was like they couldn’t see anything else,” she says. “In high school, people joke about bad things all the time and they always say they were kidding to make it OK, but after a time, it gets to you,” she says.

By her senior year, she recalls, “something was just not right.”

It wasn’t feeling hurt that alarmed her. It was feeling nothing at all.

The spring of her senior year, Wellons received a call from the MIT Office of Engineering Outreach Programs with the news that she’d been awarded a scholarship.

“It should’ve been a very happy moment but I didn’t feel anything and just hung up the phone and sat outside by the lockers,” she recalls. “When I realized I couldn’t feel happy about that, I realized there was something really wrong with me.

“That’s when the suicidal thoughts started to creep in, like, ‘Why can’t I have authentic reactions anymore?’ I knew it was a serious problem.”

“Discovering that I suffered from serious depression, was and continues to be something that surprises people who know me because people often describe me as always smiling and happy,” she adds. “That was one of the scariest times of my life.”

Shedding the label

Wellons’ parents sought out a therapist to help her, and as she entered MIT, things dramatically improved. She joined a black student union, pledged a sorority and interacted with a multicultural community on campus.

“I definitely had a huge transformation in college,” she says. “When you take away the ‘smart black girl’ label, you become your own person and people can have a conversation beyond that.”

Still, her course load was demanding and she quickly realized she was “in another realm of smart,” finding herself sitting next to a gold medalist winner of the International Math Olympiad and doubting why she was admitted. But she persevered.

“I came in feeling pretty good and was quickly reminded that I’m at the bottom of the totem pole,” Wellons says. “But that was a good thing.”

At first, she thought she might major in mathematics, but the first day of an aerospace engineering class changed her mind. The professor showed a photo of an astronaut fixing NASA’s Hubble Space Telescope, and revealed that the person in the photo was himself. Wellons was in awe.

“The opportunity to be taught by an astronaut was something I could not pass up,” she says. “I realized that’s what I wanted to do—I’m going to learn about space from experts! I was blown away by that.”

She was eager to learn from her professors and her peers, and while she struggled with imposter syndrome her first two years, she found her stride, and more importantly, her confidence her junior year designing a CubeSat to go to the Moon as part of a NASA competition her professor assigned as a capstone project.

In her second capstone involving an Antarctic penetrator probe, another professor introduced the value of critical self-assessment. “He was a really tough professor who would angrily say, ‘This would never pass a review in the industry,’ and would heavily criticize our presentations,” she recalls. “But my standards are much higher now because of him and I’m just as nitpicky.”

Real-time engineer

Wellons has to apply that work ethic around the clock at JPL since she’s on call 24/7 for the Lunar Reconnaissance Orbiter, sometimes getting calls at 2 a.m. or, on one rare occasion, having to rush to her laptop in the middle of a night out with friends.

“The one scary thing is you are the engineer responsible for the instrument’s success,” she says. “You are the operator and you can’t afford to be sloppy in this job. Instruments don’t sleep.”

Wellons’ typical day starts by first checking on the health and safety of her instrument or, as she puts it, “making sure it’s alive and well.” Then she’ll work with the science team and, depending on what they would like to look at, help them figure out if their requests can be met without putting the instrument’s well-being at risk. Then she creates the commands for the instrument to obey.

“You’re in charge of making sure the scientists don’t push the limit,” she explains. “If you get too greedy, you might break the instrument.”

Community builder

At JPL, Wellons toes the line between gratitude for her career and awareness that being a black female engineer comes with its continued challenges.

“I am so thankful to be here because growing up, I rarely, if ever, saw someone who looks like me working at a company so incredibly amazing, making history every day,” she says. “At the same time, that doesn’t mean [there aren’t] comments toward me. JPL is made up of individuals with their own thoughts and experiences and perspectives on life, so of course you’re going to have instances. It’s definitely not going to slow me down, though.”

To help spread the message of inclusion on Lab, Wellons is on the board of AART—JPL’s African American Resource Team—an employee resource group she’s helping revitalize alongside two other early career hires.

“It’s about building a cultural community and encouraging other young people to come work here,” she says.

For interns arriving on Lab this summer, AART will be one of many employee resource groups here to welcome them so they know there’s a supportive network available. And Wellons has some sage advice of her own for wide-eyed interns joining JPL for the first time.

“Talk to everyone around you. JPL’s people are its best assets,” she says. “They are friendly, excited to talk about their work, ready to help, and extremely accessible. Even if you’re starstruck, try to get past it and strike up a conversation and actually meet people. This is a once-in-a-lifetime opportunity. ”

Equally important: Don’t stay stuck in your cubicle.

“Explore the Lab,” she says. “You don’t want to be that one intern who sat in the same building all summer and didn’t walk down the hill and take a break to see history being made.”

While Wellons often has work on the brain, she also carves out time for her favorite hobby: playing video games, something her dad introduced her to at a young age.

“Video games taught me that your imagination can become reality,” she says, citing the Legend of Zelda, Pokemon, and Sonic the Hedgehog franchises as some of her favorites. “I feel like I am exploring a world I wouldn’t otherwise be able to experience in real life.”

Last summer, she also spent two weeks in South Korea teaching space camp to third through sixth-graders, helping them learn about extraterrestrial volcanic bodies, launch bottle rockets and simulate rover driving.

This summer, Wellons will be supporting a group closer to her own age: community college students. She’ll be one of four JPLers serving as mentors at the NASA Community College Aerospace Scholars (NCAS) session on Lab in July, helping STEM students engage in a mini-Mars rover competition using LEGO EV3 kits.

“I always enjoy opportunities to encourage students to pursue their passions,” she says. “That same encouragement is what propelled me to JPL so I have a strong appreciation for outreach endeavours.”

Turning her world right side up

The pursuit that has probably meant the most to Wellons to date is the memoir she wrote about her struggles with depression, “When the World Was Upside Down,” which was published in May 2018. In June of last year, Wellons held a book signing in her hometown of South Jersey, and addressed smaller groups so she could talk to young people about her story.

“It brought back a lot of memories hearing some of the girls in the room talking about feeling like they’re not worthy of things and like other people deserve more than them,” she says. “That’s why I am finally able to openly talk about my experience. My eyes are open to the world now and I hope to be something that makes it a bit better.”

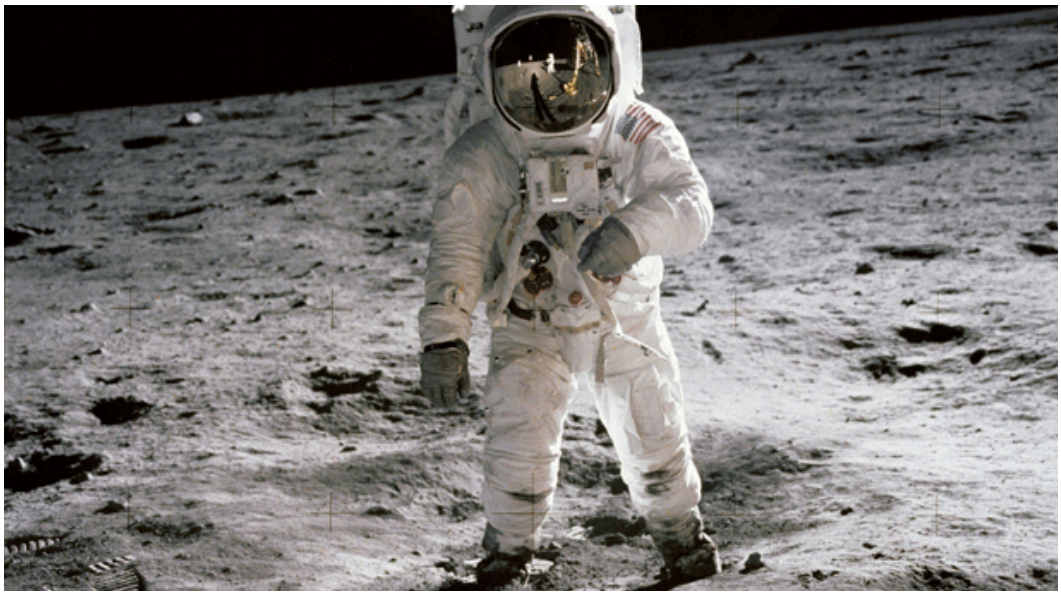
Looking back on what she’s been through, Wellons remains focused on positivity and making the most of her time at JPL—seeking out mentors, gaining a wide variety of experiences, and setting her sights on making her voice and her vision heard.

“Being here a short time doesn’t mean that you can’t accomplish great things quickly,” she says.

But not easily, in her experience, and not without the right people on your side along the way.

"I am immensely thankful for the opportunities and support that have brought me to JPL, because it was never a straight shot," Wellons says. "Don't forget those who have supported you, believed in you, prayed for you, taught you, and lifted you up when you felt especially down."

Events



The Many Ways to Celebrate Apollo's 50th

You might remember the vivid experience of witnessing Apollo 11's Moon landing on July 20, 1969, or perhaps how it touched you years later when learning about it for the first time.

Now, as we approach Apollo's 50th anniversary, below are the many ways to make new memories and celebrate that historic first time humans set foot on another world.

July 10: "Apollo 11: An Immersive Live Show" premiere at the Rose Bowl. JPLers have a NASA selfie station and NASA stickers.
https://www.rosebowlstadium.com/events/detail/apollo-11

July 11 and July 12: Apollo 50th Anniversary von Karman lecture series.
https://www.jpl.nasa.gov/events/lectures_archive.php?year=2019&month=7

July 16: "Destination Moon" screening directed by Blaine Baggett at noon in Pickering Auditorium. After the screening, JPL's John Casani, one of the great space exploration pioneers, will answer questions. Casini joined JPL before Sputnik, led the design of the Ranger spacecraft that first sent the U.S. to the Moon, and later served as project

manager for Voyager, Galileo, and Cassini. First-come, first-served.
https://js.jpl.nasa.gov/Pages/story.aspx?StoryID=27462

July 18: “Apollo 11” documentary directed by Todd Douglas Miller in Pickering Auditorium from 11:30 a.m. to 1 p.m. and from 4 to 5:30 p.m. This event is first-come, first-served.
https://js.jpl.nasa.gov/Pages/story.aspx?StoryID=27465

July 18: The Hub presents “Flash-format Storytelling: Your Apollo 11 Stories” from 2:30 to 4 p.m. https://js.jpl.nasa.gov/Pages/story.aspx?StoryID=27347

July 18: What better way to celebrate than to travel through time by transforming ourselves to look like Apollo-era scientists and engineers? Dress up in your best 1960s space professional attire. More details here:
https://js.jpl.nasa.gov/Pages/story.aspx?StoryID=27496

July 18: Join NASA and centers nationwide to build a virtual Moon mission. Follow #VirtualMoonshot on Instagram, Facebook and Twitter to vote on household materials to build rockets, landers and rovers; improve designs; then watch them launch. Plus, find out how students can also make lunar spacecraft at home or at school. Click for more info.

July 19: NASA's live broadcast of “NASA’s Giant Leaps: Past and Future,” from multiple locations, featuring a live look at Neil Armstrong’s hometown of Wapakoneta, Ohio, the Apollo 11 command module display in Seattle, and more celebrations around the country.
https://www.nasa.gov/nasalive

July 28: The California Philharmonic at Walt Disney Concert Hall is celebrating with “Space: A Giant Leap.” Hear title tracks from “Apollo 13,” “Star Wars,” “Star Trek,” and more. The show will feature NASA and JPL images.
http://www.calphil.com/july-28-space-a-giant-leap

JPLers can also take part in a number of local, family-friendly activities:

July 13-28: Discovery Cube sites in Sylmar and Orange County have opportunities for visitors to calibrate a 34-meter antenna to track spacecraft, learn radio astronomy, and discover the dynamics of energy, pressure and motion while blasting rockets. This event is made possible by a new collaboration between JPL education and public engagement teams, along with the Goldstone Apple Valley Radio Telescope (GAVRT) program.
https://la.discoverycube.org/event/apollo50th/
https://oc.discoverycube.org/event/apollo50th/

July 20: On the site in Downey where Apollo spacecraft were designed and built, the Columbia Memorial Space Center will be commemorating this momentous day by asking visitors to come dressed in 1960s attire. Stick around that night for a special outdoor

screening of the Apollo 11 documentary film.
https://www.columbiaspacescience.org/apollo

July 20: The California Science Center hosts a “Looking Back, Leaping Forward” event for families that includes hands-on activities such as exploring real space capsules from the Mercury, Gemini and Apollo-Soyuz missions, and an experience inside JPL’s custom portable planetarium for a live, interactive, immersive presentation about space science.
https://californiasciencecenter.org/headlines/apollo-11-celebration

August 15: The Hollywood Bowl presents "America in Space" to celebrate the Apollo 50th, with David Newman conducting the L.A. Philharmonic alongside film clips to transport you back to that time.
https://www.hollywoodbowl.com/events/performances/599/2019-08-15/america-in-space

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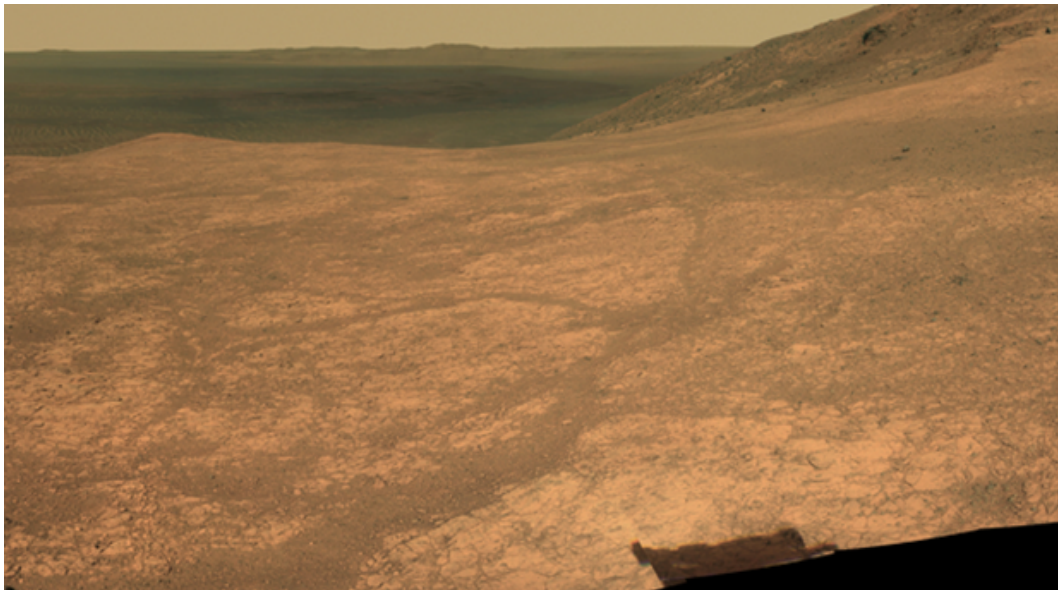

Spirit, Opportunity, and the Exploration of Mars

Wednesday, July 24
7:30 to 8:30 p.m.
Caltech's Beckman Auditorium

Steve Squyres, the principal investigator of the Mars Exploration Rover (MER) missions, will speak about the MER team, mission, and science legacy on July 24. This public talk has been organized as part of the Ninth International Conference on Mars. This event is open to all, and doors open at 7 p.m.

About the Mission

In January of 2004, twin robotic explorers named Spirit and Opportunity landed on Mars. Expected to last for 90 days, their mission went on for more than 14 years. Its objective was to search for evidence of past water on Mars, and to determine if Mars ever had conditions that would have been suitable for life.

To develop Spirit and Opportunity, a team of more than 4,000 highly motivated engineers and scientists overcame a host of technical challenges. The talk will provide a summary of the missions of Spirit and Opportunity, from their initial conception through their development, launch, landing, and operations on the surface of Mars.

JPL Family News

Retirees

The following JPL employees recently announced their retirements:

Gregory W Boreham, 30 years, Section 5124; **Maryhelen Munoz**, 11 years, Section 356F; **Jay D Goguen**, 31 years, Section 3224; **Elizabeth Herrera**, 34 years, Section 1000; **Atul Mehta**, 24 years, Section 356C; **Richard Roessler**, 22 years, Section 1100; **Huyen H Duong**, 30 years, Section 173D; **Albert Magallanes**, 42 years, Section 1213

Passings

Charles "Chuck" W. Moore died May 7, 2019. Chuck began his career at JPL in 1966 as a member of the Support Equipment Group of Engineers. The first project Chuck worked on was Mars Mariner 6 and 7, the first dual mission to Mars. His 31 years of service allowed Chuck to do work he found challenging and meaningful, working on many different missions. As with the beginning of his career at JPL, Chuck's last project, Mars Pathfinder, also involved the red planet. He worked in section 348 at the time of his retirement. Pathfinder's landing occurred shortly after his retirement. He took great joy watching many of his friends and colleagues on TV celebrating the successful landing. Chuck is survived by his wife of 60 years, Beverly, daughter Valerie, sons Keith and Paul, and many grandchildren and great grandchildren.

Jay Bradley Curtwright, 83, died on June 15, 2019. He worked at JPL for 32 years, supporting projects beginning with Ranger, Vanguard and Apollo Moon program, including the first lunar landing, Apollo 11. He worked with electronic engineers and implemented prototype systems at the Goldston tracking stations. Curtwright is survived by his wife, Peggy, six children and numerous grandchildren and great-grandchildren.

Al Bhanji died on Friday, July 5, after a brave fight with cancer. Bhanji joined JPL in 1975, and most recently served as Deep Space Network project manager. Funeral services were held July 9 at Forest Lawn-Hollywood Hills Memorial Park.

Awards

Presidential Awards for Three JPL Scientists and Engineers

Three JPLers are receiving the highest honor given by the U.S. government to scientists and engineers who are beginning their research careers.

The award recognizes recipients' potential to advance the frontiers of scientific knowledge and their commitment to community service, as demonstrated through professional leadership, education or community outreach.

The JPL recipients of the Presidential Early Career Award for Scientists and Engineers (PECASE), named by President Trump, are:

Laurie Barge, for innovative fuel-cell based research; John Reager, for analysis of terrestrial global water cycles; and Jonathan Sauder, for demonstrating innovative technologies to enable a new class of space missions.

Barge, an astrobiologist, explains her work as "using fuel cells in an innovative way to simulate geological systems, with rock samples made into a geo-fuel cell. This can simulate deep-sea vents, but could also be applied to environments where life might survive on other worlds." She said by working in astrobiology and incorporating fuel cells, she learned that the combination could help scientists figure out what might fuel life, or even the origin of life, in other environments.

When she's not studying how life might start on other planets, Barge plays the fiddle in an Irish band at local farmers' markets and runs races with local running clubs.

Laurie Barge

Reager is being honored for his work on the GRACE mission, studying Earth's water cycle by measuring groundwater, floods and drought. This helps him and his colleagues study how extremes of water vary with time and climate change.

He clearly paid attention to his IT security classes. Reager was notified of the award via "a strange email about an award, with attachments and a link. I thought it was a phishing email." He forwarded the email to his section manager, who assured him, "It's a real email. Congratulations!"

John Reager

The other JPL award recipient, Jonathan Sauder, is a senior mechatronics engineer in the Technology Infusion group. He is being honored for his roles as lead mechanical engineer on RainCube (the first radar in a CubeSat), mechanical development of the KaPDA antenna, and as a NASA Innovative Advanced Concepts Fellow and Principal Investigator for a "Clockwork " Venus rover mission concept enabled by mechanical technology.

When not at JPL, Sauder can be found lecturing at USC, fixing up his house in Altadena, or conspiring with his three young sons.

Jonathan Sauder

NASA chief scientist James Green said all the NASA recipients "were selected for what they have already accomplished, but more importantly, we expect they will reach even higher goals in the future. They are shining stars."

The awards will be presented July 25 in Washington and will honor 18 NASA researchers, including the three JPLers, along with 296 other federal researchers.

The PECASE awards were created to highlight the importance of science and technology for America's future. These early career awards foster innovative developments in science and technology, increase awareness of careers in science and engineering, provide recognition to the scientific missions of participating agencies, and enhance connections between research and challenges facing the nation. Click here for a complete list of award winners.

Two New AIAA Fellows: Larry James, Henry Garrett

Deputy Director Larry James holds his plaque after becoming an AIAA Fellow.

Henry Garrett holds his plaque while standing next to AIAA President John Langford.

The American Institute of Aeronautics and Astronautics (AIAA) has selected two JPLers as Fellows in the Class of 2019. AIAA Fellows are "persons of distinction in aeronautics or astronautics, who have made notable and valuable contributions to the arts, sciences, or technology thereof."

The AIAA honored the recipients recently at its Aerosapce Spotlight Awards Gala in Washington and at a ceremony in Crystal City, Virginia.

The plaque presented to Larry James cites his "extraordinary contributions in military, intelligence, and civil space acquisition and operations fields across 40 years, including GPS, signals intelligence, and NASA missions."

James said it's a tremendous honor for him because of the company he's in--the long list of "amazing people who have had a dramatic impact on aerospace."

His recognition honors his military career, and his work for NASA/JPL.

"The joy is in doing what you love and being part of something bigger than yourself," he said. "I'm very fortunate that I spent 35 years with the Department of Defense to help develop the nation's military space capabilities, and had the opportunity to head the integration and testing of the first GPS satellite. That technology is pretty amazing and has changed the world dramatically."

And since joining JPL in 2014, James is proud to be in a leadership position at a world-renowned facility where "we expand the frontiers of human knowledge by tackling the hard science questions every day." He noted the wide variety of projects--"ranging from building rovers for Mars to conducting quantum physics on the International Space Station with the Cold Atom Lab."

James also expressed admiration for the AIAA. "Kudos to a very important organization that does great work globally and is very important to our field."

The second AIAA Fellow selected from JPL for the Class of 2019 is Henry Garrett, a Principal Scientist in the Reliability Engineering Office. AIAA honored him for "leadership in the Institute and the broader space community in modeling spacecraft radiation interactions and effects."

"Being made an AIAA Fellow has been a singular honor in my career. It is the result of almost 40 years of work with my colleagues at JPL in defining the space environment and its effects on our missions. Working on these missions has been a great honor, which this award recognizes."

Garrett's career has encompassed atmospheric physics, the low-Earth ionosphere, radiation, micrometeoroids, space plasma environments, and effects on materials and systems in space. "I'm proud to say that the results of the environmental models I've developed with my colleagues have directly affected the design of many JPL missions, from Galileo and Cassini to Juno and Europa."

The models have led to numerous changes in shielding, electronic parts selection, and mission trajectory designs to help improve reliability and enhance mission success. He also co-authored with Albert Whittlesey a NASA handbook that is the principal international guideline for designing spacecraft to protect them from charging effects--a major source of potential adverse effects.

Exceptional Woman Contributor Award

Taguhi Arakelian received the "2019 Exceptional Woman Contributor Award" from IEST (Institute of Environmental Science and Technology), for her guidance in the contamination control field at JPL, and for her leadership and dedicated contributions to the IEST Contamination Control Recommended Practices program, as well as the Education and ESTECH planning committees.

The Institute of Environmental Sciences and Technology (IEST) is the leading technical, nonprofit membership association that connects professionals who deal with controlled environments. The IEST gives technical guidance through International Standards, Recommended Practices, and education programs developed by experts in the fields of contamination control, environmental test and reliability, and nanotechnology facilities.

Two Trophies for JPL Podcast Series

Writer, producer, host Leslie Mullen accepted the awards (pictured below).

Season one of JPL's "On a Mission" podcast, about the InSight Mission to Mars, has won two New York Festivals Radio Awards: a gold for technology podcast series, and a silver for technology podcast single episode (for episode 2, "Music of the Spheres").

Leslie Mullen wrote, produced and hosted the podcast series, with audio mixing by Colin McNutt. Elizabeth Landau was an assistant producer, Melody Ho created the website, David Delgado did the website artwork, and Laurie Cantillo had oversight and worked with Graphic Services on the logo brand. Mullen accepted the awards at a recent ceremony in New York.

You can hear the series at this site.