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A monthly full-text digest of JPL news, for JPL retirees and others without convenient intranet access

Featured Stories

Jessica Stoller-Conrad is participating in the trial at Kaiser Permanente Los Angeles Medical Center.

A JPLer's Experience With a COVID-19 Vaccine Trial

By Celeste Hoang

Since the beginning of the pandemic, Jessica Stoller-Conrad has had one enduring thought: "I always said that the moment they have a vaccine ready for trial, I want to be the first in line."

On a sweltering day in early August, the web producer for NASA Space Place found her window of opportunity. That morning, her husband heard on the news that Pfizer vaccine trials for COVID-19 were beginning in Los Angeles at various Kaiser locations. The two immediately logged on to the Kaiser site to see how they could sign up for a trial near Pasadena, where they live with their two young children, 4-year-old Freddie and 1-year-old Felix.

"I kept refreshing the page over and over," Stoller-Conrad recalls. "I must have been one of the first people to sign up."

While her husband ultimately wasn't selected for the trial—researchers looked for a wide variety of demographics, from gender to age and ethnic background—Stoller-Conrad was chosen to be part of the Los Angeles program, a subset of Pfizer's 44,000-person trial across the nation.

It's a commitment she doesn't take lightly, and the thought of participating in a drug trial had never been on Stoller-Conrad's radar before 2020. But a pandemic that has claimed more than 1 million lives globally—and upended her family's life as she knew it—carried a unique urgency.

"I wanted to do this because my son asks us all the time when the coronavirus is going to be over and when he can see his friends, and I feel so helpless," she says. "I also want people to know how the trial works. When there is a vaccine ready, I don't want people to be scared of getting the vaccine."

Stoller-Conrad with her husband, Tim, and their sons, 4-year-old Freddie and 1-year-old Felix.

Fear Not

For Stoller-Conrad—who holds a master's degree in biology and a keen interest in the science of a vaccine trial—the key to putting her mind at ease was participating in one of the later phases. In her case, she signed up for the Phase 2/3 clinical trial of a vaccine developed jointly by Pfizer and the German biotechnology company BioNTech. During this phase, researchers collect information on the safety of the vaccine and the amount of immunity, if any, that it provides.

"I was never really scared," Stoller-Conrad says, explaining that Phase 1 had already helped researchers determine the just-right concentration of the vaccine for the lowest risk of side effects. "It might be a scary process for some people because they worry they're going to be a guinea pig and something will be tested on them unsafely. But by this phase, researchers had already optimized [the dosage] and knew it didn't hurt people. I felt like if it was going to be super dangerous for anyone, it wouldn't have advanced to this stage."

Prior to being selected, she was asked a series of screening questions, including where she lived and whether she was an essential worker, so that researchers could gauge the likelihood of her contracting the virus. She also checked with the JPL Ethics Office for approval, since participants do get paid during the trial—$100 per appointment, and $5 for every week they log their symptoms (or lack of symptoms) into an app.

Three weeks after submitting her name online, Stoller-Conrad arrived at Kaiser Permanente Los Angeles Medical Center's clinical trial wing for her first injection on Sept. 1.

The type of injection she received was particularly intriguing to Stoller-Conrad: a brand-new technology known as an mRNA vaccine. If successful, it could be the first mRNA vaccine approved by the FDA.

“A normal vaccine injects you with a piece of a protein and your body would create an immune response,” she says. “But with an mRNA vaccine, you’re injected with the genetic code to create a piece of protein. I thought the new technology part, and to be one of the first people to potentially test it out, was cool.”

The First Shot

Stoller-Conrad after her first vaccine injection on Sept. 1 at Kaiser Permanente Los Angeles Medical Center.

Stoller-Conrad’s initial visit was the longest, lasting about three hours.

On the docket: a COVID nasal swab test to see if she already had the virus; a blood test to identify if she already had antibodies against the virus; instructional videos to watch; a physical to ensure her heart and lungs are healthy; a quick monitoring of vital signs; and forms to fill out.

“As someone who has to write about science simply for my own work, I thought they did a good job of explaining things,” Stoller-Conrad says of the paperwork, which detailed how a vaccine trial works in a straightforward fashion.

Then, it was a 45-minute wait for the vaccine—which is stored frozen at about -112 degrees Fahrenheit (-80 degrees Celsius)—to thaw before being injected. After the injection, 30 minutes of observation to check for any immediate adverse reactions.

Both wait times were mandatory, whether the subject received the actual vaccine or a placebo. Yes, you read that right. For all of Stoller-Conrad’s eagerness to be inoculated, the inescapable math of vaccine trials gives her only a 50% chance of getting the real thing. Only the person administering the injection knows which type the subject has received. The trial’s researchers are also kept in the dark to ensure the trial’s integrity.

After the visit, Stoller-Conrad was given a thermometer to monitor her temperature, a tool to measure redness at the injection site, and a medical card and packet that describes exactly which trial she’s part of. In the case of an emergency, the information can be easily referenced by hospital doctors, and Pfizer and BioNTech cover all medical bills for trial subjects should they experience any serious negative side effects.

From there, her at-home instructions were to simply log weekly “diary” entries into a Kaiser app that records possible coronavirus symptoms, such as muscle pain, vomiting, shortness of breath, or fever.

In Science We Trust

Once the trial initiation was official, Stoller-Conrad returned for a second and final injection on Sept. 25, then went back to the everyday routine of her life as usual—or at least what’s now the new normal during a pandemic.

“I don’t think I’ve changed my behavior at all really,” she says when asked if receiving the potential vaccine has lowered her guard. “I’m still doing curbside pickups for groceries and Target and such whenever possible. And we’re still masked or outdoors and 6 feet apart with people outside our household.”

She and other participants are asked to stay in the trial for up to two years, but have the option of dropping out anytime for any reason, or if another COVID-19 vaccine is approved and they would like to be inoculated earlier.

Stoller-Conrad’s only continued obligations for now are the diary entries and four subsequent appointments for blood tests over the course of two years.

In the meantime, it’s a waiting game alongside the rest of the world to see which vaccine is approved first. But for Stoller-Conrad, it’s well worth the experience to put her scientific beliefs to the test and encourage others to get vaccinated when the time does come.

“I have educated and science-minded friends and so many of them were like, ‘I would never sign up for the trial.’ I’m not judging anyone, but if you say you have trust in the scientific methods and in our systems, then prove it,” she says. “There are also a lot of people in my hometown in the Midwest who are anti-vaccine, and I want to be able to be transparent with them about the process.”

Until then, she has a homegrown audience of people who are big fans of what she’s doing.

“My son will be five soon, and I get to tell him that mommy is getting a shot that might help people not worry about the virus anymore,” she says. “He has a little medical bag that he carries around to give me check-ups.”

And her message to the adults out there: “This will hopefully make it feel like we’re bringing an end to this sooner and that there’s a light at the end of the tunnel.”

Bobby Braun in Building 230 Image Credit: NASA/JPL-Caltech

When the Planetary Science Directorate Aligns

By Taylor Hill

On March 30, JPL announced the newly formed Planetary Science Directorate (4X). The move integrates JPL's Mars Exploration and Solar System Exploration directorates into one—a merger Director Mike Watkins said better aligns the Lab with NASA Headquarters and the planetary science community, while continuing to ensure strong oversight and leadership of JPL's ongoing projects.

To head up the new 4X, JPL has called on Bobby Braun—a former NASA chief technologist and long-time JPL collaborator—who joined the Lab as part of its executive team at the beginning of the year, and joined Caltech as a Professor of Aerospace.

"This is the job that I wanted when I was a kid gazing up at the stars or watching the Viking 1 team during landing – solar system exploration at JPL," Braun said. "It doesn't get any better than this."

Below, Braun talks about his new role at JPL, what the new 4X will look like, and how JPL can lead in engineering, science and research in the 21st century.

What will your new role look like as Director for Planetary Science?

Braun: It's an exciting time to be at JPL and in planetary science. My role is focused on moving forward implementation of our present planetary exploration missions while planning the future of this enterprise, which is critical to the Lab, NASA and the nation.

We want to ensure all Planetary Science Directorate (4X) activities are conducted with a science-first mentality while successfully delivering and operating each project within the required technical, cost and schedule constraints. We intend to expand engagement with the broader planetary science community. It's also the right time to increase the pace of technology infusion, pioneer the use of new business practices and create new strategic partnerships that enable a compelling future in planetary science and astrobiology.

With Perseverance on its way to Mars, now is the time to begin implementation of the remaining missions in the Mars Sample Return campaign. It's critical that we deliver Psyche, Europa Clipper and Lunar Trailblazer on the pace that their interplanetary launch windows dictate. On the technology and research front, it's time to focus our investments on landing, mobility and sampling to grow astrobiology research and create opportunities for Ocean World exploration.

While the JPL culture is built on the need to work together for mission success, I am also committed to working together toward the creation of a work environment built upon freedom, equity and respect for all. As a new employee at JPL, it's clear to me that we have work ahead of us on this journey.

What was your path that led you to JPL?

After being inspired to study aerospace engineering by watching Gentry Lee and others in the control room during the Viking landings as a kid in Maryland, I went off to college at Penn State and then earned a M.S. at George Washington University before beginning my engineering career at NASA's Langley Research Center.

When Mars Pathfinder started taking shape in the early 1990s, Richard Cook and others from JPL came to Langley looking for Viking people because they wanted a few experienced folks for their team. Most of the Viking people had retired by this time and, instead, all they found was this relatively junior kid who had been building computer simulations of landing humans on Mars. They asked me to join the team, and I was more than happy to adapt my initial work to robotic exploration. I worked on Mars Pathfinder from 1992 through its 1997 landing.

Braun in the Mars Pathfinder JPL testbed in 1997

After a few years more at Langley, I joined the faculty of Georgia Tech in 2003, led the Space Systems Design Laboratory and was the founding director of the university's Center for Space Technology and Research. In early 2010, then-NASA Administrator Charlie Bolden asked me to come to Washington, DC to serve as NASA's first Chief Technologist in more than a decade. After two years at NASA HQ, I returned to Georgia Tech before eventually becoming Dean of Engineering at the University of Colorado Boulder.

Whether at NASA Langley, NASA HQ, Georgia Tech or CU, collaboration with JPL was the one constant in my professional life. While in academia, I consulted on EDL projects and served on spaceflight project review boards as well as the JPL Advisory Council. I am proud that many of my students are now employed by the Lab.

When Director Mike Watkins asked me to join the Lab's leadership team in 2019, it was too much of a dream job to pass up.

How do you see your past experience influencing or benefitting your new role?

I have participated in JPL research, technology and flight programs through the eyes of an "external insider" for most of my career. Melded with the strong, in-house experience of others on the 4X team, these diverse experiences should help us organize and execute the grand planetary science missions of the coming decade. I hope to make us a more outward-focused organization.

Working with Congress and the White House in 2010 to create a new organization within NASA that invests in the technologies needed for future missions in space was definitely a learning experience – one that I think can benefit us here at JPL. Through this experience, I learned how NASA HQ and the various stakeholders of our democracy work to advance the nation's science and technology agenda. JPL and Caltech are important stakeholders and contributors in this domain.

As a university professor and dean, I learned about collegial influence and the critical interplay of science and engineering. Georgia Tech and CU Boulder are both JPL Strategic University Research Partners, so I have certainly seen JPL from the vantage point of an external partner. My 16 years at NASA Langley was

Braun speaking at NASA Langley Research Center in 2010.

focused primarily on providing mission support and building capabilities for JPL flight projects. Leadership of these efforts for the final six years I was at Langley was analogous to the line management experience of a 3X section manager.

I hope to utilize this interwoven set of experiences from different sectors of our space community in crafting the future of JPL's planetary science efforts.

Can you explain the thought process behind combining 4X and 6X and how that will benefit JPL in the future?

Following about six months of study and discussion, 4X (the Solar System Exploration Directorate) and 6X (the Mars Exploration Directorate) were officially merged, and we've been operating as a single organization since April. This merger was designed to improve efficiency across the Lab, and alignment and communications with NASA HQ, our partner organizations and the planetary science community. As examples, there is a single Decadal Survey for planetary science and astrobiology and a single division at NASA HQ, the Planetary Science Division, which is responsible for the management and funding of our planetary science efforts. JPL is now better aligned with these external efforts.

As part of the new 4X, the Mars Exploration Program (MEP) is continuing. In addition, we have now been granted authority to create a new NASA program office, the Mars Sample Return Program Office, within 4X. By combining these two directorates, we also intend to improve workforce and staffing decisions across flight projects while providing more stability in our research and technology enterprise as well as our formulation and strategy activities.

What are some key strategy points for 4X that you hope to implement in the coming years?

We need to improve our engagement with the broad planetary science community outside of JPL while also spending more of our time and effort formulating, developing and operating JPL-unique missions. The aerospace world is changing rapidly and there are more organizations engaged in planetary science than ever before. JPL needs to adapt by focusing on the unique science missions that only we can do. Mars Sample Return and surface exploration of ocean worlds immediately jump to mind as clear examples. We need to focus our technology efforts on the landing, mobility and sampling developments required to implement these next decade of missions. I also believe we need to be open to innovative partnerships with industry, academia and other NASA Centers. JPL won't lead every planetary science mission in the coming decades, but there are clear roles for JPL aligned with our core competencies.

What are some of the biggest challenges and potential opportunities you see in the Planetary Science Directorate?

I expect the coming decade to be one of tight budgets and strong competition. I think this will bring out the innovative spirit that has been a hallmark of the Lab for decades. I look forward to working with others across the Lab to position us for success in this new era. Culturally, we also need to acknowledge that cost performance is just as important as technical performance. Providing cutting-edge opportunities for continued growth of our personnel is at the forefront of my plan. Learning how to say "no" to opportunities that aren't aligned with advancing the Lab's core competencies has to be part of this strategy as well.

There are numerous opportunities for partnerships with industry, academia and the other NASA Centers. Being aligned and receptive to the needs of the science community, as expressed in the coming Decadal Survey, is critically important as well.

What do you see as some of the opportunities within the newly combined 4X Directorate to highlight or emphasize some of the talent or work here, that may not have had an opportunity to shine yet?

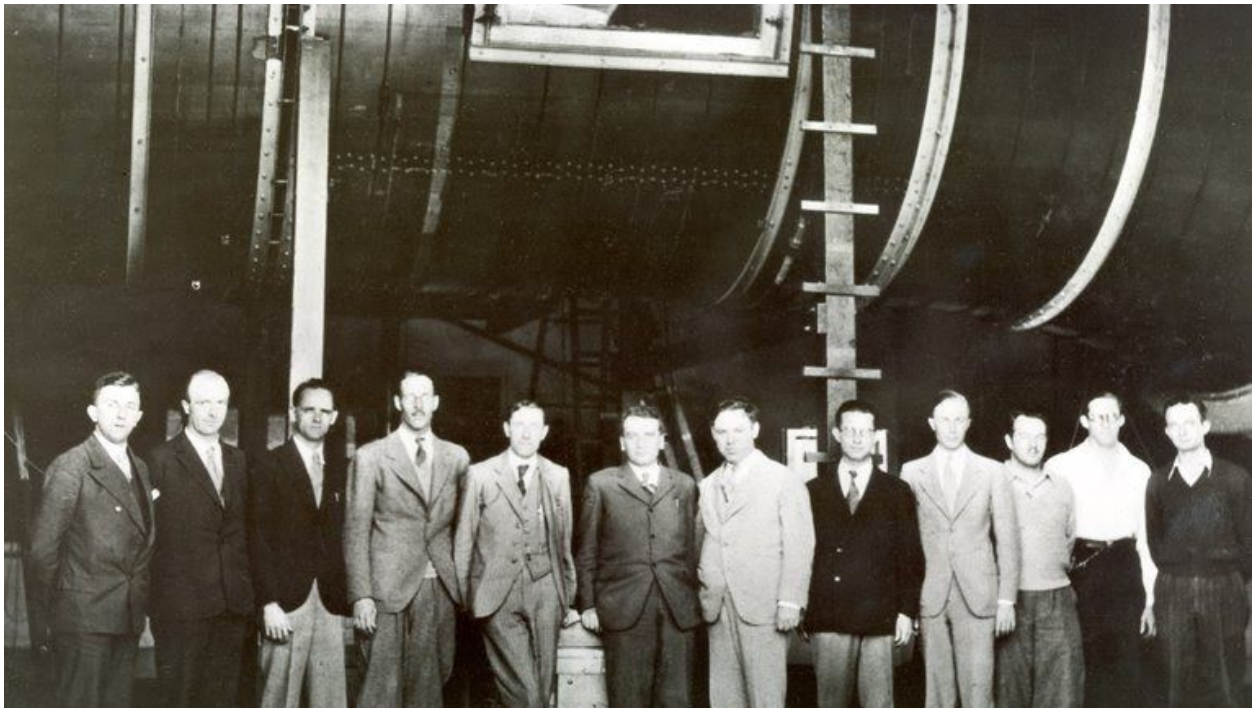
Applying our demonstrated engineering capability to enable future astrobiology missions will be a major opportunity for JPL in the coming decade. Applying our system engineering expertise to Mars Sample Return is another such opportunity.

From a workforce perspective, I believe there is an opportunity for the Lab to be a leader and change-agent among STEM organizations in diversity, equity and inclusion. There is much work to do in this domain, and I believe the lessons I've learned in academia around these topics are applicable at JPL.

I truly believe that innovation shines brightest from diverse teams. This initiative could be the energy that powers the Lab forward in the 21st century.

Is there something in particular you are looking forward to working on at JPL?

The growing field of Astrobiology and finding signs of past life elsewhere in the solar system will change our worldview as a society. I believe we are on the cusp of getting answers to the age-old question, "Are we alone?" and am thrilled to play a small role in this journey.



The GALCIT 10 foot wind tunnel in 1930. Theodore von Karman is in the center, 6th from the left. Clark Millikan is 4th from the left. Image Credit: Courtesy Caltech Archives

The First JPLers, Part 1: Self-Assembling Founders

By Erik Conway

Welcome to the Historian's Corner, a new JPL Space column that explores the origins, mysteries, and curiosities of our Lab. I'm Erik Conway, JPL's historian, and I'll be your guide as we travel through time together. In this first part of the series, we go back to the origins of the Laboratory. Next month, we'll explore the group's testing and analysis during late 1936 and early 1937.

JPL's origins lie in a predecessor organization, Caltech's Guggenheim Aeronautical Laboratory, now its Graduate Aerospace Laboratories (GALCIT). GALCIT was the result of a gift to the Institute by the Daniel Guggenheim Fund for the Promotion of Aeronautics in June 1926. Caltech President Robert Millikan invited Hungarian engineer Theodore von Kármán, then the director of an aeronautical research institute at Aachen University, to become GALCIT's director. It took von Kármán nearly three years to make the move to Pasadena, arriving in December 1929, just weeks after the great stock market crash.

The person most directly responsible for JPL's founding, though, arrived in fall 1934. Frank Malina had been born in Brenham, Texas, in 1912, to Czech immigrant parents. He graduated from Texas A&M and won a graduate fellowship to Caltech. Malina initially worked on propeller efficiencies using the GALCIT

wind tunnel, and soon became interested in the potential of rockets. The eventual founders might never have assembled, however, had it not been for a public lecture by another GALCIT student.

William Bollay gave a seminar in March 1935 on Eugen Sanger's rocket experiments in Vienna. Two rocket enthusiasts, John "Jack" Parsons and Edward Forman, came to meet Bollay after the Los Angeles Times published a front-page story about his talk, and Bollay sent them to Malina.

Parsons and Forman, who had both attended John Muir High School in Pasadena, had been experimenting with gunpowder-based rockets for several years. After high school, Parsons had attended both Pasadena Junior College and Stanford University but hadn't been able to afford to stay at either; he went to work for the Hercules Powder Company, first in Los Angeles, and then at the company's main facility in Pinole, California. Forman worked for Hercules, too, but the two had very different interests. Parsons was a self-trained chemist, while Forman was the mechanical expert and machinist of the pair. Both were aware of the liquid-fuel rocketry work done by the amateur rocket society in Germany (the Verein für Raumschiffahrt) and in the U.S. by the American Interplanetary Society and had drawn some of their enthusiasm from those efforts. They also knew they lacked the skills and resources to duplicate those achievements.

For nearly another year, these three reviewed the small body of existing literature on rocket propulsion. They were not immediately successful at gaining support for a research program, at least in part because Parsons and Forman wanted to launch rockets, not collect data. And launch they did, driving out to the Mojave to fire off powder rockets. But for Malina, data was key, and only a ground test setup would produce it.

Sometime in either fall 1935 or winter 1936, they finally agreed to build a methyl alcohol and gaseous oxygen motor and test stand to gather thrust data. They reviewed plans in February 1936, and in March, Malina tried to interest Clark Millikan, son of Robert Millikan and also a member of GALCIT's faculty, into letting him do a Ph.D. thesis based on analysis of the unbuilt motor's performance. Millikan said no, and told him to go work for one of the aircraft plants in Southern California instead. Von Kármán was more supportive and allowed them use of GALCIT's facilities for the work but offered no additional funding.

The three spent the summer of 1936 struggling to assemble their apparatus, and gained more supporters in the process. One, Rudolph Schott, was both a GALCIT student and one of Malina's friends off campus. Malina bought Schott's Model A Ford in March 1936, and it became one of their logistics vehicles for chasing down discarded equipment in L.A.'s junkyards. Schott would help assemble the test gear. The other, more intellectual contributor was Apollo M. O. Smith ("Amo"), a Harvard graduate from Missouri who was a GALCIT master's student in 1936 and committed to helping Malina with the data analysis—once they had data.

The final member of the little group to appear in 1936 was Qian Xuesen, more commonly known as Tsien Hsue-shen. Qian came to GALCIT from MIT, but had been born in Hangzhou, China, in 1911, and had attended Jiaotong University in Shanghai beginning in 1929. At the time Shanghai hosted many western businesses and businessmen, and was already a hotbed of anti-imperialist activism by students due to the government's collaboration with Westerners. The Japanese invasion of Manchuria in 1931 further inflamed the situation, particularly after China's government decided not to contest the invasion. Japan bombed Shanghai anyway, exposing China's fundamental weakness to Qian. A country without an air force was hopelessly vulnerable. Qian, who was a railroad engineering major at Jiaotong, applied for a Boxer Rebellion scholarship in aeronautics instead. Funded from money China owed the U.S. as a result of this failed turn-of-the-century revolt, 20 of these fellowships were awarded by Tsinghua University in 1934, and Qian was one of the awardees. He spent his first fellowship year studying the tiny Chinese aircraft industry.

Qian moved to MIT in August 1935. He didn't stay long, though. MIT's aeronautical program was very hands-on, while Tsien's own skills were in theory and mathematics. The MIT faculty also expected him to

work in the aircraft industry to gain experience, which, as a Chinese national, he couldn't do. He arrived at Caltech for an interview with von Kármán sometime during the summer of 1936, and von Kármán recruited him on the spot. We don't know when Qian became aware of the rocketeers, though he became Amo Smith's office mate at GALCIT in early 1937, and would then remain involved with the GALCIT Rocket Research Project for a decade.

Next month, we'll explore the group's testing and analysis during late 1936 and early 1937.

My Culture, My Voice

By Elena Mejia

Christina Hernandez made her way to JPL in 2013, but her challenges from childhood through college shaped who she is today. Below, she sits down to share her struggles with attending college, being Latina, and one of the proudest moments of her life so far.

My Journey to JPL

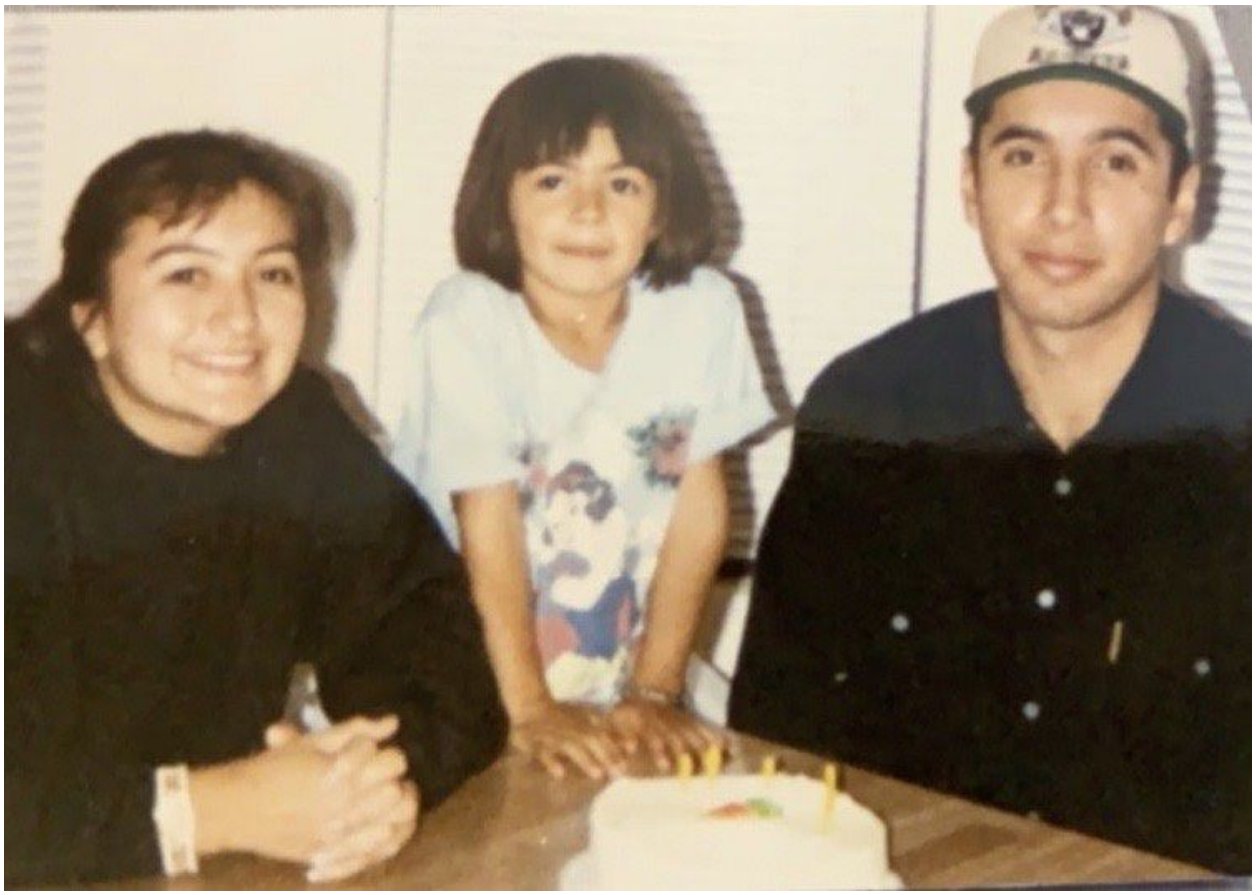
As a little girl growing up in Gardena, California, Christina Hernandez's parents and grandparents came to Los Angeles from Mexico's Baja California and Jalisco in search of better opportunities than they had in their home country.

While both sets of grandparents looked after her at home, her parents attended college by day.

“Reflecting back, it was tough times, but as a kid, in my mind, I thought it was actually cool to be reading and studying next to mom and dad as they were reading their textbooks,” Hernandez says.

Hernandez’s dad Frank, was studying to be an electrical engineer. She remembers her dad bringing home circuit boards and even trying to teach her calculus as a young girl, but she had no interest. “Which is really funny because I grew to really love math after that,” she recalls.

Starting at a young age, Hernandez’s parents encouraged her to follow her passions, to explore and to learn. Her family couldn’t afford to send her to special programs like Space Camp, but her mom found other activities to expand her world. She would take her to the library once a week, where the two would check out the maximum number of books, and visit museums together at least once a month.



Christina and her parents at her early childhood home in Gardena, California.

She loved school and always wanted to learn. By the time Hernandez’s father graduated from college when she was in the fourth grade, engineering was part of her everyday vocabulary. She knew she wanted to be an engineer like her dad. However, at the time, she didn’t necessarily like electrical engineering because “I didn’t think it was as pretty as space,” says Hernandez. “I put aerospace together on my own and I went to the California Academy of Math and Science in Carson, California.”

The academy only accepted the brightest students in L.A., and was created specifically for students from Black and brown communities that didn’t always have the access to the best education.

The school was very multicultural, and Hernandez went to school with people from a wide variety of backgrounds, upbringings and cultures.

“I think this allowed me to recognize the importance of my own culture because I didn’t necessarily get that previously in school,” she says.

Hernandez gained the confidence to see herself in science and engineering and went on to attend Cal Poly San Luis Obispo, where she chose to do Aerospace Engineering. However, college was tough for her: “I went through some pretty difficult times there, but somehow, I graduated with a Bachelor’s and Master’s degree in Aerospace in five years and a job offer at JPL on hand. It somehow worked out.”

What does it mean to be Latina?

I grew up not seeing my culture in American history books and I discovered my culture through my grandmother. You are engrained with this drive of perseverance, hard work, passion, and grit because of the people who come before you. I feel it’s in our blood to be hard working, to be passionate about what we do and whenever I see that in myself, I always link it back to my roots.

You studied Aerospace Engineering at Cal Poly San Luis Obispo but said it was a challenging time. What were some of the issues you faced?

When I was in class, I was either the only brown kid, only woman, or both. There are comments that are made, and you feel that you don’t belong and you’re not welcomed. I started to struggle with mental health as a result of classism, sexism, and racism. This happens to a lot of first-generation college students and students from underrepresented and marginalized communities in STEM. But that entire time, I knew I wanted to work for NASA. I wanted to explore the solar system. It had always been my dream and I knew I had to figure out a way forward. Luckily at Cal Poly San Luis Obispo, there was this great program called the Multicultural Engineering Program (MEP), and it was really like a beacon of hope on campus for students of color. I also joined SHPE (Society of Hispanic Professional Engineers) and I quickly found a group of students who were like me, similar experiences and also struggling through engineering, but together. I had finally found "mi familia" in San Luis Obispo. I was empowered by students who understood the struggle, the obstacles, and the complexities of intersectionality all while being in STEM. All of a sudden, I felt I could get through this. It took a lot of grit and perseverance, but I quickly started to find my confidence in my academics. I ended up graduating with honors, and to me, that was my little comeback story.

What are your earliest memories of JPL?

My mom took me to a JPL open house one year. But when I was little, my earliest memory of JPL was when I used to sneak out of bed to watch "NOVA" on PBS. It was Wednesdays at 9 p.m., which was way past my bedtime as a kid. Every now and then, there would be an episode on space exploration. There was actually one on Saturn and they were talking about engineers at the time who were sending a spacecraft called Cassini over to Saturn. This planted the seed. I really don’t think there is another place in the world where you can do the work that we do. It’s always been JPL.

What were some of your first projects on Lab?

My thesis work was on orbital debris, so I naturally joined JPL's Natural Space Environment group in the Safety and Mission Assurance Directorate right out of college. My job was to model micrometeoroid environments, perform orbital debris risk assessments for spacecraft, and calculate when our earth-bound spacecraft reenter at the end of mission, in order to meet the orbital debris mitigation requirements. About a year into working here, I got to work on the tiger team called Comet Siding Spring with Soren Madsen, and that was my introduction to the Mars world. I started on the Perseverance mission over five years where I was Elizabeth Cordoba's support engineer, who at the time was the RIMFAX and MEDA instrument engineer. When she became the payload lead systems engineer, she handed off those instruments to me where I took them from pre-CDR through ATLO. And since I learned how to swim in those high-octane environments, I ended up with PIXL, who I got to see through HRCR and eventually, will see through to the surface of Mars.

Christina after receiving her Masters in Aerospace Engineering at Cal Poly San Luis Obispo. She had a large Saturn mohawk on her graduation cap.

What was it like to work on Mars 2020?

It's hard not to get emotional even thinking about it. This rover really means everything. We couldn't have named it anything better than Perseverance. I often reflect back on not seeing people who look like me in engineering. All of sudden you're in the room, you're in the meeting, you're at the table, you're helping make the decisions, you're leading the test, you're in the thick of it. That's when you realize, you've made it.

What have been some of your biggest career challenges?

I think sometimes, as engineers, when we think of the word challenge, we think of technical challenge, and there have been plenty of those! But there are also personal challenges. As a Latina, being a woman and being part of the Latinx community, given past experiences, I sometimes felt like I had to try extra hard to prove my worth and make my presence known.

I had to take charge of the meeting. I had to be in the problem and part of the solution to make myself feel known and feel like, 'Hey, I'm here in the room.' After the Perseverance launch, I did a lot of self-reflection on what it means to be a good leader and team member. I realized that as time progressed, I got to the point where I had established already who I was and what I was capable of doing. I had proven it to myself. I didn't need to prove it to others anymore. I recognized that now I needed to challenge myself to know when it was important to take a step back, amplify others, and allow them to grow. The biggest challenge has been becoming a better team member and learning to become a better team leader.

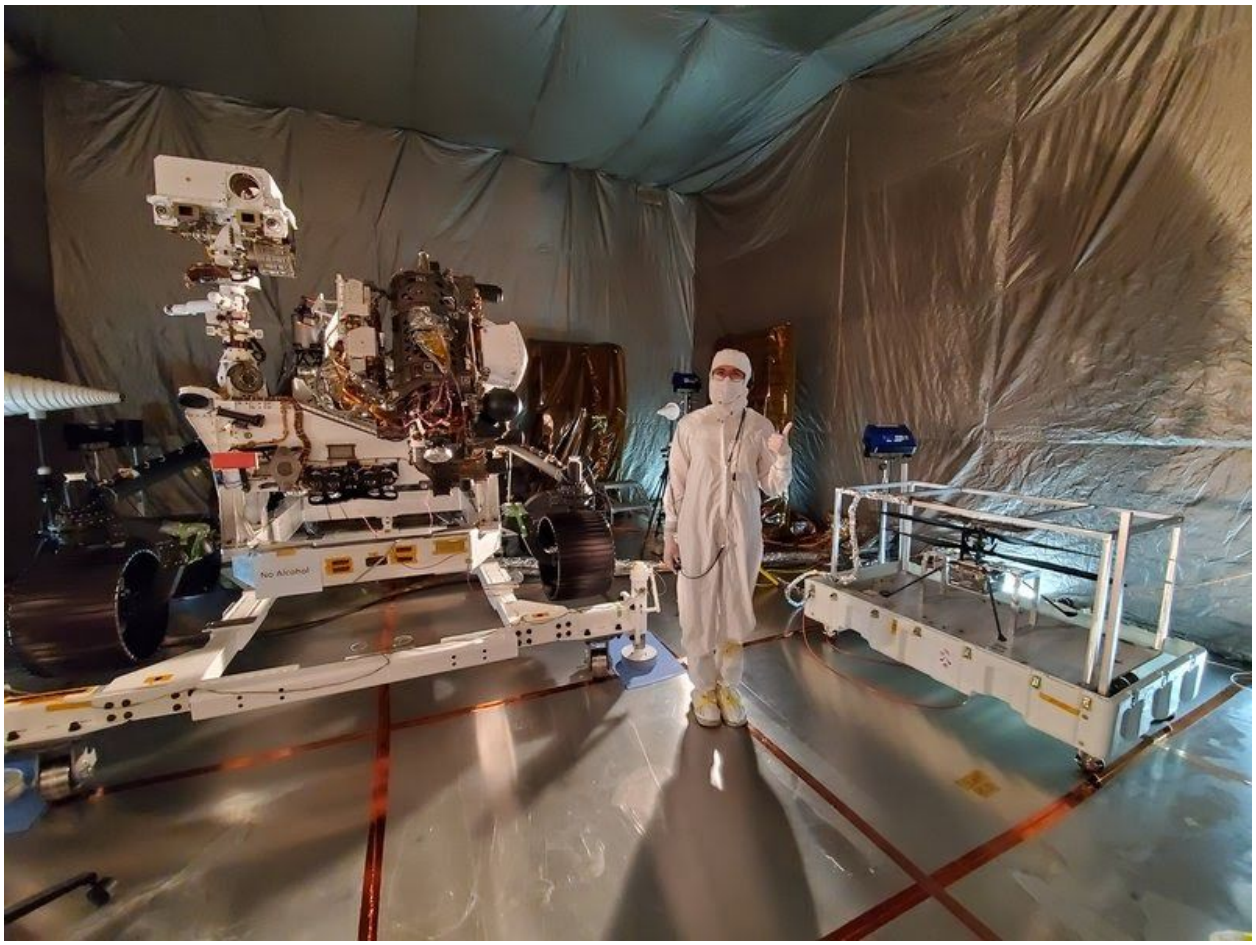
What are some additional goals that you would like to accomplish?

Since we're talking Hispanic Heritage Month, I would really love to work toward seeing more Latinx engineers in leadership and in technical roles, especially my Latina sisters. It's one thing to get ourselves up there, but another to also help create and retain a continuous flow of engineers who are on the path

toward leadership. One of my goals is to advocate for more mentorship and allyship but not just within our community. Our Black, indigenous and LGBTQ+ communities need our community's help in amplifying their voices and goals. I want to help make JPL even more equitable and inclusive.

Career-wise, what have been your proudest moments so far?

The moment that I walked into the ATLO cleanroom to get one of the first instruments that I worked on installed on the rover. I never thought I'd be in that room and it was cool because at the time we had the YouTube live channel and my whole family was able to see me. Going back to launch day, when I saw that countdown and the rocket liftoff, I realized everything that had happened in the past five years. The hardware that we had touched, tested, all the problems, all the successes, all the team happy hours, it was all represented by that rocket launching. I never felt a sense of belonging until that moment.



Christina in ATLO during the System Level EMI/EMC test - photo features three instruments Christina worked on (MEDA, RIMFAX, and PIXL) on Perseverance.

What are some of your future goals at JPL?

I would love to work on a project and say that I went to each of the planets. I am going to Mars. I'd love to go to Neptune, or even go explore an asteroid, or help out with Earth climate science. I would like to explore the Universe and even though I can't necessarily be an explorer today, physically out there in space, I can explore through engineering.

What do you like to do in your spare time?

I love to read and I think that's something that has stayed with me ever since I was little. I'm actually in a JPL book club. We love books so much that now we're actually running two book clubs. We have a sci-fi book club and then we have a general book club. I have read 40 books this year, so I have surpassed my goal. If I can get to 60 books by the end of year I would be extremely happy.

Do you have any advice for students who are looking to follow in a similar career path? As engineers, we have to be lifetime learners who are constantly learning and growing every day. Practicing that skill is incredibly important and you should start as soon as you can. The second thing that I would say is be fearless. Don't be too afraid of failure. It keeps you humble and properly paranoid. I feel JPL has shown me that there are benefits in failing as long as you learn from it. It teaches you to think critically about how to solve a problem, how to come to a solution, and how to identify what caused the problem. That's very much JPL bread and butter there.

Answers have been edited for length and clarity.

Events

Handprints on Hubble: An Astronaut's Story of Invention

Oct. 14
9 to 10 a.m.
Join via Microsoft Teams
Dial-in: 256-715-9946
Conference ID: 580 921 084#

Kathryn D. Sullivan, the first American woman to walk in space, recounts her experience as part of the team that launched, rescued, repaired, and maintained the Hubble Space Telescope.

The Hubble Space Telescope has revolutionized our understanding of the universe. It has, among many other achievements, revealed thousands of galaxies in what seemed to be empty patches of sky; transformed our knowledge of black holes; found dwarf planets

with moons orbiting other stars; and measured precisely how fast the universe is expanding. In Handprints on Hubble, retired astronaut Kathryn Sullivan describes her work on the NASA team that made all of this possible. Sullivan, the first American woman to walk in space, recounts how she and other astronauts, engineers, and scientists launched, rescued, repaired, and maintained Hubble, the most productive observatory ever built.

Along the way, Sullivan chronicles her early life as a “Sputnik Baby,” her path to NASA through oceanography, and her initiation into the space program as one of “thirty-five new guys.” (She was also one of the first six women to join NASA's storied astronaut corps.) She describes in vivid detail what liftoff feels like inside a spacecraft (it's like “being in an earthquake and a fighter jet at the same time”), shows us the view from a spacewalk, and recounts the temporary grounding of the shuttle program after the Challenger disaster. Sullivan explains that “maintainability” was designed into Hubble, and she describes the work of inventing the tools and processes that made on-orbit maintenance possible. Because in-flight repair and upgrade was part of the plan, NASA was able to fix a serious defect in Hubble's mirrors—leaving literal and metaphorical “handprints on Hubble.” (from MIT Press site)

Contact Nadine Andreassen (202) 358-0087 or Catherine Baldwin at (202) 358-4397 if you experience any technical issues.

Teaching Space With NASA: Infrared Light

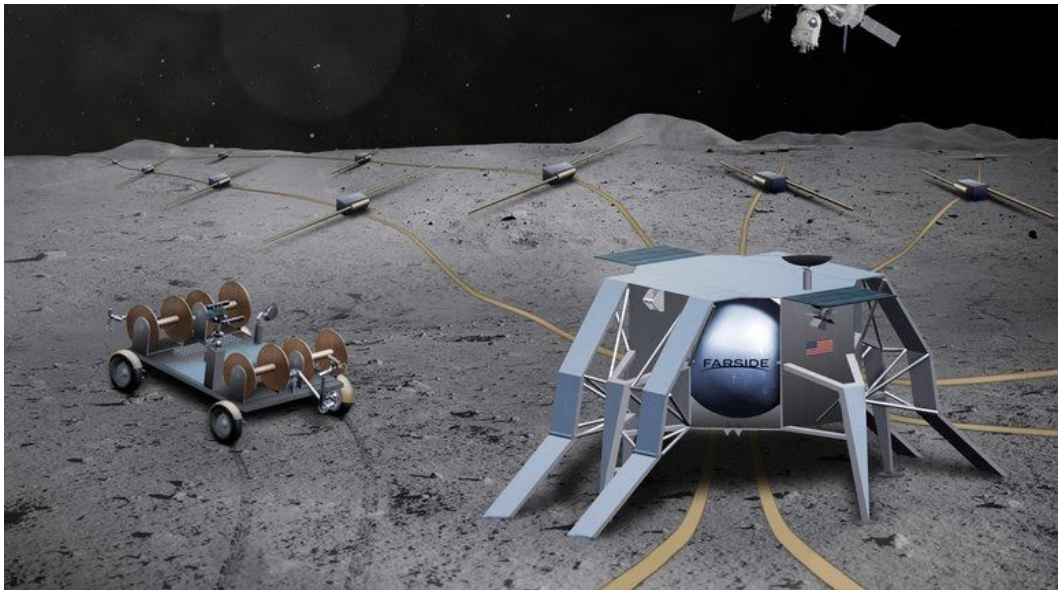
Oct. 14
3 to 4 p.m.

Watch online: https://go.nasa.gov/teachingspace
Register to join the Q&A: https://go.nasa.gov/3l3mAq4

In this one-hour education webinar, NASA experts will discuss how we use non-visible light to explore the universe. Our focus will be on infrared astronomy and the upcoming ASTHROS mission, a balloon-based telescope that will study star-forming regions in the Milky Way galaxy in far-infrared light. JPL Education Specialist Brandon Rodriguez will be joined by mission Engineer Jose Siles for a presentation about how NASA is using infrared light to reveal the hidden universe around us.

The live broadcast will also include a Q&A for registered participants. All audiences are welcome. The presentation will conclude with a short discussion for educators about how the content aligns with the Next Generation Science Standards (NGSS) and related educational resources from NASA.

For educational resources related to the workshop, visit:
https://go.nasa.gov/teachingspace#resources



FARSIDE: A Mission to Place a Radio Telescope on the Lunar Farside

Oct. 19
5 to 6 p.m.
Register at: https://caltech.zoom.us/webinar/register/WN_yVQPyZ9xQF24Wd3zsDdqiQ

Speaker: Professor Gregg Hallinan - Caltech

FARSIDE (Farside Array for Radio Science Investigations of the Dark ages and Exoplanets) is a Probe-class mission to place a low radio frequency interferometric array on the farside of the Moon. A NASA-funded design study, focused on the instrument, a deployment rover, the lander and base station, delivered an architecture consistent with the mass and cost requirements for a Probe mission. This architecture consists of 128 dual polarization antennas deployed across a 10 km area by a rover, and tethered to a base station for central processing, power and data transmission to the Lunar Gateway.

FARSIDE will provide the capability to image the entire sky each minute in 1,400 channels spanning frequencies from 200 kHz to 40 MHz, extending down two orders of magnitude below bands accessible to ground-based radio astronomy. The lunar farside can simultaneously provide isolation from terrestrial radio frequency interference, auroral kilometric radiation, and plasma noise from the solar wind. It is thus the only location within the inner solar system from which sky noise limited observations can be carried out at sub-MHz frequencies.

This will enable near-continuous monitoring of the nearest stellar systems in the search for the radio signatures of coronal mass ejections and energetic particle events, and will also detect the magnetospheres for the nearest candidate habitable planets. Simultaneously, FARSIDE will be used to characterize similar activity in our own solar system, from the Sun to the outer planets, including the hypothetical Planet Nine. Through precision calibration via an orbiting beacon, and exquisite foreground characterization, FARSIDE will also measure the Dark Ages global 21-cm signal at redshifts z~50-100.

The unique observational window offered by FARSIDE will enable an abundance of additional science ranging from sounding of the lunar subsurface to characterization of the interstellar medium in the solar system neighborhood.

Speaker Bio: Gregg Hallinan is professor of Astronomy at Caltech, and director of the Owens Valley Radio Observatory (OVRO). His primary interests are the magnetic fields of exoplanets, brown dwarfs and stars and all sources of transient radio emission.

JPLers and guests are invited to attend this virtual lecture.

JPL Family News

Retirees

The following JPL employees recently announced their retirements:

30+ Years:

Carol A. Fisher, Section 2410, 37 years

John C. Bousman, Section 383G, 35 years

Alicia Bojko (Leonard), 32 years

20+ Years:

Aram Yagubian, Section 2298, 29 years

Barbara B Velosoyap, Section 2210, 20 years

Letters

I would like to thank the people from my section and the project for their support and understanding following the passing of my mother. I also want to thank JPL Hospitality Group for the beautiful plant.

-Hui-Yin Shaw