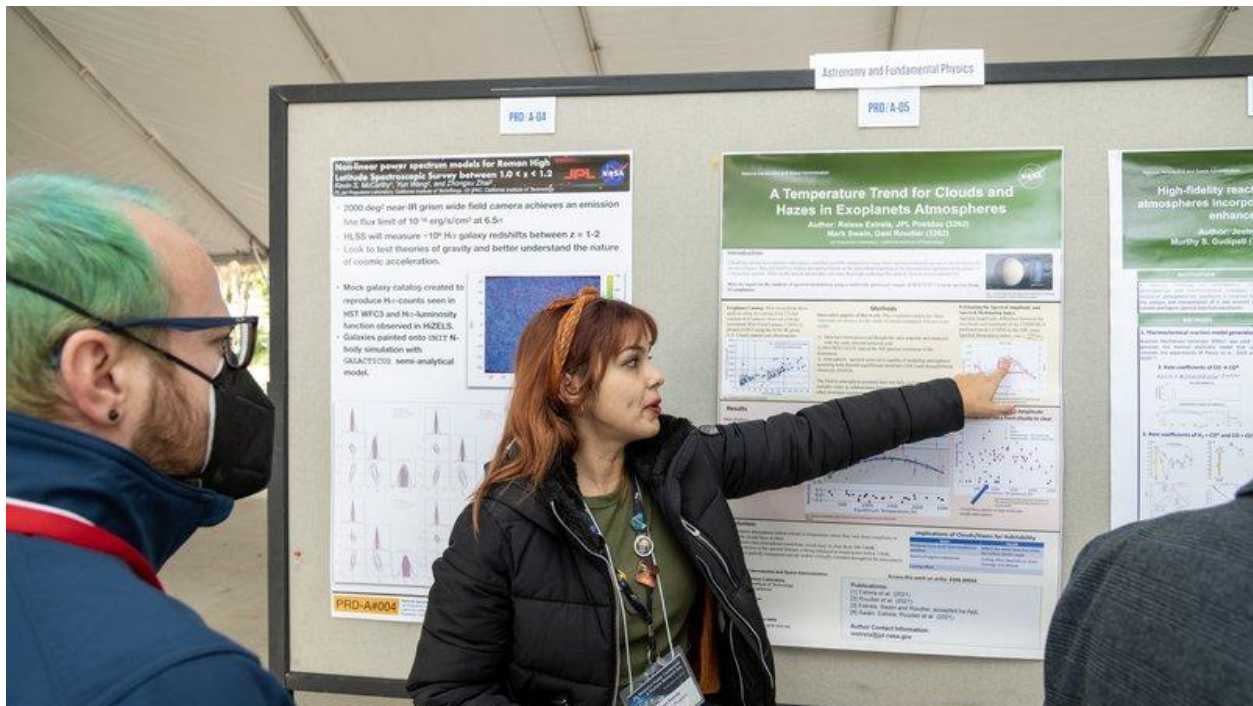


Featured Stories



JPL Postdoctoral Fellow Raissa Estrela discusses her research at the 2022 Research Poster Conference and Postdoc Research Day. Image Credit: PhotoLab

Posters Pack the Mall Once Again

By Christian Hill and Vincent Robbins

A labyrinth of temporary walls rose on JPL's Mall on Nov. 30, each panel hanging the scientific hopes and dreams of JPL researchers, engineers, and postdocs—the annual Research Poster Conference and Postdoc Research Day was back.

Throughout the day, hundreds of JPLers met and interacted with investigators of the 305 posters. It's the visible culmination of months—and sometimes years—of work put in by JPLers and postdocs, featuring the Lab's investments through the Research and Technology Development (R&TD) and the Strategic University Partnership (SURP) Programs.

The outdoor gathering was a familiar and welcome return for the poster conference, once a lively staple on the Mall that had pivoted to a virtual experience during the pandemic.

“The past two years, the event has been missing that connection,” said Research and Technology Development Program Manager Christina Richey. “The ability to really network, highlight, and project your research out to a greater group—we have that today.”

Under the tent, amidst the din of a few hundred JPLers and postdoctoral fellows explaining their fields of research, JPL Deputy Director Larry James and Chief Scientist Mark Simons took turns addressing the crowd, with James pointing out the uniqueness of such an event.

“When you see the 300-plus posters out here, you think about the amazing diversity represented with respect to the investments we’re doing in technology development across the board, that’s pretty powerful,” James said. “This is the crew that will drive us forward in the future. You are setting the foundation for an incredible future for all of us, to develop crazy missions that we are all thinking about, and making them successful.”

Simons followed with a call to remember the vital role collaborative events have on bringing the Lab’s research efforts from the poster board to real-world applications.



JPL Postdoctoral Fellows contributed 75 posters to this year's Research Poster Conference & Postdoc Research Day. Image Credit: PhotoLab

“Research is a very personal endeavor—you sit and bang your head against the wall, sorting through problems, dealing with cranky software—but it’s also a very social activity,” Simons said. “The research is most impactful if you have the opportunity to talk about it and share your ideas. Otherwise, we don’t have a way of bringing it to the next step. The idea of exposing your successes and your research challenges, and thinking about ways to infuse your ideas into the next step, whether that be a new, bigger proposal, or even adding it to a mission, is very important.”

As crowds snaked through rows and rows of posters, a few postdocs took time out to share their thoughts on this special, once-a-year chance to share their research with a large crowd of colleagues.

Postdoc Elodie Lesage (3226), who is researching cryovolcanic eruptions on Europa, reflected on the opportunity to explain her work to others outside of her discipline.

"I love outreach," Lesage said. "It's different from presenting technical results to colleagues, but it's very important because it allows you to step back from your work and you can share it with people who don't work on the same thing."

Lauren Mc Keown (3223), a postdoc studying Martian ice 'spiders,' said the casual, in-person setting created a more comfortable atmosphere .

"I don't like speaking to a room of people—that scares me—but I love talking one-on-one with people about my work and about other people's work," Mc Keown said. "One of my favorite things about JPL is all the organic conversations I've had with the most amazing scientists here, and this is another opportunity to have that. A lot of people at JPL are very open to chatting, even the busiest people that you might perceive to be 'so important'...will give you their time."

The event was also fertile ground for the cross-pollination of ideas.

Andreas Gottscholl (389T), a postdoc working on quantum magnetometers for space application, explained that even unrelated projects can lead to applicable insights for his own work.

"In these poster events, often there are topics I don't know anything about, but sometimes, there is just an approach they are using [and I think] 'Oh, I can also use this approach for my project.'"

FAST FACTS:

- Total number of posters represented: 305
- Internal investment program posters: 230
- Postdoc posters: 75

For more information on the internal Research and Technology Development Program, visit the R&TD Program website at rtd.jpl.nasa.gov and the SURP website at surp.jpl.nasa.gov.





(L to R): Powtawche Valerino, Mike Nieto, and Aaron Yazzie at the Native American booth during 2011's American Heritage Event at JPL, where the group was known for their popular fry bread.

NEBULA's Growing Community

By Celeste Hoang

When JPL's Native American employee resource group searched for a new name a couple of years ago, they only had to look to the skies.

"A nebula is a cluster of many beautiful celestial bodies and that's how we saw our community," said board member and Mechanical Engineer Aaron Yazzie. "Not only are we Indigenous peoples, but we each have our own unique tribes and cultures and titles, and we include allies. It was this nebula of people."

As JPL recognizes Native American History Month in November, the Lab's employee resource group NEBULA—Native Engagement in Building a Unified Leadership Alliance—is re-establishing their presence in the community and reimagining the future of events and membership.

Originally known as the American Indian Affinity Group when first established by former JPLer Mike Nieto around the 1980s, the group saw fluctuating membership levels over the decades. By the time Yazzie joined in 2008, he remembers meeting a group of four or five members for lunch. As the years wore on, several left the Lab and upkeep of the group's efforts fell on the few who stayed, including Yazzie. Membership and programming became stagnant.

But then 2020 happened. As the world came to a standstill from the Covid-19 pandemic, protests over George Floyd's death and the Black Lives Matter movement galvanized the JPL community to support all historically marginalized groups on Lab.

"There was a giant uptick in revamping ERGs around the Lab with better representation, better funding, and a voice all the way up to the Executive Council," Yazzie recalled. "Every group got a boost, and we now have this established platform. That was when NEBULA really got started."

Two years later, NEBULA has approximately 35 members. One major change that helped drive membership: opening the group to anybody who wanted to be an ally for the Indigenous peoples community at JPL.

“That was really important,” said Yazzie, who explained that a previously low number of Native American JPL employees meant low membership, and that meant much of the work to upkeep an ERG internally—put on programming every year, hold meetings, apply for funding—fell on a few people, which caused burnout. “Now, it’s open to anybody who wants to keep this community healthy, and there’s way more help. Those that are allies are also getting to learn a lot about our communities, our backgrounds, and the things that surround Native issues.”

Some of those issues include working to educate the JPL community on Native American history, Indigenous Peoples’ Day instead of Columbus Day, and what Yazzie described as the “complex feelings” around Thanksgiving.

“What Thanksgiving really represents is the beginning of colonialism,” he said. “It’s a hard thing to celebrate, right? I think there are a lot of Native communities and families that have Thanksgiving meals—myself, I have a big gathering with my whole extended family—and it’s a time to come together, but the focus there is not really commemorating the original Thanksgiving, but a time to be thankful for our culture and our families.”

As NEBULA’s membership has grown over the last two years, so has its programming and outreach efforts. Earlier this month, the group hosted a talk with Sherman Indian School Museum Curator Lorene Sisquoc, who discussed the history of Native American children being sent to boarding schools—including Sherman Indian School—starting in 1892. It was a practice designed to integrate the children into American culture by cutting their hair, forcing them to speak English, and not allowing the wearing of traditional regalia.

In October, members of NEBULA attended the national conference for AISES—the American Indian Science and Engineering Society—in an effort to recruit students by sharing their personal career journeys alongside JPL’s projects and missions.

On JPL’s Inclusion page, approximately 0.5% of the Lab population identifies as Native American or Native Hawaiian in the most recently shared [demographic data](#) for fiscal year 2021. Yazzie, along with other members of NEBULA, hope that with continued outreach efforts by members and allies, that number will increase significantly over the years.

“The reason NEBULA exists is that we want to create a safe, healthy community for JPLers,” he says. “[Based on] history and the low number of Native Americans in the whole science and engineering field, there’s a lot of need for supportive communities like this to exist at places like JPL.”

To learn more about NEBULA, email nebula_leaders@jpl.nasa.gov.

Below, we share a special roundup of Native American employee spotlights contributed by JPL’s Human Resources Communications group. Read on to learn the stories and backgrounds of your colleagues.

Spotlight Q&A: Bree Shepherd

Job Title: Engineering Graduate Student - Academic Part-time
Directorate: 352M
Tribal Affiliation: Diné (Navajo)
Pronouns: She/her/hers

What sparked your interest in space and science?

During eighth grade, I received a scholarship which helped sponsor students of military members to attend NASA Space Camp in Huntsville, AL. At the time, I was living in northern Japan, so it was a huge deal for me to get to travel back to America. That trip was really transformative [in] helping me realize I had potential to enter the science and engineering world. I remember looking up at one of the spacecrafts on display and thinking, "I want to work on one of those one day."

What made you pursue your current career?

At the moment, my career is still under development, but I have a strong desire to make it a diverse one. I love working in design and product development, but in my degree program, I'm also learning how to expand my skills in project management. In general, I love entering into new roles that challenge me in new ways and, thankfully, my current position at JPL has definitely been doing just that.



How did you get to JPL?

Last year I attended the AISES National Conference, and was reached out by a JPL representative for an informational interview. After a couple of great conversations with group supervisors, I was offered a summer internship position, which has now evolved to my part-time role today.

Describe your job at JPL.

As an academic part-time (APX) intern, I support the analysis of mass properties for the Mars Sample Return spacecraft. Essentially, I work through a lot of data to produce results that help us understand how the mass allocated across the spacecraft can affect flight.

Favorite thing about JPL?

Even while working remotely, I've received amazing support from my colleagues, and I love hearing about the diverse career backgrounds everyone has.

Career advice/wisdom for others?

Growth is expected within a role. Job descriptions can be intimidating, but there's more than one way to be successful in a role and willingness to take on whatever comes your way can really go a long way.

Is there someone from the Native American community you look up to?

I look up to all the women in my community. There's so much strength that lives within them in helping continue the traditional culture, whether it's through storytelling, food, language, etc.

Spotlight Q&A: Lanie James

Job Title: Employer Brand Communications Lead
Directorate: 11x

Tribal Affiliation: Muscogee Nation

Pronouns: She/her/hers

What sparked your interest in space and science?

The credit goes to my mother. Her love of all things sci-fi is something she passed down to me and my brothers, from books to Star Trek and Star Wars. I've always been curious about what's beyond this pale blue dot we call home.

What made you pursue your current career?

I'm an extroverted talker. And I also love learning, information, and the art of persuasion. When social media and podcasting emerged, I was fascinated by it and focused my graduate studies on emerging platforms and media types. It's always changing—and I both love and hate that (laughs).

How did you get to JPL?

I participated in the NASA Social event for the Mars InSight launch in 2018. I fell in love with JPL missions and launches, so I began to regularly browse the career sites until a role that fit my skillset and experience opened up. Networking, persistence, and a voice that said, "Just go for it," are how I made it to JPL.

Describe your job at JPL.

My role is to position JPL as an employer of choice by supporting the Lab's recruitment team and leading our recruitment marketing efforts. Simply, it's my job to be JPL's number one cheerleader.

Favorite thing about JPL?

Our employees. It's a privilege to work with so many people who are passionate about the work they do and so willing to share it with others. The fact that you can be spontaneously invited to learn more about all the amazing science and technology being developed on Lab is pretty special.

Career advice/wisdom for others?

Three things: Ignore the imposter syndrome. Network. Make sure you can communicate how your skills and experience will benefit the career opportunity you're applying for.

Is there someone from the Native American Community you look up to?

The elders in my family, but specifically my grandmother, Mary Marshall James. It's only as an adult and a parent that I can truly appreciate the lessons, history, and culture they passed down to me. Looking back, I see the significance of many of the things they passed on to me. It has revived my motivation to learn, preserve, and pass on within my family.



Spotlight Q&A: Kristen Shadburn

Job Title: HR Business Partner

Directorate: 11x, supporting 34x

Tribal Affiliation: Apache

Pronouns: She/her/hers

What sparked your interest in space and science?

Growing up, I always wanted to be an astronaut. My dad bought me a NASA sweatshirt when I was little and I wore holes into it. As I got older, I dreamed of going to space camp and would pore over the pamphlet, dreaming about a week immersed in space, very well knowing that my parents could never afford to send me to such a thing. I also grew up across the street from two JPLers who had a daughter my age. Their dad would set up his telescope in the backyard and I would go over and peer into the lens to explore our solar system.

What made you pursue your current career?

I'm a people person and love business. A career in HR combined those two aspects, and I get to work through various challenges every day. No day is ever the same and I am constantly given new problems to solve.



How did you get to JPL?

I have always had my eye on a role at JPL and honestly felt like it was out of reach. About three years ago, I doubled down and started to apply to anything that [was open] and finally got the call.

Describe your job at JPL.

I strategically partner with leadership in the Autonomous Systems division to provide guidance regarding all things people. I want to make sure we are attracting, retaining, and growing our talent every day. I listen to employees to understand the challenges they face, personal and professional, and bring that into the conversation with upper management.

Favorite thing about JPL?

The collaborative nature that everyone brings to the table.

Career advice/wisdom for others?

You are meant to be somewhere for a reason, so even if it's not happening now, doesn't mean it isn't in your future. Keep pursuing the best version of yourself and show up every day.

Is there someone from the Native American Community you look up to?

Deb Haaland, current U.S. representative for New Mexico and the first Native American to serve as the U.S. Secretary of the Interior.





The Success Story Behind 25 Years of Solar System Ambassadors

By Christian Hill

In 1996, a teacher named Tom Estill from New Hampshire attended a Galileo education workshop held by then-Outreach Lead Leslie Lowes. Estill was so impressed by the experience, he wrote to Lowes saying that he wished there was a way he could take all the information back home to his community.

Lowes loved the idea, and the seed for what was then named the Galileo Ambassador Program was planted: Teachers who joined received training and educational materials about the mission to share with their communities. Estill became the first ambassador selected to the program.

Over the next few years, JPL-led missions including Cassini, Stardust, and Mars projects recognized the benefits of the Galileo Ambassador Program and offered to contribute funds to help it grow—and the broader Solar System Ambassador (SSA) program was born.

This month, NASA's Solar System Ambassadors Program celebrates 25 years of volunteer work to teach the public about our vast universe and the agency's science and space exploration efforts.

Since then, 1,122 volunteers have joined—including teachers, professors, nuns, monks, and an astronaut—hosting 58,939 events to date, revealing the science and excitement of NASA's space exploration efforts to millions of people through community centers, schools, radio broadcasts, podcast booths, social media takeovers, and more.

SSA Program Coordinator Kay Ferrari has been overseeing aspects of the program since 2000. Below, we ask Ferrari about how the program has evolved, what led to its popularity and longevity, and her favorite memories over the years.

In your time with Solar system Ambassadors, how has the program grown or changed?

Ferrari: From the beginning, the program has relied on collaboration. The ambassadors personalized the NASA story, shared it with their communities, and reported their results. Before we added any elements to SSA, we tried to figure out how both sides were going to benefit – NASA and the volunteers. Jeff Rosendhal of the Office of Space Science used to describe SSA in this way: “Solar System Ambassadors is a grass-roots effort. We’re going to plant the seeds and watch them spread.”

What do you think is behind the success of the program?

When new Ambassadors come in, they often tell us they feel like they found a family they didn’t know they had—like-minded people who share their love of NASA, space exploration, and sharing the message with others. They appreciate their connection with the agency.

And once they’re in the program, Ambassadors stay. It’s not unusual to find SSAs who’ve been with us for 10, 15 or 20 years. We have a minimum age to join, but no maximum. The oldest Ambassador who was still conducting events was 100. His assisted living home would support his events for the other residents.



Left to right: SSA founder Leslie Lowes, Kay Ferrari, SSA Loretta McKibben of Oklahoma (one of the first Galileo Ambassadors selected in 1997), and SSA Ken Brandt in 2005.

Are there any ambassadors who stand out? Any all-stars?

Where do I begin? There’s the first Ambassador to reach 1,000 reported events. It took him 13 years. We ask SSAs to conduct four events per year. His average was 76. He’s now up to 1,365 with another Ambassador on his heels with 1,320 lifetime events.

For the past 18 years, an Ambassador in rural Georgia has been writing a bi-weekly column entitled “Our Space” for her local newspaper. She picks topics that are of interest to her community members. Six

years ago, we learned that the newspaper she writes for is read to subscribers of a radio reading service that serves individuals who are blind and print-impaired. Our Ambassador thought she only had a local audience of 8,500. She found out there were 25,000 more people who enjoyed her column.

Another one of our Ambassadors works with broadcast meteorologists, addressing them at their annual conferences and providing them with information about NASA missions. He encourages them to use their platforms to share science with their audiences, telling them, "You may be the only scientist your audience will encounter in a day."

And then there's Dr. Sian Proctor, the first Solar System Ambassador to go to space on the Inspiration4 mission in September 2021. She took items with her that she said helped her to get where she was, including her SSA badges and patch.

What has been the most surprising thing you've seen come out of the SSA program?

That this grass-roots effort has become a model for other programs. Among them are NASA's Night Sky Network, the Museum and Informal Education Alliance, Lucy Asteroid Ambassadors, Osiris-REx Ambassadors, and so on. Other federal agencies have also asked about how we operate.

What does the future hold for the SSA program?

We will be introducing regional councils and a Spanish-language group to the program. Regional councils will help mentor new Ambassadors in their areas, as well as encourage collaboration and provide suggestions for outreach opportunities for SSAs in their areas.

The Spanish-language group will provide guidance for Ambassadors desiring to serve Spanish-speaking audiences. We are working towards having bilingual biography pages for those SSAs on our website to aid them in reaching their audiences.

Any Solar System Ambassadors we might know of at JPL?

Some Ambassadors have gotten jobs at NASA and JPL including Mike Malaska, astrobiologist studying Titan, and Mars Planner for Curiosity and Perseverance Rachel Kronyak. Rachel's mentor while she was in college was also a Solar System Ambassador. Also, Emilee Richardson and Sandy Marshall of 18x were Ambassadors.

What type of person do you think makes a good Solar System Ambassador?

A good candidate is a space enthusiast who is active in their community and has a desire to share the story of NASA. They're usually a person who has been inspired by someone they met growing up, like a teacher or a speaker who visited their school. As a result of that experience, they have a passion to pay it forward and inspire the generation coming up.

Solar System Ambassadors want to make a difference in the lives of others. Sometimes it's their own lives they change.

Applications to become a Solar System Ambassador are accepted on an annual basis. [Click here](#) to learn more about the program.



Cozette Parker during her early days at JPL.

Cozette Parker's Path to Commanding Spacecraft

By Mejs Hasan

Cozette Parker grew up bike-riding, roller skating, and scraping her knees from falls in Pasadena, right in the shadow of JPL.

"I got a lot of skinned knees while skating and biking down hills because I couldn't figure out how to stop," Parker said.

There was no stopping her, either, when she started working for JPL. Parker began at the Lab in October 1990 as a staff assistant supporting the Voyager mission, and transitioned to working as an operations systems engineer who now sends commands to the Orbiting Carbon Observatory 3 (OCO-3) mission aboard the International Space Station (ISS).

Read about her career journey, from her teenage job scooping ice cream, to her early years at JPL and being in charge of OCO-3's spectrometer.

Since you grew up right next to JPL, was it always your dream to work there?

I always knew about JPL, but I wasn't sure what they did. I just knew they were a huge employer. My previous jobs were actually not even close to what JPL does. First, I worked at a fast food ice cream place. I was 14, but I told them I was 16 because that was the minimum age. I wasn't a great employee. I gave away a lot of food (laughs). As a high school junior, I started at a coffee shop called Salt Shaker, where I was a hostess and waitress for a couple of years. When I graduated from high school, I was employed in a variety of different jobs including customer service at a local Fotomat, telephone operator, and school bus driver. I was robbed twice in one week at the Fotomat, so my mom said, "That's it, you're quitting!"

How did you get your foot in the door at JPL?

I was doing office work for an insurance brokerage. I had done typing and shorthand in high school, so I was trained for it. I worked in a 14th-floor office in the Century City business district of Los Angeles. When I left that job, I had a girlfriend in Pasadena who had just started working at JPL. I called her and asked, "What do I need to do to get into JPL?" She recommended I go through a temp agency. My temp job at JPL lasted three weeks, and then I was offered a permanent position supporting the Voyager mission. I was a good typist and staff assistant, so it wasn't that hard for me to get on with my new job. It was also way more laid-back at JPL. Skirts and pumps were no longer necessary, but I ruined several pairs of shoes when my heels got caught in the tiles on the JPL Mall!



Cozette Parker beside the antennas at the Deep Space Network's Goldstone Complex

You switched from staff assistant work to engineering work. How did you make it happen?

I had been at JPL for five years. I had a friend who was starting college and she told me, "You know, you should probably go to college." I said, "I work all the time; I don't have time for that." But after she'd done it for a semester or a year, I said, "Okay, I'm coming." I started at East Los Angeles College, a community college, and got an Associate Degree in Liberal Studies. When I finished, I decided I wanted to move onto something technical. I had been watching people at JPL doing what I felt was interesting work. It seemed hard, but I thought, "I'm not a stupid girl; I can go to college and learn how to do this stuff," so that's what I did. That's when I transferred to the University of La Verne, a private school in Los Angeles County.

I got all A's, except for a B in speech. I even did well in physics. I had never taken physics in high school, so I was completely intimidated because it sounded so hard, and I ended up loving it. I told everyone I knew at JPL that I'm in college and I'm going to want a job. And anytime someone had a little engineering job they wanted to be done, I told them, "I'm your girl. I can get it done." I remember coming to JPL during a weekend, crawling under a desk, breaking my nails, pulling cables, and connecting things. So when I finished my bachelor's degree, one of the supervisors I had supported for years offered me my first engineering job at JPL.

Tell us about your job commanding spacecraft.

I was a mission controller for Ulysses, a probe that orbited the Sun. I never imagined I would be sending commands to a spacecraft millions and millions of miles away. I got to see one of the antennas we used at the Goldstone Complex. It's out in the desert in California, with turtles and donkeys all over, and it was so awesome. I flew there on a NASA plane that has since been decommissioned. That was an experience I do not care to repeat (the plane ride, that is). Stand next to these antennas—they're humungous. It's amazing what we do at JPL, to be in contact with spacecraft flying millions of miles away. The Ulysses mission ended in 2009, and during its final moments, all of us mission controllers went to the operations area and watched as the communications ceased. Ulysses just floated off into space.

You now work on the Orbiting Carbon Observatory 3 (OCO-3) mission. What do you do?

I'm still very much in training and learning a lot of new things. I'm thankful to be on a team – we back each other up. OCO-3 (Orbiting Carbon Observatory 3) is located on the International Space Station (ISS). It's a very sensitive instrument called a spectrometer. It has to avoid direct sunlight because it can damage OCO-3's detectors. So we sometimes have to use the pointing mirror assembly to stow the instrument, depending on what the ISS is doing. We have to be very reactive if a visiting vehicle comes in bringing supplies to the astronauts, or a new instrument is getting installed. And for example, sometimes the ISS flies backward. So we tuck the instrument away until it's safe for it to point to Earth again and continue gathering data. We create a week's worth of commands that we send on Thursday, and then we make changes based on if the ISS has a change in schedule.

Since OCO-3 is involved in monitoring carbon dioxide (CO2) levels on Earth, has this affected your own CO2 emissions?

I try to. I turn off all the lights in the house unless I'm using them. And I recycle plastics. I'm a car person, though; I just love cars. If I could afford a brand-new electric car with a lot of power, I would do it. Call me Danica Patrick in another life. I would love to be a race car driver.

What are the most important things to you?

I come from a big family with lots of nieces and nephews. I have a niece four years younger than me, so she's like a sister-niece, and her two boys are very dear to my heart. They're adults now. I have another nephew who has two little girls; they are the most precious things in the world.

Imagine your younger self – what advice or words of hope and encouragement would you give her if she were starting out today?

Go to college right after high school. Do not fool around; you know what I mean? When I got out of high school, I thought college wasn't for me. But I was a gifted student. I could have applied for scholarships and received them, but I just wasn't interested at that time. Community colleges are very good if you don't know what you want to study. Get your prerequisites out of the way for way less money. That worked really well for me. When I finished community college, I had a direction for what to do next. Employers want to know that you can learn. Having a degree means that you're teachable.

Any advice for those just starting their careers at JPL?

Learn as much as you can, and continue to build on that knowledge. Ask lots of questions, people at JPL are happy to share what they know; networking is key here at JPL.



Post-War JPL: A Mashup of Two Missiles

By Erik Conway

Welcome back to the Historian's Corner, where we explore 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.

Even as JPL wriggled into and eventually out of missile development for the military – as I described in the previous column – the Lab undertook an effort more aligned to its modern identity: setting a high-altitude record and putting the first human object into space.

The vehicle for that effort was the Bumper WAC: a hybrid of the German V-2 missile and a modified WAC Corporal. The program's goal, still defense-focused in the immediate aftermath of World War II, was to develop the science and engineering for very long-range missiles.

The Bumper WAC's origins are a little murky. JPL Director Frank Malina attributed the idea to Martin Summerfield, who developed the Lab's acid-aniline propulsion technology. Malina unsuccessfully pitched the Army on a "step rocket" that would reach space in January 1946. Homer Joe Stewart, the Caltech aerodynamicist who also served as head of Section 1, JPL's Research Analysis group, recalled that the subject came up at White Sands Proving Ground during a V-2 launch in mid-June, 1946. At the launch, the Army Ordnance Department's Col. Toftoy, General Electric's Richard Porter, who was in charge of the V-2 launches, and Caltech's Clark Millikan discussed using the V-2 as a first stage.

Strapping two rockets to each other would prove bumpy.

The moment of separation was one key decision. V-2 failures were common, but usually occurred late in flight.

"We finally ended up with a compromise which was based on the 50 percent (failure) point on V-2 statistics... shutting down the V-2 and igniting the Corporal," Stewart recalled decades later.

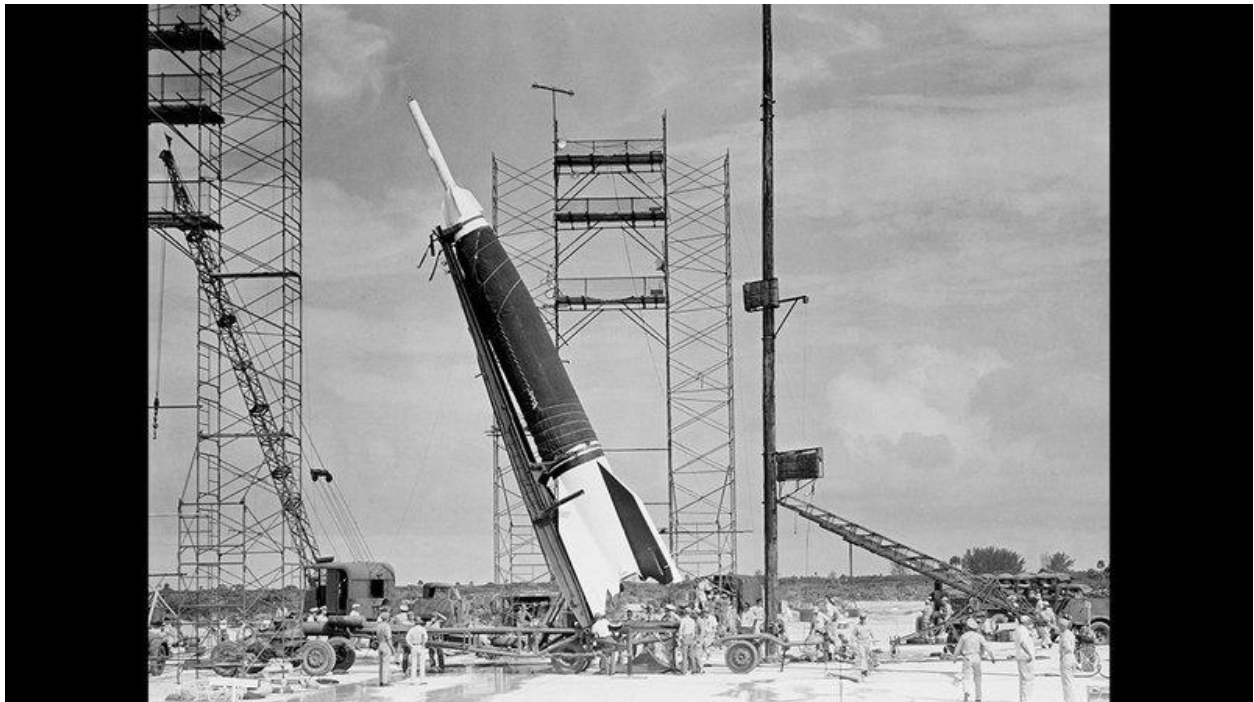
That would mean separating the rockets between 19 and 25 miles (30.5-40 km) altitude. The WAC Corporal then could fire its engine up to about 66 miles (107 km), and with inertia might coast as high as 400 miles (644 km).

The separation system itself was simple. A set of guide rails with rollers held the base of the WAC Corporal inside the V-2's nose. To ensure that the WAC's fuel system didn't experience significant lurches in acceleration, as would happen if the motor fired after the V-2 had shut down, the WAC ignited while still inside the V-2. The WAC's exhaust tripped the circuit that shut off the V-2's motor, while a conical blast plate directed the plume to channels leading out of the nose.

Stewart's group also concluded that the fin area of the WAC Corporal was about one-third too small for stable flight at high altitude, so they added a fourth fin. They supplemented the fins with a pair of spin rockets for stability once the atmosphere became too thin.

In keeping with the cautious, step-by-step approach JPLers had learned in their earlier test series, Stewart's team decided not to try launching a liquid-fueled WAC Corporal on their first attempt. They didn't know how the ignition might (or might not) work at such high altitudes. Instead, they designed what they called a Dummy WAC with a custom solid fuel. It would only have 15% of the impulse, but it would demonstrate that all of their other new designs worked.

The first two launches were with the Dummy WAC. The first try, on May 13, 1948, was a success. The Dummy WAC reached 79.1 miles (127 km) altitude, and a speed of 3,006 mph (4839 kph.) The second Dummy WAC launch failed. The V-2 lost thrust early in the flight due to a failure in its oxygen system. The Dummy WAC separated, but safety devices prevented it from igniting.



Bumper 8 being erected at the Joint Long Range Proving Ground in Florida on July 17, 1950, now part of Cape Canaveral Space Force Station

The third flight used a Bumper WAC with a small amount of liquid fuel. The V-2 performed well, but the WAC had a "hard start," and never developed enough thrust to separate. The team traced the ignition problem to the very low pressure above 100,000 feet. The fuel had evaporated so quickly it didn't ignite. The solution was to put a "burst diaphragm," a plate-shaped cover, over the WAC's nozzle to maintain normal surface air pressure in the motor until ignition.

Bumper 4's V-2 failed, this time from a fuel line rupture.

Bumper 5, launched Feb. 24, 1949 and carrying the first fully-fueled Bumper WAC (45 seconds of fuel), finally achieved complete success. Stewart remembered decades later: "On our first real operation to go to high altitude, it went to something like 250 miles. That was a real fine feeling. At that point we said, "Gee, we have done all the things you need to do in order to get to a satellite."

That was more than eight years before Explorer I, the JPL satellite that put the U.S. in space.

The Bumper WAC reached 244 miles (389 km) altitude and 7552 feet per second (5149 mph, or 8286 kph) velocity, setting records for the highest altitude and highest velocity of any human object to date. The doppler telemetry recorded the flight until the missile broke up during re-entry. The nose had been equipped with a temperature sensor, so they had also gathered the first heating data relevant to warhead re-entry—another program goal. As Stewart recalled in the same interview, "the formal objectives all had to do with long-range weapons."

The Bumper WAC program reached its literal and figurative zenith with Bumper 5. The sixth rocket failed, and the last two, numbers 7-8, were low-angle flights to test separation and heating on weapon-like trajectories in the denser lower atmosphere.

But the Bumpers had proved a concept, and not merely the military one that had motivated the program. Bumper 5 showed that the U.S. could fire a satellite into space. Bumper 8 showed from where: it was the first launch from what is now Cape Canaveral Space Force Station.

JPL Family News

Retirees

The following JPL employees recently announced their retirements:

30+ Years:

Debra A. Wade, Section 3413, 32 years