Featured Stories

The JPL-designed Accessory That Could Save Lives

By Celeste Hoang

It started as a lighthearted comment in a Monday meeting.

Staff from JPL's Office of Space Technology, including Manager Tom Cwik and Product Designer Faith Oftadeh, were seated in a conference room one late February day discussing the headlines no one could avoid: the coronavirus was spreading quickly around the world. The CDC guidelines at the time included sanitizing—the group had already thrown out all the food in their office and put hand sanitizer on the coffee counter—and not touching your face.

"Everyone became so self-aware of how often they touch their face and we started laughing about it," recalls Oftadeh. "Then Tom said, 'Wouldn't it be funny if we had a device that warned us when our hands were coming toward our face?'"

That funny idea turned out to be a seriously good one. PULSE is now a pendant designed to be worn around the neck—aptly named because it begins pulsing when the wearer's hands are nearing their face—and it can be 3D-printed and assembled for less than $20 and in under two hours, thanks to open-source designs the team published in May.

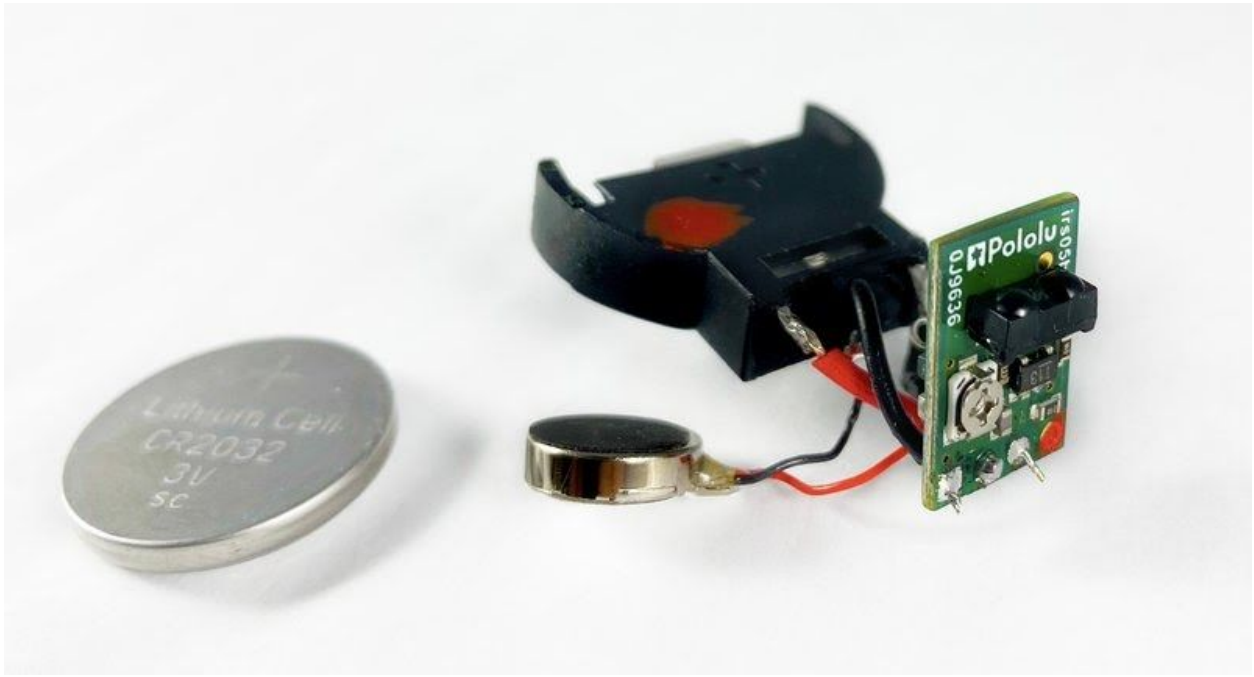
"I thought that it was really important for JPL folks who are able to, to step up during this once-a-century situation and apply our skills, large or small," Cwik says. "A pendant is small—it's not a vaccine—but as a laboratory and organization, we were able to do something meaningful and make a difference."

After Hours Heroes

While the initial idea was born of a casual comment, Oftadeh and Cwik started delving further into the creation of a real device after (home) office hours and on weekends as the U.S. infection rate and death toll took a dire turn by the end of February.

Together, they first discussed some type of warning element that every JPLer could have attached to their badge to avoid touching their face. Oftadeh mentioned that she'd seen pendants worn on users' backs to prevent slouching, and Cwik suggested perhaps they could design something worn on the front of the chest. From there, Oftadeh started researching motion sensors and haptic responses, such as vibration. By the time JPL began mandatory telework on March 17, the two were emailing and texting ideas back and forth to create the first prototype.

Weeks later, they narrowed the design down to a pendant worn around the neck, an idea inspired in part by Oftadeh's love of jewelry making. By April, Cwik was searching online for electronic hobbyist stores that sold infrared sensors. While shipments were slow at the time, Cwik sent the online company a note that his purchase was for a Covid-class sensor prototype, and "they turned the order around immediately," he says.



Once Oftadeh and Cwik had the design and the parts down, they recruited Mechanical Engineer Daniel Kolenz to join the effort and piece together the puzzle.

"Tom did all of the electronics design, but he needed a way to fashion it into a wearable device, which is where I came into the picture," Kolenz says. "He gave me all of the specifications for the electronics, and I had to somehow fit it into a 3D-printed small enclosure."

While Kolenz acknowledges he doesn't normally work with electronic packaging, he was excited by the challenge at hand.

"[It was] a little outside of my world of expertise," he says. "I'm typically in structures but I tinker with electronics and 3D printing all the time as a hobby anyway. So when they came to me, I said I can definitely do this."

Kolenz spent two days working on the assignment and came up with the initial concept seen in the open source design today: a 1.8-inch pendant with a rectangular top and a circular bottom that houses an infrared proximity sensor, coin vibration motor, tactile slide switch, and 3-volt battery and holder. The pendant can be attached to an 18- to 24-inch necklace and worn 6 to 12 inches beneath the chin.

While the lack of face-to-face communication was challenging at times—had they been able to work together in one space, "We probably could've done this in a week," Oftadeh says—the trio nonetheless pulled off the product design and moved into the testing phase as fast they could.

Cwik and Kolenz printed dozens of prototypes on their personal 3D printers, and then Oftadeh would drive to Cwik's house to pick up a bag of samples for a trial at her home. All together, "it took about a month to get a really good working prototype because we were going back and forth," she says.

The three volunteered their time during the early stages of PULSE, but once they had a working prototype, they sent the design to JPL Associate Director for Strategic Integration Dave Gallagher. He was impressed with the project and gave them a charge code from the Lab's Innovation Budget to continue the work.

By May, they had finalized two designs—one for at-home 3D printers and one for industrial printers—and were ready to share with the public. Now, the team hopes 3D printing enthusiasts around the world will continue iterating and improving on their concepts.

"The whole idea here is it can be done at home, by yourself, and if you have access to a 3D printer, you can make it," Oftadeh says.

After the open source designs were published, the team received positive feedback from the public, including “really sweet emails from people who said, ‘Boy, I could really use this today,’” says Cwik. “They were asking how they can get one from the Covid standpoint, but it turns out there are a fair number of people who shouldn’t be touching their faces for low-level medical reasons, too.”

Cwik adds that the team is currently looking for third-party companies to manufacture the pendants for broader availability to essential workers and the public. Some jewelry brands have expressed interest in adding the pendant to their inventory—and the team is continuing to reimagine their designs for a second version that “may be easier to work with and easier to use,” Cwik says.

Until then, the trio is satisfied that they could offer their own small contribution.

“The most rewarding part was seeing it come to fruition,” says Oftadeh. “I remember sitting in that conference room laughing and commiserating, and now it’s become a real thing. We have a name for it and it works, and it’s out there and could potentially help a lot of people.”

Celebrating Jakob van Zyl’s Life and Legacy

An event to honor Jakob van Zyl’s life and legacy is tentatively planned for the spring/summer of 2021, in the hope that by then his family and friends will be able to gather in person.

Jakob van Zyl died Wednesday, Aug. 26, after suffering a heart attack on Aug. 24. In a Lab-wide email announcing van Zyl’s sudden passing, Director Michael Watkins said, "JPL and NASA are richer for his many technical and managerial contributions, and for his unwavering dedication and engaging personality."

Van Zyl joined JPL in 1986 and served in crucial roles at the Lab over a 33-year career, including as Director for the Astronomy and Physics Directorate, Associate Director for Project Formulation and Strategy, and finally Director for the Solar System Exploration Directorate.

As leader of Solar System Exploration, he oversaw successful operations of such missions as Juno, Dawn, and Cassini, the implementation of InSight and MarCO, as well as ongoing development of Europa Clipper, Psyche, and all of JPL's instruments and the Mars Helicopter for Mars 2020.

Van Zyl's early achievements earned him world renown for his research in imaging radar polarimetry. He went on to manage implementation and operations of Earth Science missions and instruments under JPL's responsibility. His contributions included the design and development of many synthetic aperture radar (SAR) systems, including SIR-C, SRTM, AIRSAR, TOPSAR, and GeoSAR, and a role on the SMAP science definition team. He earned multiple patents and NASA awards.

He served as the Lab's Director for Astronomy, Physics and Space Technology while the Spitzer Space Telescope, Kepler and other missions were making breakthrough discoveries in the cosmos. While in a leadership role for Project Formulation and Strategy, van Zyl helped to formulate a new vision for the Laboratory of the future.

A native of Namibia, van Zyl received an honors degree cum laude in electronics engineering from the University of Stellenbosch in South Africa. He earned both his master's and his doctorate in electrical engineering from Caltech.

While in South Africa, van Zyl visited the American Cultural Center in Cape Town, which helped lead him on a path to NASA and a graduate education in the U.S.

Through the years, van Zyl enjoyed such leisure activities as running, rugby, and adventure travel. He was passionate about sharing the excitement of space exploration with young people in Namibia and South Africa, encouraging them to pursue science and related fields. He traveled to those areas to host presentations on the solar system and universe, and offered similar presentations for students via Skype.

In lieu of flowers, the family is requesting donations to support two of Jakob's favorite causes:

The Jakob van Zyl Memorial Fund for Namibia Schools to help the schools in Namibia that Jakob and his spouse, Kalfie, generously supported. The funds will go to a small network of schools that the couple worked with for many years, and which are located in the area of Namibia where they grew up.

- Contributions can be made through the following link: https://www.gofundme.com/f/in-memoriam-jakob-van-zyl.

- The Jakob van Zyl Memorial Fund at Caltech to support research and/or scholarships for students in the Electrical Engineering Department, where Jakob studied, graduated, and conducted research for most of his career, and in which he taught for more than 20 years. Contributions can be made through the following link: https://caltech.imodules.com/vanzylmemorial.

Friends and co-workers are also invited to post tributes at https://www.mykeeper.com/profile/JakobJapieVanZyl/.

Any questions about donations or other ways to honor van Zyl's memory should be directed to Gail Robinson at robinson.gk@verizon.net or (310) 962-1066.

Edward Swenka uses one of the hand sanitizer dispensers installed at Cafe 167.

Extraordinary Times Call for Extraordinary Cleanliness Measures

By Jane Platt

The COVID-19 pandemic is shining a light—arguably more than any other event in our lifetimes—on cleanliness and health. This heightened emphasis on maintaining a safe and healthy workplace has prompted the Lab's Facilities teams to adapt to new guidelines provided by government and health agencies, and meet the expectations of the Lab's population.

They're tackling the challenges on multiple fronts: indoor air quality improvements, cleaning and sanitizing, and hands-free device upgrades. As proof that great minds think alike, these initiatives closely parallel many of the suggestions JPLers submitted to the Spark campaign in response to a call for ideas.

Here are some details on how Facilities is battling the novel coronavirus:

The Cleanliness Front

This is where the elbow grease comes in. A fleet of nearly four dozen masked and gloved personnel is thoroughly disinfecting all occupied areas on a daily basis, emphasizing high-touch areas such as door knobs, keyboards, cabinets, and desks.

"It's very demanding, but they're now accustomed to the new structure," says Carlos Villarreal, Facilities Operations Management section manager. "At first it was a little rough, but now it's standard to wear multiple layers of PPE and be very careful for their sake and the sake of others."

Villareal and his colleagues are tracking research, recommendations, and other developments, which, for example, prompted them, when the pandemic began, to switch the type of disinfecting products used, opting for one that was determined to be more effective against the new coronavirus.

They've also supplemented their toolkit with electrostatic sanitizing, which is very efficient at reducing viruses and bacteria. The electrostatic technique might be compared loosely to a fog machine, except it disperses sanitizing solutions. It works by spraying sanitizing materials that are combined with air and given a positive electrical charge as they leave the sprayer. These charged droplets can then cling to and coat surfaces thoroughly, allowing the cleaning solution to, in essence, give a cleaner clean. In addition to combating the virus, Villareal says it "will absolutely help with the flu and cold season."

Another addition to the cleaning regimen: all potable water systems are now flushed on a daily basis.

The Hands-free Device Front

The emphasis is on making the workplace more touch-free and automatic. Facilities teams have doubled the number of touch-free hand sanitizers on Lab--from about 400 to about 800. Sanitizers are in place at the main entrance for every building, in high-traffic areas, and near all restrooms.

Restrooms have several other new features, including touchless faucets, soap dispensers, towel dispensers and lights, and automatic-flush toilets and urinals. Wastebaskets are being placed outside each restroom, so that people can use a paper towel to open a door and then toss it.

The Indoor Air Quality Front

In all buildings, a major goal is to introduce as much outside air as possible. To achieve this, Facilities has increased the hours of operation for HVAC systems--they now run extended hours in the morning and evening. And most systems switch to 100% outside-air introduction when the outdoor temperature is lower than 85 degrees Fahrenheit and humidity is greater than 35%.

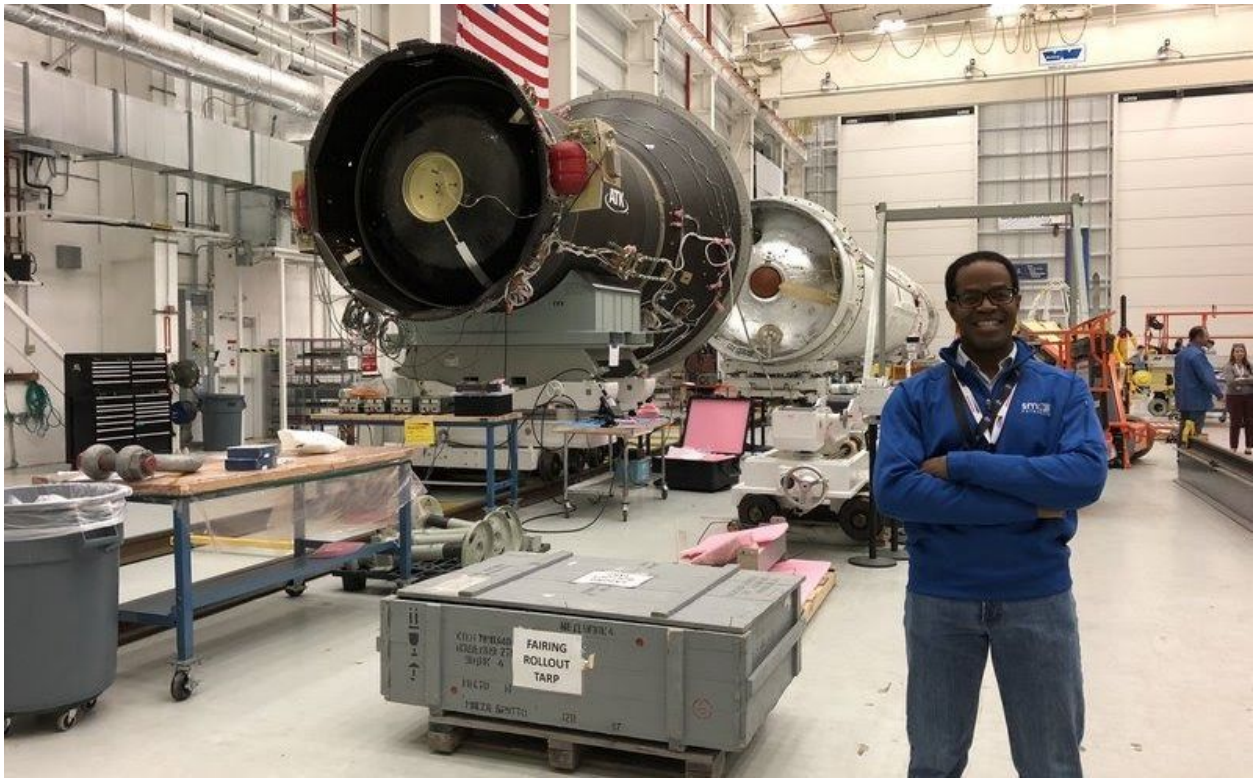
Facilities also is improving filtration in as many buildings as possible, helping to reduce viruses and bacteria in the indoor air.

One more action by Facilities teams involves retrofitting many buildings by adding ION systems. These systems apply an electromagnetic charge to the air stream, which Villareal describes as "very effective in combating a variety of indoor air contaminants."

Although these measures are designed to improve air quality, there are other fringe benefits. If you're already working on Lab, or when you return, you may notice that your workspace is less dusty and looks cleaner.

Those who like to sit outside for lunch may be happy to know that more than 200 sneeze guards are being installed in the outdoor tables.

And just in case you were wondering--the Lab's clean rooms are already designed with high-efficiency air purification systems.



Charles Norton stands next to an Antares rocket at Wallops Flight Facility in 2018. Image Credit: NASA/WFF

A Symphony is Playing in Charles Norton's Head

By Taylor Hill

Charles Norton became the Lab's associate chief technologist in July, but he's been a part of the JPL family since working as a graduate research assistant since 1993. Now, the Princeton and Rensselaer alum's primary role will involve contributing to JPL's strategic planning and oversight of technology research and development to enable science.

Norton's road at JPL began when his dissertation research was supported by NASA's Graduate Student Researchers Program (GSRP) in collaboration with JPL. As a postdoctoral researcher at JPL, Norton worked in high performance scientific computing for applications in computational plasma physics modeling and simulation. He was hired into Division 38 and worked on a variety of modeling and simulation projects in Earth and Space Science, eventually becoming a program area manager for NASA's Earth Science Technology Office (ESTO). While managing advanced information systems technology research, he co-developed the In-Space Validation of Earth Science Technologies (InVEST) program line within ESTO to enable spaceborne flight validation of new systems technologies using CubeSats. After

developing and managing multiple missions for NASA's Science Mission Directorate and Space Technology Mission Directorate, Norton was tapped to advise NASA Headquarters on strategy and policy for the development of high priority science and technology small satellite missions from ESPA-class spacecraft down to CubeSats.

Below, Norton discusses his new role at JPL, the 30th anniversary of the Microdevices Laboratory, and how his passion for music has intertwined and inspired his work at JPL.

What will your role as JPL's Associate Chief Technologist entail?

My primary role involves contributing to JPL's strategic planning and oversight of technology research and development to enable science. This spans annual investment budget planning, selection and management of the Lab's investment portfolio, and assessing progress across all strategic technology areas throughout JPL. In this role, I also lead assessments of technology needs across the Directorates, technology infusion into JPL projects, and evaluation of relevant technology innovations while collaborating closely with the Office of Chief Scientist.

What do you see as some of the opportunities at JPL to highlight or emphasize the talent or work here that may not have had an opportunity to shine yet?

JPL's media office, numerous publications (online and in print), as well as sponsored events such as the research and technology development poster sessions on the Mall, already provide very visible avenues to highlight individuals and their work across the Lab. That being said, I've been pondering introducing an annual technology all-hands focused exclusively on technologies in development that are not sponsored by internal investment programs. Some may also know we have an internal small satellite quarterly meeting that brings the internal community together to present and discuss the latest events and trends in the field where JPLers are driving new capabilities. This has been a very effective community-building event, so similar community events in technology areas of interest could be considered as well. In addition, I'm exploring holding open office hours where anyone can sign up to briefly chat about their work.

What has been your favorite mission or project to work on during your time here?

I could not identify a favorite, but I've certainly enjoyed the friendships and knowledge I've gained working with the computational solid Earth modeling group, all of the ESTO projects, as well as all of the small satellite mission teams over the last 20+ years.

With the Perseverance rover and Ingenuity helicopter on their way to Mars, what in particular are you looking forward to in JPL's latest attempt to reach the Red Planet?

This is such an exciting mission with a host of events to look forward to. Nevertheless, if I had to pick a few events I'd certainly say capture and caching of the first samples to eventually be returned to Earth, the successful flight of the Mars Helicopter Ingenuity, and flight validation of the terrain relative navigation system (and subsequent HD video stream) during EDL.

The Microdevices Lab is celebrating its 30th anniversary this year. What are your thoughts on the importance of this lab to JPL, and what the future of the facility holds?

The MDL is a remarkable facility and I remember back to the early days when Carl Kukkonen was its first director. I don't believe most JPLers realize how many missions were fundamentally enabled by the technologies invented at the MDL, as well as how many future missions will be a direct consequence of recent MDL activities. What I've always found most remarkable is the regularity in which new capabilities come from the MDL; if there ever was a place that defined the notion of creating innovation it would look like the MDL. Its capabilities extend well beyond advanced detector development, but I do believe that if or when signs of life are provably detected beyond Earth, it will be due to a technology the MDL has created.

Can you talk a bit about your musical background?

I've been a musician from a very early age, starting with Renaissance and Baroque instruments leading to the bassoon. As a bassoonist, I travelled around the world to more than 36 countries with the Long Island Youth Orchestra over six summers prior to college. During my senior year of high school, I was invited to audition for the principal chair of the New York Philharmonic, a position that only becomes available every 40 to 50 years, but instead continued on to Princeton University for my BSE in engineering followed by Rensselaer for my Ph.D in computer science. I've remained active to this day performing with the Caltech Symphony while remaining "on call" when needed for the Santa Monica Orchestra and others in Southern California.

Are there any similarities between music and your work on Lab?

For me, music is everywhere, so there are many similarities and commonalities between music and JPL activities. Music represents a culmination of many diverse and complex ideas that are orchestrated to create something new, expanding our minds and understanding of our environment from our experiences. Music also represents the strength and beauty of what can be created when a diverse team of individuals come together for a common goal. This is completely reflective of everything we strive to achieve at JPL, and just as good music will forever stand the test of time, so will the discoveries we have made and will collectively make in the future. I view us all as musicians at a very fundamental level.

What has made JPL a special place for you personally?

The people, without a doubt. JPL is a very energetic, diverse, and intellectually stimulating place that in many ways is unique in the world. It's a true privilege to work here. Also, given that I'm a product of the space age having been born on Long Island New York where my father worked on the Lunar Module for Grumman Aerospace, I feel fortunate to be connected to NASA as well.

Celebrating the Microdevices Laboratory's 30 Years: Annual Report

A letter from JPL's Microdevices Laboratory by MDL Director Robert Green and Deputy Director Siamak Forouhar:

"With this letter, we would like to share with you the 2020 annual report of JPL's Microdevices Laboratory (MDL). This year, we are celebrating the 30th anniversary of MDL and its many contributions and achievements. Operations began at MDL in the spring of 1990 with a vision to develop new microelectronic devices that were not available elsewhere. Over the next three decades, MDL exceeded all expectations, contributing broadly and deeply with original and enabling devices benefiting the full spectrum of NASA missions.

2020 has also been an unprecedented year for us all with the arrival of the COVID-19 pandemic. MDL, along with much of JPL, was shut down in March. However, as evidence of its importance to NASA missions, MDL was restarted in early May with a rigorous set of safe to work procedures and processes to facilitate critical flight mission device development. We are now advancing to deliver these devices to our customers.

Three decades is a long time in the fast-moving world of microtechnology and this annual report reflects on elements of MDL's history, its status today, and it's future. Beyond microdevice deliveries, highlights for this year include 33 refereed journal articles, 62 conference proceedings and presentations, 5 issued patents, and several professional society distinctions. MDL accomplishments are underpinned by a diverse and talented staff, state-of-the-art equipment, and enabling facility infrastructure. We are deeply grateful for the sustained support of JPL leadership as well as for the advice and guidance of the MDL Visiting Committee.

As we look forward we are inspired by the new microdevice technology directions being pioneered by the MDL Postdocs and other MDL innovators. We are committed to working with the research community to

employ these new technologies for new science and applications objectives. We hope you find topics of interest in this annual report. In addition, please reach out to MDL if you see opportunities for collaboration as we look to support new opportunities for exploration and discovery for NASA."

For more information on the Microdevices Laboratory or to read past annual reports, please visit their official website.

Events

Teaching Space With NASA Live Stream

Wednesday, Sept. 16
3 to 4 p.m.

> Watch online
> Register to join the Q&A

In this one-hour education webinar, NASA experts will discuss how we communicate with spacecraft using the Deep Space Network, a system of massive antennas stationed around the world. Join JPL engineer Bernardo Lopez and education specialist Brandon Rodriguez for a presentation about the science and engineering behind the Deep Space Network and the future of spacecraft communications.

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

Von Karman Lecture—Visualizing Space Exploration: AR, VR & Emerging Tech

Thursday, Sept. 17
7 to 8 p.m.

> Watch live on Youtube
> Watch live on Ustream

JPLers Sasha Samochina and Jason Craig will talk about how augmented reality, virtual reality, and other forms of Mission Ops visualization can influence our public outreach and vice versa. As we delve deeper into the synergy of this work, we will see how it affects the way we design our spacecraft and the way we look at the world.

JPL Family News

Retirees

The following JPL employees recently announced their retirements:

30+ Years:

Valerie C. Thomas, Section 4900, 36 years

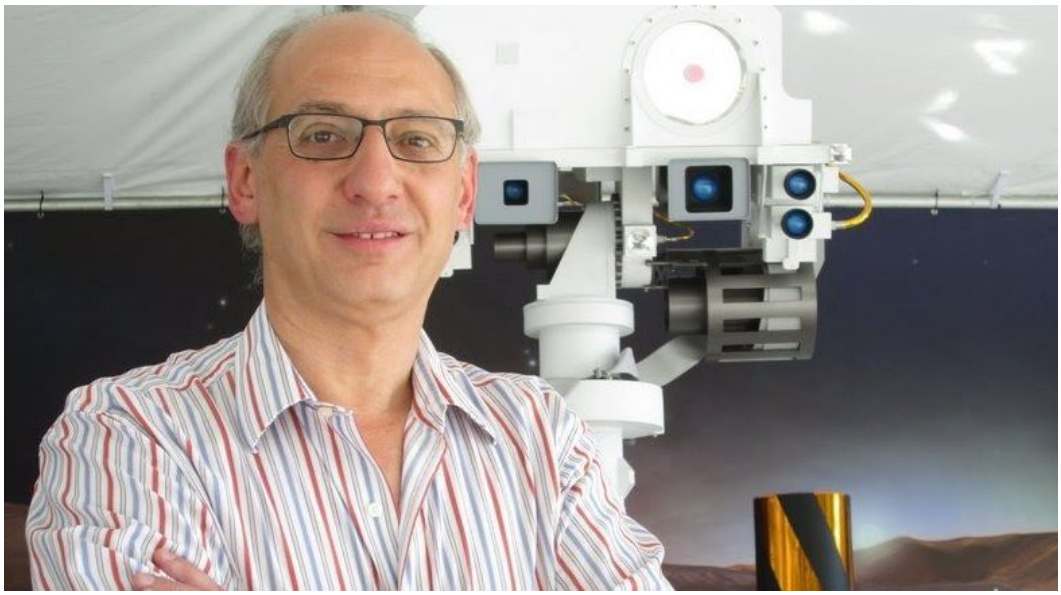
10+ Years:

David M. Gumpertz, Section 172H, 12 years

Passings

Susan Foster, a technical editor in JPL's documentation organization for 44 years and a founding member of the Lab's Advisory Council for Women, died at the age of 70 on Aug. 2, 2020. She is survived by her husband, Roberto Quintana de Foster; their newly adopted 'Foster' kids, Scott and Kimberly Maxwell; the Maxwells' baby boy, Robert; and by Susan's twin brother Stephen, his wife Sue, and nieces Laura and Kate. Hundreds of friends and family members whose lives are forever transformed by the love and kindness she showed them. Susan's memorial page can be found here.

Retired JPL scientist Joan Feynman died at the age of 93 on July 21. She first joined JPL in 1985, where she worked until her official retirement in 2017, except for a period from 2002 to 2005. Feynman made important contributions to the study of solar wind particles and fields; Sun-Earth relations; and magnetospheric physics. Feynman was also known for developing an understanding of how auroras originate. She created a model that predicts the number of high-energy particles likely to hit a spacecraft over its lifetime, and found a method for predicting sunspot cycles. Feynman is survived by her husband, JPL astrophysicist Alexander Ruzmaikin, a daughter, Susan Hirshberg, and two sons, Charles Hirshberg and Matt Hirshberg.



Miguel San Martin to Receive Engineering Award

By Jane Platt

The American Institute of Aeronautics and Astronautics/National Academy of Engineering is honoring Miguel San Martin with The Yvonne C. Brill Lectureship in Aerospace Engineering.

As part of the honor, San Martin, who is chief engineer of JPL's Guidance and Control Section, will present a lecture entitled “From Airbags to Wheels: The Evolution of GN&C for Entry, Descent, and Landing” on Oct. 7, in conjunction with the National Academy of Engineering Annual Meeting, which is being held virtually. The award will be presented at a later date.

"This award reminds me, once again, of how fortunate I am to be working at JPL with its brilliant engineers and scientists who constantly inspire me to be the best engineer and professional I can be, and I am thoroughly thankful for that," San Martin said.

San Martin was born and raised in Argentina, where he was inspired by the Apollo and Viking missions. Upon graduation from high school, he left to pursue his university studies in the United States and his dreams of working for NASA. He earned his bachelor's degree in electrical engineering from Syracuse University, and a master's in aeronautics and astronautics engineering from MIT.

When he joined JPL after graduation, he worked briefly on the Magellan mission to Venus and then, the Cassini mission to Saturn. His roles on several Mars missions included

serving as chief engineer for the guidance and control system for the 1997 Pathfinder mission, which landed Sojourner, the first robotic vehicle to land on Mars. He then held the same role for the Mars Exploration Rover mission (Spirit and Opportunity).

In addition to serving as chief engineer of guidance and control for Mars Science Laboratory/Curiosity, he was a co-architect of its innovative SkyCrane landing architecture and was Deputy Phase Lead for Entry, Descent, and Landing. He was named a JPL Fellow in 2013 and has received two NASA Exceptional Engineering Achievement Medals. San Martin was elected to the National Academy of Engineering in 2019.