

## Featured Stories



### LabGrown Part 4: JPL in Bloom

By Vincent Robbins

*In the fourth and final of a four-part series exploring the Lab's flora, we stop around Lab to discover the blooms that color our work days.*

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After one of the [gloomiest](#) and [coldest](#) LA winters in decades, it seemed like spring would never come. Over a gray, drizzly Memorial Day weekend, it seemed like summer would never arrive, either.

Was spring late? Was June gloom early? Wait, what month is it even now?

"This is a kind of an unusual year," says Liz Velarde, JPL's dedicated Brightview arborist, as she walked along the Mall during a now-familiar blustery day, her hands warming in the pockets of her puffer jacket

just days before June. “A lot of [the flowers] should have been blooming by Explore JPL and they weren't – we think it's just the cold weather.”

If every cloud has a silver lining, then perhaps some precious blooms can be found on Lab even during a dismal season. The purple bells of the jacarandas are beginning to muscle through the gloom, and wildflowers are racing up the hillsides. There's the Japanese privet outside of Building 158, its white blossoms spotting through lush green leaves, and the lemon bottlebrush tree outside of Building 79 with its clusters of crimson tufts drooping overhead. The young pink trumpet trees on the hillside above Building 67 are sprouting delicate blushed flowers, and the purple shoots of Mexican sage bob in the breeze.

The Lab is alive with color – JPL is in bloom.

### **Brightening Our Work Days**

Sitting on a sunny windowsill in a cubicle on the second floor of Building 303 are 14 plants: There are the orchids, their blossoms flush with bursts of fuschia, and the painter's palette with glossy-pink, rubbery flower-like leaves. Behind the row of eclectic pots, a flamegold rain tree stretches outside the window, flowering with pink leaves once a year.

This small garden is the work of Electrical Engineer Shayena Khandker.

“These are Marimo moss,” says Khandker, pointing to two bright green balls submerged in a glass jar of water. “I've named them N-moss and P-moss, and together they're sea moss.”

(Khandker mercifully explains the pun for the non-electrical-engineering crowd: if you connect a Negative Metal Oxide Semiconductor and Positive MOS together, you get a Complementary MOS – N-moss plus P-moss equal sea moss.)



Beyond providing fodder for clever engineering wordplay, Khandker says her collection of plants, as well as the flowering tree just beyond them outside her window, make coming to Lab special.

“I love coming to work,” Khandker says, looking at the plants lined up along the windowsill. “I can't express how much joy it brings me.”



*The view from her cubicle in Building 303 makes coming to Lab a joy for Khandker. Photo Credit: Shayena Khandker.*

### **A Vibrant Walk Around Lab**

Outside of impressive cubicle gardens, a walk around Lab at this time of year reveals the whole spectrum of the rainbow (apt timing as JPL commemorates Pride Month).

Many shades of red are dashed across the bottlebrush, red sage, penstemon, and scarlet buglers, while delicate pinks and purples emerge from the jacarandas, delias, and Cleveland sage. A gorgeous gradient that changes from deep red to fiery orange into sunflower-like yellow cascades across each petal of the blanketflower outside of Building 126. And, of course, all of these vivid hues are splashed across a backdrop of the lush green leaves of the bushes, shrubs, trees, and flowering plants that are hydrated after the long, wet spring.

Avionics Engineer and Green Club member Roger Klemm (a familiar name if you've been reading this series) is unsurprising in his preference for a dash of color: native plants.

"The Cleveland sage has been gorgeous this spring," says Klemm. "It's just not the blinding, hit-you-in-between-the-eyes of some other stuff that people like to plant. It's more subtle and, to me, that's more beautiful."



*Lantanas can be found north of Building 157.*

### **The Botany of Beauty**

In his book “The Botany of Desire,” author Michael Pollan argues that natural selection crafted the interactions not just between plants and birds and bees, but also between plants and humans.

Pollan traces the history of tulips to illustrate how flowers have exploited humans’ sense of and desire for beauty to thrive and spread. Although tulips have been pollinated by insects for millions of years, the popularity and human demand for tulips – peaking during “Tulipmania,” a period in the 17th Century during which tulips made their way from the Ottoman Empire to Holland and reached extraordinary prices – have solidified the flowers’ evolutionary immortality.



*JPLer-submitted photo: A daisy growing near the home office of Mission Design Engineer Luke Bury.*

Beauty, then, serves an essential survival purpose. At least as long as we continue to want a vase of tulips on our kitchen table.

“Darwin called such a process artificial, as opposed to natural selection, but from the flower’s point of view, this is a distinction without a difference,” Pollan writes.

But why do humans find flowers alluring?

There isn’t a conclusive answer, but we do know that some flowers provide medicinal benefits and they also can serve as general indicators of land fertility. Flowers bloom on trees and other plants weeks or months before edible fruit and nuts arrive, so early humans that evolved to have an appreciation for colorful flowers may have been better suited to gather the delicious food produced by those same plants. Our multi-sensory connection with colorful, fragrant angiosperms probably gave us a survival edge over the competition.

### **Signs of Life**

As the LabGrown series comes to a close, I can’t help but return to that question: Why do flowers — and other plants and trees for that matter — move us, connect us, inspire us, uplift us?

At JPL, we employ experts like Liz Velarde to care for them, establish affinity groups like the JPL Green Club to celebrate and protect them, build wellness gardens to sit amongst them, create Slack channels to chat about them, and some of us even (I hope) read a four-part JPL Space series dedicated to learning about them.

As Ada Limón wrote in her recent poem dedicated to the Europa Clipper Mission:

"We are creatures of constant awe,  
curious at beauty, at leaf and blossom,  
at grief and pleasure, sun and shadow."

Perhaps JPL is a perfect place to gaze at flowers and trees and wonder about the hold they have over our psyche. Is it the inverse of that insatiable desire to stare into the cosmos, the mirror image of that inability to pry one's eyes and mind from the mysteries of ice giants and black holes and distant exoplanets?

While we peer and fly and rove further into the dark, cold reaches of space, the constellations of flowers and trees on Lab remind us of our need to connect with the only place we’ve ever called home.





*The prize drawing at the 1957 Christmas Dance.*

## The Social Life of a Missile Laboratory

By Erik Conway

JPLers just wanna have fun — and the roots of some of the Lab’s most memorable gatherings and communal beginnings can be traced back to the early 1950s.

In 1952, the JPL Employee Recreation Club wrote about the celebration of its efforts to foster organized recreation at the young Laboratory: “Over 1000 JPL employees, their families and friends, enjoyed themselves at the All-Lab Barbecue at Chilao Flats, September 21, sponsored by the Employees Recreation Club. This was the largest Lab employees function ever held.”

The ERC had been launched the previous year, when JPL had around 750 employees. Its goal was to organize social events and serve as the umbrella organization for sports and hobby clubs, some of which already existed. It published JPL’s employee newspaper, itself launched in August 1951.

It was the ERC that adopted the [now-retro JPL missile logo](#) we’re familiar with, after holding a competition in early 1953. Walter Michalsky of the Wind Tunnel Section was the designer.

The Lab’s new newspaper had also been named by competition: *Lab-Oratory* had been minted by a research engineer named David Shonerd.

The ERC was a membership organization, financed by members’ dues and, as it became established, by the proceeds of vending machines at JPL. Each geographic “district” of JPL had an elected representative to the ERC’s governing board, and those representatives collected annual dues (which started at \$5.00, and dropped to \$1.00 through 1958), provided news stories for the paper, and served as points of contact. The district representatives also served on the various committees that organized the social events.

The ERC’s district representatives also supplied news from around the lab. The *Lab-Oratory* had monthly columns on births, weddings, deaths, new employees, and hobbies. It promoted social activities beyond those organized by the ERC itself. There was a Solid Rockets Wives Club that organized charity outings

for the Solid Rocket section; the Hydro Lab hosted an annual party at Huntington Beach. There were informal ski trips to Mammoth Mountain in 1957 (Mammoth only opened to skiers in 1953), and there were efforts to create a formal Ski Club in 1958. Interest in organizing a Flying Club existed but didn't get off the ground before 1959.

While the summer BBQ – or picnic, since the themes changed over the years – was the most popular ERC event, the ERC operated a number of other activities. The most influential of these were the Christmas Dance and Christmas Children's party. The Christmas Dance, which in 1951 was a semi-formal held at the Elks Club on Orange Grove in Pasadena, was for adults. The Children's Party, held at the Linda Vista School in 1951, was, of course, for the children. An employee named Nick Bokarica played the Santa Claus role, and would play it every year until 1968.

Bokarica launched a toy drive in 1952 to gather toys for local Pasadena children's charities. The impetus had apparently come from a request to repair some toys for donation – he was a plumber by training, hired in 1943 –and by 1956 was gathering hundreds of toys and needing volunteers to help restore and distribute them. His Toy Pile, as the Lab-Oratory eventually labelled it, donated more than a thousand toys in 1956.

After some criticism that the Toy Pile mostly consisted of boys' toys, in 1958 a secretary named Margaret Henry started a Doll Drive. Her Doll Drive lasted until 1980, outliving both the Toy Pile and the Lab-Oratory itself.

Another annual favorite was the Spring Dance. Beginning in 1953, the Spring Dance also was the coronation ball for the "Queen of JPL," the winner of the Miss Guided Missile popularity contest. The Miss Guided Missile candidates had to be employees, and they had to be sponsored by other employees. Much like high school prom king and queen competitions, they (and their sponsors) had to campaign, and there were lunchtime events held during the allowed one week campaign before the vote. The Spring Dance became the Coronation Ball after 1957, reflecting the importance of the competition to the event.



*1957's Miss Guided Missile competition featured a 'parade' through the Lab. Nadine Peterson was selected as Queen of The Laboratory at the renamed Coronation Ball. She was a technical illustrator and served on the ERC's dance organizing committee.*

The Queen of JPL for 1954 was Frances "Sally" Crane, the supervisor of JPL's telephone exchange. In those days, anyone who wanted to make a call off-Lab, or receive one, had to talk to an operator – so practically everyone knew her. Crane had joined JPL in December 1942, when about 80 people worked in the Arroyo, and retired in 1979.

The ERC initially sponsored sports and hobby clubs, but fairly quickly decided to make them self-funding (and reduced its own dues in compensation). The Lab had a softball team, the "Jetmen," that won numerous trophies in the 50s, first in Pasadena's Industrial League and later in its AA league. There were also basketball and volleyball teams, two and sometimes three bowling leagues; Rod and Gun, Motorsports, Archery, and Shortwave clubs. The Motorsports Club inaugurated the annual car show at JPL that continues to this day. The Rod and Gun Club organized ocean fishing charters and angling expeditions to the lakes dotting the Eastern Sierra, while the Shortwave Club's 'amateurs' were able to listen in on Sputnik before JPL's own ground station was functioning.

In 1953, the sports clubs were merged into an Athletic Club that organized its own events, including an annual banquet and occasional theater nights, and did its own fundraising. Nick Bokarica served as president for its early years.

While the ERC's dances and picnics and barbeques were open to all, only a minority of the Lab's population joined it. It grew to about 700 members in 1957, when JPL had about 1800 employees.

JPL's brief era as a missile lab for the U. S. Army came to a quick end after the October 1957 launch of the Soviet Sputnik 1. The ERC had planned a Harvest Moon Ball for October 12th, and it went ahead, at the Altadena Town and Country Club. Altadena Town and Country Club.







*Harvest Moon” ball montage for the final image so that it matches the text around it, and changing the caption to something like: “JPLers knew how to capture the fun. This montage is from 1957’s Harvest Moon Ball.*

“After a week of the Russian Satellite subject, the dance, October 12 seemed to provide a good spot to let off steam. Employees were referring to the affair as the Satellite Ball or Sputnik hop,” according to the Lab-Oratory. Like the Lab-Oratory itself, employees couldn’t resist the lure of space.

The Miss Guided Missile competition changed with the Lab, becoming the Queen of Outer Space competition. It was last held in 1969, the year of the first Apollo moon landing.

But before JPL’s career with the U.S. Army ended, it had one more weapon to deliver, the Sergeant missile. The Seargeant program is where JPL’s unique brand of systems engineering evolved, and Sergeant managers would be instrumental to JPL’s success as an explorer of the planets. In the next history column, I’ll examine JPL’s last weapons program.



*Battery Technologist John-Paul Jones with interns Loleth Robinson and Jonah Wang in the dry room of JPL's Electrochemistry Lab.*

## Powering Minds and Missions

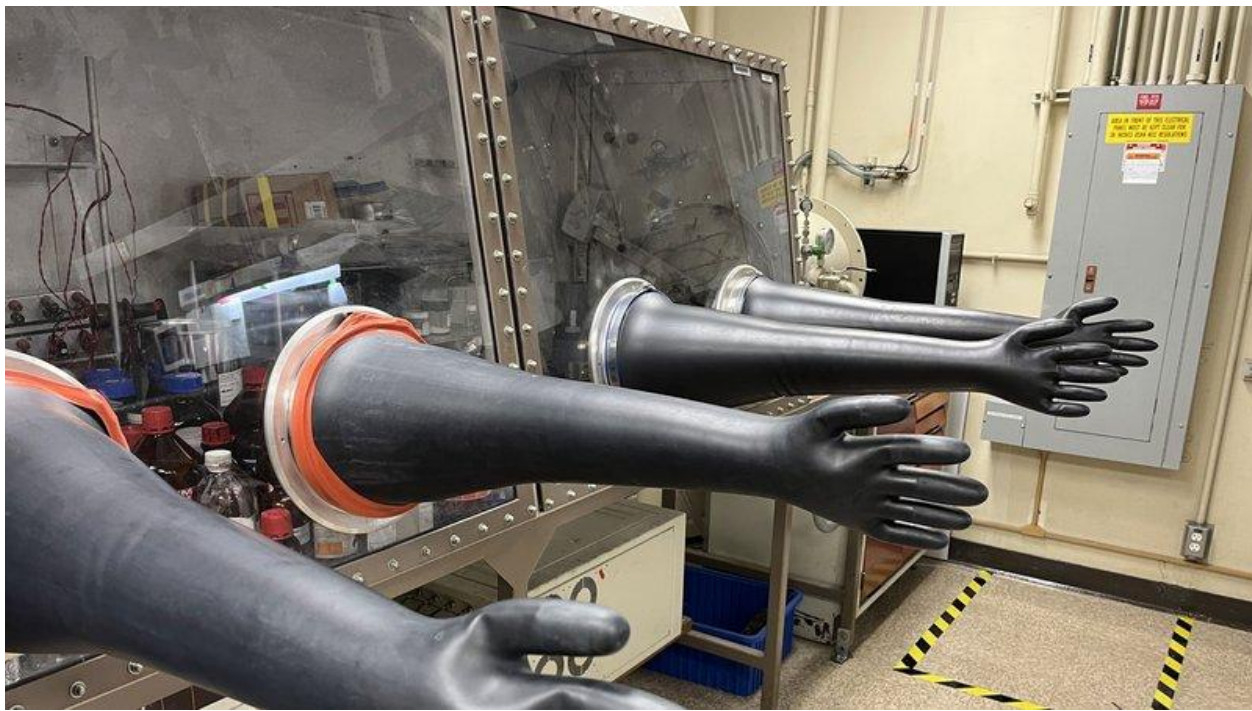
By Vincent Robbins

For the last six months, JPL interns Loleth Robinson and Jonah Wang spent their days in JPL's Electrochemistry Lab building, testing, and analyzing novel power storage cells that are pushing the frontiers of battery technology for space missions.

It's the type of work that needs to be performed with one's hands: chemicals mixed, cell casings assembled, wiring tinkered with, batteries cycled.

You can't learn this in a classroom. At JPL, you can.

Located in the basement of Building 277, the lab greets visitors with hands: four arm-length inflated rubber gloves extend as if to grab something. These gloves, inside out and ready to be fitted onto human arms, are connected to a 'glove box' — a glass case filled with what looks like pharmaceutical bottles and the metal chemical canisters of a cartoon mad scientist.



*Gloves extend from a 'glove box' in which battery electrolytes are fabricated.*

It's all very analog, retro even.

Beyond the glove boxes, a sinuous tangle of cables cascades over the edge of a desk, winding between battery cell prototypes and a potentiostat, an electronic device that measures the current and voltage cycled through the batteries. As electricity hums through this web of hardware, data pours into a series of computers, filling spreadsheets that wait to be analyzed.

For Robinson and Wang — both Ph.D. students at The City College of New York, studying chemical engineering with a concentration on the development of advanced battery technologies for space — getting their hands on this equipment in a NASA laboratory is as good as it gets.

“I don't think that I could have gotten a better opportunity anywhere else, working under brilliant scientists,” Wang says.

That internship opportunity was the product of a collaboration that spans 3,000 miles and three organizations — JPL, CCNY, and NASA's MIRO program.

### **Hands on Hardware, Minds on Missions**

From its inception, this collaborative internship program between JPL, MIRO, and CCNY's Center for Advanced Batteries for Space, now in its third year, sought to bring highly-capable Ph.D. students to JPL to put their minds to work solving problems that are of consequence to actual JPL missions and projects.

“I really wanted to make sure that the students had an opportunity to contribute to something meaningful,” says the interns' JPL mentor, John-Paul Jones, who helped develop the JPL-MIRO-CCNY internship program. Jones is a battery technologist in the Electrochemical Research, Technology & Engineering Group, and the cognizant engineer for the Mars Sample Retrieval Lander (SRL) battery and Cooperative Autonomous Distributed Robotic Exploration (CADRE) battery. “So we've tried to make sure that their projects align with something that's mission related.”



*Robinson and Wang spend their days building, testing, and analyzing novel batteries in the Electrochemistry Lab.*

Robinson and Wang are focused on the Europa Lander and Venus Aerobot mission concepts – building batteries, performing testing, analyzing data, and meeting with their JPL colleagues to present and defend their work.

“They are right in the middle of cutting-edge battery research,” says Will West, the group supervisor of the Electrochemical Research, Technology, & Engineering, who oversees the interns' work with Jones. “They are being treated on these projects just like the other team members. They're doing experiments, generating data, and interpreting the data as a scientist would. Importantly, they must present and defend their work to the JPL team members. By doing so, they strengthen their scientific rigor and communication skills.”

While current battery technologies, primarily lithium-based, have advanced significantly in efficiency and performance in recent decades, they face certain constraints, including resource scarcity, safety concerns, and performance limitations. The batteries that Robinson and Wang are researching and testing could pave the way for improved energy-storing technologies that are safer and longer lasting even here on Earth, with potential applications ranging from electric vehicles to grid-scale energy storage, while being more robust in extreme space-like conditions than current battery capabilities.

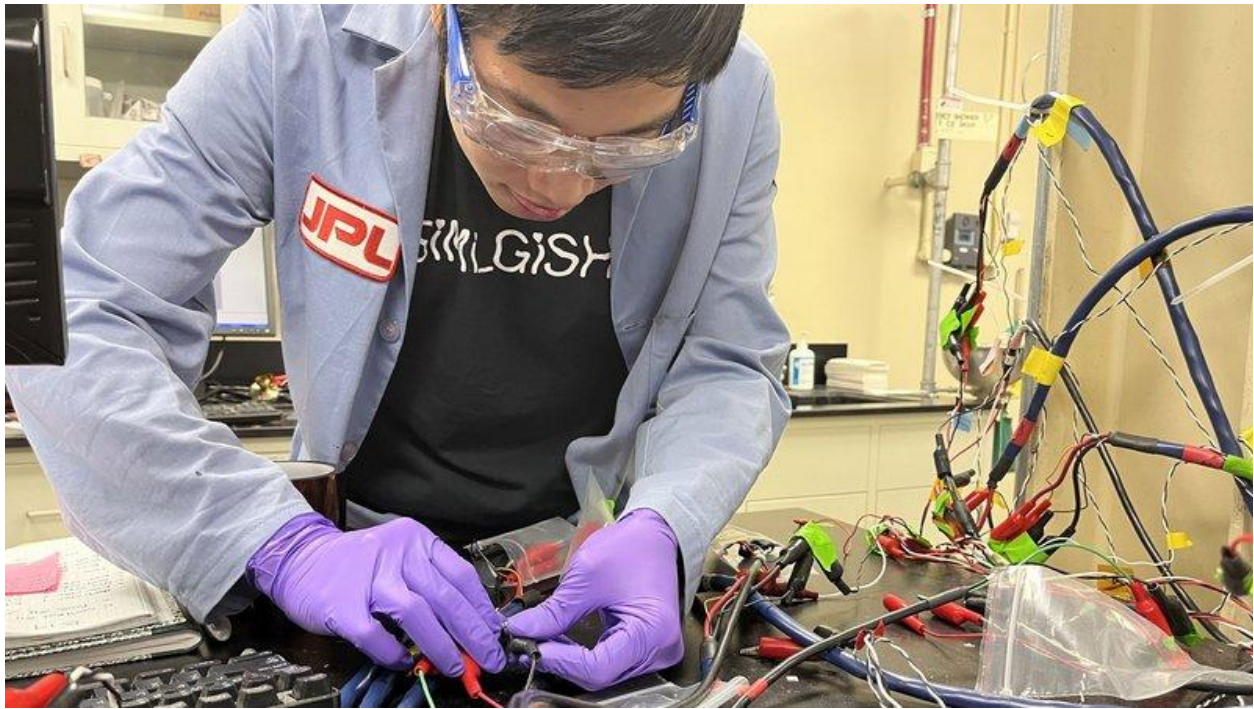


*Robinson mixes chemicals to create a battery electrolyte formula for testing.*

And what does building and testing batteries actually look like?

First, Robinson and Wang synthesize mixtures of chemicals in the glove box to fabricate a novel battery electrolyte (an electrolyte is the solution inside a battery that transfers ions between the positive and negative terminals). They then build the battery cell using little metal cell casings that look like the battery you might find in your wristwatch. This all takes place inside the glove box and a vacuum chamber to avoid exposing dangerous chemicals to open air. Once the cell enclosure is complete, the cell can be removed from the glove box and connected to a set of wires that are fed into a potentiostat. This device measures the characteristics of the battery's current and voltage and channels that information to a computer, where Robinson and Wang can analyze the data.

"It's amazing getting the hands-on experience," says Robinson. "It's an absolutely different experience from what I've seen in the industry and, of course, with just regular school research projects."



*Wang connects battery cells to a potentiostat machine to cycle and collect data.*

Beyond building, testing, and analyzing battery cells, Robinson and Wang are also scouring related scientific literature to identify promising applications for future battery technologies.

For an internship, it's no walk in the park.

"It's definitely a lot of hard work," says Wang. "There's a really steep learning curve. I've learned a lot in a really short period of time. It's really amazing to be able to learn from actual research scientists who are trained in their fields."

And while interns are not expected to have the depth of knowledge and experience that seasoned veterans do, Jones and West say they want to prepare the students for their paths in rigorous fields of research.

"Obviously we help them," Jones says. "But I really want them to have some kind of ownership."

Rob Messinger, the interns' Ph.D. advisor, is an associate professor of Chemical Engineering at The City College of New York and the director of CCNY's Center for Advanced Batteries for Space, a lab that focuses on upstream and emerging battery chemistries specifically geared toward the frontiers of powering spacecraft.

Messinger says the partnership with JPL has given the students in his program at CCNY an invaluable experience that he could not have created in the lab or classroom.

"It's difficult to even state or articulate the impact that this has on CCNY students – scientifically, professionally, and personally," says Messinger. "They have the opportunity to go into a NASA lab and directly work on NASA-relevant problems. But I think maybe even more valuable to the students is the opportunity to be mentored and trained by JPL scientists and engineers that have accumulated decades of experience."

## The Power Behind the Program

While the internship program is now humming along in its third year, only a few years ago it was just an idea.

In 2019, Jones received an email from Messenger out of the blue about collaborating on a rechargeable aluminum-graphite battery technology; his interest was piqued. As he read further, Jones saw the opportunity to create a unique internship program at JPL and jumped at the opportunity.

Jones had started at JPL in 2013 as an intern, eventually moving on to a Caltech postdoc stint before landing a full-time position at JPL. This was his chance to pay it forward.

Messenger thought that some of the research his Ph.D. students had been conducting in his lab at CCNY could be of interest to JPL.

“We had reason to believe, based on some preliminary data and prior work, that this particular aluminum-graphite technology could deliver high power at low temperatures,” says Messenger. “And so that was the initial hook to work with JPL – because those characteristics could potentially be useful for space.”

With Jones and Group Supervisor Will West on board at JPL, Messenger submitted a proposal to the MIRO funding opportunity released by NASA’s Office of STEM Engagement to support the collaboration. MIRO, which stands for MUREP Institutional Research Opportunity, was established to strengthen and develop the research capacity and infrastructure of minority-serving institutions in areas of direct alignment with NASA’s missions.

“I long had the idea of working with JPL,” says Messenger. “And then MIRO was the perfect funding source to enable this unique and strategic partnership.”

After some months of planning, Messenger and Jones launched the JPL-CCNY internship program, which was originally set to begin during the summer of 2020. The timeline, however, was derailed due to the pandemic, but after reworking their approach to accommodate remote collaboration, Jones and Messenger put their first intern, Brendan Hawkins, to work in the summer of 2021.

“It was really challenging to try to teach somebody how to build a battery in a lab from 3,000 miles away,” Jones says.

Fortunately, Hawkins was able to later come to JPL in person and gain that valuable hands-on experience for a few months at the end of the program. Since then, the program has hit the ground running, welcoming two other interns, Harrison Asare and Brian Chen, prior to Wang and Robinson in early 2023.

West says the program is a boon to all involved.

“The NASA MIRO program is funding the grad students and they’re working on projects that we assign here at JPL. We are so impressed with the huge contributions they’ve made to the projects,” says West. “So it’s a huge win for JPL and NASA. And I would say certainly a win for the grad students to have this experience and a win for CCNY who is now getting these well-trained grad students back.”

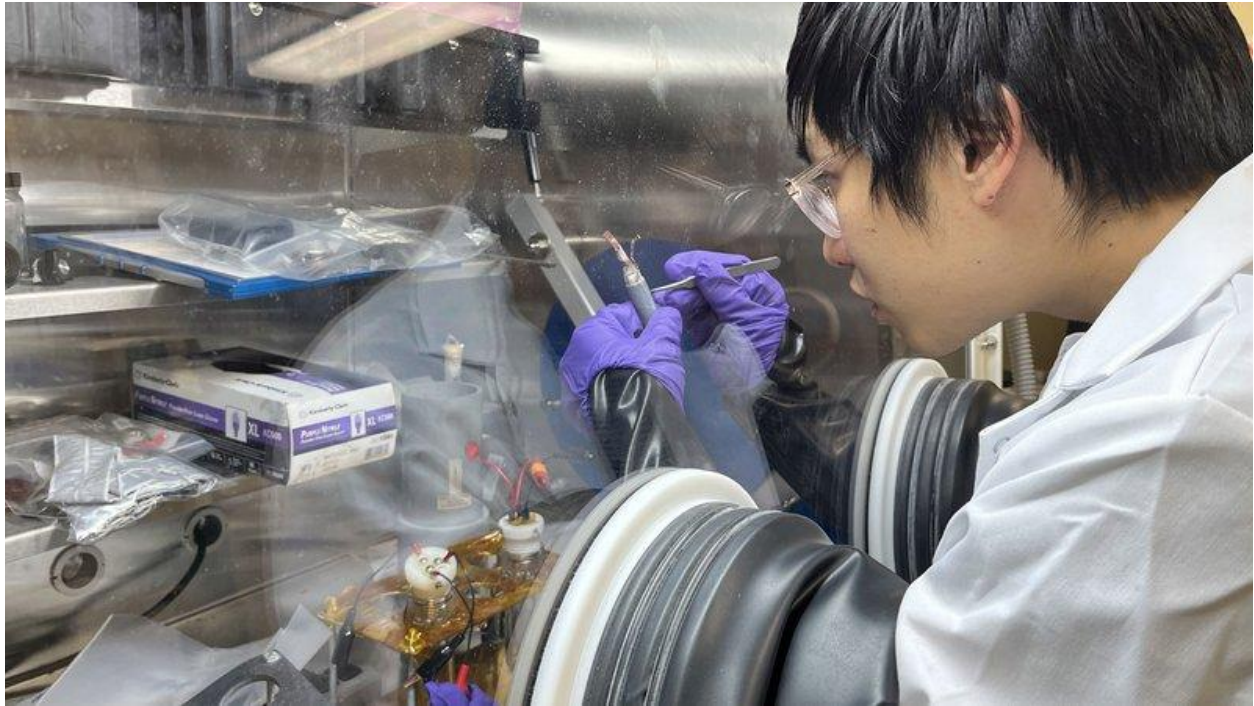
## Novel Energy Sources

For their part, the JPL staff say they have benefited immensely from the experience with their interns. West says Robinson and Wang’s infusion of ideas has been invaluable to his laboratory.

“I have been amazed by how quickly they acclimate to this high-intensity environment and contribute almost immediately,” West says. “They bring new ideas and fresh perspectives that have resulted in several JPL New Technology Reports and journal manuscripts.”

Jones says collaborating with the interns has actually made him a better engineer.

“I think that the best way you learn something is to try to teach it to somebody else,” says Jones. “And I feel like I’ve learned an awful lot from this because there are all kinds of things that you do that you don’t really know why you do them.”



*Wang works on a battery electrode inside a glove box.*

Back in New York, the interns bring renewed energy and practical experience to the Center for Advanced Batteries for Space at CCNY.

“The collaboration with JPL has taken a lot of the research and development that we do here at CCNY and it has given it life, it has given it applications that are exciting — it puts wind under our wings,” Messinger said.

### **Charged Up to Take Flight**

For Robinson and Wang, neither knows exactly where their careers will take them, but both are certain this experience has opened doors.

“My mentors have tried to teach me how to be a better scientific researcher and how to really design and also do experiments,” says Wang. “That’s something that might not show up on paper. Being able to say I worked at NASA is great, but I think actually learning the kind of stuff that it takes to do good experiments — that’s what’s really valuable.”

Robinson laughed recalling the moment she decided to pursue this course of study. She attended Messinger’s presentation about his research program and never forgot his closing remarks.

“[Messinger] said the two coolest things to work on are dinosaurs or outer space, and dinosaurs are extinct. So take the second-best thing.”



Robinson, who was born in the U.S. but grew up primarily in Costa Rica, says she could have never imagined where that “second best thing” could take her — from a Ph.D. in New York City to working on spacecraft in Southern California to who-knows-what next.

“[Younger] me would have never thought that I'd be working in a NASA internship and doing a Ph.D. in chemical engineering,” Robinson says. “I couldn't even imagine that this was possible.”

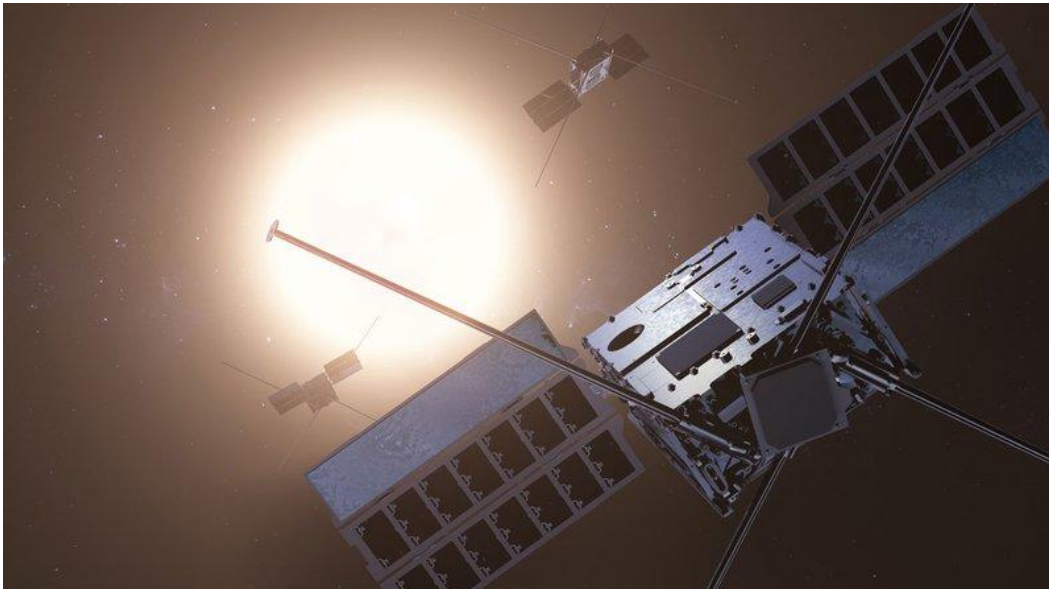
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**MIRO** — *MUREP Institutional Research Opportunity* — was established to strengthen and develop the research capacity and infrastructure of Minority Serving Institutions in areas of strategic importance and value to NASA's mission and national priorities. MIRO works with 15 Minority Serving Institutions to offer awards that aim to support bright minds in STEM, while also enhancing the capability of institutions to perform NASA-related research and education.

**MUREP** — *Minority University Research and Education Project* — is a larger program through which the NASA Office of STEM Engagement engages underrepresented populations and minority-serving institutions through a wide variety of initiatives.

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## Events



### **Von Karman Lecture Series – SunRISE: Studying Space Weather with SmallSats**

Thursday, Aug. 24  
7 to 8 p.m.

[Watch on YouTube](#)

NASA's Sun Radio Interferometer Space Experiment, or SunRISE, will send a fleet of six toaster sized SmallSats into orbit around Earth to work together as a radio telescope studying the Sun. SunRISE will help scientists better understand space weather events that have the capacity to damage spacecraft or even pose a threat to the safety of astronauts traveling through space.

**Speakers:**

Jim Lux, Project Manager, SunRISE, NASA/JPL

Shannon Berger, Mission Operations Manager, SunRISE, NASA/JPL

**Host:**

Marc Razze, Office of Communications and Education, NASA/JPL

**Co-host:**

Chelsea Gohd, Universe Public Engagement, NASA/JPL

# JPL Family News

## Retirees

The following JPL employees recently announced their retirements:

### 30+ Years:

**David R. Hodges**, Section 391B, 37 years

**Arthur Amador**, Section 3900, 35 years

**Sonia Mejia**, Section 3510, 34 years

**Allen Fong**, Section 349D, 32 years

**Carole A. Boyles**, Section 9300, 32 years

### 10+ Years:

**Lori A. Risse**, Section 5100, 16 years Letters