

Featured Stories



Left: The freighter, Tung An, that Charlene Ung arrived on as a Vietnamese refugee in 1978; Right: Ung, pictured in 2022, is now the JPL project manager for the Earth Surface Mineral Dust Source Investigation (EMIT) instrument. Image Credit: Bettmann/Getty Images and NASA/JPL-Caltech

From New Shores to the Final Frontier

Charlene Ung escaped Vietnam as a child to become a first-generation everything: JPL project manager, engineer, and legacy builder.

By Celeste Hoang

Charlene Ung used her first words of English to beg for food and water at a refugee camp.

It was 1978 and Ung was then an 11-year-old Vietnamese refugee, having boarded a rusty cargo ship with her family in the middle of the night for a month-long journey across the South China Sea. They packed between thousands of passengers among fetid conditions, desperate to escape a home country they no longer recognized before eventually reaching the shores of America in February of 1980.

Ung—now a project manager for the Earth Surface Mineral Dust Source Investigation (EMIT) instrument heading for the International Space Station in May 2022—is sure of one thing: her professional achievements grew in part out of her personal struggles.

“Where there’s a challenge, it’s in my personality to do the best I can and help others,” she says. “Some people say, ‘How can you be a project manager? That’s so tough.’ I’m not saying it’s easy. Being an engineer is a lot of work. But it’s ingrained in me: Whatever the challenge is, I will find ways to solve it and get the job done.”

Playing in a War Zone

When Ung was very young, and years before the concept of war would enter her consciousness, life was good.

Her family was wealthy, thanks to a flip-flop manufacturing business her father owned. Growing up, her favorite memories were of being surrounded by the hum and pace of factories and production lines. She was transfixed by the process of making a shoe, and would watch intently as the raw materials were rolled and mixed together, baked in the oven, and then—like cookie cutters slicing through fresh dough—run through a machine that would press out perfectly shaped flip-flops.



Ung, standing left of her father, aged four in this family portrait taken in 1971. Image Credit: Charlene Ung

“I didn’t know then that I would be an engineer,” she remarks. She simply loved seeing how the family business operated and dreamed of working alongside her father one day. As the sixth child of nine, her life revolved around her family, and they orbited around her: she grew up with close to one hundred cousins, aunts, uncles, and extended-family members, all of whom lived within walking distance.

“These were the happy memories,” she recalls wistfully.

While Ung remembers being “young enough to be ignorant” about the war, strange and tragic scenes slowly formed a picture for her over the years: soldiers carrying guns began to roam the streets she would play in; neighbors passed along warnings that a sniper was holed up in the area so it was best to stay inside; and then there were the dead bodies that began to be delivered home to families.

“Our friend’s dad was killed, and our next door neighbor’s husband was killed. You started to see kids without parents,” she says. “I would see people mourning and crying and I didn’t understand. ‘How do people get killed and what is war?’”

Ung would eventually lose her uncle in the war, and she vividly remembers “a lot of explosions” when Saigon fell in 1975. For three years, her family lived under communist control and were routinely harassed for their wealth. At age 10, Ung watched as her four elder siblings fled for America first; later, members of the Communist Party of Vietnam arrested Ung’s father and imprisoned him for months after learning he arranged his children’s escape from the country.

After her father’s release, the family knew they could no longer stay in Vietnam. While they waited for the older children to settle in America and eventually sponsor them, Ung’s father began looking for ways to leave.

But until they could, Ung was now the oldest daughter at home and responsible for taking care of the family alongside her mother.



Left: Ung’s first grade school photo, 1973. Right: Charlene Ung in 2017. Images courtesy Charlene Ung.

“I had to step up and do that at a very young age,” she says. “When my older siblings left, our lives changed. I had to wash, clean, cook after school, and feed the livestock. I collected food and water and took care of the family.”

Looking back, Ung never questioned her new responsibilities.

“Instead of complaining and not liking it, I knew we were all a family and we’d have to chip in to make it work and do the best we can,” she says. “If we can’t rely on each other, then the family can’t really function. I didn’t really think, ‘Why me?’”

And between chores and school, she still found time to just be a kid.

“I still had fun with my friends,” she says. “I knew that if I could get all of my tasks done, then I could go play. I didn’t feel, ‘Poor me, I have so much to do.’ It’s just a new thing to schedule in and do.”

Then came something she hadn't scheduled: Her father had secured spots for the family on a ship headed to America. It was time to leave her life in Vietnam behind.

Anchors on Land and Sea

The ship was sitting-room only, each refugee pressed shoulder-to-shoulder. For the 2,318 aboard—Ung still remembers the exact number—sleep took the form of leaning on the person closest to you.

“We were unwanted people,” Ung says, recounting how the freighter was turned away at Malaysia and Brunei.

When they reached the Philippines, the country was unprepared for the volume of refugees needing to land. The ship was forced to anchor offshore in Manila Bay for nearly 10 months, with every passenger living in extremely unsanitary conditions with little access to food or water. Ung recalls when an Associated Press photographer arrived onboard, he later wrote that two things hit him: “the sight and smell of a mass of humanity.”

“People asked me, ‘How did you keep your sanity?’” Ung says. “It was the hope of reuniting with my siblings and someday seeing them again that kept us going.”

When Ung was later able to disembark for a refugee camp at the Philippines' Tara Island—stepping foot on land for the first time in nearly a year—she was “relieved the ground was no longer moving.” After four months, the group was relocated to the Manila refugee camp.



Ung, far right, and her family on board a Navy ship, with Tung An pictured in the background. Image Credit: Charlene Ung

While they waited for final processing and to be reunited with their older children in California, Ung's father used some of the money he brought to purchase them a small hut on the premises. Inside was a tiny stove and a platform for sleeping, with a compact storage area underneath. Ung had brought very few possessions with her, but she had managed to pack a small stack of black-and-white family photographs, wrapped in three layers of plastic.

Over the next three months, Ung found ways to pass her time at the camp. She helped her mother collect and cook food; crocheted scarves because she heard it was cold in America; attended Sunday English

classes taught by volunteers from a Catholic Church; and—her favorite—would slip out of the hut to watch “Popeye” with her younger siblings and some of the other children on a small TV inside a gazebo at the center of camp.

“It gives people hope, right?” she says of the joy she felt watching the show. “Whatever trouble you’re in, you know you can get out of it.”

Forged in America

Eventually, the sponsorship came through and the family relocated and reunited in Los Angeles.

They put down roots in Alhambra, a suburb of Los Angeles, where her father made education the No. 1 priority for each of his children. It didn’t matter that Ung had lost nearly two years of schooling, or that she knew only a handful of English phrases. What mattered to her father was that she was 13 years old and she had to catch up to everyone her age and go to college.

“I would ask my dad, ‘How can I ever catch up?’” Ung recalls. “He would say to me, ‘That’s what nights and weekends are for.’”

So Ung set about the task of catching up. She pored over her textbooks late into the night, spending as much time as needed understanding the material. She enrolled in English as a Second Language (ESL) courses at school, and doubled down on creative ways to teach herself at home.

“I would listen to music and jot down the lyrics and sing along, learning the language,” she says, noting that The Carpenters were her favorite. “Their songs are slow and meaningful.”

She also watched TV commercials with her siblings, playing a game where they would recite phrases back to one another. When she reached high school in Alhambra, Ung started passing around a bound notebook, asking friends to write down the lyrics to their favorite songs so she could study the words.



Ung, second from right in the front row, pictured with her parents and extended family in June 1980 in Alhambra, California. Image Credit: Charlene Ung

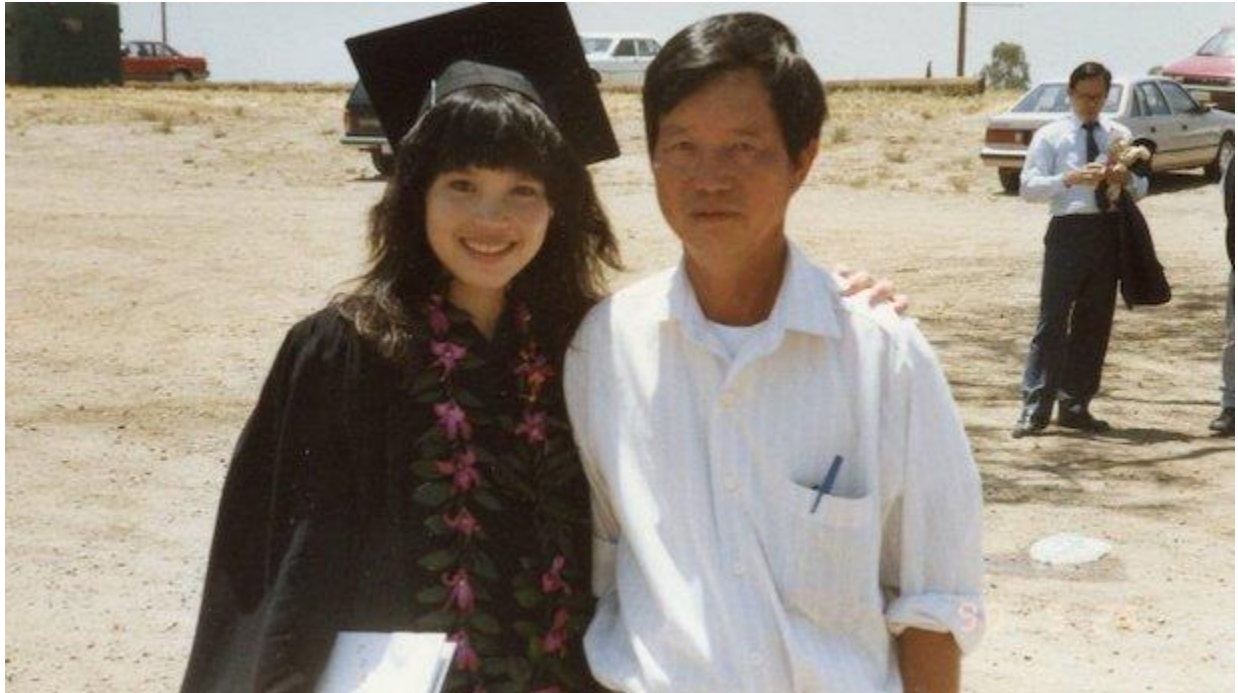
It was during those teenage years that Ung realized she wanted to be an engineer. She didn’t have her sights set on a particular industry yet, but she knew she wanted to “develop things and help people improve their lives.”

As an Asian female immigrant, she faced an intersection of challenges. None of her girlfriends at school were interested in engineering; only the boys. At home, her siblings were skeptical.

“They would say things like, ‘You can’t be an engineer, that’s for men. It’s very competitive and you can’t compete with guys in the U.S.’” she says.

Her father, however, never doubted her abilities.

“I was very close to my dad and he said, ‘You can be an engineer. I’ve seen how you interact with your brothers and you’re not only capable, but you’ll manage some smart engineers someday.’”



Ung and her father at her graduation from California State University, Northridge in 1990. Image Credit: Charlene Ung

Ung watched as her friends began to take on career paths in accounting, nursing, and teaching. But she could only imagine spending decades of her life in one job: engineering.

“I went with what I was passionate about. I stuck with engineering and, one challenge after another, I pushed through,” she says. “I think having my dad support me gave me the strength to never waver. Whatever challenges were ahead of me, I would work through them.”

That support was key, and once Ung set her sights on engineering, she sharpened her relentless work ethic.

“At no point did I feel I couldn’t do it,” she says. “That mindset helped me to get to where I am today. Every job you have will have a first day, and it’s about being curious and learning and growing. You will face problems in everything you do. How are you going to address it? How will you not give up? That will determine if you’re successful or not. There isn’t always a manual.”

By the time she finished college at California State University, Northridge with a degree in electrical engineering, she brought that same mental strength straight into her career.

Far Out Challenges

At college career fairs, Ung found herself gravitating toward the space industry. While there were a number of impressive engineering companies exhibited, the space projects felt, by far, the most challenging to her.

“You have to make it and launch it and you can’t fix it if it’s broken, so you have to make sure you do it right,” she says, adding that the projects were also varied. “Space has so many missions and each mission is so different. It’s engineering, but going to Mars or Jupiter or orbiting around Earth requires different solutions and challenges. Each mission has its own challenge. Part of me is very curious about learning new things, exploring new things, and doing new projects.”

Ung spent her early career years at Rockwell, Hughes, Boeing, and Northrop Grumman before making her way to JPL in 2004. She has held eight roles over the years on Lab, from Aquarius Power Cognizant Engineer to Flight Avionics Systems Engineering Group Supervisor. For five years, she was the section manager for the Electronic Manufacturing, Packaging & Technical Services Section. During her time there, she took then-JPL Director Charles Elachi, JPL Deputy Director Larry James, and Director for Business Operations Marc Goettel on a tour in 2014 of her building, pitching them the idea that it was crucial her team receive funding to expand from one production line to two in order to support flight electronics fabrication.

“I told them that without a remodel, there was only one production line and if equipment was ever down, we’d be dead,” Ung says. “I laid out exactly what we needed and we got the money.”

Her successful renovation of Building 103 caught the eye of Facilities Planner Pete Jones, who approached her about the long-planned Flight Electronics Integration Facility. From 2018 to 2019, she was assigned full-time to lead the building’s design, having asked then-JPL Chief Financial Officer René Fradet in 2017 if she could be in charge of the project.

“I told him, ‘Look, I’m one of the best people to help you lead this project because I understand all the services and organizations. I’m volunteering for this job because I want to help the Lab set a vision for this building,’” Ung recalls. “And he agreed.”

Ung left her high-ranking section management role—to the befuddlement of some colleagues—and went to work on the new building. For over a year, she labored alongside JPL’s contracted architects over the conceptual design, process, and people flow. When the building layouts were finished, she was confident they reflected the best possible design for the building’s longevity and future growth.

Slated to open in 2024, Ung hopes Building 350 will be her “legacy” at JPL.

Since 2019, she’s been focused on EMIT, overseeing the development, design, integration, and test of the instrument to launch. The mission features the first instrument to use NASA-invented imaging spectroscopy technology to measure the mineral composition of Earth’s arid land dust source regions.

“We are bringing technology that has not been flown in space before,” Ung says. “To bring this Dyson imaging spectrometer from laboratory testbed to space flight has its challenges—there are a lot of rigorous qualifications and space flight requirements. But it’s also rewarding because we’re proving that we have a version that can fly, and then other projects can use our knowledge and our approach.”

As with many projects around Lab, Covid delayed parts of EMIT’s timeline. But Ung would not be deterred, knowing that she shouldered the responsibility of a cost-cap mission—meaning the proposal promised that the project wouldn’t go over their funding ceiling. In May 2020, she and her team made the prediction they would complete their instrument in February of 2022, slipping past their deadline by only five months. Management was skeptical, but nearly two years later, they’re on track to complete the instrument by their predicted deadline. Next up: shipment to Kennedy Space Center in early March, with a launch date scheduled for May 1.

Ung credits the nimble, tight-knit team for their problem-solving capabilities.

“What I like about EMIT is that it’s a very fast-paced, small team,” she says. “We enrolled the team into part of the decision-making process and challenged them to find solutions to make the schedule.”



Ung, second from right in the front row, and her EMIT team. Image Credit: NASA/JPL-Caltech

One of the solutions involved rearranging the traditional order of how things got done. When the telescope and spectrometer hardware were late, Ung’s team tackled the procedures, releasing the drawings and writing up build instructions—essentially lining up everywhere else while waiting. When the hardware eventually came in, they worked with other sections, such as Mechanical Fabrication, Receiving Inspection, Quality Assurance and Paint Shop, to prioritize what they should get done first to keep the hardware integration moving.

“All of that required a lot of coordination, collaboration, communication, and building good rapport,” Ung says.

Everything she listed above, of course, takes years of laying a foundation for a strong team, and that begins from the person in charge.

Ung’s approach to management is similar to her approach as a child juggling work and school: Stay focused, get the work done, and then you can go play. Over the years, she’s treated her team members to surprise luncheons with managers serving the food, including a Halloween 2021 event where she came dressed in full pirate regalia; and she has kept in mind small, thoughtful gestures, such as bringing in avocados from her own tree, or remembering which baseball team is an employee’s favorite.

All of this, according to Ung, is what makes people want to work harder and do better. They feel seen and cared for, she explains, and they also know they have a leader who focuses on what’s important, both professionally and personally.

“I remember someone saying to me, ‘You might be small and soft-spoken, but know that when you speak, we listen,’” she says.

Years ago, Ung learned someone else was listening all along, too.

As a young post-doc, Charles Elachi closely followed stories of Vietnamese refugees and their journeys to freedom by boat. He vividly remembered accounts of those stranded in Manila Bay on a freighter for months. Later, when JPL's director, he was astonished to learn one of his top engineers had been on that specific freighter.

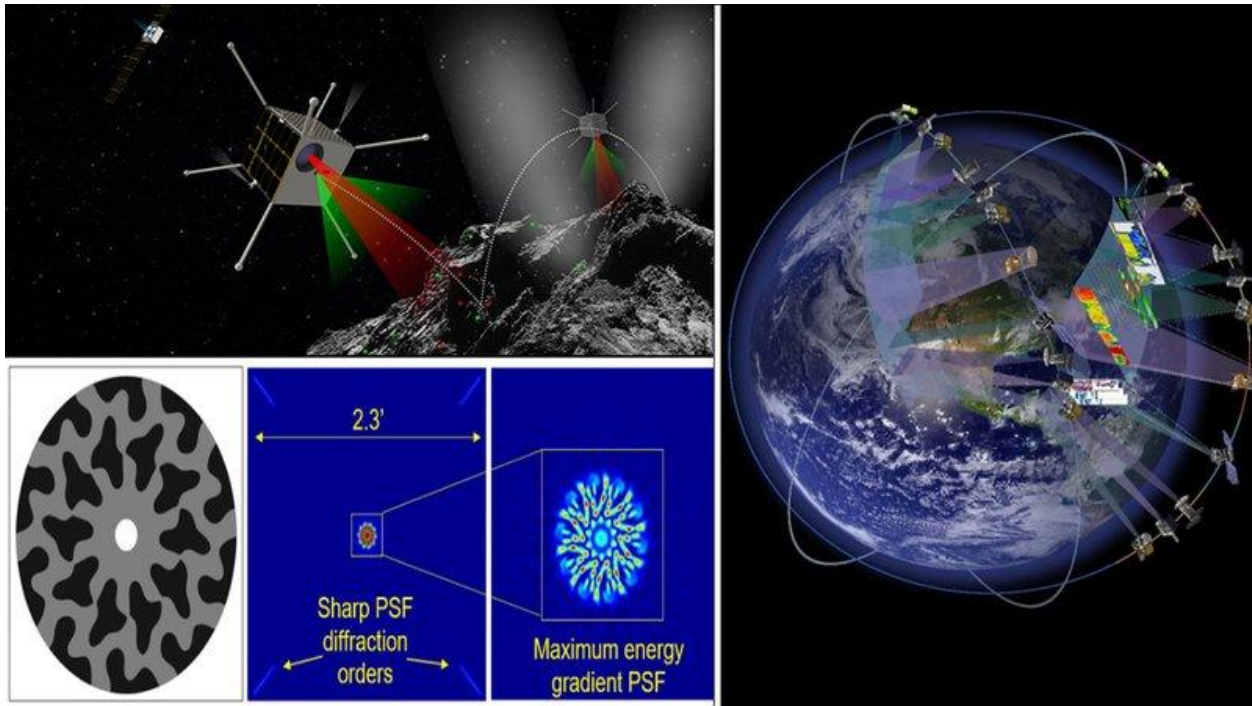


Ung with then-JPL Director Charles Elachi in 2016.

In 2015, he penned a note to Ung on JPL stationery. It read, in part:

“Dear Charlene, I was so touched by your story. I have the greatest admiration [for] how you overcame all [that] faced you and despite all of this, you became what you are, one of our most successful engineers.”

Today, Dr. Elachi's note hangs framed on the wall in Ung's home office. In the same room are the cherished family photos that shared her journey, still wrapped in three protective layers.



Josh Willis at Greenland's Russell Glacier in August 2021. Image Credit: Josh Willis.

Get to Know the Newest JPL Next Finalists

Now in its third round, JPL Next funds visionary science and technology projects for integration in future missions. Meet the PIs leading the teams moving into the final stage of competition.

By Taylor Hill

At the end of 2021, Associate Lab Director for Strategic Integration Dave Gallagher and the Space Technology Office whittled the seven projects participating in the JPL Next Accelerator program down to three teams. Now the concept phase is underway, with the finalists embarking on a nine-month sprint towards evolving their concepts into a detailed life cycle project plan, where one will be selected to move into the project phase and awarded additional funding.

The three teams are MIDDAS—a flexible software system capable of rapidly simulating Earth-observing missions; DARE—an autonomous SmallSat built to handle alien environments flush with uncertainty, and TOLIMAN—a CubeSat design with new technology capable of detecting Earth-like exoplanets.

“The teams will continue developing their concept, putting meat on the bones and producing project plans that will be reviewed in nine months,” said JPL Next Program Manager Tom Cwik. At that time, a review board and Gallagher will determine which of the three concepts will move into the project phase, receive three to five years of funding, and develop a prototype of their design.

“It’s important that the teams solidify interactions with the community that will be using the technologies and that science and formulation goals and partners are built into the plan,” Cwik said. “It’s an exciting part of the development – the interactions between various communities at the Lab.”

JPL Next is a somewhat new initiative for the Lab, supporting visionary system concepts that will change how JPL explores the universe. The program starts out with a call for ideas from across directorates 3x, 4x, 5x, 7x, 8x, and 9x. A panel selects approximately 10 ideas to begin the six-month accelerator phase. Then, a review panel and Gallagher parse the entrants down to three finalists, who embark on a nine-month concept phase. From there, one idea is selected to move on to the project phase, earning

funding for approximately three years and a goal of pushing their program toward infusion into a mission proposal, or further engineering development.

The pilot program launched in 2018 and resulted in the Ocean Worlds Life Surveyor (OWLS), which is completing field tests this year – an important step in demonstrating the viability of their technology for integration into future missions. Following OWLS, the first Lab-wide solicitation for ideas resulted in the Exobiology Extant Life Surveyor (EELS) team advancing to the project phase last January, receiving funding to develop a prototype of the autonomous ocean world-exploring instrument platform.

The current finalists will compete for the big prize of becoming the program's second official cohort, and a unique opportunity to push their technology to mature at a faster pace and with higher risk parameters than typical NASA calls for submissions.

"JPL Next fills an important niche that advances system technology across the so-called 'valley-of-death,' applying the right emphasis and resources at the right time," Cwik said. "The program now generates considerable enthusiasm across the Lab; we hear from folks in all disciplines and interests. They can get involved in current projects as they develop, and in a couple years, we will open a new solicitation."

Below, we talked with the principal investigators of the three remaining Next projects, to find out more about their game-changing technologies and what their experience has been in the JPL Next program:

MIDDAS (Mission Design through Data Science)

Principal Investigator: *Paul von Allmen, assistant manager for the Instrument Software and Science Data Systems Section, overseeing research, technology development, and science support activities.*

- **Can you talk about MIDDAS, and how this new formulation system could be beneficial for future missions?**

Von Allmen: The Mission Design through Data Science (MIDDAS) project aims at providing JPL mission formulation teams with a flexible software system that uses tools from data science to rapidly simulate new missions from end to end, including uncertainty quantification and fully taking into account past and current observations to meet new scientific goals and requirements for societal benefit.

- **Where did the idea for MIDDAS come from, and how did you end up pitching it as a potential JPL Next project?**

Von Allmen: The ideas and concepts underlying MIDDAS have been developed at JPL for many years at a research level and received substantial support in particular from the Earth Science Directorate. The JPL Next Program is the ideal and probably only venue at JPL for developing MIDDAS beyond low technology readiness levels and infuse it into JPL's formulation activities.

- **With MIDDAS moving to the concept phase in the program, what are the next goals/directives for the team to accomplish over the next nine months?**

Von Allmen: The main goals in the concept phase are to refine the design of MIDDAS and prepare detailed software definition documents that will serve in the development phase. We also plan to develop a prototype of MIDDAS in consultation with the science formulation teams of future JPL missions.

- **What has the experience been like for you and the MIDDAS team going through the JPL Next program?**

Von Allmen: Our experience with the JPL Next program office has been outstanding. I believe the three-phase format (Accelerator, Concept, Project) is excellent for the successful maturation, development, and infusion of innovative concepts with high impact on JPL's competitive position among the NASA centers. The guidance of the JPL Next program management team has been invaluable, and it has greatly helped us develop a robust and impactful concept.

DARE (Deep-space Autonomous Robotic Explorers)

Principal Investigator: *Issa Nesnas, principal robotics technologist and section staff in the Mobility Systems and Robotics Section. Nesnas serves on NASA's Autonomous Systems Capability Leadership Team as the JPL representative and on Caltech's Scientific Advisory Committee for the Center for Autonomous Systems and Technologies.*

- **Can you explain/summarize what the DARE concept is, and how this software could be beneficial for future missions?**

Nesnas: DARE, which stands for Deep-space Autonomous Robotic Explorers, is about developing the software technologies to enable "autonomous explorers," establish situational awareness, and make onboard decisions in a priori unknown environments or in challenging situations.

DARE's approach is to ground the autonomy development in a realistic and flyable mission scenario that is compelling for both science and engineering, keeping the spacecraft's physical design simple but cognitive one sophisticated. Demonstrating autonomous SmallSats at Near Earth Objects not only provides a proving ground for deep-space small-body exploration, but provides the autonomy foundations for the autonomous exploration of unknown surfaces and sub-surfaces of ocean worlds, multi-craft missions such as astrophysics constellation concepts, and eventually interstellar missions. Once matured, the proven flight/ground autonomy architecture would serve as a foundation for more challenging future missions.

- **How did you get involved in the JPL Next program and where did the idea for DARE originate?**

Nesnas: I have been involved in the JPL Next Program since its inception, working with stakeholders and technical leaders to enable a substantial advance in JPL's autonomy capability. The idea for DARE traces its roots back to the 2014 JPL Autonomy Strategic Planning (ASP) effort and some brainstorming sessions and was informed by the 2018 NASA Autonomy Workshop. DARE provides an opportunity for JPL not only to make substantial advances in key technical gaps towards autonomous exploration but also to leverage decades of technical advances across multiple autonomy elements, which, under DARE, would culminate in an integrated demonstrable capability.

- **How has the experience been with the DARE team going through the JPL Next program? Is this an experience you have found helpful for your concept?**

Nesnas: A program at the scale of JPL Next, in my mind, is critical to JPL's future. There is a class of challenges that can only be tackled through a broader engagement of JPL's innovation and deep-rooted expertise. Such disruptive concepts may not be achievable through incremental add-ons and need some space and flexibility for innovation.

JPL has many innovators, deep thinkers, and diverse experts. I see this program as providing a needed focus toward a substantial advance, working with JPL's top talent in an environment that compels us to push the boundaries of what may be possible, but doing so in a responsible manner.

TOLIMAN (Telescope for Orbit Locus Interferometric Monitoring of our Astronomical Neighborhood)

***Principal Investigator:** Eduardo Bendek, optical engineer in 383A, lead on the Nancy Roman Space Telescope Coronagraph Instrument's Verification Stimulus Instrument. Bendek is also the principal investigator of a ROSES (Research Opportunities in Space and Earth Sciences) three-year effort to advance astrometric accuracy for exoplanet detection.*

- **Can you talk about how you got involved in the JPL Next program and where the idea for TOLIMAN came from?**

Bendek: TOLIMAN is an instrument specially dedicated to find planets around our nearest star system, Alpha Centauri. I grew up in Chile observing Alpha Centauri and the Southern Cross with the naked eye, which is only visible from the southern hemisphere. As I became a scientist and engineer, I learned that the bright star that I observed as a kid is likely to host an Earth twin. TOLIMAN is a way to use the technology that I developed for my ROSES program to find that planet around Alpha Centauri.

- **Can you outline the TOLIMAN project and how this proposed CubeSat mission and the diffractive pupil technology development could be beneficial for JPL?**

Bendek: The TOLIMAN project is a plan to accelerate diffractive pupil technology and apply it to detect exoplanets using astrometry. The project will culminate with the launch of a 10-centimeter CubeSat capable of detecting Earth twins around Alpha Centauri. This technology will position JPL in the forefront of exoplanet detection technologies so the Lab can get funding to build larger missions to explore stars that are farther away.

- **With TOLIMAN moving to the concept phase in the program, what are the next goals/directives for the TOLIMAN team?**

Bendek: The directive is to demonstrate performance in the lab. Basically, we are claiming that the diffractive pupil technology would allow us to measure angular motions smaller than one micro arcsecond, which is very difficult, so we need to prove that we can do it in the lab before flight.

- **How has the experience been with the TOLIMAN team going through the JPL Next program? Is this an experience you have found helpful for your concept?**

Bendek: JPL Next offers a unique opportunity for technology to mature at a faster pace and with higher risk than a typical NASA ROSES call. This is essential because currently it is very difficult to win a PI-led mission if there is new technology involved that needs to be demonstrated in flight.



The new mural that greets visitors to the 9th floor elevator lobby in Building 180. Image Credit: Dan Goods

A Greeting in Bronze for JPL's 9th Floor Visitors

A new six-foot by 10-foot mural stands as a reminder of the historic heights achieved at JPL, and as an invitation to reach higher.

By Taylor Hill

Take one of the three elevators from Building 180's main lobby up to the 9th floor, and you'll step into the executive lobby, where JPL directors have been greeting NASA administrators, local and foreign dignitaries, and the world's scientific leaders since 1964.

Now, those visitors also encounter a six-foot by 10-foot 3D bronze-style mural, showcasing the extraordinary and wide-ranging space-based successes JPL has etched into history.

"The desire for this piece was really to inspire a 'wow' moment when people stepped off the elevator before coming into the offices," said Joby Harris, visual strategist in DesignLab's The Studio. "And to really establish for our visitors the feeling we all get when coming to the Lab."

In its current arrangement, the mural showcases 24 JPL-led missions stretching from Voyager to Mars 2020's Perseverance rover, and includes Earth-orbiting missions like Grace Follow-on, planetary explorers such as Cassini, and space-based telescopes like Spitzer. But Harris designed the mural with room to spare.

"We'll be able to incorporate future missions and affix them on the mural—so it can stay timely for years to come," Harris said.

The path for the mural from inception to completion is a winding one. In its original design, Harris created the art piece in 2016 in graphic form, for use in printed materials showcasing different missions led by JPL.

Harris felt he had just the right illustration. “Out of all the options we showed him, this bronze-style piece was the version he chose,” Harris said. “And among the black, white, and gray color scheme in the lobby, choosing the warm amber and bronze tones really enhanced the room.”

Within two weeks of Watkins’ request, The Studio had installed a brushed aluminum version of the illustration—just in time for Insight’s landing.

“The plan was for it to stay up for just a couple months, but it ended up staying there for more than a year, and the reaction we got from visitors and fellow JPLers was that this could be something more permanent,” Harris said. “Since this illustration was originally done to resemble etched bronze, we got the go-ahead to try and turn that into a reality.”



Details in the mural include 3D illustrations of 24 JPL missions. Image Credit: Joby Harris

After reviewing the weight limitations and expense of installing a true bronze mural on the 9th floor, the team shifted to the Disneyland treatment—using lightweight and cost-effective materials while making them look heavy and real. Harris contracted Los Angeles-based Pink Sparrow fabrication shop to machine a dense pink foam, transforming a two-dimensional illustration into a 3D monument with textures and levels that accentuate the featured planets and spacecraft. Finally, the mural was completed and installed on January 20, 2021.

Harris said: “A lot of us have been working from home, and work can often look a lot like just answering emails and spending an entire day in front of a screen, but when you come to Lab and walk around these buildings and see what’s going on here, it boosts your pride and confidence in what you’re doing.

“We hope this mural adds to that.”



Lindsay McLaurin, Dr. Mag Powell-Meeks, and Rich McKnight.

Black History Month: Journey to the Stars with Three JPLers

Dr. Mag Powell-Meeks, Rich McKnight, and Lindsay McLaurin detail their path to JPL and share advice for Black professionals and students on the rise.

In celebration of Black History Month, the Lab is sharing the personal career journeys of three JPLers: Chief Digital Transformation Officer Dr. Mag Powell-Meeks, Software Systems Architect Rich McKnight, and Public Engagement Lead Lindsay McLaurin.

Below, get to know how their love of space and science evolved into a career at the Lab, the advice they have for Black professionals and students, and why employee resources groups such as the Black Excellence Strategic Team (B.E.S.T.) are a vital part of JPL's culture.

DR. MAG POWELL-MEEKS, CHIEF DIGITAL TRANSFORMATION OFFICER

Dr. Mag Powell-Meeks (She/Her) is the manager of the Enterprise Operations and Transformation Office, and the chief digital transformation officer at JPL. Powell-Meeks leads a team focused on integrating Lab operations, innovating how we work, and improving the digital work experience for employees, partners, and stakeholders.

What sparked your interest in space and science?

Growing up in Mobile, Alabama, I was diagnosed with heart disease as a child. The doctors told my mother I probably wouldn't live to see my 10th birthday. I was frequently bedridden, so I turned to books, reading about the vastness of the universe and the creation of the Earth, stars, and sky. When I wasn't reading, I watched Star Trek re-runs, inspired by Lieutenant Commander Uhura, portrayed by Nichelle Nichols. My imagination ran wild with the possibilities that science and technology offered. During my sophomore year in high school, my teacher told me that if I studied science and math in college, I could

make the role of Lieutenant Commander Uhura a reality. That sealed the deal for me. I got a degree in Physics and came to JPL. I could have died when I learned Nichelle Nichols visited JPL. What a full-circle moment.

What was your path to JPL?

Leaders at JPL set up a program to recruit at Historically Black Colleges and Universities (HBCUs). I joined JPL as part of the co-op program in 1985 as an instrumentation systems engineer, working in the mission test facilities. We used personal computers to acquire and analyze mission data. I processed and visualized data for users to easily understand.

My passion for technology and interest in data management led to working in data systems and IT supporting the Technology Transfer Office. When JPL outsourced its IT services, I helped establish that contract, becoming the program manager, executive director, then VP for Desktop Services. After seven years in the private industry, I returned to JPL to lead the new Enterprise Engineering Division, where the mission test facilities, flight hardware re-use program, cleanrooms, metrology lab, eFAB, mFAB, and the institutional IT activities were all operated.

Ultimately, I was promoted to deputy director for the IT Directorate/Deputy CIO and, eventually, appointed the role of the chief digital transformation officer, where I now manage the Enterprise Operations and Transformation Office (EOTO). EOTO works with the JPL executive team to develop a Lab-wide transformation initiative, Enterprise 2.0, which focuses on integrating Lab operations, innovating how we work, and improving employee experience.



On challenging projects, courage, and diverse leadership:

I tend to look for new and innovative opportunities, or problem areas identified by leadership. At the heart of it, I like to try and solve complex problems that advance the work of the enterprise. That kind of work is not necessarily well-defined; getting it off the ground may take some time.

It takes courage to take on those kinds of jobs. It takes hard work and commitment. It takes a 'can-do' attitude, and the ability to set aside ego and work with others from diverse backgrounds who can complement your skillset. I have found that playing it safe does not grow or stretch our brains as much as high-risk, highly visible projects do.

The jobs I've taken on weren't easy or always fun. They were challenging and often full of critiques, which required broad shoulders. I learned from those experiences and took what I learned to do better on the

next adventure. I love my work today, because, again, there is no prototype for it. We just have to figure it out and keep evolving until we get it right. JPL allows time for evolution, both personally and professionally, as long as transparency, communication, and collaboration are at the center of the approach.

So, yes, sometimes, I haven't gotten it right on the first try, but I know to bring in diverse, experienced thought leaders to help. Thought leaders can contribute in different ways to help evolve the work. Challenging projects force us to seek the counsel and wisdom of others, as well as think out of the box. What a way to get to know the brilliance and talent that exists across the Lab. It is very rewarding work. Hopefully, at the end of the journey, there's a legacy of work products and relationships of which one can be proud.

Who from Black History most inspires you?

Emma Powell, my mother. My mom worked hard her entire life to raise eight productive, responsible children, including a set of twins, of which I am one. She did this in southeast America where there were obvious racial and economic divides. Because of what she poured into us, her children became educators, bankers, engineers, IT executives and professionals, and business and military leaders. My mother taught us the importance of education, and that good grades could earn scholarships. She said that because she knew she couldn't afford to pay for us to go to college, but she wanted us to go. We all attended college, even some as presidential scholars.

My mom taught us self-discipline, self-control, and she instilled in us a good work ethic. She admonished us to 'work hard on whatever task you are given, because even if I can't see you, God can. He is with you, everywhere.' She taught us to have positive attitudes and to be good citizens—to give, share, and care for others. She taught us to be resilient, self-reliant, self-sufficient, and to have integrity and character, even in the small things. All eight of us modeled our work ethic and spiritual lives after hers. My mom is my model for Black History and for Black Excellence. She inspires me the most.

Tell us about your involvement with the Black Excellence Strategic Team (B.E.S.T.) employee resource group. How do groups like B.E.S.T. impact the organization for the better?

When I first joined JPL, the group that preceded B.E.S.T. was called Alpha. This affinity group of Black leaders helped me with my transition to JPL. They created opportunities to meet senior leaders who looked like me and who talked like me. These leaders shared their journeys at JPL. That group also introduced me to leaders who were different from me.

Alpha is where I found my first JPL mentor. That mentor helped me navigate my career at JPL and helped me make decisions about 'next opportunities' to pursue and avoid. Alpha created opportunities for me to give back to the local community by tutoring at John Muir High School and Elliott Middle School. They also connected me to the Los Angeles Council of Black Professional Engineers and the Society of Women Engineers. Alpha mentors helped me plan strategic meetings with my supervisor, prepare for interviews, among other things. Alpha provided most of the things I needed from an advocate, sponsor, and mentor.

This is precisely what B.E.S.T. offers today—a safe, trusted place where advocates, mentors, and sponsors are available to guide, coach, and assist all underrepresented employee populations. B.E.S.T. has continued an important legacy of community, and will inspire the next generation of black and other underrepresented minority leaders.

What professional advice would you give other Black professionals and students interested in a similar career?

- Be prepared and always bring your best: Bring your best self to every meeting and to every work assignment. Be prepared. Listen. Speak up. Always do your best work, all of the time. Work hard;

never slack off nor take the easy road. Be an example. There is always someone in the wings waiting for the same opportunity.

- Find a mentor or network: Meet as many professionals as possible, especially those doing the work you hope to do one day. Networking, mentoring others, and/or being a mentee are always smart to do.
- Move around and learn new things: To get the experiences you're looking for, volunteer if you have to! Take on additional duty opportunities. Be willing to consider lateral moves to broaden and deepen your experiences.
- Seek feedback and ask for help: Seek advice and counsel from others you respect, admire, and trust. Create a circle of trust with those who can give you constructive feedback. Ask for feedback, and do not take it personally; use it to get better.
- Never quit: Most importantly—after working hard, continuously learning, and being prepared—never, ever give up.

RICH MCKNIGHT, SOFTWARE SYSTEMS ARCHITECT

Rich McKnight is the software systems architect at JPL. In his role, he supports the Enterprise Content Management System the Lab uses to manage and preserve information related to all flight projects.

What sparked your interest in space and science?

Growing up in the 1960s, I wanted to be an astronaut. We used to sit around the TV during the Apollo launches. I remember watching Neil Armstrong and Buzz Aldrin walking on the Moon. As a teenager, I took flying lessons and later joined the Civil Air Patrol cadet program, where I also figured out that the military would not be for me. I planned on studying Astronautical Engineering, but I received a scholarship and had to choose between Electrical Engineering, Mechanical Engineering, and Computer Science. I chose Electrical Engineering partially because of my love of music and interest in synthesizers.

What was your path to JPL?

I started out designing hardware for telecommunications systems at Bell Laboratories. During my time at Bell Labs, I transitioned to software, developing tools to support hardware simulation and then managing an embedded software group. I was awarded a patent for some of the work I did. Later, I moved into financial services technology and development related to Trading Systems and Market Data systems before transitioning to a new organization architecting and supporting Enterprise Content Management systems. This allowed me to work with customers throughout the United States and worldwide.

A position supporting JPL's content management efforts became available, and I joined JPL in April 2021.

Tell us about your current role at JPL:

JPL uses enterprise content management systems to store and preserve flight project documentation. I am responsible for one of these systems as the subject matter expert on one of the solutions we use at the Lab. I work with the other team members and our stakeholders to ensure that our users can share, find, and preserve the critical documentation and information produced from the flight projects that use our system.

There is no actual typical day. On any given day, I might be troubleshooting performance issues, gathering data to demonstrate how the system is being used, working with developers, or working with infrastructure and operations teams to improve our processes. The impact that well-built enterprise software can have on an organization is huge. Seeing the benefits that projects derive from the systems that we support is very satisfying.



Who from Black History most inspires you?

That is a tricky question. There are so many people who have paved the way for Black Americans while benefiting humankind in general. I have always been a student of history and Black history in particular. I am inspired by the pioneers who have achieved in science, medicine, technology, literature, music, social justice, civic leadership, and business. Many of these pioneers had to fight racial bias while paving the way for future generations of Black Americans and making life better for all Americans and people around the globe.

On his involvement with the Black Excellence Strategic Team (B.E.S.T.) employee resource group:

I currently serve as the webmaster for B.E.S.T. and the unofficial choir director. Given the historical exclusion of underrepresented groups in corporate America, academia, etc., these groups provide an additional support network. In my case, I have met other JPLers who have been here a while, and it gives me a ready-made network of folks from different disciplines which can be sources of information. With the dialogue about racial and social justice, I have had many discussions with B.E.S.T. members about what is going on. I appreciate the opportunities to share perspectives and ideas about improving things.

What professional advice would you give other Black professionals and students interested in a similar career?

- Every relationship is mutually beneficial. You will always bring something to the table. You bring your energy, experience, insights, and willingness to learn.
- Pursue excellence, not perfection. Always seek to give your best and understand that your best might not be perfect. You will encounter scenarios that you nor your colleagues have anticipated. Do not wait for your ideas to be perfect to share them. Bring that good but imperfect idea and allow it to be refined by you and your colleagues. Too many good ideas never see the light of day because of the fear of rejection.
- Embrace your strengths and know your shortcomings. The best teams and collaborations involve people with complementary strengths and skills. The ability to collaborate with diverse people is more important than being an expert at everything.
- Don't be a hero. At some point in your career, you will be given an impossible task. It is essential to voice your concerns sooner rather than later. That does take a level of maturity and confidence, so early in your career, it may be something that you find a bit uncomfortable doing.

LINDSAY MCLAURIN, PUBLIC ENGAGEMENT LEAD

Lindsay McLaurin (She/Her) is the public engagement lead for Earth missions and Psyche. Her role is to connect the public to the missions she supports in creative ways that will inform, educate, and capture their imagination.

What sparked your interest in space and science?

I sort of fell into it. Growing up, I lived in a moderately rural area with minimal light pollution. Most nights, I was able to see the dark night sky peppered with stars and planets—and, if I was fortunate, would see a shooting star. I've always had a general curiosity of what was happening in the great unknown: Are we alone? Is there someone else just like me on another planet wondering the same thing? A few years into my career, I started working at an aerospace company. I began working on a space mission called the James Webb Space Telescope. After that, I was hooked and knew a career in space was my calling.

Tell us about your current role at JPL:

I am a public engagement lead for JPL, responsible for strategic marketing communications initiatives for Earth and solar system missions. My job is to engage the public with the mission through creative storytelling, in-person events, and social and digital media. My favorite thing about my work is the freedom to be creative. I am a big-picture thinker and usually think way outside of the box. My job allows me to pull from different communications disciplines and mainstream trends to produce work that resonates across vast audiences.



On her favorite projects:

My favorite project to date would be creating a hidden picture coloring experience called “Color Your Universe.” During the beginning of COVID-19, public engagement teams across NASA were encouraged to develop and share ways to keep the public virtually involved during stay-at-home orders. Over six weeks, individual coloring pages were released with clues of what was hidden inside each page. In the sixth week, followers were able to see that all six pages made one large poster. We tracked the public’s participation through social media. It was so great to see their creative interpretation of coloring the pages.

Who from Black History most inspires you?

Josephine Baker would have to be one (of many) Black individuals who have inspired me. I have always been fascinated with her ability to capture audiences through her creative costumes and forward-leaning acting. In addition to her performances, she was also active in the civil rights movement in the United States.

What professional advice would you give other Black professionals and students interested in a similar career?

My advice would be to always be unapologetically you. There will be people along the way who may think your personality is too big or your ideas are too large, but that's what makes creative people creative. Always be a sponge and learn the new trends and communications styles so you are constantly evolving. The world waits on no one.

What has been your biggest challenge and how did you overcome it?

My biggest professional challenges have been my gender and my ethnicity. These are two things I cannot change, so I use them as strengths. I truly believe diversity is the cornerstone of all great ideas. Ensuring that the people in the room are multi-generational, multi-ethnic, and multi-gendered is crucial to success. I have found allies and mentors to help me navigate the challenges I face in this area to continue my success.

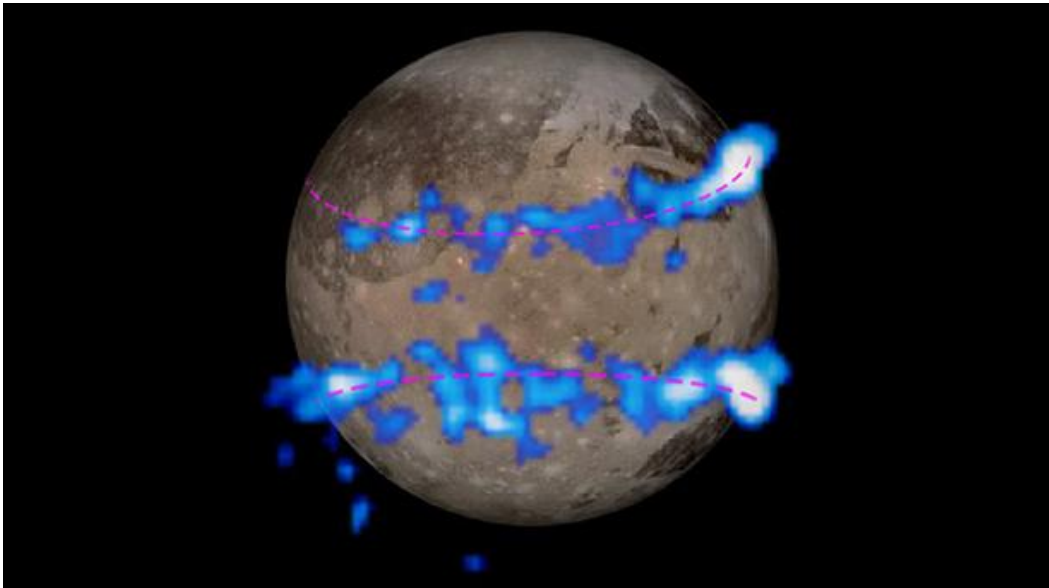
Why are employee resource groups such as B.E.S.T. (Black Excellence Strategic Team) important?

Based on my previous experience and my experience at JPL, employee resource groups like B.E.S.T. are vital to employees to have an outlet to share their experiences. Being a person of color has its unique challenges and setbacks, so it's nice to collaborate with colleagues who can share in your experience, support you, and mentor you. B.E.S.T. has been active in supporting Black colleagues at JPL during the social and justice unrests worldwide. We had meetings to share our feelings and experiences, and workshops to hear speakers that could help us during this time.

This story was adapted from [JPL's Employee Spotlights](#). Answers have been edited for length and clarity.



Events



Von Karman Lecture Series - Moon Dance: Exploring the Moons of the Outer Solar System

Thursday, March 17

7 p.m.

[YouTube link](#)

Speaker: Dr. Marina Brozovic, Navigation Engineer, NASA/JPL

They are the map makers, the orbit takers. By knowing where the small moons of our solar system are, we can plan our missions. This will be a practical story of why orbits are important when looking at solar dynamics, resonances, and moons of the outer solar system.

Host: Brian White, Public Services Office, NASA/JPL

Co-Host: Lindsay McLaurin, Public Outreach Specialist, NASA/JPL

JPL Family News

Retirees

The following JPL employees recently announced their retirements:

March Retirements:

40+ Years:

Margaret Frerking, Section 7000, 42 years

30+ Years:

Mehrdad M. Moshir, Section 312H, 37 years

Robert D. Ferraro, Section 8300, 34 years

Chris Wrigley, Section 389N, 33 years

Nancy D. Torres, Section 2640, 33 years

John M. Phillips, Section 1600, 30 years

20+ Years:

Eli David Skulsky, Section 3430, 28 years

Alan W. Kleinasser, Section 3890, 27 years

Bruce W. Troutman, Section 2800, 25 years

10+ Years:

Eric Nilson, Section 1700, 17 years

Margaret Simpson, Section 1340, 17 years

Awards



(First row, left to right): Ingenuity Helicopter, Henry Garrett, Marianne Gonzalez, Kimberly Miner, Anthem Award for Climate Change site; (Second row, left to right): Perseverance Mars Rover, Carol Polansky, Ashwin Vasavada, VITAL Ventilator, Michael Watkins.

Awards & Honors Roundup

JPLers often Dare Mighty Things, and nearly as often earn awards or professional designations. JPL Space will periodically feature a roundup of recent honorees. Please join us in congratulating your accomplished colleagues.

Ingenuity Mars Helicopter

- **National Air and Space Museum's 2022 Michael Collins Trophy Awarded to Mimi Aung and the Mars Ingenuity Helicopter Team**

The award recognizes outstanding achievements in the fields of aerospace science and technology and their history. [Full story](#).

- **National Space Club And Foundation Announces Winner Of 2022 Goddard Trophy: Ingenuity Mars Helicopter Team**

For the team's "exceptional service to this country and its space program." The trophy is the Club's highest honor. [Full story](#).

- **Royal Institute of Duke of Edinburgh Navigation Award: Ingenuity Mars Helicopter Navigation Team**

For innovative autonomous navigation enabling a series of successful Ingenuity Mars Helicopter flights in 2021. [Full story](#)

Henry Garrett: American Institute of Aeronautics and Astronautics James A. Van Allen Space Environments Award

"...For a lifetime of contributions to the understanding of the interactions of spacecraft with the Earth's magnetosphere and those of other planets." [Full story](#).

Marianne Gonzalez: Forbes 30 Under 30

Worked on an experiment to generate oxygen on the surface of Mars and also helped build an atmospheric monitor for the International Space Station. She now focuses on the Europa Clipper. [Full story](#).

Kimberley Miner: Smithsonian's New 'Women's Futures Month'

Statues of Miner and other female researchers are on the Mall in Washington during March. [Full story](#)

Climate Change Site: Anthem Award

"...honors the purpose & mission-driven work of people, companies, and organizations worldwide. by amplifying the voices that spark global change...defining a new benchmark for impactful work that inspires others to take action in their own communities." [Full story](#).

Perseverance Mars Rover: The Engineers Council Distinguished Engineering Project of the Year Achievement Award

"...outstanding achievements in completing a mission of National and international significance..." [Full story](#).

Carol Polanskey: AAAS Fellow

"...honors members whose efforts on behalf of the advancement of science or its applications in service to society have distinguished them among their peers and colleagues." [Full story](#).

Ashwin Vasavada: Honorary Fellowship, Royal Astronomical Society

"...significant and important contributions to solar system science and exploration...and his enduring impact as Project Scientist on NASA's Curiosity Rover." [Full story](#).

VITAL Ventilator: Anthem Awards—2 categories

The award "honors the purpose & mission-driven work of people, companies, and organizations worldwide. by amplifying the voices that spark global change...defining a new benchmark for impactful work that inspires others to take action in their own communities." [Full story](#).

Michael Watkins: The German Research Centre for Geosciences Rolf Emmermann Medal

"...Through his long-standing cooperation with the GFZ in the pioneering Gravity Recovery and Climate Experiment (GRACE).....and its succeeding mission GRACE Follow-On, Michael M. Watkins has provided uniquely valuable service to the GFZ and to the whole science community." [Full story](#).
