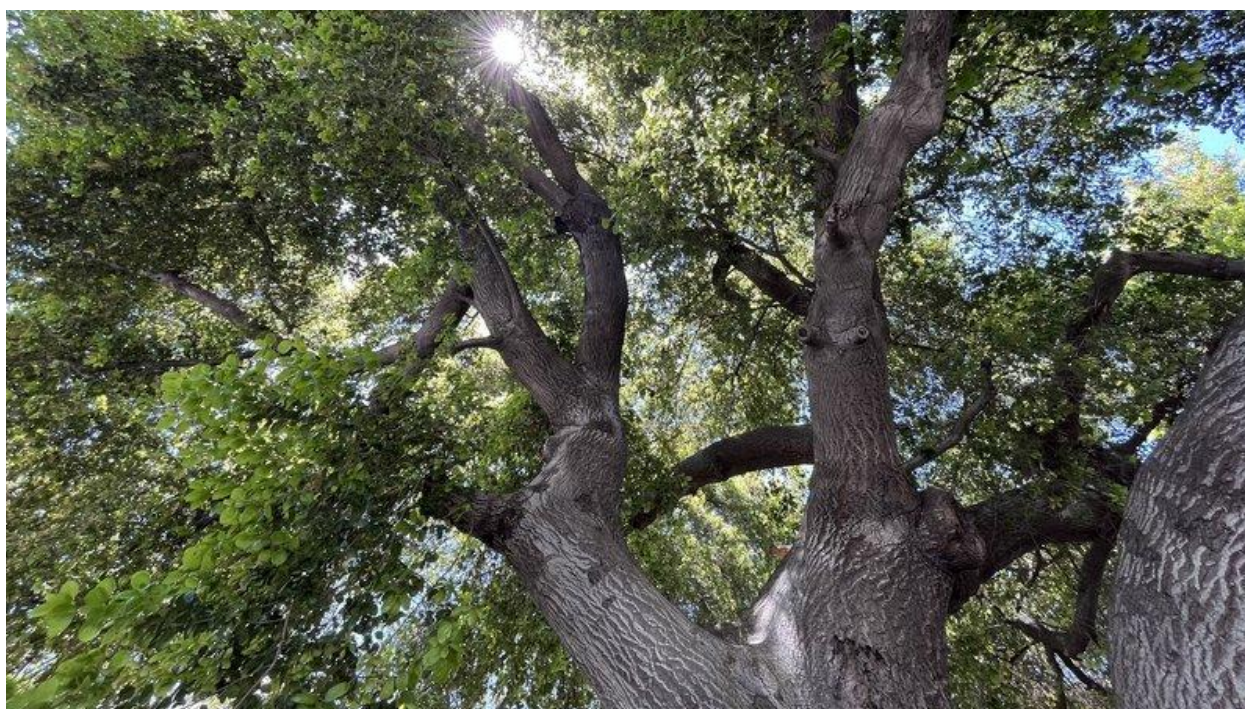


Read the 2022 JPL Annual Report [here](#).

## Featured Stories



### LabGrown, Part 1: Standing in the Shade of Giants

By Vincent Robbins

*In the first of a four-part series exploring the Lab's flora, we survey the history, character, and care of JPL's treescape. Next up: the hunt for the oldest tree ; native plants of JPL; and last but not least, our shrubs and flowers.*

As JPLers gaze out their office window or stroll back from the coffee cart, pondering the evasive riddles of our cosmos, they might take comfort in John Muir's words: "The clearest way into the universe is through a forest wilderness."

JPL is home to hundreds of plant and tree species that are sources of shade and fragrance, contemplation and inspiration. The numbers of our buildings tell a story of how the Lab has grown and changed over the years, but tracing the roots and branches of our trees takes us on a more complex journey.



In the quest to better understand our treescape, we set out to discover what types of species grow on Lab, where they come from, how they are managed and cared for, and why their presence matters to JPLers. Along the way, we invited a cast of plant specialists and nature enthusiasts to share their perspectives and wisdom.



## Home in the Arroyo

Long before the Lab began taking shape in the 1930s, the [Tongvaar](#) that we call the Arroyo Seco – which continues to be the homelands of the Gabrieleño Tongva (Kizh Gabrieleño Band Of Mission Indians and other Indigenous peoples of the region) – was home to many plants and shrubs still there today: California sagebrush and buckwheat, mule fat and willow scrub. And, as far as trees go, oaks claimed most of the real estate.

“Oak Grove park, ‘Oak Grove drive’ – that’s it,” says Avionics Engineer Roger Klemm, president of JPL’s Green Club and a self-described native plant geek. “Coast live oak, with a little bit of Engelmann oak.”

Klemm adds California sycamore and white alder to that short list, but that’s about it: “That is what was here first. A lot of them still grow on our hillsides and canyons on rainfall alone.” (We’ll dive deeper into the native species on Lab in a further installment of this series.)

If JPL’s natural habitat is limited to a handful of native species – where did everything else come from?

Centuries of urban and landscaping development make the horticultural history of Southern California a layered story to untangle. Plants have crossed borders for centuries. As immigrant settlers populated the western United States, non-native species arrived with them. From the Australian eucalyptus trees that permeate the coastal air to the iconic palm trees that line the streets of Pasadena, the Lab’s surroundings are teeming with species whose origins can be difficult to trace.





*Avionics Engineer Roger Klemm, president of JPL's Green Club and a self-described native plant geek, hosts a Nature Walk in the Arroyo just outside of the East Gate.*

## **Garden Variety**

On Lab, an evolving landscaping philosophy has created an eclectic mix of trees today.

"I see JPL as a botanical garden more than as a natural setting," says Media Producer Leslie Mullen, a member of JPL's Green Club. "We have species of trees from all over."

Those international inhabitants include jacaranda (South America), bunya-bunya (Australia), strawberry tree (Mediterranean), Lebanese cedar (Eastern Mediterranean), camelia (Asia), floss silk tree (South America), carrotwood (Australia), Italian cypress (Mediterranean), dawn redwood (China), olive (Mediterranean), and many more.

"I would say I have inspected over 2,000 [individual] trees on Lab," says Liz Velarde, JPL's dedicated arborist from Brightview, the Lab's facilities contractor. "Either they were here already when the Lab was being built or people planted them without really knowing too much about the species. Especially 50, 40 years ago, people just planted them because they were from a Mediterranean climate, similar to Southern California's."

"[JPL] tells the same kind of story of development as most urban places," says Garrett Crawford, a superintendent for the City of Pasadena Parks, Recreation, and Community Services department who oversees all of the natural areas in the Arroyo. "You can see as you've added buildings and changed things, the landscape has changed. Good things and mistakes have been made — as in most places."

Over the last few decades, however, Crawford says the ethics of environmentalism and sustainability have significantly impacted the philosophy of landscaping and grounds maintenance. Here at JPL — encouraged by the activism of Green Club members and other individuals — a growing environmental consciousness helped establish a more thoughtful approach to planting and maintenance.

## Right Tree, Right Place

The guiding arboreal philosophy of today is simple: Plant the right tree in the right place. In other words, prior to planting, assess the characteristics of the tree and the natural environment. Factors like space, tree height, root systems, canopy spread, growth rate, soil, climate, and sun all affect a tree's chances of flourishing.

This is one reason Klemm is passionate about native plants – what could be more “right place” than a tree’s natural environment? Native plants also pay it forward, supporting the environment far better than non-native trees.

“Native plants support native insects, which support the ecosystem. When you have the native stuff, you have a lot more activity, a lot more biology,” Klemm says.

Crawford says Klemm’s view has become standard in landscaping education and practice.

“Anyone who is a contractor for landscape architecture or land maintenance – they’re all taught to work around native stuff,” says Crawford. “I think that’s pretty normal and the curriculum is really just accepted.”

But even for native trees, JPL’s environment is not exactly native. Velarde, JPL’s arborist, says she and her team have to consider complicating factors such as changes to the soil, underground utilities, above-ground buildings, roads, sewer lines, concrete foundations, future construction plans, pests and diseases, and safety concerns when choosing species for planting sites. That’s why species from all parts of the world continue to land on Lab.

“It’s almost like you’re getting a dog,” says Velarde. “If you’re living in a small apartment, you’re not going to get a big breed. It’s something you should really take the time to think about.”

Like dogs, trees grow – a lot.

Crawford says it’s crucial to think about the future when planting new trees: “It becomes a huge issue in 10, 15 years because of the size and the roots and everything. You want to put a tree that’s going to be successful because you don’t want to go back and remove it later.”



*Brightview Arborist Liz Velarde and Supervisor Marvin Garcia inspect trees and plants around Lab on a daily basis.*



## Maintaining and Preserving

In Southern California's arid climate, a place like JPL — with all of its landscaping — requires more water than nature can provide. For this, Facilities uses an advanced irrigation system programmed to water individual trees, planters, and landscaping areas based on their individual needs.

"Every area has its own calculations of how much water is needed," says Brightview Supervisor Marvin Garcia. "We have irrigation designated for certain areas depending on, let's say the slope or how much shade they get from a nearby building."

Garcia explains the system can also detect rainfall and evaporation in order to regulate water output.

While irrigation is necessary to maintain JPL's landscape, and sophisticated systems to limit its waste are important, Garcia and Velarde say that focusing on native, naturalized, or drought-tolerant plants is a vital strategy for reducing water usage.

## Health of Our Trees

Even with plenty of thought, labor, and attention, trees can die, fail, or otherwise require removal.

One significant cause of health concern is pests, like the invasive shot hole borer insect — a type of beetle — that has wreaked havoc on several trees at JPL.

"It's a tiny insect, but if you get enough of them, they'll bore through the tree's vascular system and it will eventually kill the tree," says Velarde. "It's kind of like cutting through all your blood vessels — the tree can't uptake nutrients or water anymore."

Other threats are over-pruning, ground compaction, and routine decay. But trees can be impressively resistant to adversity, Velarde explains.

"Even if a tree has decay, they can compartmentalize it. They can build a wall around the [decay], blocking it from spreading further and deeper into the trunk or branch."

When a tree does require removal, Facilities has a rule that helps maintain the Lab's tree population: "Let's say we're removing a healthy tree, we have a two-to-one ratio," says Velarde. "If we remove one healthy tree, let's say for construction, then we have to plant two trees somewhere else on Lab."

Adding young trees not only strengthens the population, it also provides age diversity to JPL's mature urban forest which helps counteract some of the ecological losses from removals. These days, young trees planted on Lab tend to be coast live oaks, California sycamores, manzanitas, palo verdes, and western redbuds. Thanks to the two-to-one ratio and the voices of tree enthusiasts in the JPL community, the Lab plans to maintain a healthy population of trees for decades to come.

"No one can really visualize [JPL] without trees and green spaces," says Velarde. "Green spaces are so important, I think [JPLers] acknowledge that."

## Branching Out into the Cosmos

As we look for signs of life in the universe, let us not forget that we are surrounded by it here on Lab. Beautiful trees surround our work at JPL, standing sentry outside our offices and over our lunch tables. At



times, they have even intersected with our work more explicitly: there are the Moon seeds that recently flew around the moon on Artemis I before returning to JPL; a project involving JPLers that studied how the long lives of trees might inform technology for extending the life of antennas; the Lebanese cedar on the Mall, standing tribute to former Director Charles Elachi; and, of course, Newton's famous apple tree that underpins centuries of science since his famous, if apocryphal, epiphany.

Anyone who steps on Lab recognizes the natural beauty of JPL extends beyond the California sunshine. Whether they are new hires or seasoned JPLers, the appreciation feels universal and enduring.

"[JPL's] trees are reminders of the foundations of where we came from," says Chief Engineer Rob Manning, who has been at JPL since the '80s. "A belief in technical authenticity (i.e. be real not fake), a touch of irreverence to authority; a belief that, while it may be hard to find, there is a truth out there independent of us... Those are our trees. I hope they last."

How profoundly that treescape has contributed to our exploration of the cosmos can't be measured – but scenic, meditative walks between meetings, under the canopy of our trees, are ripe for the imagination, almost certainly bearing fruit that has found its way into space.

In the next installment, we'll go on a hunt to find JPL's oldest surviving tree.





## Celebrating InSight's Successes

By Taylor Hill

Braving another rainy day in this record-setting wet year in Southern California, JPLers gathered in von Karman Auditorium March 30 to celebrate InSight, which spent more than four years gathering science, data – and dust – on the Red Planet.

“We set out to literally rewrite the textbooks on the interior structure of Mars, and we have,” said InSight Principal Investigator Bruce Banerdt. “That’s the legacy of InSight.”

The InSight mission was declared over in December 2022 after mission controllers were unable to contact the lander. The data from its four years on Mars yielded details about Mars’ interior layers, quake activity, meteoroid impacts, and regional weather details, helping scientists determine the age of the planet’s surface, and a way to study the planet’s crust, mantle, and core.

While the goal was straightforward, the path for InSight to reach Mars and gather data on the more than 1,300 seismic events and meteor impacts it registered was anything but.

During the celebration, JPL Director Laurie Leshin opened the talk, touching on the determination and resourcefulness the team showed to bring the mission from concept to completion.

“I know Bruce has been working to make this mission happen for probably half of his career, and I know the team’s effort it took to get to see inside this fascinating neighboring planet, and to understand it better,” Leshin said. “As you all know, we are very focused on geochemistry and biology on Mars, and we will only understand those things if we have the context of the geophysics of this planet. And to do what you did in the ingenious way of not needing three or four network nodes to peer inside the planet, and landing on Mars on a Discovery budget, it’s not easy to do. It’s about the best of what we do here at JPL.”

In their talks, InSight Project Managers Tom Hoffman and Chuck Scott reminisced about the years put in the mission, working through the early development challenges to integration and testing – including sealing issues with the Seismic Experiment for Interior Structure (SEIS) that led to a launch delay – and



the months of effort put into attempts to get the Heat Flow and Physical Properties Package instrument (also known as “the mole”) to dig a hole on Mars.

“I look back on those challenges the way women look back on childbirth – with joy,” Hoffman quipped. “At the time, it was pure pain and suffering, but nonetheless, it was spectacular.”

Hoffman also touched on the international scientific family that made InSight a possibility – showing a group photo taken of the InSight Project team and partners on the steps of Building 180 in January 2019.

“It really does take an entire world to get to Mars – not just a village,” Hoffman said.



### **An ‘Inevitable’ Mission**

For Banerdt, getting a seismometer was 20 years in the works when the first proposal for the InSight mission – then known as “Gems” (Geophysical Monitoring Station) – was originally submitted in 2010.

“It just took some better graphics and a name change for the proposal to be accepted two years later,” Banerdt said. InSight was selected on Aug. 20, 2012 – Banerdt’s birthday – and launched from Vandenberg Air Force Base May 5, 2018 before landing on Mars Nov. 26, 2019.

Once on the surface, Banerdt said the work began to get the 10 numbers pitched as InSight Level-1 science requirements: Determine the crust thickness of Mars, the crust layering, and the planet’s mantle structure; determine the core’s radius and density, and the state of the core as either liquid or solid; determine the rate of seismic activity, the epicenter distance of seismic events, and the impact rates of meteorites; and lastly, determine the heat flux, or interior temperature of Mars.

“We got nine out of 10 – basically nailed it,” Banerdt said, noting the Mole instrument’s failed attempts to get to the depth needed to accurately capture the data.

Thanks to InSight’s extended mission – which allowed for operations to continue past the initial two-year prime mission window – the lander gathered additional data on Marsquakes, meteor impacts, weather impacts, the planet’s magnetic field, and more.

“For a discovery mission to have this many accomplishments, is really unbelievable,” Banerdt said.



To close out the event, Hoffman came up to the von Karman stage with a gavel built by JPL's own Rick Welch, which he would jokingly use to restore order during unruly InSight meetings.

"This is the reasonably-sized one," Hoffman said. "Rick also made me a tiny travel gavel that I used when going to Lockheed Martin meetings, and I really wanted to bring 'the hammer of Thor' 70-pound version that he made, but it's really heavy, and I had enough trouble getting across the Mall with this one."

Hoffman ceremoniously handed the gavel over to Banerdt — who slammed it down one last time and declared, "End of mission!"

After the closing festivities and cake, Banerdt mused on a career goal finally realized.

"It's interesting to look back and think about what kept me going through the years, and it was a feeling that this mission is inevitable, it had to happen." Banerdt said.

From the beginning, Banerdt made clear putting a seismometer on Mars wasn't originally his idea. In his early presentations pitching the mission, Banerdt would show NASA slides from the '70s that included committee recommendations for a seismometer.

"I was in the service of that idea, and we kept working at getting it on the surface of Mars, and I'm fortunate to be a part of it," Banerdt said. "I actually came to the realization that if it didn't happen, and I got to the end of my career without it being selected, I wouldn't regret it, because I truly enjoyed the work, and the people I worked with and met along the way. Luckily for me, I get to see the data and the fruit of so many people's efforts. It's been a great ride."

The hole in understanding the structure of the deep interior of Mars was there, and InSight filled it.

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## Inside a Special B.E.S.T. Lunch with Astronaut Jessica Watkins

By Celeste Hoang

You could say it was the best kind of day. The Black Excellence Strategic Team, one of JPL's employee resource groups, enjoyed a private lunch with astronaut and former JPL intern Jessica Watkins when she was in town for speaking engagements at Lab and on the Caltech campus.

While the talks — sponsored by B.E.S.T. and the Caltech Management Association — were attended by hundreds, the April 7 lunch on campus was a private affair between Watkins, B.E.S.T., and the student group Black Scientists & Engineers of Caltech.

For those wishing they could've been a fly on the wall, we caught up with a few B.E.S.T. members about their quality time with Watkins, key takeaways, the value of Watkins' role in inclusion efforts, and what made the event with her especially meaningful.

### Joey Jefferson

Her dedication was inspiring. Hearing how she navigated her training, pulled teamwork skills from other [interests] like rugby, and fearlessly met all the challenges that being an astronaut presents illustrated her tenacity and persistence for mission success.

I especially was impressed [by] her minor in African-American studies while pursuing a technical degree, and how she didn't see the unique challenges POC experience as an overwhelming, paralyzing obstacle. Her ability to look beyond these challenges and to continue to pursue her dreams resonated strongly in the context of inclusion. Additionally, her presence as an astronaut proves we are continuing to progress in inclusion at the highest technical levels.



Her personality was infectious. She was kind, warmhearted, funny, and answered our questions with grace and supreme understanding. It was a great experience!

### **Devin Johnson**

I really appreciated her insight into why the work of NASA and astronauts aboard the ISS is so important. She spoke of the countless tasks and experiments they performed every day for six months, and I realized just how dedicated NASA is to furthering the boundaries of science and technology on all fronts.

Dr. Watkins' presence was extremely beneficial to publicizing the diversity of our NASA community, and showing that POC and gender minorities – as she is a Black woman – are high achievers, even in the face of societal disadvantages. She shared that her dedication to doing what she loved allowed her to overcome obstacles with relative ease, and that serves as inspiration to not only JPLers that share some of those identities, but also to the younger generations with huge aspirations.

Dr. Watkins provided such a personal account [of] being an astronaut that I couldn't help but feel connected to her. We tend to think of astronauts as celebrities far removed from us, but they are scientists and engineers who have family dinners, work out, do laundry, and play games in their free time just like all of us – the only difference is that they're in space!



### **Madalyn Young**

The most meaningful take away from spending time with Dr. Watkins was learning how valuable mentorships were to her career. Those relationships that she had with her mentors enabled her to acquire knowledge, networking opportunities, support, role modeling, and more importantly helped her navigate challenges. She created a playbook for achieving her goal of becoming an astronaut. [With that in mind,] I would like to encourage JPLers to participate in the mentorship program that we have as either a mentee or mentor because it is so important to JPL's future, as well as legacy.

### **Julianne Igbokwe**

Dr. Watkins talked about how even though she wanted to be an astronaut from a young age, she was never narrow-minded in the interests she pursued. She did whatever she was passionate about — like playing rugby and minoring in African-American studies — so long as it didn't close the door on her ultimate dream. And in the end, the skills she gained from doing things she loved are what allowed her to become an astronaut. I found it really encouraging to hear how far she got by staying true to a path she genuinely enjoyed.

Beyond the awesome representation of a Black woman who is a NASA astronaut with a doctorate degree, it was also great to meet other women and Black folks from Caltech and JPL, which is important to fostering a sense of community.

A lot of the Q&A was about life on the ISS and I loved hearing the details of how she lived. It's wild that instead of doing laundry, they just send their dirty clothes back to Earth and it burns up on re-entry.

*Answers have been edited for length and clarity.*

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## Neighborhood Emissary: Interstellar Art Connects JPLers

By Vincent Robbins

On a rare sunny day this rainy season, Thermal Systems Engineer Kyle Zada was walking his dog when he did something just as rare: turn down a different street.

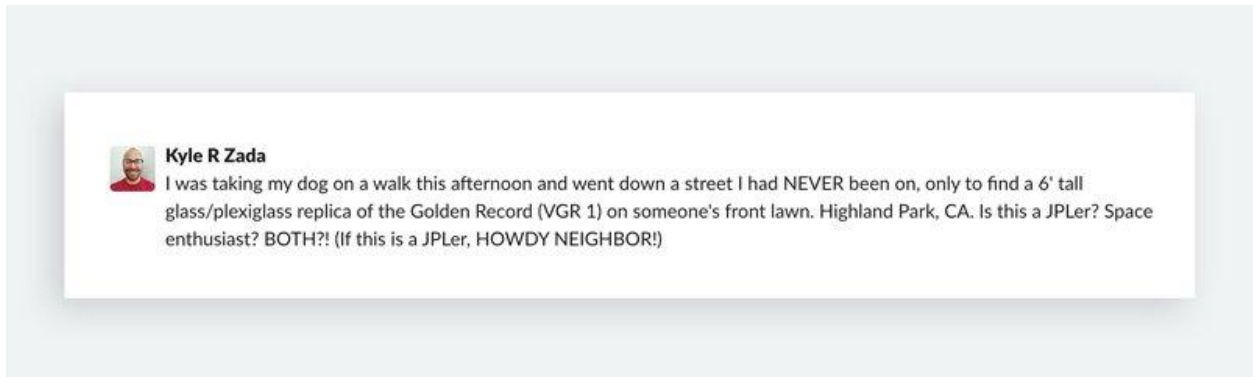
"I do a pretty regular loop and I was like, 'You know what, I've got some extra time, why don't we go this way,'" Zada says. "I had never gone down the street before."

Soon he came across a large suspended glass disk in the front yard of a historic Craftsman home — and instantly recognized a set of engraved symbols.

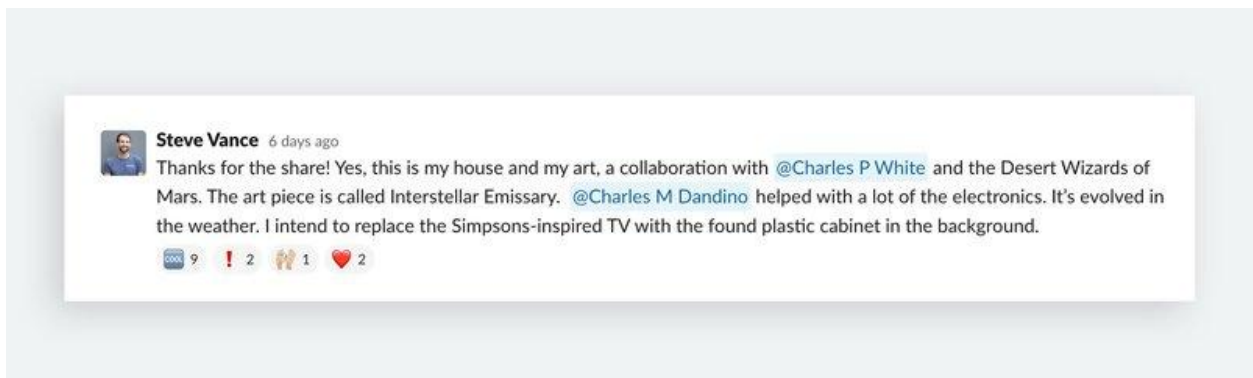


"I said, 'This is the Golden Record,'" Zada recalls. "So either it's someone who works at JPL or someone who is a fanatic about space — or both."

Zada had to meet whoever lived a few feet from where he stood. So he did the obvious thing: he went on Slack.



Zada's post quickly turned up tips that the art piece might indeed belong to a JPLer. And in just under 24 hours — a much faster connection with neighboring life forms than the real golden record has achieved — Deputy Section Manager for Planetary Science Steve Vance identified himself as the owner of the art piece and the home where it's on display.



The installation, a circular polycarbonate disk with engraved replicas of the symbols on the Voyager golden record cover, is titled "Interstellar Emissary." The idea for the piece came to Vance at Burning Man in 2014, when he had difficulty finding his way to another space-related art project at the festival.

"Some other friends from JPL had helped to build this giant observatory called the Black Rock Observatory," Vance explains. "And I tried to find it out there and I couldn't because they didn't have any lighting, because they were astronomers so they wanted to have a light pollution policy. So my first thought was that they needed to have some kind of beacon."

So Vance, with the help of Charles White, Charles Dandino, a group called the Desert Wizards of Mars, and others, set out to build a sculpture that could be seen from afar — guiding other earthlings through the cosmos of Burning Man.

Vance had been experimenting with laser etching for some time, and after making several smaller prototypes — including necklace-pendant-sized versions — he worked with vendors and artists in Los Angeles to etch the symbols onto a six-foot transparent disk using a computer numerical control machine. Then they rigged the disk with color-changing lights and built a custom metal frame to hold it all upright.

The result is a stunning rendition of the golden record cover that glows vividly, attracting visitors from afar.



*Interstellar Emissary's color-changing lights glowing at night. Photo credit: Steve Vance.*

"The idea was to make it visible from a mile away," says Vance. "It's a nice beacon when you're out in the middle of the desert."

Although the project was intended for Burning Man and has since made several appearances there, its permanent home is now in Vance's front yard in Highland Park, where he also built a Simpsons-inspired console TV that, with the press of a button, plays sounds and displays images from the golden record. Vance says it's been a hit in his neighborhood.

"It's fun hearing [Zada's] experience with it because both at Burning Man and here [at home], it's a really fun experience to just sort of hang back and see people walk by," says Vance, adding that oftentimes, one person in a group will know something about the symbols or the record.

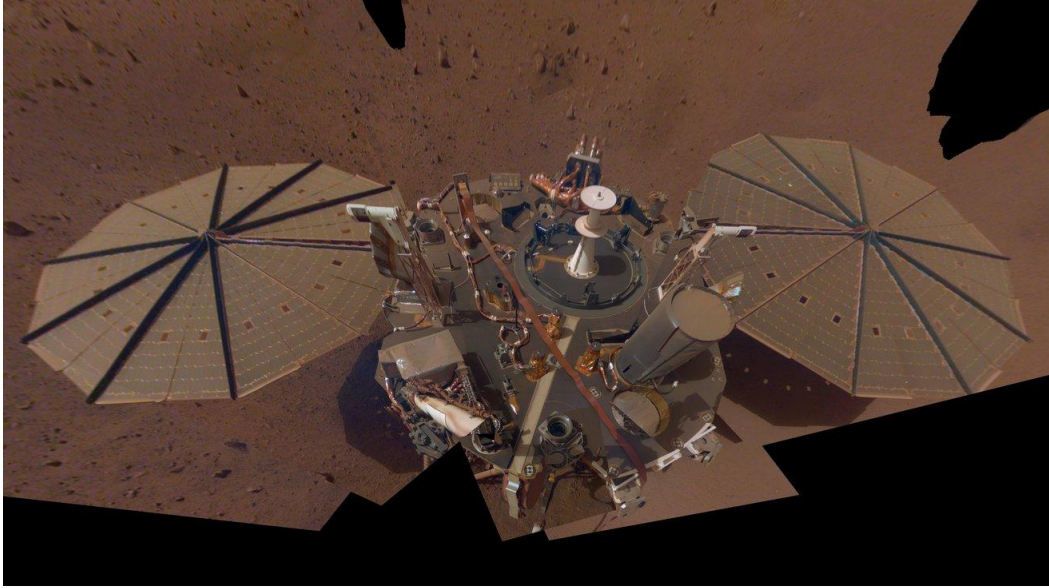
"Usually, they get most of it right. And then I say, 'Well, you want to hear more?' Because I've learned a lot about it over the years," Vance says.

The real cover for the Golden Record contains symbols representing instructions for decoding the phonograph record and its contents, as well as a map that describes the location of our solar system in relation to 14 pulsars. This information, which has been carried on the Voyager 1 spacecraft since its launch in 1977, is intended to communicate details of our world to intelligent extraterrestrials who may come across it.

Vance's cover, too, serves as an emissary to intelligent life forms, albeit ones a bit closer to home. Zada returned to the site of his discovery for a different perspective on the enigmatic piece: "It totally glows at night! Very cool project," he wrote to Vance on Slack.



## Events



### **Von Karman Lecture: InSight End of Mission - Our Time on Mars**

Thursday, May 18

7 to 8 p.m.

[Watch on YouTube](#)

The InSight mission to Mars began its journey to the red planet in May 2018.

Upon its arrival in November of that year, InSight began an ambitious mission to reveal the internal structure of Mars. The lander detected over 1000 Mars seismic events, studied the Martian weather, and even found magnetic “ghosts” from an old electrical field.

The mission ended 4 years after it began, when the solar panels finally succumbed to the dust deposition that prevented them from generating power.

#### **Speakers:**

Dr. Mark Panning, Project Scientist, InSight, NASA/JPL

Dr. Ingrid Daubar, InSight Participating Scientist, NASA/JPL

#### **Hosts:**

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

Sarah Marcotte, Mars Public Engagement, NASA/JPL



## Speculative Fiction by Caltech and JPL Authors: Anthology Launch Celebration

Saturday, May 20  
7 to 8:30 p.m.

Caltech Beckman Auditorium or [join via YouTube](#)

Caltech's creative writing club, TechLit, is hosting a public celebration of Caltech's first anthology of speculative fiction, *Inner Space and Outer Thoughts*. The free public event will feature readings by Caltech alumni and science fiction authors David Brin, S. B. Divya, and Larry Niven.

Authors will participate in a moderated panel Q&A where in-person attendees will have the opportunity to ask authors questions about their stories, their science, and the intersection of the two.

For more information, please contact Rachael Kuintzle at [rkuintzl@caltech.edu](mailto:rkuintzl@caltech.edu) and 530-518-6895, or Samuel Clamons at [sclamons@gmail.com](mailto:sclamons@gmail.com) and 703-980-1472

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# JPL Family News

## Retirees

The following JPL employees recently announced their retirements:

### 40+ Years:

**Robert Gershman**, Section 3121, 45 years

### 30+ Years:

**Victor Zlotnicki**, Section 3290, 38 years

**Herman Wagner Jr.**, Section 2692, 38 years

**Cinzia Zuffada**, Section 1200, 31 years

### 20+ Years:

**Rebecca J. Heninger**, Section 313W, 25 years

**Christopher Lim**, Section 947D, 25 years

**Claire Marie-Peterson**, Section 1844, 23 years

## Passings

Passings must be submitted through Human Resources, which coordinates with the family of the deceased.

**Eldred F. Tubbs** died on March 21, 2023, at the age of 98. He worked at JPL for 26 years, most recently in Section 346.

From member of the photography club in high school, through the astronomy club in retirement, Eldred spent a life fascinated with optics and the natural world, and thrived on sharing his knowledge and enthusiasm with his students, colleagues, and friends. He followed these threads through his years in the Army during WWII, and his education at Carnegie Mellon and Johns Hopkins. Eldred developed interferometric and microwave technologies, and optical instruments for medicine. He taught at Harvey Mudd College for 17 years, inspiring students and developing innovative teaching methods.

At JPL, Eldred was a manager, engineer, and mentor, who developed active optical sensors utilizing laser ranging, interferometry, and imaging. He was the Cognizant Engineer for the Electronic Distance Measurement subsystem on the STS-99 Shuttle Radar Topography Mission that flew in February 2000. He managed the contract for monitoring of the surface-sensing system for the STS-77 Inflatable Antenna Experiment that flew in May 1996. Eldred developed laser ablation techniques and rover imaging for the exploration of Mars and calibrated autocollimator systems for the Deep Space Network. He was a member of a number of design and study teams in the areas of large space telescopes and antennas, extrasolar planet detection, spacecraft autonomy, and military systems.

Eldred is survived by his daughter, Rebecca; son William; his daughter-in-law Phyllis; grandsons Thomas and Eric. He was preceded in death by his wife Virginia, sister Lois, and son David. A memorial service will be held on Saturday, June 3, 2023, at 10:30 a.m. at St. Ambrose Episcopal Church, 830 W. Bonita Ave.,



Claremont, CA 91711, with a reception following (please RSVP for the reception to [len.dorsky@jpl.nasa.gov](mailto:len.dorsky@jpl.nasa.gov) by Wednesday, May 24).

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**Ojars Juris Sovers**, one of the key contributors to the development of VLBI for astrometry, geodesy, and spacecraft navigation, died on November 11, 2022 at his home in Florence, Oregon surrounded by family.

He was born to Karlis and Olga (Kaneps) Sovers in Riga, Latvia in 1937.

In 1950 he immigrated with his parents to the U.S. He finished a bachelors degree in physics and chemistry from Brooklyn College in 1958. In 1959 he married Zinta Aisters whom he met at Brooklyn College and with whom he spent the rest of his life.

In 1962, he finished a Ph.D. in physics and physical chemistry from Princeton followed by post-doctoral work at Oxford and Columbia Universities. He worked at GTE labs from 1964 to 1972 and at Sony in Tokyo, Japan from 1972 to 1978.



In 1979 he was recruited by Eri Cohen to join the JPL VLBI group. VLBI became the focus of the rest of his professional life. He developed the VLBI software MODEST, based on Jack Fanelow's MASTERFIT. Ojars was known for including detailed documentation-much appreciated by his users. Ojars was also early to realize the value of GNSS for geodesy and its synergy with VLBI. By 1988, Ojars and Jim Border had written JPL's first modeling code for the analysis of GNSS data.

Starting in the 1990s, Ojars was a member of the ICRF working groups which produced ICRF1 and ICRF2. Ojars is perhaps best known for the review of VLBI modelling in *Reviews of Modern Physics* (1998) which has been a standard reference.

In 1998, Ojars and his wife, Zinta, who often joined him at IVS meetings, moved to Florence, Oregon, from where Ojars continued VLBI work for JPL as a contractor for Remote Systems Analysis alongside Jack Fanelow. In 2000, Ojars & Hans Walter co-authored "Astrometry of Fundamental Catalogues" covering the transition in astrometry from optical star measurements to radio VLBI measurements of extragalactic sources.

In the decade of the 2000s, Ojars was part of the teams that initiated celestial frame work at other radio frequencies: at K and Q-bands led by Gabor Lanyi and Chuck Naudet, and at X/Ka-band with Chris Jacobs. K and X/Ka-bands became an official part of the 3rd ICRF in 2018, work at all three bands continues to this day.

In 2015, Ojars fully retired to spend time enjoying life with his wife, extended family, and friends and colleagues. His legacy is carried on by many including two IVS members whom he mentored and who went on to chair the 3rd ICRF working group: Chris Jacobs and Patrick Charlot who was his postdoc at JPL in 1989-1990.

On January 21, 2023 family, friends, and colleagues from around the world gathered to celebrate the life of Ojars Sovers remembering him for his many accomplishments, intelligence, dry humor, generosity,

kindness, and his love for his family and friends. We are so very fortunate to have known him. He will be missed.