Featured Stories

Left to right (top): Davit Stepanyan, Jason Craig, Matthew Garcia, Kristine Nguyen, Charles-Henri Mattei. (Bottom): Jon Nelson, Stephen O'Rourley, Kit Petrie, Mi Nguyen.

The Faces Behind JPL's 'Eyes'

By Taylor Hill

For the past two years, JPL's Visualization Technology Applications and Development team (VTAD) has been reworking, revamping, and retooling "Eyes on the Solar System," leading the flagship visualization tool away from the tethers of a desktop download to web-based freedom.

It's the latest product upgrade from the team that's brought asteroids, exoplanets, the Deep Space Network, Earth, and more into a mobile-friendly, three-dimensional arena that's readily accessible.

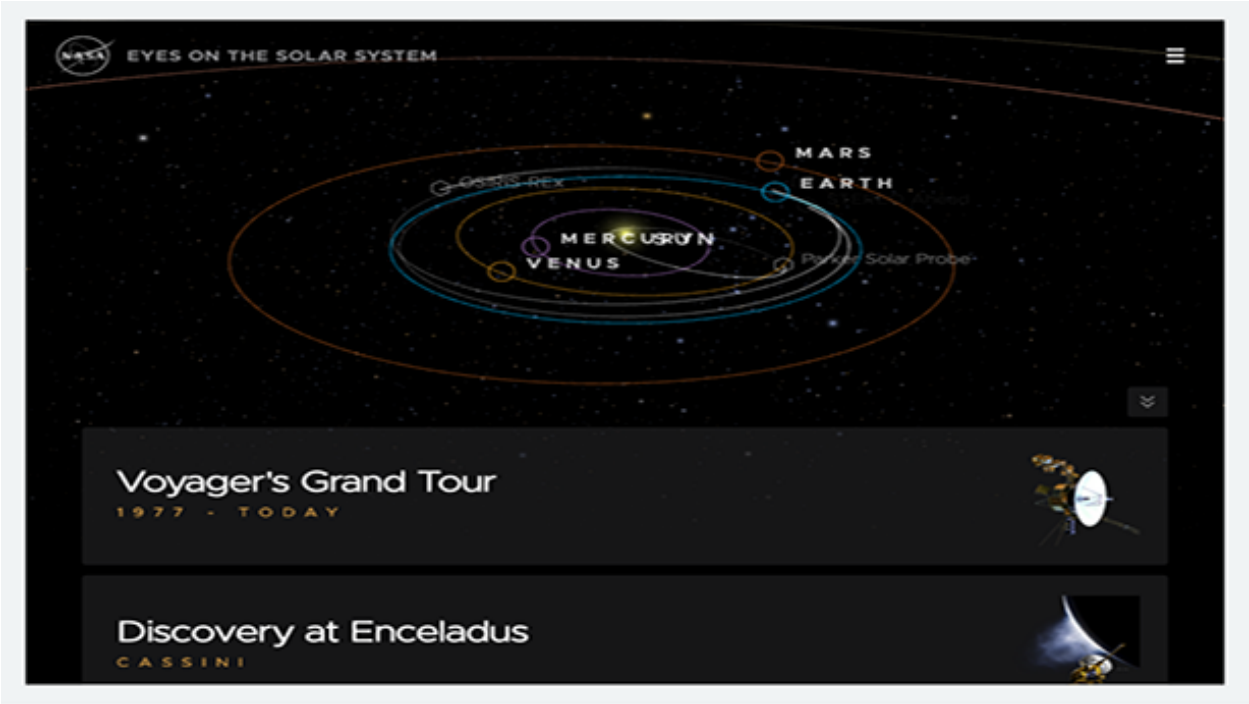
"Now, if you have an internet connection, anyone in the world can interact with it, from schoolchildren in the classroom to Governor Newsom getting a presentation of Eyes during his recent JPL visit," said Jon Nelson, VTAD manager.

The move from downloadable desktop application to a browser-based program was borne from upticks in technological advancements. When the first Eyes products launched in 2010, mobile phones and desktops didn't have the graphics card capabilities or internet bandwidth to handle

the 3D assets and information. Programs such as Eyes on the Solar System were built in a game engine and ran mostly on higher-end PCs.

As smart phones became more widely used, the VTAD team began targeting a mobile-first approach, developing a proprietary engine that could manage and compress all of the assets needed to deliver a real-time, interactive 3D experience on any device with a browser and an internet connection.

“Hence we came up with our slogan: Any time, any place, any device, in space,” Nelson said.



The Eyes on the Solar System homepage and the new "Stories" that users can click on and scroll through.

On top of the browser-based migration, the VTAD team has upgraded Eyes on the Solar System by improving the site’s navigation and implementing better controls so users can more easily scroll, zoom in, rotate objects and planets, toggle time control settings, and more. A total of 126 models of space missions—past and present—are now on the site. Users can scroll through interactive stories of some of NASA’s most memorable mission milestones, including following Cassini on its discoveries at Enceladus, witnessing Perseverance’s harrowing EDL, and riding along Voyager’s Grand Tour.

Eyes software producer Jason Craig said the upgrade was only possible because each member of the small VTAD team took on big challenges.

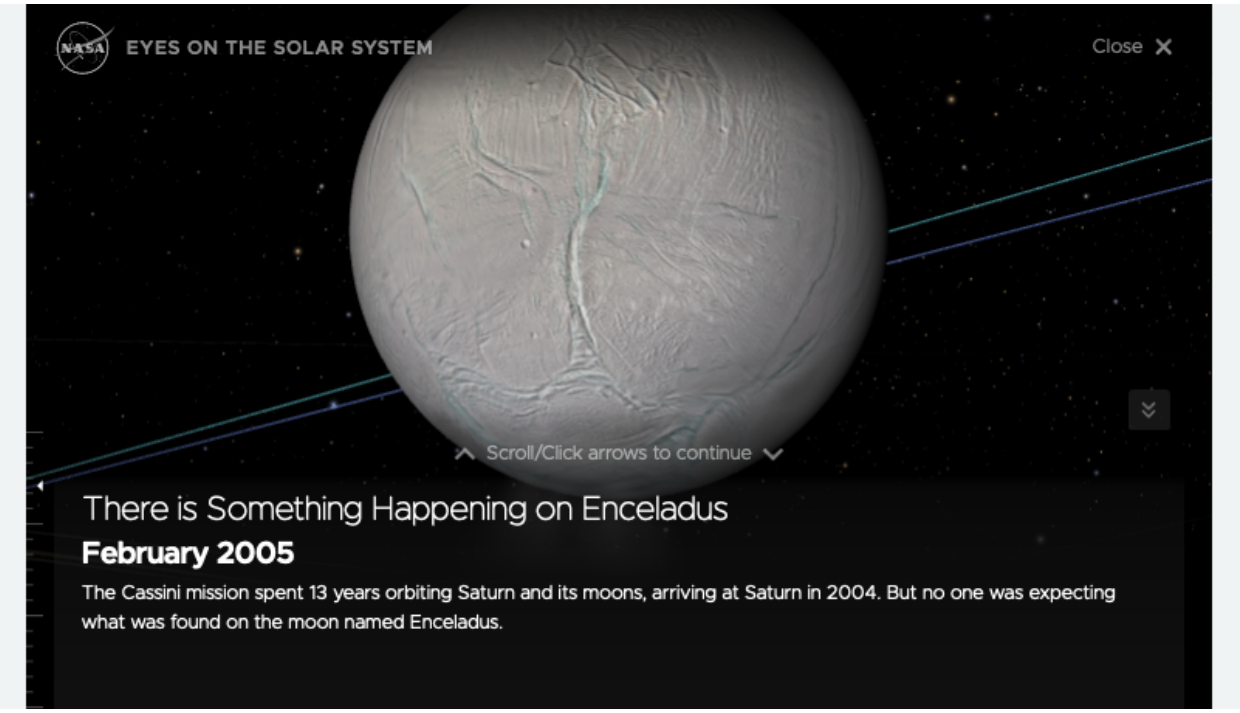
“We had to make a few technical breakthroughs ourselves, rather than relying on existing technology, which is very much in the spirit of JPL,” Craig said. “This required a bit of courage, but we had encouragement from JPL teams running public outreach websites such as Solar System Exploration, Climate, and Exoplanets, who have embedded our web-based products for years.”

Below, we asked VTAD team members Mi Nguyen, Matthew Garcia, Charles Mattei, Steven O’Rourley, Kit Petrie, Davit Stepanyan, Kristine Nguyen, and Jason Craig about Eyes, their roles in bringing the software to life, and some of their favorite features from the site.

Mi Nguyen, software assurance engineer, worked on the "Eyes on the Solar System" upgrade at its inception, discussing the requirements and designs, and proposing and implementing a framework the team is currently using in applications.

- **On her favorite component of the new site:**
  I have many favorites, but if I have to choose one, it would be Stories. I implemented it back in our Mars 2020 Entry, Descent, and Landing app, and continued it here in Eyes on the Solar System. Obviously, I'm proud of it, but I'm also a firm believer of storytelling to engage people. Our goal is to enhance it to allow more captivating stories.

- **On how Stories in Eyes works:**
  Once a user clicks on a story, it will display scrollable tiles where users can scroll through a story's 'slides.' Each slide usually talks about a certain event at some time and place. The user can read about it, see the corresponding event in the 3D scene, and interact with the scene. For now, we have stories about Voyager and Enceladus, and they are both created by our producer Jason Craig, with my assistance.



"Stories" on Eyes on the Solar System featuring Enceladus.

- **On what Stories can do:**
  We hope these stories connect to the audience in a captivating way and relay the excitement of the missions and discoveries. A picture is worth a thousand words, and Eyes products are more than a picture. They're the bridge between scientific data and the public.

Matthew Garcia is the sole 3D artist on the VTAD team, responsible for creating the spacecraft models, and implementing textures and graphic content throughout Eyes products. If it's visual, Garcia probably had a hand in it.

- **On converting 3D models from the old desktop format to the browser-based product:**
  We switched over to building models in the Graphics Language Transmission Format (GLTF), which has gained a ton of traction for use on the web, but it's still a relatively new format. That being the case, there are limitations that require workarounds or workflows in order to achieve a visual effect that we desire. Sometimes my role becomes less artistic and more technical; identifying these limitations and either figuring out a solution or collaborating with our programmers to see how we can overcome them.

- **On the new user interface within Eyes on the Solar System:**
  The previous UI was dated and clunky. Our new UI has been modernized, it's much more intuitive, and more responsive. One of the best features is the search bar where you don't even need to play with the interface at all. Go to the URL, type in what you're looking for, done.

Charles-Henri Mattei is a technical lead for VTAD applications, and is also project manager for Eyes products Solar System, Orrery, and the Mars Relay Network.

- **On bringing Eyes on the Solar System from desktop application to the web:**
  I've been working on the rebirth of Eyes on the Solar System starting almost five years ago at the inception stage with Matt Garcia our art director. For me, releasing the first version this year is really the culmination of all these years of thinking how we can translate this huge desktop application to the web. I've worked on every single bit of this project, from the UX/UI design to coding to managing the team.

- **On Eyes product's future:**
  Our products are planned to be embedded in many places including on the new NASA sites, and we have lots of cool ideas on how to improve them further. It has huge potential, from covering new launches to education, and can be used not only to show and tell, but also to let people explore the beauty of our universe by themselves.

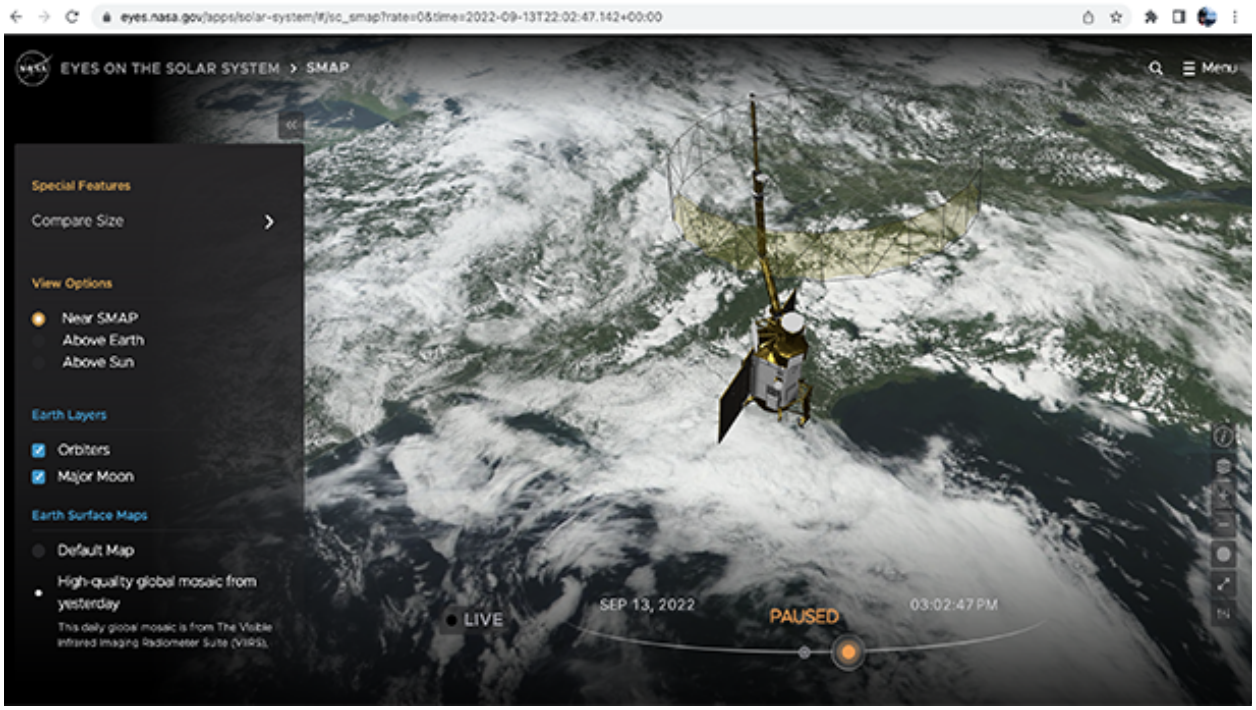
Stephen O'Rourley works on the 3D engine called Pioneer, which powers the Eyes application and utilizes many data pipelines to create 3D scenes. His work involves gathering large amounts of data—from trajectories to planetary data sets—optimizing them, and shrinking them down small enough so they are viewable on a smartphone.

- **On the work to bring Eyes on the Solar System to the web:**
  With our old Eyes application, it was a download and used an old version of the game engine Unity. Not only was it showing its age, but it would only work on Windows and Mac machines. I authored the Pioneer engine, leveraging the 3D JavaScript library to move us to the web, so that our products could be on any device that supports web browsing. We also had to create new data pipelines, since we had to take into account not just desktop internet connection, but less capable mobile network connections. For instance, I created Dynamo, a lightweight format that takes advantage of orbital mechanics to shrink our trajectory data to be only a tiny fraction of the size of the source data.

- **On his favorite component of the new Eyes:**
  I love how we now have much more info on each spacecraft. In our old application, at best we had a small blurb about each object you visited. But now we have a good description, launch dates, comparison with other objects, and so much more.

Kit Petrie is a scientific software engineer for web apps on the VTAD team, and lead developer for mobile apps. He worked on integrating many of the options in the content panel on Eyes on the Solar System, including view options for all events for a spacecraft, toggling between alternate surface maps for planets and moons, and adding the ability to show and hide moons, orbiters, and landers when viewing a planet.

- **On highlights of the new Eyes:**
  I'm so happy we were able to bring in high resolution imagery for planets and moons. It's amazing to fly along with an Earth-observing mission like SMAP, and then enable the high quality mosaic from Visible Infrared Imaging Radiometer Suite (VIIRS) and see the SMAP 3D model flying over the Earth as it looked yesterday from space. You can also go to Mars and look at the Curiosity landing site. When you enable the global mosaic from the Viking mission it feels like you are about to land on mars yourself.



SMAP visualized in Eyes on the Solar System and the high quality mosaic of Earth below.

- **On what makes the Eyes team special:**
  It really helps that our team brings a lot of different skill sets to the table. From 3D modeling to Quaternion math to UI/UX design, map making, programming, data pipelines and more, we all get to wear more than one hat and I appreciate learning about new technology from all of the VTAD team. Over half of our team was born outside the U.S. We hail from France, Vietnam, Canada, the United States, England, and Armenia. The work that NASA and JPL do really transcends national boundaries and inspires people from all over our planet to expand their worldview.

Davit Stepanyan is a software engineer who worked on Eyes on the Solar System's megamenu, along with the comparison feature, where users can compare planets, spacecraft, comets, and more to other objects.

- **On what bringing Eyes on the Solar System to a wider audience means:**
  It is absolutely fantastic to be able to show it on your phone and talk to people about our solar system and missions. With this upgrade, you can do it anywhere and anytime as long as you have internet access.

- **On what makes the visualization software special:**
  One of the things on top of the list is data. We use the latest data from our missions and visualize them in a way that the public can enjoy consuming. Sometimes we update our data multiple times per day to make sure that it is accessible to the public as soon as it is available to us and ready to share with the world. We help to show the work that JPL does thanks to our taxpayers.

Kristine Nguyen started work on the VTAD team in 2011 as a software developer and project manager, handling everything from coding, to testing, to managing tickets and project schedules.

- **On her favorite thing about the new Eyes product:**
  I love being able to bring Eyes on the Solar System up on my phone and show off the various JPL missions to friends and family without needing to download and install anything.

- **On how these types of visualization tools can inspire:**
  Being able to visually see so many missions, based on their actual data, over such a large range of time, all in one app, in 3D is just amazing. It highlights the history of space exploration and scientific discovery, and how large of a role JPL has had in those endeavors. This project was a true team effort, with every single member of the VTAD team contributing to its success. I am proud to have been a part of it.

Jason Craig is the producer and technical manager of all Eyes products, and regularly participates in public outreach and demonstrations for the VTAD team.

- **On his favorite components of the upgraded Eyes on the Solar System:**
  I am happy that we are starting to lean into storytelling with our interactive 3D features, which we call “scrolly-telling,” using the New York Times as an aspirational example. I also like the improved time controls, the high-resolution streaming textures for certain bodies, and the events section for some of the missions, which functions as a bookmark to get to the cool stuff.

- **On why these types of visualizations are important to JPL and to the public:**
  Visualizations connect to a different part of the brain and allow people to understand things a little more intuitively, without a startup cost. Also, it democratizes visualization of NASA’s missions, since any single mission at any time can be embedded in any website. The vast scope and breadth of NASA’s missions is larger than the general public knows. This is even true with people who work for NASA. An engaged and informed public is healthy for the republic, and NASA inspires wonder like no other.

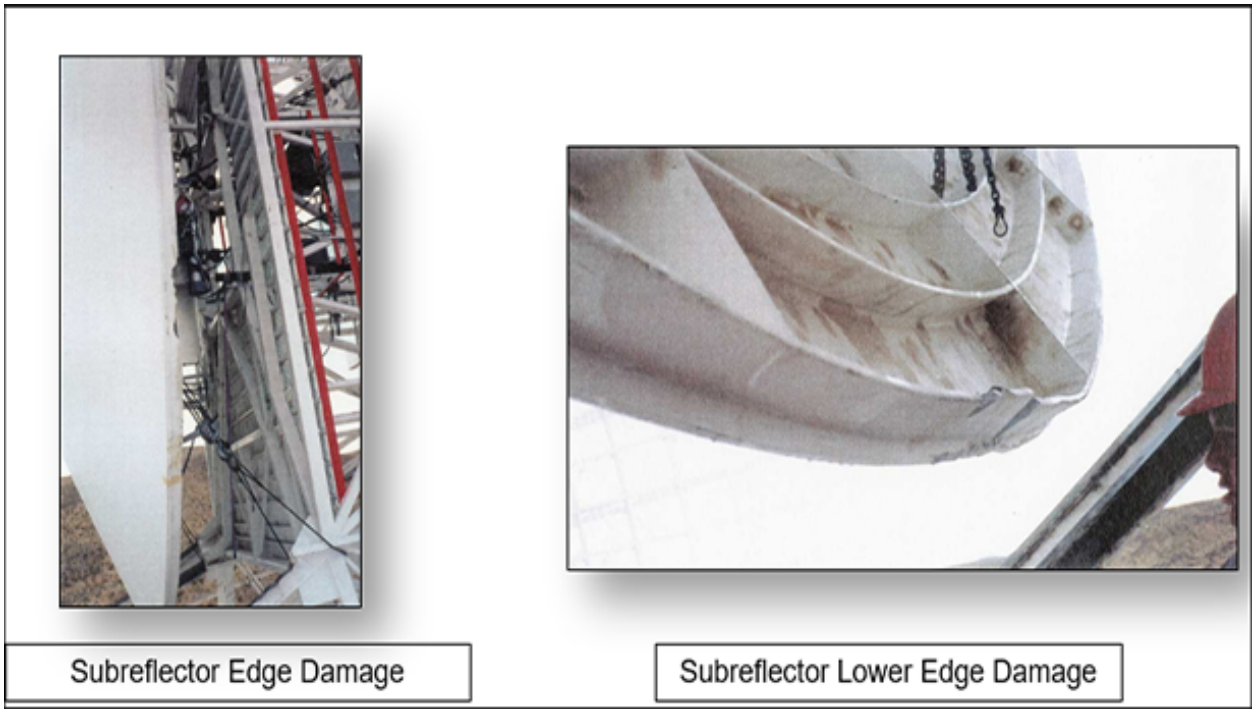
Shake, Rattle and Stow: Keeping the DSN Antennas Safe

By Taylor Hill

In 1992, the 7.3-magnitude Landers earthquake shook the Goldstone Deep Space Communications Complex, damaging the subreflector's drive mechanism atop the famed 70-meter antenna.

The damage was repaired and the subreflector system's design improved, but the event made real the types of hazards faced by the team responsible for tracking and communicating with interplanetary space missions.

For Germaine Aziz, her time as a structural engineer at the Deep Space Network (DSN) made her keenly aware of the situation, and an advocate to make the antennae she was responsible for as safe as possible.



The 1992 Landers earthquake damaged the 70-meter antenna's subreflector drive mechanism, causing the subreflector to break free and swing on two of four restraint cables. Image Credit: NASA/JPL-Caltech

“It was around 2013 and we were doing seismic retrofits and upgrades for the buildings out at Goldstone, and we started thinking about what we could do for the antennas,” Aziz said.

That’s when ShakeAlert came to the epicenter of discussion.

Originally developed by Caltech, ShakeAlert is an earthquake early warning system now managed by the U.S. Geological Survey (USGS) that can quickly identify a seismic event and issue alerts before the shaking starts.

The system relies on a network of thousands of seismometers placed all across California, Oregon, and Washington that detect an earthquake's fast moving (but less damaging) P waves. Then the network computes the event's location and estimated magnitude, after which it issues the warning. In many instances, people receiving the alerts may be far enough from the quake’s epicenter to get to safety before the slower moving (but destructive) S waves and shaking occurs.

In 2015, the Deep Space Network team placed seismic recorders near the Mars site—where the 70-meter DSS 14 antenna is located, and at its Apollo site – where several 34-meter antennae are located. Those sensors have been tied into the ShakeAlert system, and JPL has partnered with the USGS to gain access to the data coming out of its earthquake early warning system.

Seismic instrumentation reside in underground locations near antennae at both the Apollo and Mars sites at Goldstone.

“Now, when there is an earthquake that reaches a certain peak ground acceleration level, there are a number of us that have the alerts coming to our phones and computers, and we are able to stop operations and movement of the antennae before the shaking is felt, limiting the potential for damage,” Aziz said. “And depending on how much of a buffer we have before the shaking is expected to occur, we can either command the antennae move to their stow positions, or we can halt them right in place.”

While ShakeAlert remains in beta testing, DSN Continuity Operations Manager James Buckley hopes that as the system becomes more established, the DSN will be able to automate commands to shutdown moving antennae as the alerts come in, shaving off vital seconds in getting the equipment into a safer position.

“If we’re able to get our equipment into a safe position prior to an earthquake hitting, that means we can keep our day-to-day antenna operations functioning, and hopefully limit long-term maintenance or repair costs that could be inflicted by an earthquake,” Buckley said.

For more information on the ShakeAlert system, visit https://www.shakealert.org/

JPL's Birthday Conjures Creative Costumes and Kickstarts Giving Season

By Celeste Hoang and Taylor Hill

And just like that, JPL is 86.

The Lab took another trip around the Sun on Monday, Oct. 31, marking its birthday and founding date—thanks to the first JPLers who tested experimental rockets in the Arroyo Seco back in 1936—with the kickoff of the annual United Way Giving Campaign and the first in-person Halloween costume contest since 2019.

This year, the festivities were in full force, with a large crowd of eclectic attendees on the Mall: a quick glance around and one could spot Little Mermaid, Stranger Things' Eleven, Dorothy from The Wizard of Oz, Catwoman, Schrodinger's Cat (in human form), and a bevy of JPL-centric costumes nodding to a variety of missions throughout the years.

The gathering was an opportunity to celebrate, but also a chance to acknowledge the spirit of giving as the community heads into the upcoming holiday season. Deputy Larry James opened the event with remarks on the steps of Building 180, calling on JPLers to consider donating to United Way and help the Lab reach this year's goal of giving $525,000 to communities in need.

"One of the reasons we come together today is our opportunity to help those less fortunate than us," James shared. "One of the things we want to encourage you to do as you move into this campaign season is to just give: give of your time, your talent, your resources."

James also shared that, as the chairman of the board of directors for United Way for the last three years, he has witnessed the impact of their projects firsthand.

"I get to intimately see the work that they are doing, to see all the innovative ideas they are developing to address homelessness, to address the lack of prosperity in many of our communities, and to address the educational needs of our students," he said.

He closed his remarks by reminding JPLers to join him and fellow JPLers at WalkUnitedLA on Nov. 12 at SoFi Stadium in Inglewood, before handing the mic to Elise Buik, CEO of United Way of Greater Los Angeles.

“I just wanted to personally be here today to thank you. We’ve had a very long partnership with the employees of JPL,” Buik said. “You are the heart and soul and engine of this campaign, and you give so generously, as Larry said, through your time and your donations.”

Buik explained that donations from JPLers go to support families in need.

“It’s been really tough out there, as you probably know. Families have really struggled and borne the brunt through Covid, and they’re still struggling,” she said, adding that stressors include the rising cost of gas, rent, and groceries.

“What we really do at United Way is stand for two things: one, help families throughout this county who are dealing with the daily crisis of poverty—we try to bring them some stability—and we work on longer term change in the region,” she said. “We’re working on building more affordable units of housing so that we don’t have the homeless crisis that we have, and really helping families on their pathways to prosperity. That’s what your donations allow us to do.”

Closing out the remarks was Katherine Trejo, who spoke about United Way’s student-focused Young Civic Leaders Program, an out-of-high school program that supports students and advocates for resources.

“We want to create a city where kids can be kids, where families have their basic needs met,” Trejo said.

Last year, more than 1,500 JPLers raised close to $500,000 for United Way via one-time or recurring donations. This year, inspired by a theme of “Giving Together,” the Lab has raised the bar to $525,000.

Starting Oct. 31, JPLers, family, and friends can make a contribution at: https://unitedwayla.org/ways-to-help/workplace-giving/jpl/.

Costume Contest Back in Full Force

As the United Way kickoff wrapped up, the steps of Building 180 were quickly overtaken by DC comic book villains, Europa scuba divers, asteroid-eating dinosaurs, and cardboard DART satellites. JPL's annual costume contest—on hold since 2019—was once again underway.

This year's event saw 38 costume entries—some individuals and many teams—displaying the imagination and ingenuity (yes, there were Mars helicopter costumes) JPL thrives on.

Brian White from the Public Services Office, doubling as "buck the JPL deer," quickly took the reins of the event as emcee of the contest, introducing each costume entry across the stage.

The judges were JPL Communications and Educations Deputy Director George Goode, Acting CIO and Deputy Director for ITSD Beth Apillanes, and Human Resources Communications Manager Patricia Lapadula.

"Wow, did JPLers show up!" said Goode. "DART, JWST, helicopters picking up Mars samples…Thor shouting, 'Bring me Europa!' You really could not ask for any more creativity, ingenuity and fun. A huge congratulations to our winners and for everyone who took part."

JPLers Melissa Hooke, Emily Bohannon, and Greta Studier paid homage to JPL's "Line of Sight" pointers display on the Mall—wearing bicycle helmets affixed with black cardboard arrows, swiveling their heads toward various points in the sky, and velcroing on different spacecraft and planet names.

The same team—which entered the contest together in 2019 as "The Sky Crane Maneuver"—had been sitting on the idea for years.

"My mom came to visit JPL pre-Covid and said, 'Why don't you all go as those signs for the contest?' And this year we finally got our chance," Bohannan said.

"It felt like the costumes were really strong this year," said Studier. "I think a lot of people had been sitting on ideas for a few years, and were excited to celebrate Halloween again."

This year's contest winners and honorable mentions included:

- **1st Place - Tie**

  Natalie Condzal, Nimisha Mittal, Pryscila Verduzco, Blaaire Weinberg and Lorraine Valenzuela
  Description: Three dinosaurs trying to avoid obliteration by a rogue asteroid that's targeting them. But wait….here comes a…box? That's no box, that's DART coming to help the dinosaurs and save the day!

- **1st Place – Tie**

  Brianna Ganly
  Description: Mini-Dart and Dimorphos

- **2nd Place**

  Greta Studier, Emily Bohannon, Melissa Hooke
  Description: "Line of Sight" robotic signs

- **3rd Place**

  Lauren Mc Keown
  Description: Jupiter & Its Moon Babies – based on a meme showing Mars asking Earth if she will "have another one" (moon baby) and Earth saying, "Nah, too much responsibility. Don't want to end up like Jupiter."

- **Honorable mention:**

  Marshall Styczinski
  Description: James Webb Space Telescope

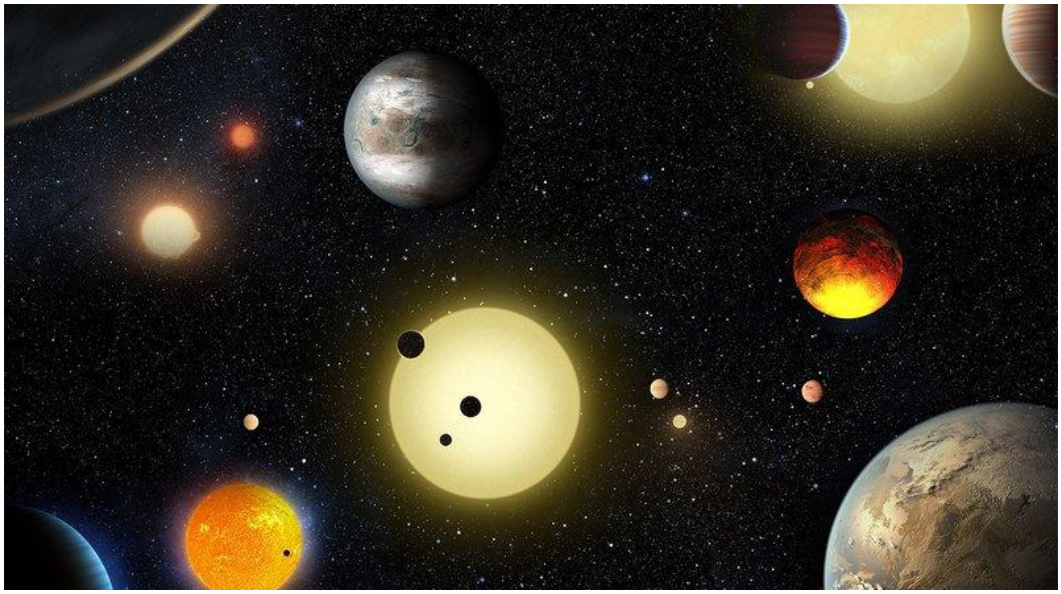
- **Honorable mention:**

  Laurie Higa, Nick Lupica, Molly Stein, Dolores Zawol
  Description: "Mirror Mirrors on the Mall" – The "Golden Eye" of the James Webb Space Telescope with articulating side-panel deployment feature

- **Honorable mention:**

  Emme Wiederhold, Lea Chandler
  Description: Perseverance Rover and Mars Sample Return Helicopter enacting sample tube drop off and recovery

Events



Von Karman Lecture: What's in a Name? How We Find, Name, and Investigate Exoplanets

Thursday, Nov. 10
7 to 8:30 p.m.
Watch on YouTube

All of us live in a golden age of discovery having confirmed over 5,000 Exoplanets. How do people find these worlds and what challenges do they face in the search for more? In this talk, Marie Ygouf will take a look at the discovery process and what lies ahead for exoplanet discovery.

Speaker: Marie Ygouf, Technologist, NASA/JPL, Member of the Roman Coronagraph Project Science and James Webb Space Telescope NIRCam Science Teams
Host: Brian White, Public Services Office, NASA/JPL
Co-host: Nora Bailey, Public Outreach Specialist, NASA/JPL

Register for WalkUnitedLA 2022

Saturday, Nov. 12
9 a.m. to 2 p.m.
Sofi Stadium

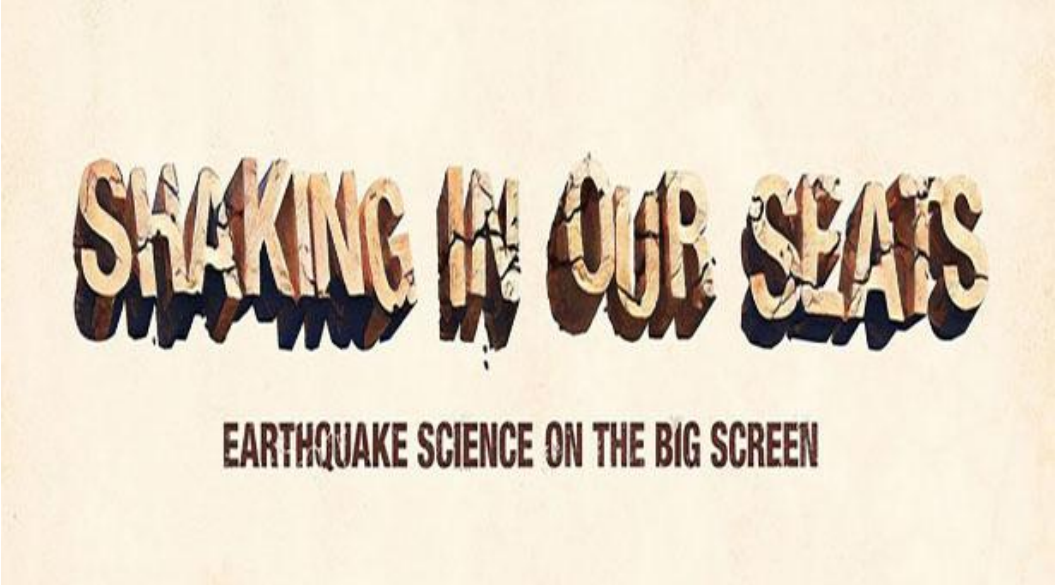
JPL is excited to join United Way, the Super Bowl Champion Los Angeles Rams, and thousands of Angelenos on Saturday, Nov. 12, at SoFi Stadium for WalkUnitedLA, an annual 5k family walk/run to end poverty in L.A. County.

Over the past 14 years, WalkUnitedLA (formerly HomeWalk) has mobilized more than 125,000 participants and raised over $9.5 million to support our communities and transform the lives of thousands of Angelenos.

New to WalkUnitedLA this year will be United Way's post-walk/run Centennial Celebration. Don't miss out on this family-friendly experience celebrating 100 years of impact in our communities with live music and storytelling, volunteer opportunities, food trucks, a photo booth, face painting, and so much more.

JPLers are encouraged to bring family and friends to run or walk with JPL's official WalkUnitedLA team, 'JPL Voyagers'. All JPL walk participants or donators will get a special commemorative t-shirt. Click here to register and help change the lives of our neighbors.

Together JPLers are powering the movement to end poverty for our unhoused neighbors, students, and working families.



Caltech Event: Shaking in our Seats: Earthquake Science on the Big Screen

Saturday, Nov. 12
1 to 2:30 p.m.
Beckman Auditorium, Caltech Campus

To celebrate the Seismo Lab's centennial, the Caltech Science Exchange, in collaboration with the Dr. Lucy Jones Center for Science and Society, will host a public event that explores the science behind onscreen earthquakes in films such as 1974's *Earthquake* and 2015's *San Andreas.* Moderated by seismologist Lucy Jones, a panel of scientists, engineers, and public officials will provide insight into what happens during and after earthquakes, how scientists and government officials interact, and the future of the field.

JPL Family News

Retirees

The following JPL employees recently announced their retirements:

30+ Years:

Paul L. Springer, Section 398K, 38 years

Fannie Chen, Section 397R, 37 years

Christine Farguson, Section 5134, 32 years

Charles E. Dunn, Section 8700, 32 years

10+ Years:

Ken Lam, Section 172C, 15 years