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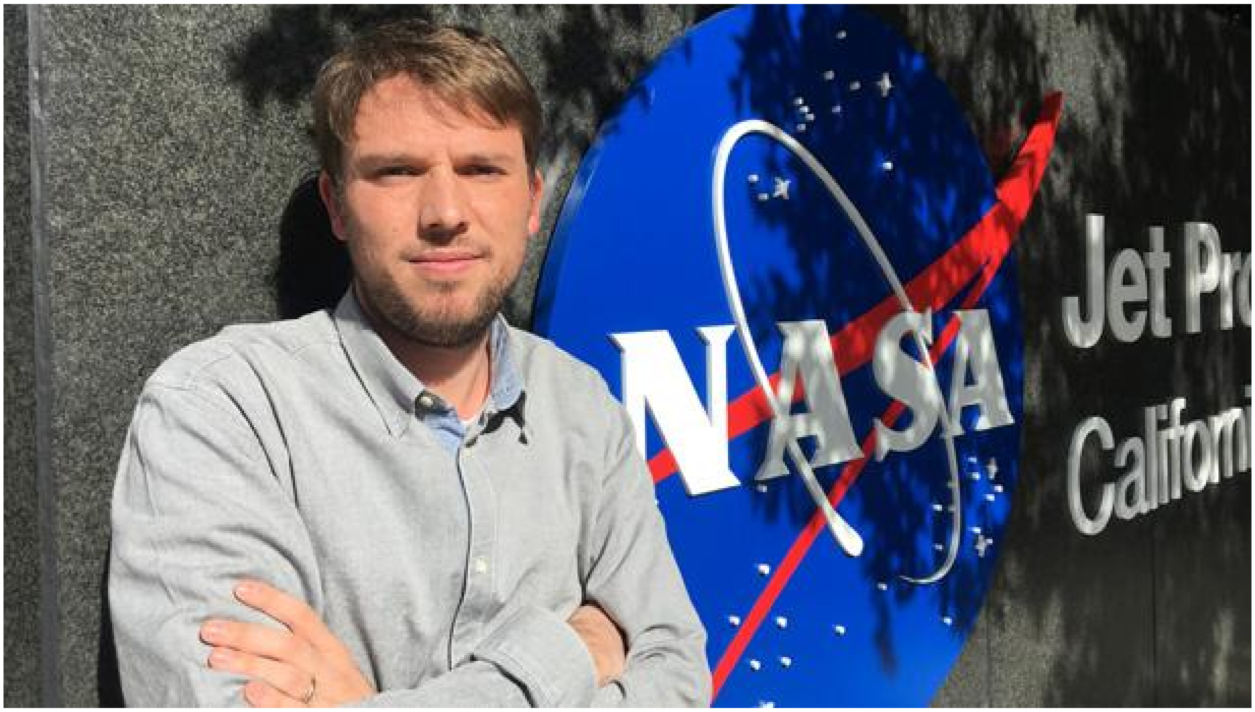
April 2022

Featured Stories



Navigation engineer Davide Farnocchia. Image Credit: Davide Farnocchia

Soccer Fields to Starry Skies

By Celeste Hoang

Born and raised in a tiny Italian town, navigation engineer Davide Farnocchia chased childhood dreams of becoming a soccer star—until fate sent him chasing comets and asteroids instead.

There's an Earth-shattering moment—pun intended—about 10 minutes into the 2021 film Don't Look Up, a satire about the end of the world, where Jennifer Lawrence's character spots a comet on a collision course with Earth.

While the dark comedy is fictional, the possibility of a cataclysmic comet or asteroid strike is real. This is exactly why, in 2002, JPL engineers—led by Steve Chesley—developed Sentry, an automated asteroid impact monitoring system.

Now, 20 years later, the baton has been passed to Davide Farnocchia, a navigation engineer and member of the Center of Near-Earth Objects Studies (CNEOS). Farnocchia worked closely alongside former JPLer Javier Roa Vicens, who upgraded and redesigned Sentry. The second generation system, Sentry-II, launched in December 2021 and improves NASA's ability to assess the odds of impact for all known near-Earth objects. It promptly earned the Sentry team the National Space Club's Nelson P. Jackson Aerospace Award for outstanding contribution to the missile, aircraft, or space field.

With the updated system's rollout successfully underway, Farnocchia has taken the lead on the program's day-to-day operations—a full-circle moment for the engineer, who first heard of Chesley as a doctoral student in Italy and now oversees the next chapter of the decades-old program.

"After 20 years, we knew that by rethinking the algorithm we could make the system more general and robust," Farnocchia says. "It was thrilling to build on Chesley's previous work and collaborate with Javier on the first major advance in asteroid impact monitoring over the last 20 years."

Farnocchia playing soccer as a child in Capezzano, Italy. Image Credit: Davide Farnocchia

Small Town, Big Future

Farnocchia grew up in Capezzano, a very small town on the Tuscan coast in the province of Lucca, Italy.

"It was a happy childhood," he recalls. "I was blessed to get to spend a lot of time with my grandparents and gain from their down-to-Earth wisdom. We had a little farm, and I played soccer in the streets because there were rarely any cars going by."

Looking back on his childhood, Farnocchia himself is surprised he ended up working in space exploration. As a youth, he shared a common dream among many Italian kids: to be a professional soccer player.

"This is true of 90 percent of Italian boys," he says with a laugh. "I played for over 20 years, but at some point, it became clear that I was not going to become a pro."

Second to soccer, Farnocchia did have another life passion off the field: mathematics. He soared in high school math and decided to study it in college at the University of Pisa. There, he met Professor Andrea Milani, a mathematician who was working on asteroids, calculating and modeling their trajectory.

“I didn’t really know what an asteroid was at the time,” Farnocchia says, laughing.

What Farnocchia did know, however, was that he was interested in studying mathematics with real-world applications. He started talking to Milani, learning more about his work, and found himself becoming enthralled with how mathematics could be applied to study and monitor near-Earth asteroids (NEA). Milani then asked Farnocchia if he was interested in studying the orbit determination of these objects.

To Farnocchia, there was only one answer.

The Other Side of the Ocean

Farnocchia went on to complete his bachelor’s, master’s, and PhD at the University of Pisa. In the last year of his doctoral program, Farnocchia began thinking about leaving Italy to gain more diverse work experience in a different country. His adviser suggested places in both Europe and the U.S. Ultimately, the possibility of working in America and experiencing a different culture lured him stateside.

“I thought it was the right time to try the United States,” he says, adding that he made sure his wife was on board. “We could be there for one or two years, and even if it didn’t work out with a job, it would be good life experience.”

Fortuitously, Milani knew a JPLer—Chesley—whom he had hosted as a postdoc researcher at the University of Pisa in the late 1990s, and suggested the Lab might be the best fit for Farnocchia. Chesley, now a senior research scientist and principal engineer at JPL, and Farnocchia had plenty in common: Both had worked with Milani on NEODyS, the first operational asteroid impact monitoring system.

Farnocchia applied to NASA’s postdoc program and was offered a position at JPL in 2012.

Eyes in the Skies

When discussing the likelihood of an NEA’s trajectory toward Earth, accurate predictions—and the speed of those predictions—are crucial.

“It’s so important to get the right answer,” Farnocchia says. “It’s about robustness, reliability, and performance. You need to be able to run these calculations in the time frame of hours, not days or weeks.”

Farnocchia was offered the role of navigation engineer at JPL in 2014. When Roa Vicens later joined JPL, the two began collaborating closely on Sentry-II. Together, they created an updated algorithm that could more reliably assess the probability of an asteroid impact by cutting out unnecessary assumptions that somewhat limited the first-generation software’s predictions.

Farnocchia and Steve Chesley, right, go-karting during some free time ahead of the 2012 Division of Planetary Sciences Conference in Nevada. Image Credit: Davide Farnocchia

“When you have an asteroid, you get observational data from which you estimate the orbit,” Farnocchia explains. “But the data always has some degree of uncertainty and in turn so does the estimated orbit. So, you just have a region where the true orbit is, but you don’t know which one it is, just that it’s inside that region. The question is, inside this region, are there orbit trajectories that hit the Earth? These impact trajectories might be hard to find, just like needles in a haystack.”

With Sentry-II, the new algorithm provides a more precise search for possible impacts.

“The old algorithm would mainly analyze a suitably chosen direction of the uncertainty region and make assumptions on its evolution over time,” Farnocchia explains. “However, in some cases, the orbital uncertainty can get stretched and folded by multiple planetary encounters, thus making the analysis complex and leaving open the possibility that the system could miss some of the possible dynamical paths.”

In the new algorithm, the full orbital uncertainty region is explored and no assumption is made on its structure in the future. Another significant improvement is that Sentry-II is capable of automatically handling non-gravitational perturbations such as the Yarkovsky effect, which has become an increasingly important factor in high-precision modeling of asteroid trajectories.

“The first step is to draw random orbital samples within the uncertainty region and compute their trajectory over the next 100 years,” Farnocchia says. “If any of the samples comes close to Earth in the future, Sentry-II automatically tries to gently change that trajectory into an impacting one while still matching the available observational data. If this attempt fails, then the impact is not possible. On the other hand, if the impact trajectory is found, the probability of an impact is computed.”

Going the Distance

One of Farnocchia’s most memorable moments on the job is the first discovery of an interstellar object. In 2017, he and his team received data for a new object for which their software could not find an orbit bound to the solar system.

“We realized, ‘Oh my god, this is coming from interstellar space, not our solar system,” he recalls. “That was pretty cool.”

In 2018, Farnocchia was attending a meeting on near-Earth objects in Munich when he received an automated text alert from Scout, a software system he developed at JPL for short-term impact warnings. A small asteroid called 2018 LA had just been discovered with a high impact probability and, as more data came in, he and his team were able to determine the impact location in Botswana.

“Our impact location prediction was confirmed by security camera videos and by the retrieval of meteorites in the area we had identified,” he says of the 5-meter asteroid that broke up in the atmosphere and showered down in tiny pieces. “That's the beauty of our job, we use high-fidelity models to predict the future motion of asteroids. Then, we get to confirm those predictions when astronomers observe asteroids in the sky, space missions visit asteroids, or meteorites are found on the ground. It’s very satisfying.”

Of course, those satisfying moments are the result of months and years of challenges on a daily basis.

“It’s a lot of work, on both the operational and the research sides,” Farnocchia says. “You never stop learning. The development of Sentry-II doesn’t mean that you develop a system and it’s there forever, and you never need to touch it again. You always have to improve your models. One of the drives of this job is learning something new all the time.”

With the hope that all those new lessons will preclude the one new thing that would make everyone look up.

Corporal E round 1 on the launch pad at White Sands Proving Ground. Image Credit: JPL/Caltech

Post-War JPL: Corporal E, The Lab's 'Research Bird' in the 1940s

By Erik Conway

Welcome back to the Historian's Corner, where we explore the origins, mysteries, and curiosities of our Lab. I'm Erik Conway, JPL's historian, and I'll be your guide as we travel through time together.

In the last history column, I looked at JPL in 1947, the first full year of Louis Dunn's tenure as JPL director. It was also the year of the first flight of JPL's Corporal E, the first American surface-to-surface missile. The Corporal E was based on the WAC Corporal, the sounding rocket JPL had first flown in 1945, but scaled up dramatically. It was not yet a weapon design, but instead was intended as a research bird, a stepping stone on the way to a useful, deployable weapon. It featured JPL's first guidance and control system. It would also demonstrate that simply scaling up the WAC Corporal's thrust by an order of magnitude wouldn't be straightforward.

The key issue in scaling up the WAC Corporal into the Corporal E was the propulsion system. The WAC Corporal had used a booster based on the Tiny Tim solid fuel rocket to get it off the ground and up to a high enough velocity for its fixed fins to maintain stability. The Corporal E was not going to use a booster, and in fact it didn't use a launch tower, either. So the motor thrust grew from the WAC Corporal's 2,000 pounds to 20,000 pounds.

The initial version of this larger motor had a flight weight of 650 pounds (295 kilograms), and JPLers would take to calling it the "heavyweight motor." It was a regeneratively cooled motor, with the aniline fuel cooling the combustion chamber and the motor throat and nozzle by flowing through helical passages wound around them before reaching the fuel injector. It was very heavy because the design had the mechanical load carried by the motor's outer shell, which also formed the cooling passages. That meant the metal cooling passages were relatively thick, which also made them less effective at carrying heat to the coolant.

Three generations of Corporal motors. Left to right are the "heavyweight," "lightweight," and "axial cooling" motors. The cooling channel orientation is visible in the surfaces of the motors. The objects in the foreground are the injector plates. Image Credit: JPL/Caltech

JPL's liquid propulsion section designed a "lightweight" motor weighing 200 pounds (90.7 kilograms). This design kept the helical cooling passages, but carried the mechanical loads with the motor's inner shell instead of the outer shell. That permitted the cooling passages to be made of much thinner metal, and they gained cooling efficiency from that change.

But during the ground test program, every single lightweight motor failed. Worse, most of the heavyweight motors did, too. The design requirement was two 60-second runs on a motor, and neither design met it reliably. So they had to try again.

Meanwhile, the first three Corporal E's flew with 'heavyweight' motors, so as not to delay the guidance and control system development that was proceeding in parallel too much.

The Corporal E's control system had been chosen in 1944. Made by Sperry Gyroscope, it was based on an ordinary pneumatic aircraft autopilot. The autopilot controlled the movements of the missile's four fins. But when the missile was at very low speeds, the fins would have no effect, so attached to the fins were a set of "jet vanes" that were immersed in the motor exhaust, allowing some amount of control.

The missile also hosted a 10-channel telemetry system using frequency modulation to send and receive data on the missile's motions and automatic control response, as well as some key propulsion parameters. On the ground, operators of a war-surplus SCR-584 radar tracked the missile manually, on display boards. And steering commands could be sent to the missile by joystick.

First Test Flights

Homer J. Stewart, who had started working with JPL's founders before World War II, was the controller and range safety officer for the first Corporal E flight, which took place at White Sands Proving Ground. He recalled in 1982: "I sat there with my hand on the little throttle that could maneuver the [missile] by the command circuits that were involved in the guidance system, and I could push the destroy button. I had nightmares about that. . . .Well, anyway, when it came time to fly, why it went beautifully. It went through the speed of sound so smoothly there wasn't even a wiggle in the telemetry trace. . . .As it was coming in at about Mach 3, at about 100,000 feet, I maneuvered it a little to the right, a little to the left, so we could check out our maneuver calculations."

The missile impacted 62.5 miles from the launch site, but about 2 miles from the intended impact site, much further than they had expected based on the telemetered data. Stewart recalled that it wasn't the guidance system's fault. "Our guidance system was 10 times as accurate as the mapping system." The maps weren't good enough to serve as an accurate basis for assessing the missile's performance, though it took JPL several years to convince the Army that it needed better maps.

The first flight of the Corporal E was fantastically successful, and perhaps gave the JPLers a bit of overconfidence. Their second flight would disabuse them of it. Launched on July 17, 1947, Corporal E Round 2 barely left the ground. The aniline fuel and nitric acid oxidizer were pressure-fed, with the pressure coming from a tank of compressed air. The regulator valve developed a leak, so the motor never reached full pressure. Round 2 sat on the launch pad until it had burned enough fuel off to become airborne, climbed a few feet in the air, and then went sideways into the ground and exploded.

The July 17, 1947 flight of Corporal E round 2, the "Rabbit Killer." Image Credit: JPL/Caltech

This flight we call the "rabbit killer." In later years, the JPL Photolab would cut the film footage of this flight into a spoof called The Corporal Story. We still have it.

The third, and as it turned out last, Corporal E flight of this configuration was on Nov. 4, 1947. In this case, the motor failed 43 seconds into its 60-second burn, but had displayed "violent fluctuations in motor chamber pressure after 10 seconds of flight."

They called a halt to the flight test program at this point, as each of the flown motors had shown a good deal of erosion within the motor just as the ground test motors had. They wouldn't restart flight testing until 1949, when they finally had a motor that, at least in ground tests, ran reliably for the required two one-minute periods without significant erosion.

Finally, a Reliable Motor

The new motor was very different from its predecessors. It was even lighter than the lightweight motor at a mere 125 pounds (56.7 kilograms). The designers abandoned the helical flow cooling design for axial flow, so that the propellant flowed along the motor's long axis instead of around it. They had initially experimented with axial flow hoping the shorter passages would reduce the pumping needed to drive the flow, but it hadn't. Instead, it simplified construction. The failed motors had all shown damage at the welded joints between the inner and outer shells, and much of the research effort went towards experimenting with welding and joining techniques, looking to find, or design, thinner joints that were also more reproducible to ease manufacturing. Ultimately, they settled on copper brazing.

The final change was to the motor's 'contraction ratio,' the ratio of the areas of the combustion chamber's cross section to the throat's cross section. The earlier motors' had been 10. But the lightest structure's ratio would be one—a simple tube. Reducing the ratio came at a cost, though. As the contraction ratio went down, the pressure needed to force the fuel and oxidizer into the combustion chamber went up. So reducing the motor weight this way meant increasing the weight of the pumping system. But this proved a worthwhile trade-off for the Corporal, and they chose a contraction ratio of two for this new, axial flow motor.

For the fourth Corporal E, in addition to the new motor design, they also made the fins larger to increase control authority. But Round 4 was not a success. Fired on June 7, 1949, the missile veered off course after 15 seconds, and the range safety officer destroyed it 23 seconds into the flight. Here the problem turned out to be the jet vane assembly at the base of the missile. The exhaust flame had burned into the base of the missile, damaging the vanes and their pneumatic controls.

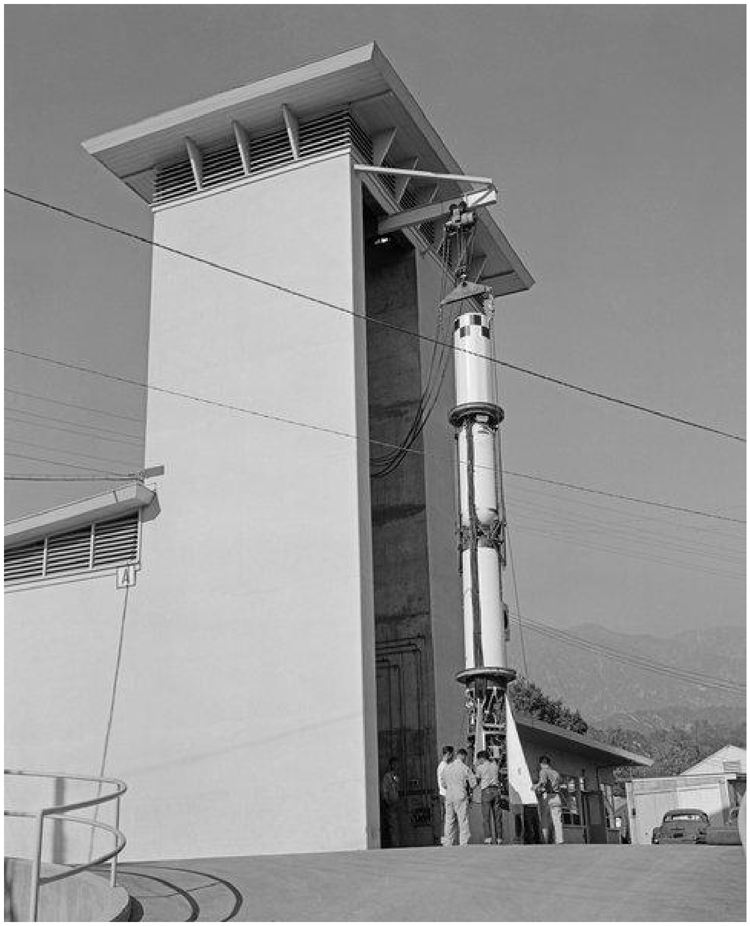
Again, they called a halt to flight testing for a redesign. In addition to a redesigned flame shield and jet vane assembly, Corporal E Round 5 also received a new guidance system to replace the Sperry pneumatic system. Designed at JPL, it was a hybrid electronic-pneumatic system intended to allow greater functionality and also to simplify the system overall.

Round 5 was fired July 11, 1950, about 10 months after the Army's decision to turn the Corporal into a weapon system. It achieved a range of 51 miles, about 3.5 miles short of its aim point. It demonstrated the effectiveness of the new guidance system and of the jet vane redesign, but had a failure of its own. A coupling in the pressurization system leaked, which they concluded resulted from vibration in flight.

The End of Corporal's Beginning

The remaining five flights in the Corporal E test program all had similar problems, with vibration causing failures of various kinds. One report to the Army put it this way: "With the high incidence of electronic in-flight failures, a concentrated effort was made to determine the vibration environment; an effort was also made to simulate the effects of the vibration environment through the use of vibration test tables for design improvement and for testing individual flight units before installation in the missile. Without any prior knowledge of such extreme environments, the educational process was naturally slow."

The Laboratory's engineers and technicians were discovering that making a reliable guided missile was hard. One result was greater investment in ground test facilities. In addition to the vibration tables, a complete pressure test facility for Corporals was built, standing approximately where buildings 303 and 317 are today.



The Corporal Flow Metering tower in 1952. Image Credit: JPL/Caltech

In the next column, we'll look at the Army's decision to transform the Corporal from an experiment into a weapon system.

Image Credit: NASA

When Inventing at JPL, Everyone Benefits

By Jane Platt

Anyone who works at JPL knows the Lab's creativity and expertise are plentiful. Perhaps less commonly known is that these strengths produce new technologies that are adopted by a variety of industries to improve our lives. In addition, when inventions are licensed commercially and Caltech receives royalties, the proceeds are shared with the inventors and authors, the general fund for research, and the support of Caltech/JPL activities – and, if the licensed technology is software, the JPL Innovative Software Initiative to fund more software development on Lab.

Each year, JPLers submit about 300 New Technology Reports — reports that begin the process of licensing inventions and software for commercial use. About half of the inventions end up being licensed or optioned to industry. We caught up with Dan Broderick, manager of JPL's Office of Technology Transfer, as well as some JPL inventors, to find out more.

The Concept and the Payoff

Since JPL is a federally funded nonprofit, you'd probably think no one would be eligible to receive royalties.

In fact, some JPL inventions actually do earn royalties for Caltech and the creators of the technology, thanks to the federal Bayh-Dole Act. The act, signed into law in 1980, allows universities, nonprofit research institutions, and small businesses to own, patent, and license inventions developed under federally funded research programs. In exchange, Caltech has the obligation to report such inventions to the funding agency and grant a license to the government for its own use.

The concept is that, since public funds are used to develop the technologies, they should be shared with the public for the greater good.

"Taxpayers are funding the development of these new technologies, and they should benefit from them," said Broderick.

Because Caltech manages JPL, the Bayh-Dole Act applies on Lab. That means JPL is required to license new technologies, with any money received going back to Caltech and the researchers that created the technology.

If NASA employees invent something, they may be eligible to share in royalties, but the amount is capped. However, Broderick explains that JPL employees are covered by the Caltech patent policy, which allows them to receive 25% of the royalties, minus outside patent expenses, and there is no cap to the amount that the inventors receive. In addition, when software is licensed, a share of the royalties goes into the Innovative Software Initiative, which provides funds for JPL software development through a periodic Lab-wide Request for Proposal process.

Success Stories

Smartphones carry CMOS digital imaging technology developed at JPL. Image Credit: NASA

CMOS digital imaging: This JPL-developed technology is everywhere—in smartphones, webcams, and nearly all commercial digital cameras. Former JPLer Eric Fossum has been inducted into the National Inventors Hall of Fame, and recently won a Technology and Engineering Emmy award for his work while at JPL in pioneering the first generation of the technology. Caltech, Fossum, and his team received significant sums from their share of revenue from companies such as Nikon, Samsung, and suppliers of camera chips to iPhones. Broderick points out, "Unfortunately, the patent expired before the peak of smartphones, but we are very happy with how things turned out."

VITAL team members: Top row, l-r: Shaunessy Grant, Michael Johnson, David Van Buren, Michelle Easter, Bottom row, l-r: Brandon Metz, Patrick Degrosse Image Credit: NASA/JPL-Caltech

VITAL ventilator: JPL's can-do attitude yielded an invention during the pandemic that was licensed without fees during the World Health Organization Public Health Emergency of International Concern, with many hospitals facing a severe ventilator shortage. A JPL team embarked on a purposeful, humanitarian effort to save lives around the world, including in developing countries. They invented the VITAL ventilator in five weeks and shared it with qualifying manufacturers, to ease the shortage.

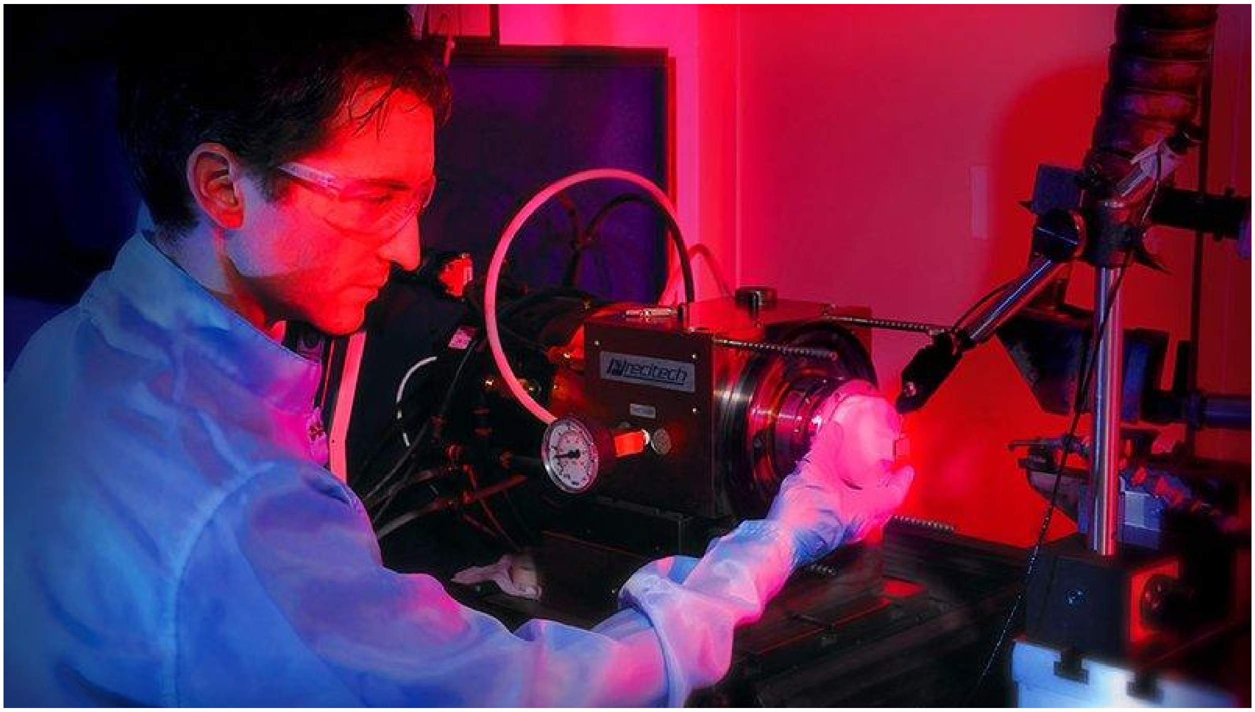
The inventors expressed great satisfaction and pride knowing they had helped in the crisis, and the ventilators are still used in Brazil, India, and Chile. When the royalty-free licenses granted during the emergency expire after the pandemic is over, there is a possibility of future royalties, but that was never the purpose of this quest to apply JPL ingenuity for the greater good.

Infrared camera detectors: Sophisticated infrared detectors developed at JPL have many applications on Earth and in space. Some of those technologies that are funded by the Department of Defense have been used extensively for military purposes. The technologies are also used commercially for breast imaging, brain surgery, firefighting, and industrial quality control, as well as service and maintenance of such items as power lines, buildings, and trains.

Sarath Gunapala, senior research scientist and engineering fellow, has worked at JPL for 30 years and holds 27 patents, many in collaboration with other inventors. He loves his work and describes royalties received as "icing on the cake." While a patent looks good on a resume and can yield royalties, Gunapala also feels great satisfaction when a patent is picked up for commercial use.

"It's even more satisfying, because it means it's useful for someone. It makes me happy to help the DOD, NASA, and commercial companies," he says.

Examples of this technology's use include helping brain surgeons at USC Childrens' Hospital track capillaries growing around a tumor to determine which ones may need to be removed. It also helps doctors track pressure that builds up in tubes inserted after brain surgery, which can be painful for the young patients.



JPLer Cory Hill working on a BIRD focal plane array. Image Credit: NASA/JPL-Caltech

Infrared QWIP (quantum well infrared photodetector) cameras have also demonstrated their ability to detect hotspots in wildfires, and help rail companies maintain safety by detecting warm, failure-prone areas in brakes. Many QWIP patents were licensed by the QWIP Technologies and Omnicorder Technologies. Recently, Teledyne FLIR licensed 12 Caltech HOT BIRD (high operating temperature – barrier infrared detector) patents for commercial applications. And the infrared detectors are of great use in Earth sciences.

Sophisticated HOT BIRD IR detectors can be used on tiny Earth-orbiting satellites without the ultra-low cooling equipment needed previously. HOT BIRD will soon fly on the HyTI (Hyperspectral Thermal Imager), an instrument technology demonstration to monitor spatial, spectral, and temporal information on hydrological dynamics and land surface temperature. This information can be used for water resource management in agricultural applications. Another project in the works, called c-FIRST, will monitor small and large fires from Earth orbit.

GipsyX/RTGx: JPL's precision software package is used for positioning, navigation, timing, and Earth science with measurements using GPS and other space geodetic techniques (such as satellite laser ranging). JPL Technologist Yoaz Bar-Sever says GPS civilian applications came to the fore in the mid 1980s, and GPS soon became the dominant technology for precise geolocation and for its many civilian and scientific applications. Many applications were pioneered by early versions of GipsyX/RTGx. For example, plate tectonics science and satellite altimetry (starting with the TOPEX/Poseidon mission) were revolutionized by the advent of GPS and the GipsyX/RTGx software.

Commercial applications for JPL's sophisticated software further expanded when the software added real-time data processing capabilities. That brought a strong demand for licensing from industry. Among the dozens of commercial licensees of GipsyX/RTGx over the last 30+ years, Bar-Sever counts nearly all major U.S. aerospace corporations, such as Boeing, Lockheed Martin, and Raytheon, satellite operators such as Maxar, and industrial corporations, such as John Deere. Some of these applications led to partnerships with JPL that enabled industrial revolutions. For example, the partnership with John Deere ushered in automated precision agriculture, with the company using it to provide precise positions for tractors used in agriculture so they can operate more autonomously.

John Deere uses GipsyX/RTGx for precision agriculture. Image Credit: John Deere

While the commercial licenses can yield royalties to the JPL innovators, they usually also bring in funds for further technological developments that help maintain the cutting edge capabilities of the software and drive its evolution.

GPS from Space: Over the last 30 years, JPL has refined use of GPS for precise orbit determination (POD) of satellites and for observing the atmosphere as Global Navigation Satellite System signals cut through it (radio occultations). Garth Franklin, GNSS and Signals of Opportunity Flight Instruments Supervisor, says that to meet position and timing requirements and measure the atmosphere, many new technologies developed at JPL have been used through the years, with expanding capabilities and applications as time passes. "The primary ones are the GPS tracking loops, algorithms, and atmospheric models that are documented in the JPL New Technology Report system." Over the past 30 years, JPL employees have received monetary compensation from Caltech for their contributions to these technologies. The JPL POD and radio occultation technologies have been licensed to various companies, including MoogBroadReach and GeoOptics. Franklin says that, as a manager, one of his goals is to encourage people to submit New Technology Reports, which document the technical approach. He says, "My goal is to enable people to contribute to key technologies that Caltech licenses and then receive monetary compensation for their efforts."

The Slow and Steady Return to Lab

By Taylor Hill

As of March 14, all JPL employees and affiliates had an open invitation to return to the 128-acre facility in the foothills for the first time in exactly two years.

The last full business day before Covid was March 13, 2020. For some, the past week was their first time on JPL's campus ever. Part of the class of employees hired during the pandemic, they flashed their badges and finally stepped foot on the Mall for their long-awaited, in-person initiation. For others, the gradual transition to on-site work represents a return to familiar surroundings they've gone largely without for two years. And for workers deemed "mission essential" all along, the week was business as usual, with the upside of an open coffee shop, and a little more company.

Regardless of which of these groups one belongs to, the transition comes with a mix of emotions for JPLers. We talked with our colleagues to see how they're feeling about returning at least some of their time in person.

Supporting the First-Time JPLer

For Contracts Manager Junette Sheen, Monday marked only her second day back on Lab since the shutdown in 2020. Her plan is to remain on full telework, but she came on campus to show her new coworker, Sabel Morales, the ropes.

"It's her first official day at JPL ever, and it just happens to be the first day we're coming back on Lab," Sheen said.

Sheen, who started in 24x in 2019, attributes her comfort with full time telework to her on-site experience and ability to form relationships pre-pandemic, and she wanted to make sure Morales felt welcomed in person.

“I feel like I’ve been here enough time to establish my network, and I feel comfortable enough to do that,” Sheen said. “But I can’t imagine starting a new job fully remote—I feel like that’s a big challenge. So I wanted to come and be a buddy for her.”

For Morales’ part, she said if it weren’t for Sheen meeting her on campus, she would have turned around shortly after getting through the visitor’s center.

“I don’t know any of this,” Morales said.

Sheen showed Morales her new desk location in Building 301, and grabbed lunch with her at Café 167, sitting outside on the Mall in a timeworn habit of pandemic.

“I am still not fully comfortable yet,” Sheen said. “If I ever have to come back, I will probably just stay masked. But it is nice to be physically here and walk around. Living through the pandemic, and working from home, you don’t have boundaries. It’s nice to remember when you worked on Lab and would actually walk to meetings, take coffee breaks, and that sort of thing…I don’t do that stuff now. I just work all day,” she laughs.

Missing a Simpler Time

Outside Café 190, Optical Engineer Harrison Herzog had just received a meeting cancellation, and had a few minutes to offer his take on the voluntary return to on-site work.

“For me, I’m not as concerned about the safety aspect,” Herzog said. “I often have to do my work in cleanrooms, so I’m masked around my co-workers.”

When he was assigned to work on the EMIT (Earth Surface Mineral Dust Source Investigation) instrument in the winter of 2021, Herzog was coming on Lab about three or four days a week to get the instrument assembled. Lately, he’s been coming on Lab less frequently, but looks forward to having more colleagues around.

“It felt like prior to the pandemic, you had everyone on Lab at the same time, and so you would have so many resources at your disposal,” Herzog said. “So, if you’re in the integration phase of an instrument or a spacecraft, you could reliably go to places to get things, whether it was fasteners you needed, or space on Lab that you wanted to use. But in the last couple years, it seemed that you’d have to send some emails instead of just calling someone up or showing up at their door to get what you need quickly.”

He found himself often having to deal with an extra level of scheduling to get tasks accomplished that were routine before.

“You’d get a hold of the person who had the item you needed, but they might not be coming on to Lab until Wednesday, and then you have to figure out if you’re going to be on Lab that day,” Herzog said. “It’s made it a little more difficult to get things done efficiently. I’m hoping to have fewer of those issues in the near future.”

Purposeful Presence

Chris Mattmann, JPL’s chief technology & innovation officer, said his day back on Lab was an enjoyable experience, full of face-to-face connections.

“That's the point of coming back,” Mattmann said. “Asynchronous work can be done asynchronously and remote, but when we get together, there should be a purpose—today, I'm here for the EC [Executive Council] Software Summit meeting.”

For Microdevices Lab veterans Bruce Bumble and Henry LeDuc (33 and 39 years respectively at JPL) the main concerns regarding voluntary return to work include possible eventual parking impacts and café limitations.

The pair have been on the essential personnel list since the early days of the pandemic, reporting on site daily even when the only food option on Lab was the JPL self-service mini-mart. Now, with Café 167 open for dining services, Bumble said the daily excursions across Lab have kept his step count high, but he wonders if the Lab under its planned hybrid policy will have high enough numbers to justify opening Café 303.

“I’m sure there’s a lot that still has to be worked out, and they’ll have to figure it out as we go,” Bumble said.

Lynn Boyden, human-centered researcher in 319H, started her career at JPL on May 4, 2020—so returning to on-site work for her is more of a welcome to the Lab.

“I've been able to really connect and form relationships with most of my project teammates over the past two years via mediated channels like Slack, email, and Webex,” Boyden said. “But It was nice to see my team in person.”

Boyden’s day on Lab was pretty “seamless,”: no Wi-Fi connectivity issues, just a lack of caffeine accessibility with the coffee cart closing at 11 a.m.

But she noted it’s not just those returning to work who need to get used to the transition.

“I got home last night, and my cat was both angry and needy,” Boyden said.

It’s not just furry friends JPLers will be leaving behind. Small humans are also part of the return-to-Lab equation for some.

For Mars Science Laboratory Systems Engineer Elena Amador-French, the health of her daughter, Catalina, remains a top priority.

“As a parent to an unvaccinated toddler, this pandemic is very much going strong for us,” Amador-French said. “I still worry about what the next variant might look like.”

Amador-French has been coming on Lab regularly since August 2021. Mission operations work is more enjoyable in person, she says, and with her childcare option in La Cañada Flintridge, being able to come back to Lab sooner rather than later was an important step.

“I work in Building 264 and it has been pretty much a ghost town, so I always felt very safe and comfortable coming to my office,” Amador-French said. But this week, she noticed a marked increase in activity on her floor.

“It was a little overwhelming, but also great,” Amador-French said. “Now, suddenly there are more folks on my floor. I am generally still being cautious about Covid, so I’ve kept my mask on inside when around other people. It will take a bit of getting used to having other people around, but generally, I was very happy to see my wonderful colleagues face to face again.”

Events

Von Karman Lecture Series: A Look at NASA's Earth System Observatory

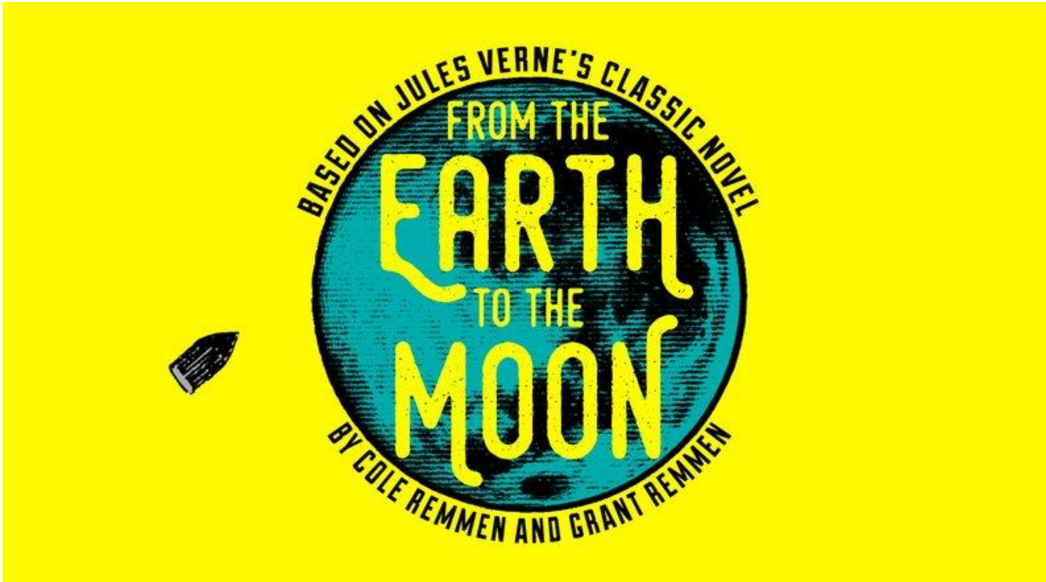
April 14 at 7 p.m.
Youtube link

NASA is working on a new set of Earth-focused missions to provide key information to guide efforts related to climate change, natural hazard mitigation, fighting forest fires, and improving real-time agricultural processes. Each uniquely designed satellite in the Earth System Observatory will complement the others, working in tandem to create a 3D, holistic view of Earth, from bedrock to atmosphere.

Speaker: Erika Podest, Carbon Cycle and Ecosystems Scientist, NASA/JPL

Host: Nikki Wyrick, Public Services Office, NASA/JPL

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



Caltech Theater Presents 'From the Earth to the Moon'

April 15 - April 24 (multiple times, see below)

Caltech's Theater Arts program will present a new musical, "From the Earth to the Moon," opening April 15, 2022.

From the creators of Caltech's Star Trek musical parody "Boldly Go!" comes a fresh new science fiction musical based on a Jules Verne classic. "From the Earth to the Moon" is a dynamic tale, set to vibrant, electrifying music that captures the wonder of Jules Verne's extraordinary voyages.

Showtimes:

- Friday, April 15, 7:30 p.m.
- Saturday, April 16, 7:30 p.m.
- Thursday, April 21, 7:30 p.m.
- Friday, April 22, 7:30 p.m.
- Saturday, April 23, 7:30 p.m.
- Sunday, April 24, 2:30 p.m.

For more information on the show, and to purchase tickets, visit the Caltech events calendar.

Caltech Event: Conversations on the Quantum World: Storytelling and Science

April 21 at 11 a.m.

Registration link

Spiros Michalakis, manager of outreach and staff researcher, Institute for Quantum Information and Matter at Caltech, and Ed Solomon, writer/producer in conversation with Whitney Clavin, senior content and media strategist, Office of Strategic Communication at Caltech.

Learn more about the series:
https://scienceexchange.caltech.edu/connect/conversations/conversations-quantum

JPL Family News

Retirees

The following JPL employees recently announced their retirements:

40+ Years:

Wallace Tai, Section 9000, 41 years

30+ Years:

James T. Diener, Section 357B, 38 years

Deborah A. Durham, Section 1630, 32 years

20+ Years:

Jeffrey Behar, Section 5020, 24 years

Robert S. Kowalczyk, Section 3463, 24 years

Margaret R. Cooper, Section 2662, 22 years

10+ Years:

Thomas A. Slager, Section 1841, 14 years

Letters

I would like to thank my JPL family for their support and kind words following the passing of my father. And I also would like to thank the JPL Hospitality Group for the beautiful plant I received in his memory. It will be cherished! **-Sonia Mejia**

"A few days ago I received a most wonderful floral arrangement from my "JPL Family." It literally made my day see and smell the lovely spring flowers in sympathy regarding the passing of my father. Thank you so much for your kindness, thoughts and sympathies, it means a lot to find so many caring friends around me…especially during these last 2 years in which we've been physically isolated from one another for the most part. I can feel you near me even though we're still distant from one another. Soon we will be seeing one another, face to face, having those hallway chats. I'm really looking forward to that. It is in those quiet moments, sitting in the backyard, watching a hummingbird flit from the ceanothus to the elderberry then over to the white sage flowers, when we miss our loved ones. Nature, always busy, always moving, yet somehow quiet, peaceful and allowing contemplation to take over the busy mind we think of those we lost and those we still have. I planted the bulbs from the floral arrangement and look forward to the new blooms very spring in memory of my father. Grateful for all of you. **-Mike Pauken**