

# A celebration of America's first satellite

Explorer 1 launched JPL—and the United States—into the Space Age

By Taylor Hill

Sixty years to the day, JPL commemorated the Jan. 31, 1958 launch of America's first satellite, Explorer 1, with a day full of events, lectures, music, photo ops, and even ice cream. The celebration also shed light on the scientific significance of Explorer 1—which became the first vessel to carry a scientific instrument into space.

"It made the first scientific discoveries in space as it explored the Van Allen radiation belts, and with it created for NASA and the American space program a scientific basis," said JPL Director Michael Watkins. "It represents an achievement, really, in 1958, as great as Cassini or Curiosity is today for us."

Explorer 1's success and scientific discoveries proved to be just the beginning of JPL's involvement in America's space program, as the Laboratory proved over the next several decades to be an integral partner with NASA in breaking barriers in space.

The day's festivities kicked off in von Karman Auditorium, where JPL Deputy Director Larry James and JPL Historian Erik Conway highlighted the symbolic impact of Explorer 1 in terms of matching the Soviet Union's space program in suc-



JPLers had their pictures taken with life-size Explorer 1 props and shared them with hashtag #ExploreAsOne.

cessfully reaching orbit, and the significance the satellite has had in cementing JPL as a leader in science, technology and space exploration.

"It's really incredible to see in many ways, our roots have not changed," James said. "We are about doing things that no one else has ever done, we are about exploring science that no one else has explored, and we are really about accepting any challenge that comes our way to answer these very difficult science questions. We really do stand on the shoulders of giants, who created incredible science over the last six decades, and yet this team continues to create incredible science."

Sasha Ukhorskiy, a Van Allen Probes

project scientist at Johns Hopkins University's Applied Physics Laboratory, also spoke on how our understanding of the Van Allen radiation belts has evolved over time. Recent research has greatly expanded on Explorer 1's discovery—including the launch of NASA's Van Allen probes in 2012—which have been equipped with instruments capable of observing particles, waves and fields in the radiation belts.

On the Mall, JPLers were treated to ice cream and the sweet tunes of JPL's Jazz Propulsion Band, and all were invited to take their photo with a 79.9-inch foam cutout of Explorer 1, and mimic the iconic 1958 image of JPL Director William Pickering, James Van Allen, and Wernher von Braun hoisting the satellite overhead.

The celebration wrapped up with retired JPL engineer Henry Richter holding

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For a complete report on the launch, science and success of America's first satellite, please visit <https://explorer1.jpl.nasa.gov>

# How a picture inspired a career

A former JPLer tells the tale of what the iconic Explorer 1 image meant to him as a boy in Cairo, Egypt

Nabil Elgabalawi was 13 years old living in Cairo when “artificial satellites” such as Sputnik and Explorer 1 started circling the Earth in 1958. “Back then, I didn’t know anything about satellites, and I had never heard of ‘orbit,’ so I thought they were just hovering above us, looking down from above,” Elgabalawi said.

Sixty years later, Elgabalawi explains how the photo of JPL Director Pickering, Van Allen, and von Braun triumphantly holding up the Explorer 1 satellite changed his life.

“I went to the library at the American Embassy in Cairo to read about these satellites, and that’s where I saw the photo in a magazine,” Elgabalawi said. “I asked ‘where is this?’ and was told that it was the Jet Propulsion Laboratory in Pasadena, California. That’s when I knew I wanted to work there.”

He had never heard of JPL or Pasadena before seeing the photo. But 15 years

later, after studying engineering and jet propulsion in Cairo and Germany, Elgabalawi was shaking hands with Pickering himself in Pasadena and starting his career at JPL.

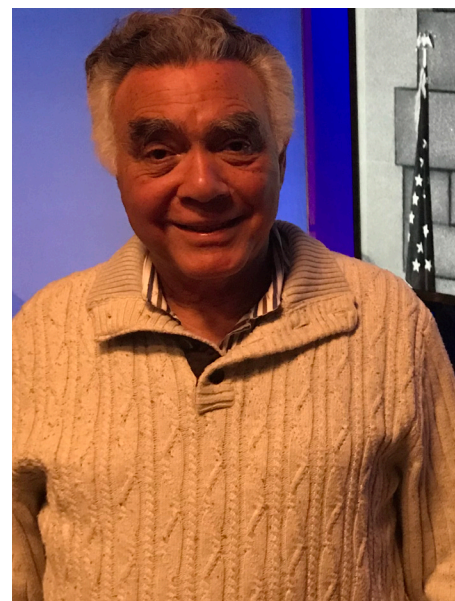
“It was like shaking hands with God to me,” Elgabalawi said.

In his 25 years at JPL, Elgabalawi tested the radioisotope thermoelectric generators placed on the Voyager spacecraft, conducted microgravity research on the space shuttle and International Space Station, and was the group supervisor for environmental testing of the Cassini spacecraft.

Now retired and living in Altadena, Elgabalawi looks back and marvels at where he’s come from.

“I cannot believe it, I remember when I was a teenager looking in the sky, and here I am 60 years later, still alive and in the right place,” he said.

Today, Elgabalawi is excited by what



he sees in the younger generation at JPL, pushing the boundaries of science, technology and space exploration, just as he and his colleagues did.

“I still go to lectures at JPL today, and I learn from the young doctors,” Elgabalawi said. “They have the same drive for knowledge, the same excitement, the same devotion that I remember. It’s the same spirit, and that’s what will keep JPL pushing the space program forward.”

—Taylor Hill

## EXPLORER 1 *Continued from page 1*

a discussion about his time working on Explorer and other activities in the late 1950s. The Long Beach native reminisced about his years working on Explorer 1, and the difficulties he and his Explorer payload design team faced, trying to construct transistors, transmitters and receivers capable of surviving the extremes of space, and powerful enough to send signals back to Earth—all while being grounded by order of the U.S. government. The problem, Richter explained, was that even though JPL—in partnership with the Army’s Jupiter-C rocket—had shown success in suborbital flights as early as 1956, the Navy had proposed a

rocket system that had been designed from the ground up for civilian scientific purposes. U.S. officials wary of using military equipment in the launch chose the Navy’s Vanguard project. When Sputnik was launched on Oct. 4, 1957, the pressure on the Navy to put a satellite up intensified. The rocket’s failure on Dec. 6, 1957 led the Eisenhower administration to turn to the Army and JPL.

“The [Soviets] did us a favor launching Sputnik,” Richter said. “The people in this country were panicked, the [Soviets] were now ahead of us in the race for space. And so our government rushed the Vanguard satellite, that debacle happened, which really opened the door for us.”

Coincidentally, the 60th anniversary event overlapped with a super blue blood moon—a trilogy of fairly common lunar occurrences all uncommonly occurring at once: the second full moon of the month (blue moon), a full moon closely coinciding with perigee, the closest the moon is to Earth in its orbit (super moon), and a total lunar eclipse (blood moon). The lunar event seems apt, as many newspapers in the late 1950s proclaimed Explorer 1 “the Caltech moon” or “a new artificial moon” that was now orbiting Earth. This “new moon” was made possible thanks to three uncommonly brilliant minds coming together—Pickering, Van Allen, and von Braun—teaming up to launch America and JPL into the space race.

# 60 years of America in space

Panel discussion examines how early success with Explorer 1 led to JPL's wide portfolio

By Taylor Hill

Sixty years ago, Explorer 1 captured the hearts and minds of the American public as its successful orbit and subsequent scientific discoveries marked the beginning of the U.S. space age. It was a swift response to the jarring technological advances the Soviet Union had made by successfully launching Sputnik into orbit a mere four months prior. It also altered the trajectory of JPL, as the Laboratory was now firmly placed at the forefront of space exploration and research—a shift JPL still benefits from today.

In celebration of the Jan. 31, 1958 launch, JPL Fellow and documentarian Blaine Baggett hosted a panel Jan. 25 at von Karman Auditorium. The discussion started with a look back at the historic significance of the first study of Earth from space, and sped ahead 60 years to highlight some of the work and research currently underway at NASA that continue to improve our knowledge of life on our own planet.

JPL Historian Erik Conway was the first on stage, highlighting the early days of JPL as a group of Caltech undergrads launching rockets in the 1930s, leading up to the iconic photo taken of the Lab's then-director William Pickering, University of Iowa physicist James Van Allen, and Wernher von Braun holding a model Explorer 1 triumphantly over their heads.

The mission was deemed an immediate success for its role in putting the United States back on level ground with the Soviets in the space race. But what truly made it exceptional was the scientific discovery made possible by Van Allen's science instrument aboard the satellite.

"Van Allen's instrument was essentially a Geiger counter," Conway explained. It was used for detecting cosmic rays, and it was behaving oddly in space. After months of testing and research back on



Many newspapers referred to the Explorer 1 spacecraft as a "moon."

Earth, Van Allen's team discovered that the instrument was detecting the Earth's magnetic field, and the radiation trapped there. "It showed we have a radiation belt and radiation shielding from the magnetic field that a handful of scientists had thought might be true, but this proved it," Conway said. And thanks to that radiation belt—now known as the Van Allen radiation belt—Earth is protected from cosmic rays. "It might be key to life on Earth," Conway noted.

After the trip down memory lane, Baggett introduced two researchers gathering data from more recent Earth-circling satellites: Carmen Boening, a scientist working on the Gravity Recovery and Climate Experiment (GRACE) mission conducting research on ocean/climate interactions including global water cycles and sea-level rise, and Erika Podest, who is working on the Soil Moisture Active Passive (SMAP) mission, researching global carbon and water cycles and climate change.

Podest talked about the 20 current NASA Earth-observing missions in space, all playing different roles in observing the global environment including the oceans, the atmosphere, and the continents—giving a picture of Earth as a system.

"We can study almost everything from the air we breathe, to the rain and snow that provide water for agriculture or communities, to natural disasters like floods and droughts," Podest said. "The study from space has revolutionized our understanding of our planet, and it's constantly providing new information that helps us understand how the planet functions and how it's changing. And all of this is thanks to the incredible technological achievements that have been developed through decades of experiments, going back to Explorer 1."

Baggett noted he takes great comfort in knowing that scientists such as Boening and Podest are continuing the work started by the Explorer 1 team 60 years ago.

"We began the night talking about Explorer 1, the satellite that gave us the very first space-science discovery, and it helped answer the question of why we live in such a special place, with such special circumstances," Baggett said. "And we've progressed to talking about all of this technology that we now have and this fleet of science instruments that NASA has to help us understand the changing world that we live in."



# Media maven rides the last wave home

By Mark Whalen

*As 2017 came to a close, so did the JPL career of oceanographer and climatologist Bill Patzert, who for almost 35 years has been at the forefront of studying the ocean from space and communicating Earth science to the American public.*

*Patzert came to California after earning a master's and doctorate in oceanography from the University of Hawaii. He was there at the start of serious studies of El Nino, and helped pitch a new program centered on doing oceanography from space to NASA — which turned into the Topex/Poseidon mission that measured the surface height of the ocean, providing valuable data about our changing planet. The climate data record begun by Topex/Poseidon now extends more than a quarter century.*

*Universe caught up with Patzert for a chat about his love for the ocean and his best memories of JPL.*

**Q: What was your inspiration to study Earth science?**

It started with my father. He was a sea captain and operated a commercial fishing boat out of Long Island, N.Y. in the late 1940s. From a young age, I would often go out to sea with him. My dad loved the water, and had a deep respect for nature.

When I was growing up, he would take me outside and we would shoot the stars with a sextant, trying to locate our backyard, which we did — hundreds of times.

I remember the first books he bought for me were Rachel Carson's *Silent Spring* and *The Sea Around Us*. So, from an early age, I was steered toward respect for the environment and oceanography.

In college, at Purdue University in In-



diana, I majored in math and physics, a double major, and a double minor, in geology and American literature. Purdue was far from an ocean.

So when it came time for graduate school, I was ready for a change — what I really wanted to do was go to Hawaii and become a big-wave surfer.

**Q: Well, you did that, didn't you?**

I did. I spent seven years in Hawaii, surfing the waves all around Oahu. But in spite of my wayward ways and as fate would have it, my mentor there was one of the early researchers in large-scale climate research, as well as El Nino.

After graduate school, I headed for California. My first job was at Scripps Institution of Oceanography. The beach in La Jolla sealed the deal. I could continue my surfing as well as my academic career. At Scripps, I was a sea-going oceanographer and led expeditions in most of the oceans. My research was focused on large-scale climate connections, especially on El Nino.

I was happy at Scripps, but in the

early 1980s oceanography was about to change. These were the early days of NASA Earth science and I had an opportunity to join a team of visionary folks who were dreaming of and organizing an oceanography from space program. I joined this team at NASA Headquarters and helped organize, design and sell a big program, which turned out to be the U.S./French Topex/Poseidon mission that was managed here at JPL.

**Q: How did El Nino become so famous?**

Let's take a look back over the length of my career. In the mid-1980s, an interesting thing happened — in society as well as in science. It was the birth of desktop computing.

I had to type my doctoral thesis on an IBM Selectric typewriter. We had no word processing or desktop computing capability. At the same time, NASA was preparing to revolutionize meteorology and oceanography.

In the late '70s and early '80s, NASA

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and NOAA had already launched the first weather satel-lites; oceanography arrived in space when Topex/Poseidon was launched in 1992. By that time, we had desktop computing. But the interesting thing that happened in the 1990s is what complemented desktop computing — the internet.

So, from the beginning of my career at JPL, we went from electric typewriters, to desktop computing, to the internet.

We launched Topex/Poseidon, and from the start of the mission it was wildly successful. After 25 years of monitoring the global oceans, it has revolutionized oceanography and climate science. One of the key climate measurements is sea level. Ninety-five percent of the heat from global warming is captured in the ocean. So the unequivocal proof of global warming is sea-level rise. We measured it, and it's now an unequivocal scientific fact.

So all these things came together: the tech revolution, internet, satellites that could monitor essentially what was historically an inaccessible global ocean. Then the 1997-98 El Nino hit, just as all

these things were peaking. We were riding a tsunami of many factors.

Within a couple of years of that '97-'98 El Nino, more than a billion people around the planet had seen our JPL Topex/Poseidon El Nino images, and I became a fixture on reporters' Rolodexes.

Now, part of this was luck. It's not just me — JPL scientists in general have benefited from where we are located, how close we are to the media, and Los Angeles being the second-largest media outlet in the United States. All the main media outlets — radio, TV, newspapers, internet — all are within an hour of JPL.

Very rapidly, I was doing interviews in studio, on Lab, at home — Monday through Sunday. And people just loved how JPL visualized El Nino. There was something that tweaked the media's cerebral cortex about El Nino.

Let's not forget that we also had a keen focus on another significant climate pattern. Following the El Nino of 1997-98, the equatorial Pacific shifted to a cooler pattern, La Nina, that often has the flip impacts of El Nino. So, my research switched to understanding the relationship between the warm El Nino to his cooler sibling, La Nina.

The satellite data revealed even larger and longer-lasting patterns that influence the frequency and intensity of these two phenomenon. One of those patterns is the Pacific Decadal Oscillation, a slow-moving variation of temperatures between the western and eastern sections of the Pacific. In 1998, the western portion was becoming warmer than the eastern portion, leading me to conclude that in the long term, an El Nino-repellant pattern was forming that would favor drought in Southern Califor-

nia for many years.

Now we have 25+ years of continuous data, with Topex/Poseidon and Jasons 1 through 3, and the next satellite in the series, Sentinel 6, in the queue. And remarkable things happened, not just El Nino. The measurements were so well done, so precise, that we actually measured global sea-level rise — which now is about 3 millimeters per year. So over the last two and a half decades, the rise in sea level has been almost three and a half inches.

**Q: Can the average person make sense of what that means?**

In a scientific sense, it's the unequivocal proof of global warming. Sea-level-rise projections are now at an inch per decade. Global sea-level rise is projected over the next 50 to 100 years to be anywhere between 2 and 6 feet — which will rewrite coastlines across the planet. It is the real deal and is now part of public policy.

**Q: Have there been cases where public policy was improved due to the Topex/Poseidon and Jason data?**

One thing for sure is that El Nino forecasting is taken much more seriously than it was 25 years ago. It's better understood, so the forecasts have dramatically improved. Of course, with sea-level rise happening all across the planet, our data are now factored into not just present public policy, but public-policy planning. People are actually building adaptations to deal with sea-level rise. It will become a multi-billion-dollar issue. Our JPL measurements — which show that sea-level rise is climate change — are embraced by policy makers across our planet.

**Q: What has been your approach in dealing with the news media?**

I'm a generalist, because I can talk about the societal implications, or how



**PATZERT** *Continued from page 5*

different missions overlap, how it all fits together in the big picture. I learned a long time ago that as a communicator, if you just do one thing and it's climate related or technically innovative, you're going to have a half-dozen interviews a year if you're lucky. So early on, I thought, what do the media talk about every day? What is the public always interested in — every day?

It's the weather. I've worked with all the local TV news and weather-forecasting journalists for two and a half decades. I haven't given them many bum steers. Well, maybe a few. Nobody's perfect. But I can weave an interesting story. I use a lot of alliteration and a little humor to tell stories that are relatable.

It's good to be a scientist in an ivory tower, but the long-term goal of any scientist is to understand — in this case, how the climate works — and to test your theories by making credible forecasts and predictions.

I keep a running tally on the rainfall. From mid-February 2017 to early-January 2018, we had less than an inch of rain in downtown Los Angeles.

I know that right off the top of my head. In the rain year starting Oct. 1, downtown L.A., and most of Southern California, were at 5% of normal. Until the storms that came the second week of January, it's the longest and driest Santa Ana period I've seen in Southern California during my career.

All the stationary high-pressure systems in December are related to the jet stream patterns. The jet stream goes far to the north over the west, then swoops down into the Midwest and northeast. The flip side of a heat wave in L.A. is frigid weather in Washington, D.C. and New York.

**Q: It seems you are having a great time explaining nature to people. True?**

Yes, of course, I love to do it. But there are certain rules on communications.

You're much more credible if you're smiling and happy, and you're talking slowly and loudly. Articulate and enunciate. That's part of my nature and, mostly, many years of practice.

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**“At JPL, we're doing cutting edge, important science. We do things that nobody else in the world does, and a critical part of this is to communicate it.”**

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— Bill Patzert

How many different Hawaiian shirts have you seen me wear? It cheers people up.

**Q: What are the keys to successful interviews?**

It's preparation, preparation, preparation — that makes the interview seem seamless. The one thing you cannot do if you're on TV is sit there and look at your notes; you've got to look right at the camera or at the reporter. If you lose eye contact with the reporter, you've lost it.

I try to find simple words. For example, instead of making a complicated comparison between years of data, sometimes I do one of my famous quotes, such as: “It's so hot in Riverside, the cows are giving powdered milk.”

There's not a lot of time to get your point across. The average interview on the evening news lasts two minutes.

Here's a tip: Before the interview, ask them what the segment is about. They're only going to make one or two points. Just tell me what you want, and I can give it to you in a clean, concise way.

Why is all this important? At JPL, we're doing cutting edge, important science. We do things at JPL that nobody else in the world does, and a critical part of this is to communicate it — not only with our colleagues, but also the media and the general public. And the conduit for that communication is the media. You might have the story, but they're the storytellers.

Most of these people are pros, and they

all want to get it right. I always figure give them the maximum amount of cooperation, don't confuse them, treat them with the highest level of respect, and they will tell your story well — to the world.

You're in a partnership with the press. They need you for news, and we need them to tell our great stories.

**Q: Didn't you make the news once during an El Nino, not for your expertise, but for the storm's effect on your house?**

Yes, during a heavy rainstorm in 1997 I actually had a leak in the roof that went right into my bedroom. Dan Rather of CBS News and I talked about it on national TV.

At that time, every Friday night during the fall and winter of 1997, Dan and I did the “El Nino Watch.” At the end of the show, we would have a mano-a-mano interview — I was here and Dan was in New York. That program went on for three or four months.

As I think back, I did it for a long time,

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**PATZERT** *Continued from page 6*

and never really screwed up that bad. I rationalize that it was good for NASA, good for JPL. And it was good for science.

**Q: Any regrets?**

Yes. My one regret is that I never learned to speak Spanish.

In addition to all the local TV stations and American networks, Telemundo, a Spanish-speaking network, actually has a bigger viewing audience than some of the major American networks. They are seen all over the United States, and throughout Latin America.

**Q: Have you had any help from JPL Spanish speakers?**

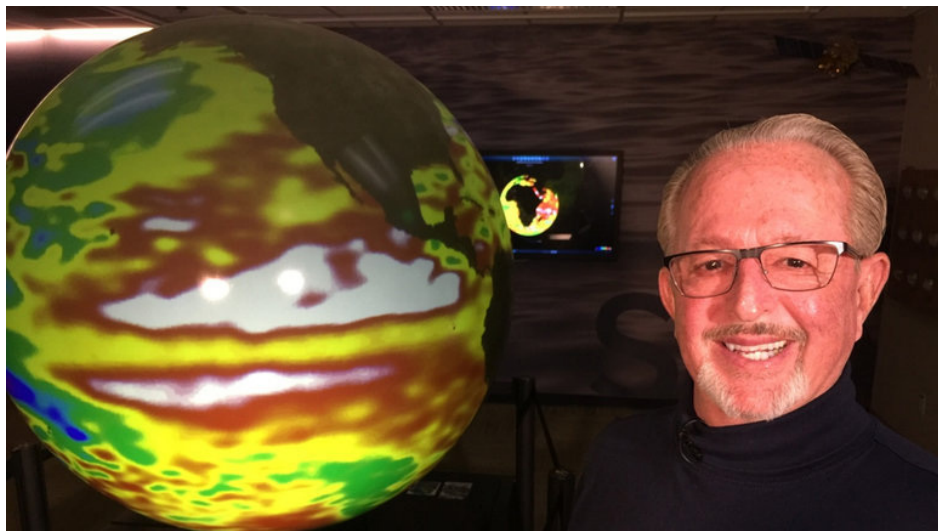
Yes, I've had great help from two colleagues: Veronica Nieves, from Spain; and Erika Podest, from Panama. Erika and I just did a five-part special for Telemundo on climate change and ecology. For her part, they didn't have to translate. For my part, they had to.

**Q: What has changed for the better at JPL since you started here?**

One of the things that has changed the most about JPL during my career is that it's more diverse.

JPL looks a lot more like California than when I was hired — more women, more ethnic diversity. JPL is getting smarter and better. It looks a lot like the future of America. And it's a good thing.

**Q: Now that you have retired from JPL, will you also retire from public life? Or are there some future lectures still to come?**



I already have some lectures scheduled for after my official retirement day [Jan. 18]. I might be 76, almost 77, but I want to continue to make a difference.

I'm planning to volunteer for some humanitarian and environmental work.

**Q: Final thoughts?**

I'm pretty upbeat about JPL. To be sure, it's been an exciting career. It's been a privilege to work with so many talented women and men. Being a part of the great Topex/Poseidon team was fantastic. I've given more than 10,000 interviews. Wow, I'm one lucky surfer.

I've been fortunate to receive a lot of support from JPL, from the directors, from the Media Relations Office. Whatever I accomplished in my career was because of the great teams of scientists, engineers and communicators that I've worked with. I turned into a team player, in spite of my natural tendencies.

It's a natural time to pass the baton on to the younger generation, who have different skills and will do an even better job. Because the media of today is not the media of 1997.

**Q: Will someone at JPL step right into what you've been doing?**

No. I don't think anybody will ever do it like I did it again. On the other hand, I think some of the younger people will be better trained and less timid about developing relationships with the media. Because if they don't, it would be a shame.

You can't leave and tell everyone what to do. Let the young people figure it out. In some ways, we're just at the beginnings of the potential of the internet. Young people are more technically skilled and agile; they'll do it differently, improve on what we have done.

I was 42 years old when I got my first desktop computer. Now these young people are using iPhones in kindergarten. So, the next generation of science communicators will look different than me, they will do it differently than I did. But I'm optimistic, not only about what JPL will do over the next few decades, but how we will communicate it.

# Physics students learn the JPL way

Lab scientists and engineers meet with women undergrads

By Mark Whalen

JPL women who are leaders in science research, engineering and technology participated in the recent American Physical Society Conference for Undergraduate Women in Physics in Pomona.

"This conference was a great opportunity for us to be proactive and reach out to students who might not be aware of JPL and the opportunities available to them," said JPL Associate Chief Scientist Cinzia Zuffada, one of the scientists in attendance.

Held over the weekend of Jan. 12-14 at Cal Poly Pomona, Harvey Mudd and Pomona College, the event provided student attendees, at a very early stage in their university life, a chance to learn about JPL's careers based on physics studies, internships and other opportunities.

About 250 students attended the event, which is partially funded by the National Science Foundation. JPL was one of the local sponsors.

Panel discussions were held on diversity and inclusion in STEM and balancing life and career. Students also attend-

ed talks, career fairs, poster sessions and workshops. For the agenda, visit <https://cuwipsocal2018.org>.

"By the students' reactions, they were clearly engaged" in learning about JPL and a possible future here, said Zuffada.

"This was a good opportunity to introduce JPL and showcase several of our women scientists and engineers at various stages of their careers."

Some of the attendees were undecided about their career path, noted Vanessa Bailey of the Exoplanet Discovery and Science Group. "Some were committed to grad school in physics or a related discipline, others were interested in grad school but might consider switching their research area or pursue industry jobs, and were here to get a feel for the options," she said.

"At the end of the panel, a few students approached me excitedly, interested in



JPL engineer Farisa Morales speaks with a student at the conference.

advice for applying to JPL for internships and full-time opportunities," said instrument operations engineer Janelle Wellons. "I made it very clear that physics majors were part of JPL's technical workforce and their interests in exoplanets and astrophysics lined up well with JPL's current work."

Rowena Dineris of JPL's Postdoc Office, who supported a career fair at the event, recommended students take advantage of the professional associations at their schools through student memberships.

The Pomona conference was among multiple events held simultaneously throughout the United States and Canada for undergraduate women and underrepresented genders interested in physics and astronomy. For details, visit <http://www.aps.org/programs/women/workshops/cuwip.cfm>.

"JPL recognizes that the talent pool comes from a wide variety of places," said Zuffada. "Now these young women know what a great place JPL is, and it just increases their opportunities for a potential career here, in industry or academia."

The next scheduled event for the American Physical Society Conference for Undergraduate Women in Physics will be held next winter at UC Santa Barbara.



JPL's Jordana Blacksberg (second from left) and Cinzia Zuffada are flanked by Cal Poly Pomona's Hector Mireles (left) and Nina Abramzon.



# Passings

Retired JPL Senior Scientist Robert Nathan, 90, died Sept. 29.

Joining Caltech in 1952, Nathan managed the institute's Electrical Engineering Computer Lab until transitioning to JPL in 1959, where he developed a special microchip for image enhancement, resulting in a significant NASA award in the field of imaging. His innovative work led to the creation of the JPL Biomedical Image Analysis Facility.

Nathan is predeceased by his wife and brother and survived by two children.



Robert Nathan

Gerald Levy, 87, a retired engineer credited with helping develop a critical new technique for ground-based radio studies, died Oct. 27.

Levy joined JPL in 1959. Starting in 1985, he served as Telecommunications and Data Acquisition Observatory manager. In 1988 he received the Charles Stark Draper Award from the International Aeronautical Federation for his innovative work in three-year-long astronomical experiment. From 1986–88, Levy and colleagues obtained better resolutions of three quasars than possible at the same wavelength. Levy led an international team of scientists and engineers that designed the technique—very long baseline

interferometry—to combine data from radio telescopes on the ground with data from an antenna on the satellite.

He was earlier awarded the NASA Exceptional Service Medal and the NASA Medal for Exceptional Scientific Achievement.

Levy is survived by his wife, Dorothy, children Mark and Caren, and four grandchildren.

George Milligan, 91, a retired electronics engineer, died Dec. 2.

Milligan worked at the Lab from 1956 to 1988. Among the missions he contributed to were Ranger, Mariner, Viking and Voyager.

He is survived by son John and daughter Nancy. Memorial services were held in Coshoc-ton, Ohio.

Richard Weller, 96, a retired senior systems engineer, died Dec. 19.

Weller joined JPL in 1950 to work on the Corporal missile ground computer in White Sands, NM, then went on to work on ground radio receiver projects in Goldstone, Calif.,



Richard Weller

Cape Canaveral, Puerto Rico, South Africa, Spain and Australia. He received Group Achievement Awards for his work on the Viking, Pioneer, Voyager, Magellan and Galileo missions.

Weller retired from JPL in 1989, but continued at JPL as a contractor, working on the Carrier Array project until 1995. He is survived by his wife, Betty, children Sandra, David and Catherine, five grandchildren, and two great-grandchildren.

Gregg Hanchett, 67, a communications technical engineer in the Television Operations Office, died Jan. 12.

Hanchett had been with JPL since 1979. He was bestowed numerous NASA Group Achievement Awards and JPL awards for technical achievements in JPL television, video and audio operations.

He is survived by his wife, Madeline, and stepchildren Andrew Clar and Ilene Perry. Services are pending.



Gregg Hanchett

# News Briefs

## Infrared achievement honor to JPL

For its major contributions to infrared device science and technology, JPL has been named winner of the Herschel Award by the Military Sensing Symposia Committee.

The award honors JPL's High Operating Temperature Barrier Infrared Detector (HOT-BIRD) technology. The detector was originally developed in the mid-wavelength infrared by the JPL Infrared Photonics Group for an external government sponsor.

Under other government-sponsored programs, the technology was further developed for the long-wavelength infrared as well as in the mid/long-wavelength dual-band infrared detectors and disseminated to U.S. infrared industry along with the mid-wavelength HOT-BIRD.

The organization noted that the JPL Infrared Photonics Group is now actively engaged in long-wavelength infrared and very long-wavelength infrared HOT-BIRD development for Earth and planetary infrared imaging applications supported by the NASA ROSES, ACT and PICASSO programs.

HOT-BIRD team members are David Ting, Alexander Soibel, Arezou Khoshakhlagh, Linda Höglund, Sam Keo, Sir Rafol, Cory Hill, Anita Fisher, Edward Luong, John K. Liu, Jason Mumolo, Brian Pepper, and Sarath Gunapala from Section 389.

The award will be presented at the committee's mid-March meeting in Gaithersburg, Md.

# Letters

I would like to thank everyone for their expressions of support and sympathy upon the illness and passing of my father, George Mooradian. He was a remarkable teacher at Pasadena High School, and a beloved person to all who knew him. He almost made it to 90 years old, and it wasn't nearly enough. His life of honor, wisdom and love will always be my guide and make me proud to be his daughter. Thanks to JPL for the beautiful plant. It brings great comfort, as ever.

Lori Mooradian Brown

In this time of deep sorrow, it is comforting to know I have so many friends at JPL. I am honored to work at such an extraordinary place. After the sudden passing of my brother on Dec. 16, a ray of sunshine came from JPL in the form of a beautiful plant. Thank you is hardly adequate to express my heartfelt gratitude!

Melissa L. Brown

# Classifieds

Ads submitted Jan. 27-Feb. 2.

## For Sale

COMPUTER, Acer 14" Chromebook, wireless mouse, 4 GB memory, 32 GB storage, Intel Celeron quad-core processor, HD IPS display, webcam, Wi-Fi, all-day battery life, USB and HDMI ports; barely used – only 3 months old, in original box; was over \$300 new with tax at Costco; \$250 or make an offer. 626-975-5135, [salvo\\_systems@yahoo.com](mailto:salvo_systems@yahoo.com).

PET CARRIER, airline approved, quality, expandable, soft-sided, best for small or medium dog/cat, fits under front airplane seat, never used, photos available; \$30. [nuyrstar@hotmail.com](mailto:nuyrstar@hotmail.com).

## Vehicles / Accessories

'08 ACURA TL, vg condition, silver with gray interior, V6, navigation, Bluetooth, well maintained, non-smoker, service records, clean title, one owner, 157K miles, \$6,500. [viss324@yahoo.com](mailto:viss324@yahoo.com), 661-305-2898.

BIKE, Haro Metro Gomez disc brake commuter, 18" frame (medium size), newly tuned, new parts include stem, grips, handlebar and tubes; some slight scratches throughout no dents or dings, 700c tires very rare full hard suspension bike; \$250. Text 818-370-5774.

BIKE, Softride 650cc, medium sized, purchased, assembled, stored away, a rare, unique TT bike, ridden only a few times; serious offers only, I am downsizing; will come with a beam bag and larger aero water bottle, smaller water bottle, spd pedals and seat not included (I will include and install another bike seat and pedals); Rolf Vector rims, Hutchinson Carbon Comp Gold tires, stainless steel spokes, Shimano 105 dual pivot brakes, Shimano 105 dual control levers, Shimano Ultegra crankset, generic pedals, Shimano bottom bracket, 9-speed rear cogs; pickup only; \$550. Text 818-370-5774.

'17 CHEVY Camaro RS V6, showroom new condition, automatic, garnet red body, black leather

interior, loaded with nav, hud, lane alert, performance exhaust, spectrum lighting; 200 miles, showroom new and mint condition, covered and garaged, photos available; \$35.5K. Call/text Chris: 801-529-8454.

'12 TOYOTA Yaris SE, 5D hatchback, automatic, cruise control, excellent condition, one owner, 63,500 miles, \$6,900/obo. [LACRESCENTA2847@gmail.com](mailto:LACRESCENTA2847@gmail.com).

'08 TOYOTA Yaris, 4D sedan, automatic, runs well, one owner, 100,600 miles, \$4,900/obo. [LACRESCENTA2847@gmail.com](mailto:LACRESCENTA2847@gmail.com).

## Wanted

SPACE INFO/memorabilia from U.S. & other countries, past & present, for personal use (see <http://www.youtube.com/watch?v=S7PvjGp7mCU>). [mrayman@alumni.princeton.edu](mailto:mrayman@alumni.princeton.edu), 818-790-8523, Marc Rayman.

## Real Estate for Sale

LEBEC-area mountaintop retreat, spectacular views, 4 bedrooms/2 baths, 3,210 sq. ft. custom-built house on 20 acres, surrounded by vast fields of wildflowers in spring but stunning year-round; only about an hour from JPL north on I-5; includes spacious workshop or artist's studio; see <http://tours.tourfactory.com/tours/tour.asp?t=1308594&idx=1>; \$524,500. 805-358-1626 or [Robert.A.Preston@icloud.com](mailto:Robert.A.Preston@icloud.com).

## For Rent

ALTADENA condo (91001), available March; 2 bedrooms, 1 3/4 baths, security access & gated, security alarm ready, central air/heat, internet access, well maintained, carport parking (#2), nice closet organizers, kitchen w/marble floors, washer/dryer, den, fireplace, patio w/garden and hot tub, community pool and more, you pay utilities, trash excld., \$1,890/month. 626-798-6185.

ALTADENA (91001), available March, furn. room w/awesome view for lease; non-smoker to share beautiful 4-bedroom, 3-bath house across from community garden, close to local colleges, Pasadena schools, walk to JPL; utilities are included, central air/heat, internet access, near 210/134/110, bus stop, shopping, banking, entertainment, restaurants; \$820/month. 818-370-0601.

ALTADENA (91001), 2-bdrm. apt., ground floor, available March, appliances optional, freshly painted, clean, 1 bath, fireplace, good-size closets & bedrooms, carpeting TBD, tile in kitchen and bath, miniblinds throughout, carport parking and storage, laundry room on site; very close to bus stop, JPL, Odyssey Charter School, grocery stores, pharmacy, 24-hour fitness; option: \$750 share or \$1,500 rent entire apt. 818-370-0601.

ARCADIA, newly remodeled upper unit in contemporary style, walking distance to downtown restaurants, open floor plan, new kitchen, granite countertops, pantry, stainless steel appliances, space for 36" fridge w/water hookup, split system a/c and heat, washer/dryer hookups, large bedrooms w/walk-in closet, ample storage, carport, \$1,975. 626-318-9001 or [nesnas05@gmail.com](mailto:nesnas05@gmail.com).

MONTROSE, 1,000 SF, 2 bedroom – one bathroom, walking distance to free Ocean View 3 and 33 Beeline bus stop straight to and from JPL, laundry area, wood laminate floors, covered parking for two vehicles, renovated kitchen with stain-

less steel stove/refrigerator/dishwasher/microwave, A/C, private balcony, outdoor patio; available now; \$1,995/mo. Carla: 323-791-7160.

ORANGE, for lease, beautiful 4 bedrooms, 3 baths, family room, living room, ranch-style home, on corner lot with pool and spa, totally renovated in 2015; open great room/kitchen with center island, 2 sinks, laundry room, 2-car garage; close to 55 and 57 fwys, Chapman University, Cal State Fullerton, Disneyland, Honda Center, Angel Stadium and The Orange Circle; \$4,500/mo. [bettyrs@earthlink.net](mailto:bettyrs@earthlink.net) or 626-429-3677.

PASADENA, Jan. 15-June 15, 2 bedroom, furnished 2-bath home in historic Bungalow Heaven District; features include dining and living rooms, washer-dryer, enclosed backyard patio area, tree-lined street and nearby park; \$2,400 monthly. 626-376-7975 or [lumg@oxy.edu](mailto:lumg@oxy.edu).

PASADENA, furn. room in a lovely 4-bd./2-bath house, big backyard, hardwood floor, big closet, shared bathroom, kitchen/laundry privileges; 2 miles to JPL, close to public transportation; short- or long-term lease avail.; must like dogs and be very clean; \$900 + \$900 deposit. 818-960-8654.

PASADENA, furn. room in a lovely 4-bd./2-bath house, big backyard, hardwood floor, big closet, shared bathroom, kitchen and laundry privileges; 2 miles to JPL, close to public transportation; short- or long-term lease available; must like dogs and be very clean; \$900 + \$900 deposit. 818-960-8654.

SIERRA MADRE: Fully furnished, inviting bedrooms for short term (1 week @ \$250, 1-3 month @ \$900/m) rental in gorgeous eco-friendly home in quiet neighborhood. Includes access to gourmet kitchen, wifi, laundry, pool, spa, vegetable garden, mini bocce court, car parking in driveway &/or bike storage in garage, utilities included. ½ mile to shops, restaurants, JPL bus line. Email: [sierramadresue@gmail.com](mailto:sierramadresue@gmail.com). Perfect for visiting researchers or interns.

SIERRA MADRE, 2-bedroom, 2-bath apartment (1,500 sq. ft.) in a 2-level townhouse (3 units) with fireplace, dishwasher, space for dryer & washer on 2nd floor and attached 2-car garage (connected to apt.); Metro bus stop to JPL in walking distance; \$2,600 monthly; 626-233-2047, Pauli.

## Vacation Rentals

MAMMOTH, Snowcreek, 2 bd., 2 ba. + loft, sleeps 6-8, fully equip'd kitchen incl. microwave, D/W, cable TV, VCR, phone, balcony w/mtn. vw., Jacz., sauna, streams, fishponds, close to Mammoth Creek, JPL discount, no pets. 626-798-9222, 626-840-3749 or [valeriee@caltech.edu](mailto:valeriee@caltech.edu).

MAMMOTH, Snowcreek, beautiful updated condo, 2 bd., 2 ba. + loft (sleeps 6-8), near pond/meadow, new appliances, TVs, DVD players, free wireless internet, washer/dryer, no pets. 818-952-2696 or [BigMtnPrettySky@gmail.com](mailto:BigMtnPrettySky@gmail.com).

MAMMOTH, remodeled 2 bed/2 bath + loft, short walk to Canyon Lodge; Courchevel 6 features full kitchen, cable/Internet TV, DVD, Blu-Ray, wireless hi-speed Internet, 2-car garage, Jacuzzi, grill, pool; no pets. <http://Courchevel6.com>.

PALM DESERT, Waring Place community, 4 bd, 3 ba, pool, spa, BBQ, fully equipped kitchen, wireless internet, washer/dryer, photos available. 626-487-9437 or [nuyrstar@hotmail.com](mailto:nuyrstar@hotmail.com).

# Universe

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