

# Teens rule Invention Challenge

JPL contest celebrates its 20th consecutive year with student teams from near and far

By Carl Marziali

You can whiff on a wiffle ball toss — and many teams did — but the JPL Invention Challenge was a can't-miss destination for teenage engineers.

The annual contest, held Dec. 1 on the Mall, poses a low-budget, high-ingenuity problem. This year, teams had to shoot up to 10 wiffle balls into a plastic tub 20 feet away within one minute, using a handmade launcher but no human power.

Results varied from amazing to abysmal. The winning student team nailed eight of 10 tosses, shifting direction on the fly when one ball missed slightly on the right, and overshooting the last toss when a tailwind gusted.

Their device used slingshots made from surgical tubing and a plastic rod, with pint-sized ice cream containers to hold the wiffle balls.

"We had to eat a lot of ice cream," said Megan Ho, a freshman at Diamond Bar High School.

The self-deprecating humor masked an engineer's thoughtfulness. The device held five ice cream containers on five separate slingshots, because the resistance of each was calibrated to a different wind speed. A wind gauge on the device told Ho and her teammate Joshua Chou which slingshot to use.

Ho and Chou edged out second place South East High School (South Gate),



JPL engineer Paul MacNeal, organizer of the Invention Challenge, with Megan Ho and Joshua Chou of Diamond Bar High School's Project Defying Gravity team, who took first place as well as most unusual entry in the student competition. For more information on the event, visit <https://www.jpl.nasa.gov/events/inventionchallenge/2017/results.php>.

which sank seven balls, and third place Lawndale High School, with five balls and a faster time than two other teams also at five.

On the other end, a team flew to the contest from Ethiopia, only to discover that their launcher was longer than the

*Continued on page 2*

**CHALLENGE** *Continued from page 1*

rules allowed. They were disqualified but allowed to participate.

Paul MacNeal, a mechanical engineer in Section 355, started the challenge in 1998 to replace a paper airplane contest that petered out when its organizer left the Lab. The challenge is different every year, but the bar is equally low: no entry fee, less than \$50 required in materials.

Originally only JPL teams participated, but MacNeal added a category for high school and middle school students when he saw there were few affordable engineering contests.

Even today, he said, the most common competitions involve expensive robotics kits.

Asked why he has kept running the contest for two decades, MacNeal said: "I've heard so many stories, heartfelt stories, of people who didn't know what they wanted to do, got involved in an engineering type club or a robotics type club and ended up becoming engineers."

Ara Kourchians was one of those students. He competed five years running,



Directing wiffle balls into a plastic tub proved a major challenge, indeed.

starting in his last year of middle school, then through all four years at Crescenta Valley High School in Glendale.

"The Invention Challenge was a fantastic gateway into engineering," Ara said, noting that math and science instruction often lacks concrete application.

The challenge, he said, "really gave me a 'Oh, wow, we can actually use math to fire a tennis ball into a trash can'" — maybe not the most useful application for society, but an eye opener for a teenager.

Kourchians went to Cal Poly Pomona for electrical engineering, and later came to JPL. He works on expensive robotics.



Two teams from Ethiopia journeyed to JPL for the competition.

# Following the invisible light

Value of infrared proven in space exploration as well as here at home

By Mark Whalen

Lying just outside what we can see in the visible spectrum, infrared light has proven a major key to discovery at JPL.

“Infrared is so important because many molecules in the universe have infrared absorption and emissions,” said Sarath Gunapala, who leads JPL’s efforts to stay on the cutting edge of remote-sensing technology based on photonics, the technology of generating and harnessing light. “Observing infrared light is an ideal way to remotely sense other planetary bodies, their atmospheres, their minerals,” he said.

Gunapala, a JPL Engineering Fellow, manages the Infrared Photonics Group, which develops infrared detectors for cameras, spectrometers and other instruments. Over the years, through advancements in device designs and semiconductor materials, the infrared detectors have become increasingly sensitive and operate at higher temperature, making them “ideal for space,” he said.

Cost-reduction was also critical for making the devices available for wider use.

“In the early days, infrared systems were mostly available for military applications and certain NASA high-end NASA satellites,” said Gunapala. “But they cost millions of dollars. Now the same sensor can cost an order of magnitude less, enabling a big increase in applications.”

Before joining JPL in 1992, while still at AT&T/Bell Labs in New Jersey, Gunapala began working with the Quantum Well Infrared Photodetector (QWIP), a quantum mechanical device structure designed to detect mid-wavelength and long-wavelength infrared radiation.

In the intervening years, continuous

progress has led to the development of large-format focal plane arrays (arrays of receivers placed at the focus of a telescope) for a myriad of applications in the long-wavelength infrared spectrum.

Non-space applications are hot as well, providing what Gunapala called “a quantum leap in terms of technology.” Key JPL contributions have benefited such advancements as night-vision apparatus and the ability for first-aid responders to observe “hot spots” to find victims of earthquakes and other disasters. And as a result of the maturing infrared detector technology, all firefighting aircraft and helicopters now have infrared vision systems to see through smoke.

There have been multiple benefits in the commercial sector too. Gunapala noted the development of compact infrared sensors used for building maintenance to detect leaks in heating and air-conditioning units, as well as those that monitor the temperature of concrete to aid building construction. In the agriculture sector, land managers can better control their water usage via a fresh look at their fields through infrared.

“All these are coming because of miniaturization,” said Gunapala.

As a young man growing up in Sri Lanka, Gunapala developed a curiosity for nature and how the world works. His interest was boosted by a generous and kind middle-school physics teacher, who encouraged him to keep aiming higher. “He helped me a lot and pushed me to do better,” Gunapala said, “not only in physics but in other subjects as well.”

Gunapala studied at the University of Colombo and later came to the U.S. for a Ph.D. in physics at the University of



Sarath Gunapala

Pittsburgh. This year he was named a recipient of the 2018 Goddard Award from SPIE, the international society of optics and photonics, which recognizes exceptional achievement in optical or photonic technology or instrumentation. He joins an elite group of previous winners that includes former JPL directors Lew Allen and Bruce Murray and Chief Scientist Mustafa Chahine.

Gunapala’s group has established itself as world leaders. With ample opportunities for his technologists to leave the Lab to work in industry, he is particularly proud that five members who recently left JPL decided to return.

“We are very lucky to have very good people,” Gunapala noted. “Some who leave JPL are coming back not only because it’s a great place to work, but it’s a place where they can put their hearts and minds to develop neat technologies that could enable new space missions that were not possible before.”

# News Briefs



Shari Asplund receives NASA's Exceptional Public Service Medal from Acting Administrator Robert Lightfoot and Acting Deputy Administrator Krista Paquin.

## Agency honor to Asplund

In recognition of her 35-year JPL career sharing news on agency programs, retired education and public outreach manager Shari Asplund has been awarded NASA's Exceptional Public Service Medal.

Asplund was recognized for her body of work promoting the Discovery and New Frontiers programs, developing websites for each as well as a quarterly newsletter. She presented conference workshops and coordinated training for educators, taking a special interest in STEAM, adding "arts" to science, technology, engineering and math learning.

Asplund retired in February. She was nominated for the award by her former NASA program manager, David Jarrett, who worked in the NASA Management Office at JPL from 1999-2003. The award was presented in October at NASA Headquarters.

## Mountain named for Ivins

To honor his influential research on glacial isostatic adjustment, a mountain in the Antarctic Peninsula has been named after JPL Senior Research Scientist Erik Ivins.

The honor was bestowed by the United Kingdom Antarctic Place-names Committee. Mount Ivins, the most prominent mountain in a series of peaks between Fleece and Leppard glaciers, is a 4.2-kilometer-long ridge rising to about 2,000 meters, mainly snow covered but with extensive rock outcrops along the ridge and on the southwest flank.

Ivins' research focuses particularly on Antarctica's response to past and present ice-sheet change.

The new name will be added to the British Antarctic Territory Gazetteer (<http://apc.antarctica.ac.uk>) and



Erik Ivins

is available for use on all maps, charts and publications.

## FOI award to Patzert

The Radio & Television News Association of Southern California has named JPL climatologist Bill Patzert to receive the 2018 Freedom of Information Award.

Patzert, a leading expert on El Niño and La Niña, has been a key part of Southland rain and drought coverage for decades.

The award will be bestowed at the Golden Mike Awards Jan. 27 at the Universal Hilton Hotel in Universal City.



Bill Patzert

## Gulkis appointed AAAS Fellow

Astronomer Sam Gulkis has been named a Fellow of the American Association for the Advancement of Science.

Gulkis is one of 396 association members named Fellow in recognition of their contributions to science and technology, scientific leadership and extraordinary achievements across disciplines.

Gulkis, a veteran of Voyagers 1 and 2 and the Cosmic Background Explorer mission, retired in 2016 after 48 years at JPL. He is currently is a researcher on the Juno science team.



Sam Gulkis

## Letters

I would like to thank JPL for the beautiful plant sent to me after my brother, Ed, recently passed away. Moreover, I wish to express my deep appreciation to my friends and colleagues at the Lab for their thoughts and prayers after my brother's unexpected passing. These kindnesses have been a great source of support, for which I am very grateful. Thank you.

Norm Lay

## Passings

Michael Urban, 64, a retired engineer, died July 15.

Urban joined JPL in 1992. He contributed to the Voyager mission as well as the International Space Station mission in Virginia. He later was a system administrator for the Tropospheric Emission Spectrometer's ground data system team. He retired in May 2017.

He is survived by his wife, Carol, and children Joy and Keith.

Retiree M. Joseph Cork, 79, died Aug. 19.

Cork was first introduced to the Lab as a detailee doing propulsion work when the U.S. Army sent him to JPL to serve his active duty commitment from 1961 to 1963. He officially joined JPL in 1965 in the Propulsion Division.

Among the projects Cork contributed to were Voyager, Mariner 71, Ulysses and Galileo. He served as a NASA detailee in Washington, D.C. in 1976-77, and finished his career in the Flight Projects Office and the Office of Engineering and Mission Assurance. He retired in 1998.

Cork is survived by his wife, Jo Ann, son Mark, daughter Wendy Cork Keyzer and three grandchildren.

# JPLers contribute almost a half-million dollars

To aid homeless families in need of permanent housing, job placement and better educational opportunities, JPLers donated \$476,954 to the recently completed United Way campaign.

The total was about \$7,900 more than last year's drive.

Employee participants this year numbered 1,386, a 2% decline from 2016.

Beyond the generosity of staff at the annual holiday drive, many JPLers offer their time to United Way year-round as local board members or ambassadors.

Through her involvement with United Way, Airborne Snow Observatory Project

Manager Judy Lai-Norling became an ardent advocate of preventing homelessness in Los Angeles County, particularly programs such as the coordinated entry system to quickly and efficiently match people to available housing and permanent supportive housing for the chronically homeless.

"Being involved with the United Way also gives me opportunities to volunteer for cross-cutting educational programs including the Young Civic Leaders Program and Linked Learning showcases," said Lai-Norling, who has worked with United Way for seven years as a member

of the Emerging Leaders Council and the Women United Cabinet and Community Impact Cabinet.

"United Way is the premier charity organization in the Los Angeles area, making a critical impact on homelessness, education and veteran employment," said JPL Deputy Director Larry James. "They support worthy charities in every community around JPL, and provide opportunities for us to give back throughout the year. Thanks to everyone at JPL who raised our giving this year — it has a major impact in the lives of those less fortunate."

## Classifieds

Ads submitted Nov. 27-Dec. 6

### For Sale

**BIKE TRAINER SET**, CycleOps wind indoor trainer and stackable climbing block, like new, \$100. Redgordon2@gmail.com.

**PET SUPPLIES**: air-travel carrier for dogs & cats, airline approved, quality, expandable, soft-sided, best for small/medium pet, fits under front airplane seat, never used, \$30; bed, aqua colored, approx. 19" L x 25" W x 7" H, rarely used, photos avail.; \$12. nuyrstar@hotmail.com.

**PIANO**, Baldwin "Howard" Spinnet, 36" x 57" x 23, good shape, perfect for a beginner or occasional player; been in our home for almost 20 years and we are upgrading to a larger piano; easy access for moving; \$80. Redgordon2@gmail.com.

**STAR TREK FIGURES**, large collection; from original series, Next Generation, Deep Space 9 and Voyager, all sold as one lot; best offer. 626-305-9456.

**WASHER/DRYER**, moving so need to sell, 1-year-old GE W & D used only once per week, perfect condition and working order; washer model #GT-W330ASKWW, gas dryer model #GTX33GASK-WW; original cost near \$1,100, sell both for \$650, can deliver local for extra charge of \$50. Call or text Steve: 626-714-8752.

**WASHER/DRYER**, used, GE Electric Stacked Laundry Center w/2 cu ft. washer and 4.4-cu ft. dryer in white, 2.5 years old but gently used by only one person, still working great; see <https://www.lowes.com/pd/GE-Electric-Stacked-Laundry-Center-with-2-cu-ft-Washer-and-4-4-cu-ft-Dryer-White/50442486>; pickup is in Glendale near GCC; \$800/obo. moragthescot@yahoo.com.

### Vehicles / Accessories

'09 VW CC Sport, silver, very clean, 116K miles, asking \$4,100. robtoaz@gmail.com.

### Wanted

**BOY SCOUT MEMORABILIA** – patches, kerchiefs, woggles, etc., paying cash. Greg: 909-969-4580 or 909-948-9595.

**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, 818-790-8523, Marc Rayman.

### Real Estate for Sale

**NE ALTADENA**, beautifully maintained home w/ guest house; front house: 4 beds + 2 baths, back house: 2 beds + 2 baths; sep. yards and covered patios for each; \$1,198,000. Samuel Darahdgian: 818-512-0622 or text, Samuel@aaroe.com.

### For Rent

**ALHAMBRA**, 1808 S. 8th St.; 2 bedrooms, formal living + dining rooms, 2-car garage, large gated-enclosed yard, 20 minutes from JPL; tenant pays all utilities, \$2,300/mo. 626-616-6511, Lorenzo.

**PASADENA**: master bedrm. w/¾ bath in 3-bed/2-bath house shared w/2 other JPLers (one only there 2 nights/week) and 1 small dog, likes other cats and dogs (pets welcome); fenced backyard w/citrus trees, washer/dryer, gas stove, wood fireplace, central air, hardwood floors, ample storage, off-st. parking, 18 min. to JPL; \$1,255, includes gardener, utilities separate. Emily: 626-765-1207, emily.leylek@gmail.com.

**PASADENA**, room in lg. 4-bd. house in the Hastings Ranch area; other tenants are late 20s, early 30s JPL employees; walk to Trader Joe's, Whole Foods, Metro Gold Line; home includes 2-car garage, basement, backyard w/fruit trees, and an outdoor patio w/ private entrances to each room; \$1,050/mo. 818-458-4200. mattabramit@gmail.com.

**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.

### 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.

**MAMMOTH**, Snowcreek, beautiful updated condo, 2 bd., 2 ba. + loft (sleeps 6-8), great location by pond/meadow, new appliances, TVs, DVD players, free wireless Internet and washer/dryer, no pets. 818-952-2696 or 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, Jacuzzis, 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.

Universe

Editor

Mark Whalen

universe@jpl.nasa.gov

Universe is published by the  
Communications and Education  
Directorate of the Jet Propulsion  
Laboratory,  
4800 Oak Grove Drive,  
Pasadena, CA 91109.