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Girls Who Code learn the JPL language

Computer literacy program brings high schoolers to Lab for talks on topics from admissions to skycranes

By Mark Whalen

Summer school was in session for a group of precocious teenage girls who visited JPL in late July.

They've been studying computer science. But now they also have a feel for what real technology and science jobs are like.

About 25 high-schoolers participating in Girls Who Code, a nationwide STEM program aimed at encouraging girls to pursue careers in technology, toured several areas on Lab and met many JPLers.

"The girls wanted to know if the programming language they're learning this summer was used at JPL, and found out that indeed we do use Python along with other languages," said Vandi Verma, a robotics technologist in the Robot Operations Group. "We discussed how in the long run it's not learning specific syntax—but understanding the fundamental principles of programming—that makes it easy to pick up a new language and enjoy creating elegant software."

"I was expecting questions about coding, and working as a programmer, but they wanted to know much more," said Maddalena Jackson, a software systems engineer in the Mission Control Systems Engineering and Software Architecture Group.

Jackson and the girls discussed Europa Clipper—one of her projects—as well as college admissions and how she ended up at JPL.

Software systems engineer Maddalena Jackson talks to Girls Who Code visitors.

On the subject of coding, her favorite question was "about how I, an adult with a software job, find the answers if I get stuck. I was really excited to talk about that because I remember being new to coding and how intimidating it was—and sometimes still is—to have a question but it seems like everyone else already knows all the answers, especially when you look around and don't see a lot of people like you."

"So it was fun to pull back the curtain a little and talk about how effective Googling is a necessary skill for developers," she added.

The group toured the Ops Lab in Building 301, witnessed a demonstration of RoboSimian, a JPL-developed apelike robot that can map its environment in 3-D, and visited with Cassini engineers at the Space Flight Operations Facility.

Mars Exploration Rover Project Manager John Callas joined Verma, Jackson and other JPLers who spoke to the visitors during a lunch break.

"I told them what I tell many young people," said Callas. "Follow your passion. You will be at your best when you enjoy what you do. If you love what you do, you'll never work another day in your life."

Callas urged the girls to tackle the hard problems. "Those will be the ones worth solving," he said. "Anyone can do the easy ones. Anyone can write the next social networking app. But, how do you land a rover on Mars with a skycrane?"

The networking lunch included a briefing on internships. "Many of the girls ex-

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Lab team wins international mission design challenge

It's JPL's fourth victory in nine years in the Global Trajectory Optimization Competition

By Carl Marziali

JPL started way behind and wound up far ahead in the ninth Global Trajectory Optimization Competition, an annual race to solve a complex navigation challenge.

One of nearly 70 teams in the competition, the JPL group spent a good week of the month-long contest trying to understand the problem, while watching in disbelief as other teams posted solutions on the public leader board almost immediately.

The problem was garbage, literally. Teams had to figure out how to clean up ("deorbit") 123 pieces of debris in space around Earth.

The cheapest solution would win. And fast solutions had a decided advantage.

NASA scientist Donald Kessler showed almost 40 years ago that debris in low-Earth orbit could cause a chain reaction of impacts to spacecraft. The faster the debris can be removed, the lower the odds of catastrophe.

To account for the Kessler effect, the cost of launching a mission went up every day. JPL was off to an expensive start.

Also unnerving was the Twitter chatter (with #GTOC9) from the other teams: "Tsinghua breaking away, as JPL enters the field, Who needs football, when you've got a live #GTOC9 leaderboard?!"

The JPLers had realized early on that their existing trajectory software could not solve the whole problem. They decided to write new programs and tools from scratch, mostly when they should have been sleeping.

The Chinese team from Tsinghua University got right to it.

"They deorbited all 123 objects on the fifth day. We had no idea how to effectively deorbit more than a handful at that point. That gave us a small panic," said Nitin Arora, a systems engineer in Mission Concepts Development Group (312A).

Front row, from left: Juan Senent (Group 392P), Nitin Arora (312A), Try Lam (392M), Gregory Lantoine (392M), Frank Laipert (392C). Back row, from left: Anastassios Petropoulos (392M), Daniel Grebow (392M), Jeffrey Stuart (392K), Jon Sims (392M), Javier Roa (392R-Caltech), Austin Nicholas (312E), Damon Landau (312A), Thomas Pavlak (392D), Nicholas Bradley (392J). Not pictured: Drew Jones (392A), Tim McElrath (3920), Ralph Roncoli (3920), David Garza (392D), Zahi Tarzi (392J), Eugene Bonfiglio (3445), Mark Wallace (392D).

But while the Chinese had the world's most powerful supercomputer, and a national competition held for the purpose of training teams for GTOC, the Americans had the Lab's best.

"Having the ingenuity at JPL and the creativity of the people around JPL on our team was really important," said Arora. "They were able to craft solutions which the computer never found.

"We were confident that even if the difference in launch costs was 10 million from the start to the end date, if you find a solution that was substantially better, it doesn't matter. Because the solution with which we won was submitted on the last day."

The team's best solution proposed 10 separate clean-up missions, in total $100 million more expensive than if submitted a month earlier.

But it was still more than $50 million cheaper than the runner-up in the competition.

The JPL team finished checking its best solution 15 minutes before the 3 p.m. upload deadline on May 1. Then, the competition server went down for reasons unknown. The team filed by email, and after two hours of uncertainty, were recognized as the winners.

Team leads Anastassios Petropoulos and Daniel Grebow presented the team's work at the GTOC9 Workshop held in June at the 2017 International Symposium on Spaceflight Dynamics in Matsuyama, Japan, and accepted both the traveling GTOC trophy (an artistic design based on JPL's winning trajectory in GTOC1) and the permanent GTOC9 trophy at the conference awards ceremony.

The contest brings more than bragging rights. Tools developed to solve the GTOC problem could be used in planning trajectories for future JPL missions.

Established by the European Space Agency in 2005, the GTOC competition aims at advancing new algorithms and techniques to solve large global trajectory optimization problems.

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Solar power adds to Lab's renewable-energy use

By Leslie Mullen

JPL's solar panels generate power for two buildings, and there are plans to add more solar panels to the Lab soon.

The Project Formulation building (301) and the Microdevices Lab (302) have solar panels that generate power for each building's use. The solar panels are part of a larger effort for JPL to meet mandated standards for federally-owned facilities to increase their use of renewable energy.

Building 302's solar panels were installed first, in 2007. That system was meant to be a test case, and thus is a smaller, 30-kilowatt system. The solar panels on Building 301, installed last year, is a larger 300 kilowatt system, generating 10 times the power of 302.

Building 301's solar power generation can be seen here: *https://minisite.alsoenergy.com/Dashboard/2a566973506447484541304b772b71513d.*

Steve Rigdon, the Lab's facilities energy manager, says JPL now has the funding to build solar panels on top of the parking structure (Building 349). That will be JPL's largest solar power structure yet, a 1 megawatt system, and the power it generates will feed the Lab's electrical grid. Rigdon expects construction on the parking structure solar panels will begin within the next year, and could take up to a year to complete.

Visit JPL Tube [*https://jpltube.jpl.nasa.gov/Watch=x9uqgv*] for a video about the solar panels.

The amount of power generated by the solar panels waxes and wanes depending on cloud cover and other factors. For instance, they'll be affected by the upcoming partial solar eclipse on Monday, Aug. 21, from about 9 a.m. to noon. Because the Sun will be obscured up to 62 percent in Southern California, the power output of the solar panels will drop during that time.

GIRLS WHO CODE *Continued from page 1*

pressed interest in an internship or future employment at JPL," Verma said.

"I think it's important for us to reach out to students, since it can spark a lifelong passion for the work we do here," she said. "So I try and make time for it."

The girls were joined by their teachers and AT&T sponsors during their visit to the Laboratory. The group represented an El Segundo–based Girls Who Code summer immersion program.

Employees interested in participating in next summer's event are urged to contact the organizers: Rhiannon Conrado (staff assistant in the Guidance and Control Section), Lan Dang (scientific applications software engineer in the Instrument Software and Science Data Systems Section), Cristina Sorice (robotics systems engineer in the Mobility & Robotics Systems Section).

DESIGN CHALLENGE *Continued from page 2*

This was JPL's fourth victory in nine years. The next four teams on the leaderboard (*https://kelvins.esa.int/gtoc9-kessler-run/leaderboard*) are all from China.

JPL has competed in the GTOC six times and has hosted it three times.

The JPL team comprised Anastassios Petropoulos, Daniel Grebow, Nitin Arora, Eugene Bonfiglio, Nicholas Bradley, David Garza, Drew Jones, Frank Laipert, Try Lam, Damon Landau, Gregory Lantoine, Timothy McElrath, Austin Nicholas, Thomas Pavlak, Javier Roa, Ralph Roncoli, Juan Senent, Jon Sims, Jeffrey Stuart, Zahi Tarzi and Mark Wallace.

The team included individuals from three divisions, highlighting the multidisciplinary teamwork involved and building connections between disparate parts of the Lab.

News Briefs


Bonnie Buratti


Erik Ivins


Ron Kwok

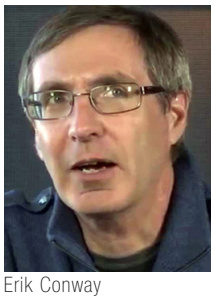
AGU honors JPL researchers

The American Geophysical Union last month recognized five JPLers for exceptional contributions and service to the scientific community.

Among the 61 members of the 2017 class of Fellows were JPL's Bonnie Buratti, a senior research scientist and supervisor of the Asteroids, Comets & Satellites Group; Erik Ivins, a scientist in the Sea Level and Ice Group; and Ronald Kwok, a scientist in the Radar Science and Engineering Group.

In its citation, the AGU recognized the Fellows for eminence in the Earth and space sciences, and for remarkable and often groundbreaking contributions. Only one in a thousand AGU members are recognized as Fellows any given year.

The AGU also honored JPL historian Erik Conway with the Athelstan Spilhaus Award, and Hook Hua, a data scientist in the Architecture and Systems Engineering Group, with the Charles S. Falkenberg Award.

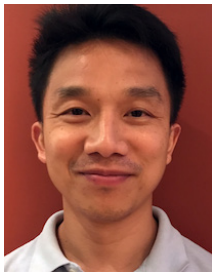

Erik Conway

They were among 29 award recipients in the AGU Honors Program, which recognizes work that embodies AGU's mission of promoting discovery in Earth and space science for the benefit of society.

"Their passion, vision, creativity and leadership have helped to expand scientific understanding, pave the way to new research directions, and have made Earth and space science accessible, relevant and inspiring to audiences across the scientific community and general public," the AGU said in its announcement on July 20.

Recipients in the AGU Honors Program come from varied backgrounds and professional stages—from science to journalism, from early career to senior scientist.

The AGU honorees will be feted at the organization's fall meeting Dec. 13 in New Orleans.


Hook Hua

Raincube technology paper authors honored

Five JPL researchers who co-authored a journal paper on an enabling technology for the Raincube cubesat mission have won the 2017 IEEE Antenna and Propagation Society's Sergei A. Schelkunoff Best Journal Paper Award.

Nacer Chahat, Richard Hodges, Jonathan Sauder, Eva Peral and Yahya Rahmat-Samii authored "CubeSat Deployable Ka-Band Mesh Reflector Antenna Development for Earth Science Missions." The technology has been patented and was licensed by a commercial company for use in low-Earth orbit, high-data-rate communication systems. The paper highlights the different radio frequency innovations enabling the use of deployable mesh reflectors at Ka-band.

The award is presented to the authors of the best paper published in the IEEE Transaction on Antennas and Propagation during the previous year, among thousands of papers. The award was presented July 12 at the Antenna and Propagation Symposium in San Diego.

Five named JPL Fellows

Five JPLers have been appointed JPL Fellows, the top of the Laboratory's individual contributor career ladder, recognizing those who have made extraordinary technical and institutional contributions to JPL over an extended period of time.

The honorees comprise experts in infrared astronomy, science systems engineering, electric propulsion, tunable laser spectrometers, and mechanical systems engineering.

The five selections are the consensus outcome of a rigorous process that included current JPL Fellows, management representatives from the directorates, and a subgroup of the Executive Council.

The honorees:

Charles Beichman: For pioneering contributions to infrared astronomy and for leadership in the development of new instrumentation for precision radial velocity measurements, advancing NASA's capabilities to identify Earth-like exoplanets.

Riley Duren: For extraordinary leadership in the emerging field of science systems engineering, and for serving as a principal investigator and leading thinker in programs advancing global climate change awareness.

Dan Goebel: For seminal work in conceptualizing, implementing and troubleshooting electric propulsion technology for NASA missions, such as Dawn and Psyche, and serving as a JPL expert in other emerging mission technologies, including microwave sources, advanced plasma sources, high voltage engineering, and ultra-linear traveling wave tube amplifiers.

Donald Sevilla: For leadership in mechanical systems engineering, keeping JPL mechanical design principles and flight project practices at the forefront of the industry.

Chris Webster: For pioneering the development of tunable laser spectrometers in flight and robotic missions, leading to the commercial transfer of a technology that has revolutionized the real-time detection of gases and isotope ratios in diverse environments.

Tompson is Fellow honoree

Sara Tompson, manager of the Library, Archives & Records Section, was recently inducted as a Fellow in the Special Libraries Association.

SLA President Dee Magnoni of the Los Alamos Library presented Tompson and the other new Fellows with the honor at the SLA conference in Phoenix in June. Tompson was one of 12 librarians nationwide to be recognized.

Tompson has been at JPL for four years and has been an SLA member for 26 years. She is currently president of the SLA SoCal Chapter.

Letters

On behalf of my family and myself, I want to thank my JPL friends and colleagues for their thoughts and prayers at the passing of my father, Ralph Atkins, on July 1, 2017. He lived a full life and was just 6 months short of reaching his 100th birthday. Thank you also to JPL for the beautiful plant sent to my home.

Linda Scott

I would like to thank my colleagues for their condolences and kind thoughts on the recent passing of my Mother at age 96. It was reassuring to have so many supportive friends to help me get through this difficult time. Thanks also to the Acquisition Division for the beautiful plant, cards, and to several colleagues for covering my contracts while I was away in Tennessee.

Marty Scarbrough

Passings

Gordon Neiswanger, 90, a retired business administrator, died July 3.

Neiswanger joined JPL in the early 1950s, left the Lab for about a decade, and returned to contribute to projects such as Voyager and Galileo. He also served as an assistant to JPL Deputy Director Alvin Luedecke. Neiswanger retired in 1989.

Neiswanger is survived by his wife, Marj, and children Kathy, John, Ann and Laura; nine grandchildren and a great-grandson.

Classifieds

Ads submitted July 29–Aug. 4.

For Sale

FOOTBALL TICKETS: Rams vs. Chargers, Aug. 26, 5 p.m., $130; Rams vs. Redskins, Sept. 17, 1:25 p.m., $200; Rams vs Texans, Nov. 12, 1:05 p.m., $175; price is for 2 seats, visitor side, Section 25L, Row 79, seats 4-5; all games at L.A. Coliseum, possible row of 4 seats for certain games. 626-216-2160, Wayne.

LEATHER SECTIONAL, excellent condition, soft beige, not used much, seats 6, $499. 909-953-5027.

Vehicles / Accessories

'02 ACURA TL, black (some paint issue), runs well, 140K miles, $2,500/obo. Text 818-439-3094 or ynglin@yahoo.com.

JEEP Wrangler windows, MOPAR soft top, (sides only) in black, dark tint, great condition, barely used, $150/obo. Text 724-288-3976.

'10 KAWASAKI Ninja 250 Red/Black Special Edition, ~1,500 miles, garage kept, low miles, was used mainly for school commuting, also have men's medium riding and safety gear; clean title, reg. good till July 2018; pictures: https://losangeles.craigslist.org/lac/mcy/6244462594.html; $3,000/obo. Call/text 951-454-9916.

'04 SUBARU Impreza Wagon WRX, a very fine auto that has been carefully taken care of by my family since 2004; five years ago a new motor was installed, recently new air conditioning equipment, a radiator and new battery; the 108,000 miles is misleading, with the new motor the car will easily be good for another 100,000 miles; only reason I am selling it is that I have a poor left knee and constant clutching is painful; $7,500. Gordon Hazlitt: painter220@sbcglobal.net, 626-584-9034.

Wanted

SPACE INFORMATION/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.

For Rent

DUARTE, North Fish Canyon neighborhood, nestled under San Gabriel foothills; 1,555 sq. ft. single-level family home, open floor plan offers 3 bedrooms/2 baths, formal living/dining area, family room w/fireplace that opens to a spacious kitchen, with new quartz counter tops & recessed lights & new kitchen sink, microwave and refrigerator included, large backyard, 2-car garage; close to Foothill Gold Line, award-winning Valley View Elementary school, parks & trails; owner pays for gardener, tenant pays water, trash, electric, gas; see http://matrix.crmls.org/matrix/shared/P1R58vK9ncGd/3329ShadylawnDrive .

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.

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.

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Universe

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