

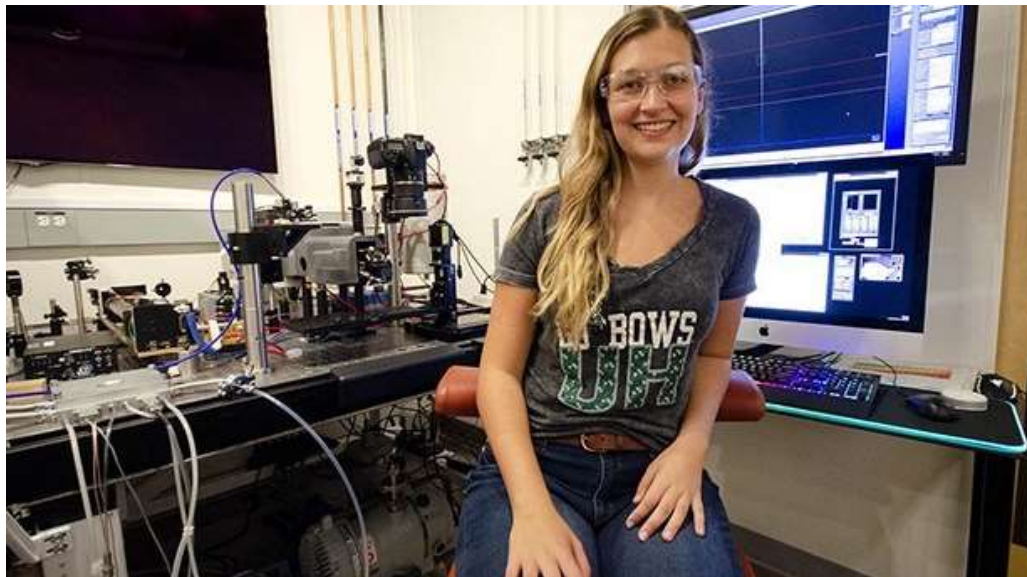


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STARS Alumnus Interns at NASA-JPL to Help Search for Life on Mars

MESSAGE FROM THE DIRECTOR



Rodrigo Romo

Above: University of Hawai'i at Mānoa undergrad Schelin Ireland at her NASA-JPL workstation where she ran tests on SHERLOC. Photo: NASA-JPL-Caltech/Kim Orr.

Aloha kākou,

I want to start this month's letter by extending a warm welcome to two new Board members. Dr. Kim Binsted is returning to the Board after a one-year fellowship in Washington, D.C. and Dr. Rachel Solemsaas, Chancellor of Hawai'i Community College, is a new addition. Together, we look forward to setting the path for PISCES over the next few years and strengthening our relationship with the community college.

A UH Mānoa geology and geophysics student and STARS program alumnus spent the summer helping NASA prepare a life-hunting instrument for its upcoming Mars 2020 rover mission. Schelin Ireland of Kailua-Kona [interned at NASA's Jet Propulsion Laboratory](#) in Pasadena, California as part of a team working on SHERLOC, or the Scanning Habitable Environments with Raman & Luminescence for Organics & Chemicals instrument.

inorganic materials that will help researchers interpret the data they get back once the Mars 2020 rover arrives on the Martian surface.

During her internship—provided through Hawaii Space Grant—Ireland tested the prototype version of SHERLOC in the lab, making calibrations to prepare its successor for launch next summer. She also applied her geology knowledge to compile a database of organic and

SHERLOC will be the first instrument of its kind on Mars capable of detecting and extracting data from microscopic particles in search of life on the Red Planet. Up until now, NASA's Curiosity rover has been using infrared spectroscopy to study the Martian surface. In contrast, SHERLOC uses UV Raman spectroscopy, beaming a laser at samples of interest to seek out signs of biological life—now or in the past.

Ireland's internship—supported through a Hawai'i Space Grant—was right in line with her future goals.

(Cont. on page 3...)

In other news at PISCES, two students we mentored have been working with NASA: Schelin Ireland, a STARS program alumnus interned with NASA-JPL this summer through the Hawai'i Space Grant, and Aaron Roth, a two-time summer who worked on our planetary rover Helelani. *(Cont. on page 3...)*

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PISCES Sintere XL Basalt Tiles for Commercial Testing



Above: A sintered basalt tile measuring 13" x 13" x 1.5" is the largest basalt product created by PISCES so far. The 15-lb. block was made using no additives—just basalt and heat.

As part of an applied research project to develop sustainable construction materials using volcanic basalt, PISCES has sintered its largest basalt tiles yet using only heat and rock dust.

Last month, the PISCES team created two extra-large tiles for an investor interested in commercializing the material. They measured 13" by 13" and 1.5" thick. Due to their high thermal conductivity, the tiles could be used in kitchen ovens and are anticipated to prevent heat loss and improve energy efficiency. In July, PISCES provided more than two-dozen smaller versions of the tile to the same investor for a series of durability tests. The results will be published soon.

PISCES has been researching sintered basalt for ISRU (in-situ resource utilization) since 2015. The product has potential applications for both Earth and space, especially on the moon and Mars.

Binsted and Solemsaas Join Board of Directors



Above: UH Mānoa Professor Kim Binsted (left) and HawCC Chancellor Rachel Solemsaas. Courtesy photos.

PISCES is welcoming two new members to its Board of Directors. Rachel Solemsaas, Chancellor of Hawai'i Community College, and Kim Binsted, Professor of Computer Science at the University of Hawai'i at Mānoa, joined the Board last month.

Solemsaas has been the Chancellor of HawCC since July 2016 and serves as the chief executive officer for the college, and as an officer

for the University of Hawai'i system. She has nearly 30 years of public service and leadership experience, previously working with community colleges in Nevada and Washington. Solemsaas also serves as a member of the Hawai'i County Workforce Development Board, the Hawai'i Island Chamber of Commerce and the East Hawai'i Community Partnership HUI. She received her PhD in higher education with an emphasis on community college leadership from Washington State University in 2012, a Master's in Public Administration from University of Washington in 2002, and a Bachelor's of Science in Accounting from De La Salle University in 1982.

Binsted is a returning member who left the PISCES Board in September 2018 to pursue a fellowship program in

Washington, D.C. As a researcher, she formerly served as the Principal Investigator for the Hawai'i Space Exploration and Analog Simulation (HI-SEAS) on Mauna Loa—a NASA-funded study investigating the psychological effects of long-term isolation on humans for space settlement. Binsted previously worked for the Canadian Space Agency from 2009 to 2010 as a program scientist. She also founded a consulting agency in artificial intelligence in 2000. Binsted received her PhD in Artificial Intelligence from the University of Edinburgh in 1996 and a Bachelor's in Physics from McGill University in 1991.

Solemsaas' and Binsted's appointments will be confirmed at the upcoming Hawai'i legislative session in January.

DIRECTOR'S MESSAGE (Cont...)

Aaron is now working at JPL as part of the team of computer engineers that processed a series of haunting images recently captured by the Curiosity rover.

These stories are very encouraging and I'm happy to learn of the successes that our local students are enjoying. We will continue providing students with opportunities to apply their learning and that develop skills and connections that will help launch them into exciting careers. This is an integral part of our workforce development objective at PISCES.

Among our own staff, our geologist Kyla Edison continues to receive praise for her basalt research and it appears that it will lead to a collaborative agreement with a renowned university.

I wish everyone a safe and happy holiday season as we move into the new year.

A hui hou,



Rodrigo Romo
Program Director

Applications Open for 2020 Akamai Internship Program



PAID POSITIONS Available for UNDERGRADS in STEM Majors

Advancing the next generation of Hawai'i's science, engineering & technology professionals



The Akamai Workforce Initiative has announced it is now accepting applications for the 2020 Akamai Internship Program. Akamai provides hands-on professional work experience to undergraduate STEM students at a variety of science and technology companies and organizations. Students are placed at a company or astronomical observatory on Maui, Hawaii Island or at TMT in California, and complete a high-tech

Project with guidance and mentoring from an engineer or scientist. Participating students also get the opportunity to advance their communication skills during the internship. The program received national recognition last year for its efforts to meet local workforce needs in astronomy, remote sensing and other related industries. To learn more or to apply, visit www.akamaihawaii.org.

Former STARS Student Helps Search for Life on Mars (Cont...)

In a NASA interview, she said she aspires to be a planetary scientist and astronaut. Ireland graduated from the same school that Hawai'i's first astronaut attended—Konawaena High School (KHS).

"One thing that inspired me when I was in high school was knowing that I attended the same high school as Hawai'i's first astronaut, Ellison Onizuka," she said in the interview. "It would be an honor to follow in his footsteps and become Hawai'i's first female astronaut."

While a student at KHS, Ireland attended the PISCES [STARS \(STEM Aerospace Research Scholars\) program](#)—a hands-on summer workshop to encourage young women to pursue STEM careers. The program's activities included an overnight stay on "Mars" at the Hawai'i Space Exploration and Analog Simulation (HI-SEAS) habitat on Mauna Loa and a mock rover mission with PISCES' planetary rover, Helelani.

The staff at PISCES is thrilled to see Ireland moving toward her dreams and contributing to the next big Mars mission. Congratulations!



Above: Schelin Ireland (left) and Marianna Oka (right—a student of Kamehameha Schools' Kapalama campus), suited up for a space walk outside the HI-SEAS habitat on Mauna Loa during the 2015 PISCES STARS Program.

An Eerie View of Mars: Capturing Images with the Curiosity Rover

By: Aaron Roth, Computer Systems Engineer, NASA-JPL



Above: An image of Central Butte inside Gale Crater on Mars captured by NASA's Curiosity rover. *PC: NASA/JPL-Caltech.* **Below:** Aaron Roth at his workstation at NASA-JPL. *Courtesy photo.*

Aaron Roth is a Waiākea High School graduate and former PISCES intern who developed the stereoscopic imaging system on the Helelani planetary analog rover. After receiving his Bachelor's in Computer Science from Arizona State University in May 2019, Aaron accepted a position at NASA's Jet Propulsion Laboratory in Pasadena, California, working on the imaging systems for NASA's Curiosity rover.

The image shown above is one of 24 captured by the Mars Curiosity rover during the dust devil panorama survey. The survey took three images in eight different locations on the Martian surface in the hopes of capturing a dust devil.

I sent the command to take this image during my Engineering Camera Payload Uplink Lead (ECAM PUL) shift at NASA-JPL. During this shift, scientists and PULs managing all the instruments aboard Curiosity get together to plan and send commands to the rover. There are 12 engineering cameras on Curiosity: four Navigational Cameras (navcams),

four Front Hazard Cameras and four Rear Hazard Cameras. The navigational cameras can be used for science (e.g. dust devil surveys), navigation (drive direction imaging) and documentation (rover part imaging). The hazard cameras can also be used for science and navigation, but they're mostly used to make sure the rover isn't in a hazardous position and about to slip or something.

Camera temperatures, sun position and image compression are some of the many factors I have to consider when taking ECAM images. Just like ECAM, each instrument comes with its own factors to consider. The PULs for each instrument need to make sure their instrument can optimally execute the plan that scientists set out for the rover. Some shifts feel like one big game of twister where you have to adjust the schedule to satisfy one of your constraints, but in a way that doesn't get in the way of another instrument's constraints. When all the planning is settled, the commands get sent to the rover and images come back.

Another part of my job is the Payload Downlink Lead (ECAM PDL) and Operational Product Generation Subsystems (OPGS). If ECAM PUL is throwing, ECAM PDL is catching. With ECAM PDL, we make sure that all the commands we send to the rover are executed as expected, and all the images we expect are received. Using the images we receive, OPGS creates products like meshes and mosaics so the people in charge of navigation know where the rover is and where they want to go. This is how we pieced together that "haunting" image I took on Mars.

