PISCES
Pacific International Space Center for Exploration Systems

Issue #7 Volume #5

PISCES HAWAII

Message from the Program Manager

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Rodrigo Romo

Aloha Kakou,

The summer has started at full speed here at PISCES and we are excited to mentor and supervise five hardworking interns who are tackling projects in two different tracks.

The interns are grouped into two teams: Robotics and Materials Science. The robotics team consists of two students from Hawai'i Community College and one from Arizona State University. This trio will be upgrading our Helelani planetary rover's entire avionics system; installing a new on-board computer; optimizing the electronics; restoring the CAN Bus data and telemetry; upgrading the GPS and navigation system; and most exciting of all, integrating a stereoscopic imaging system to create 3D images and adding a LIDAR for 3D mapping and autonomous navigation capabilities. The team has already made huge advances in this effort.

The Materials Science group is led by returning intern and UH Hilo graduate Kyla Defore, supported by Waiakea High School graduate and previous STARS student Lily Leyva. Together, they are working to research and develop an ISRU technology project that has received a joint NASA STTR grant between PISCES and Honeybee Robotics.

I am pleased to report that our 2017 Women's STARS Program was a huge success. We hosted our largest program yet with 11 high school girls from all over Hawaii Island. We received overwhelmingly positive feedback from the students about their week-long experience, and are looking for ways to improve and expand the summer STEM workshop next year.

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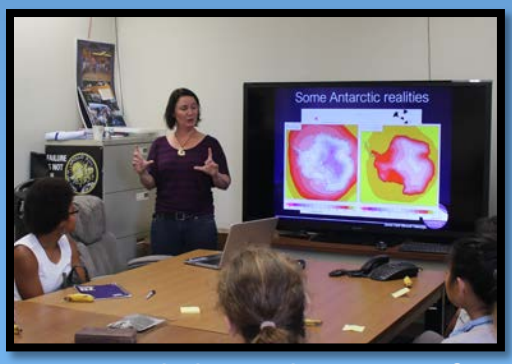
ISSUE 7 - JULY 2017

In this Issue:



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Workforce Development

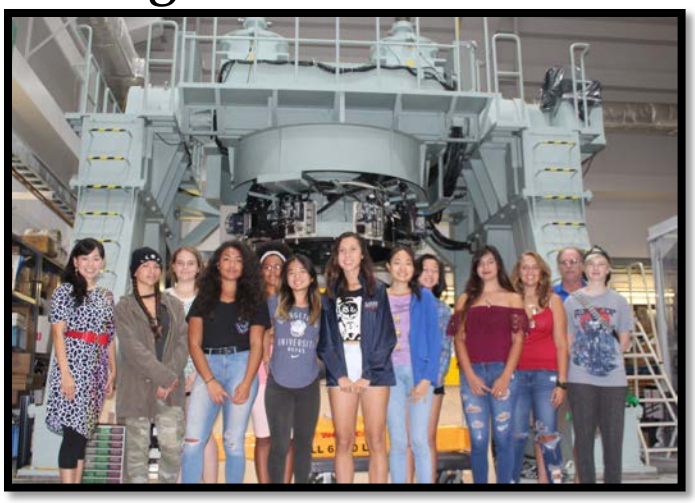
Issue #7 Volume #5

STARS Program Inspires Young Women in STEM

With nearly half of the U.S. workforce consisting of women, why is it that they occupy only a quarter of STEM careers (U.S. Census Survey, 2009)? The answers to this question may be varied, but one thing is clear—young women need more encouragement and support to actively pursue and succeed in STEM studies and careers.

PISCES began the Women's STARS (STem Aerospace Research Scholars) Program in 2014 for this very purpose—to empower Hawaii's young women with the knowledge that their dreams are not only possible, but achievable. This year from June 19 to 24, we coordinated and executed the fourth and largest STARS workshop yet, drawing 11 female students from high schools across Hawaii Island for an island-wide space and science adventure packed with engaging presentations, exciting tours and hands-on activities.

"Taking part in the STARS program was such an enlightening and empowering experience for me," said Hope Kudo, STARS student and a senior at Kealakehe High School in West Hawaii. "Getting to meet female professionals in aerospace, engineering, and more has inspired me even more towards shattering the glass ceiling.



Above: 2017 STARS students toured Subaru Telescope headquarters in Hilo led by Outreach Specialist, Yuko Kakazu. The group is standing in the foreground of a machine used to test telescope instruments before transporting them to the observatory on Maunakea's summit. Lower Left: During the six-day program held in June, STARS students built and programmed robots, toured the USGS Hawaii Volcanoes Observatory, enjoyed an overnighter at the Hale Pohaku Onizuka International Center for Astronomy, and got an insider look at the CFH Telescope on Maunakea.

I was able to meet like-minded individuals that share my interests and through our shared interests, I've gained amazing friends. I was also able to network with industry professionals, gaining future help for my science fair project, senior project, and internships."

This unique program was designed with variety in mind–and to put local students in touch with successful female scientists who have faced the challenges that many women confront in the working world. The majority of the presenters were women themselves, sharing not only their work, but their stories that got them to where they are.

PISCES is extremely grateful to HTDC for their $5,000 sponsorship of the 2017 STARS program, supporting a mutually-shared goal of developing Hawaii's skilled workforce. In addition, we were fortunate to partner with an outstanding lineup of individuals and organization from around the state to make this program possible.

In addition, PISCES would like to thank Canada-France-Hawaii Telescope, Jessica Dempsey of JCMT/EA Observatory, Hawaii Volcanoes Observatory, UH Hilo's "Team Vulcan" Robotics Team, Guest speaker Alyssa Loving, Caterpillar Inc., Subaru Telescope, Pacific Aviation Museum, and all the hardworking interns and staff at PISCES who made this summer's program a memorable and enriching experience for our local young women.

Program Manager's Message Cont…

We are very grateful to the Dept. of Labor & Industrial Relations and to the High Technology Development Corporation, who made both our Internship Program and STARS Program possible this summer.

On a final note of excitement, NASA announced 12 selectees for its 2017 astronaut class last month in June. The dozen selectees have outstanding credentials and experience. What is most encouraging about this class is the number of applicants they were carefully picked from. There were about 18,300 applicants—a record number of applicants not seen since a record of 8,000 was set in 1978.

We are living in exciting times for space exploration and here at PISCES, we look forward to maintaining an active role in the fast-growing Space Industry and positioning Hawai'i as a forerunner in the continuing global effort of Space Exploration.

Mahalo Nui,

Rodrigo Romo
PISCES Program Manager

Follow us online!

Connect with PISCES on Facebook and Twitter for the latest news in space exploration, aerospace and technology development in Hawaii and STEM education opportunities!

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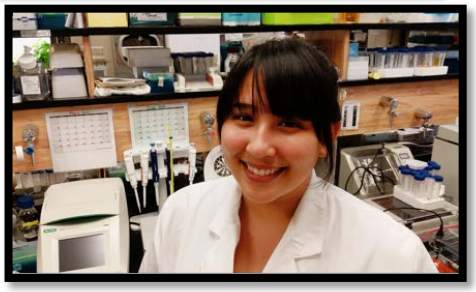
Former PISCES Intern Working with NASA-Ames



UHH student & former Intern, Niki Thomas.

Former PISCES Intern and University of Hawaii at Hilo student Niki Thomas has been invited to intern with NASA's Ames Research Center in California.

Under the mentorship of Planetary Scientist Chris McKay, she will be developing sample collectors and molecule detector instruments for flyby missions to Enceladus and Europa—moons of Saturn and Jupiter, respectively. These far-flung, icy bodies are candidates for supporting lifeforms in our solar system.

Thomas interned with PISCES in the summer of 2015 conducting site surveys for planetary analogs on Hawaii Island. She also played a supporting role in NASA's Mars BASALT (Biologic Analog Simulation Associated with Lava Terrains) project at Mauna Ulu on Hawaii Island in 2016. The BASALT project is actively developing protocols for a manned mission to the Red Planet to seek out potential signs of life.

"I'm really grateful for the opportunity," said Thomas about her internship.

For 2.5 months, Thomas will be working at NASA Ames in the development field of astrobiology. She credits her invitation to NASA-Ames with the connections and experiences she gained through her work with PISCES.

Thomas is currently majoring in Biology at the University of Hawaii at Hilo, with minors in Astronomy and Mathematics. She wants to pursue a PhD in molecular biology, and continue her post-doctoral work at NASA Ames.

Basalt Building Materials Meet Ocean Sports

Above: Stan Lawrence of Orchid Land Surfshop poses with his 9-ft basalt surfboard.

When PISCES Program Manager Rodrigo Romo realized that basalt fabric—a material that PISCES is investigating as the source of a new manufacturing industry in Hawaii—has highly similar properties to fiber glass, he was struck with a novel idea: Can it be used to make a surfboard? An avid surfer himself, Romo took his idea to a local board maker named Stan Lawrence, owner of Orchid Land Surfshop in Hilo.

A short while later, Romo had an answer to his question: Yes! And it looks incredible.

Using a thin sheet of basalt fabric manufactured by a Rhode Island-based company called Smarter Building Systems, Stan glassed the unique material into the standing surface of one of his custom, nine-foot longboards.

Seeing the outcome, Romo is setting his sights on a fully-surfaced basalt board, and even a canoe paddle. He hopes not only to have a sharp looking wave-rider, but also to raise awareness around the possible applications for basalt-based materials in Hawaii.

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Education & Outreach

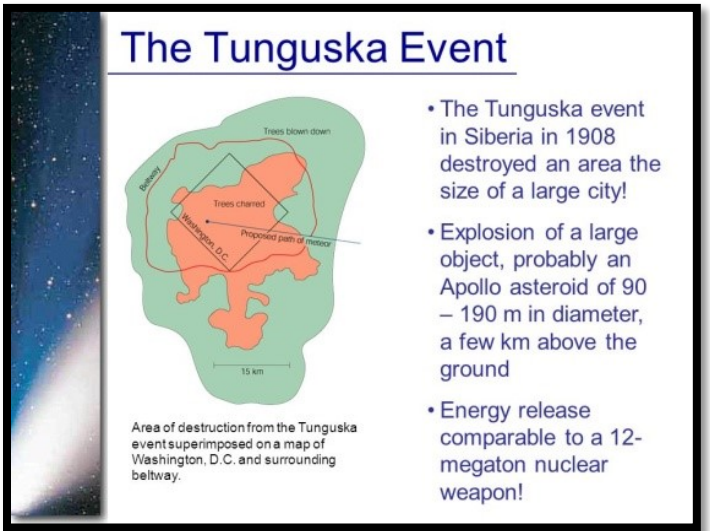
Issue #7 Volume #5

Asteroid Day Highlights Threats NEOs Pose to Earth

Several years ago, astrophysicist and famed Queen guitarist Dr. Brian May and filmmaker Gregorij Richters partnered on a project that resulted in the eventual birth of international Asteroid Day. This U.N.-sanctioned, global event is celebrated each year on June 30 to raise public awareness about the threat and impacts of NEOs (Near Earth Objects—which include comets and asteroids), and efforts to mitigate their threat to Earth and human civilization.

June 30 was specifically chosen to parallel one of the most harmful known asteroid-related events on Earth in recent history. On this date in 1908, a 220-million-pound space rock annihilated the remote Siberian wilderness near Tunguska. However, the impact left no crater. Scientists believe the asteroid exploded midair, detonated by atmospheric friction and escaping gases. The resulting force generated a blast equivalent to 185 Hiroshima bombs and flattened some 2,000 km^2 of forests—an area roughly the size of Washington D.C.! Because of World War I and the Russian Revolution, the first scientific expedition did not arrive to survey the scene until more than a decade after the event in 1921.

Trees felled by the Tunguska explosion. Credit: the Leonid Kulik Expedition.



Above: Kyla Defore talks asteroid craters on Asteroid Day.

Events like this are estimated to occur about once every 300 years. By sheer chance, the Tunguska explosion avoided populated areas despite many European cities sharing similar latitudes. Had Earth's rotation been slightly different, human history might have turned out very differently.

On February 15, 2013, a less dramatic NEO event occurred over a populated area in Russia at Chelyabinsk. An exploding meteoroid measuring about 17 to 20 meters in diameter and 11,000 tons in mass, inflicted over 1,200 injuries—many of them incurred from broken windows shattered by the asteroid's shock wave.

In light of these events, Asteroid Day is celebrated to raise public awareness about an uncommonly-thought of natural disaster—one that is preventable with proper preparations. Currently, NASA's Planetary Defense Coordination Office, established in 2016, catalogues and tracks potentially hazardous NEOs larger than 30 meters in diameter, and oversees response and mitigation efforts.

PISCES recognized the Asteroid Day on June 30 during the Maunakea Wonders Teacher's Summit hosted by JCMT/East Asian Obvervatory in Hilo on Hawaii Island. PISCES intern Kyla Defore demonstrated how asteroid craters are formed to local teachers through a hands-on activity designed to educate young students.

Carving a Place for Women in Space

Jessica Dempsey, PhD

Deputy Director, JCMT/East Asian Observatory

I was privileged to be asked to participate in the PISCES STARS program for a talented, dynamic group of young women last month in June. I have had great fortune in my experiences and career but I find it important to not gloss over the challenges faced by women looking to embark on a STEM path. This is a key concern for me as I see this generation of young people as the likely candidates to populate the first long-term journeys into our solar system and beyond.

I spent a series of summers and one full winter year at South Pole Station, Antarctica. These isolated communities are now studied as templates for the social dynamics of long-haul space travel. In fact, you are more accessible on the International Space Station than you are at the South Pole. A notable conclusion from the studies is that the closer these groups push towards gender parity, the better it is for the emotional and psychological health of the team as a whole. Diversity in all forms - ethnic and cultural - helps as well.

We need more women in space. NASA has recognized this—the latest astronaut candidate groups have reflected the drive to bring more women into the field. But there is a lot more work to do. A common dismissal from opponents is that if women wanted to work in STEM careers, we would see the numbers increase organically, without assistance. This has now been widely debunked. It is true that we now have more women starting out in technical and scientific studies, but the percentages of women in scientific faculty and management positions in industry and engineering are the same as they were decades ago (less than 5 percent in most fields). In some STEM fields, notably computer sciences, the numbers are actually falling.

Why are we losing so many talented women and how do we fix it? The issues are systemic, and too varied to discuss here – but I do believe that dedicated programs such as STARS are a starting point for solving the problem. Finding our bright, talented girls and providing them with the confidence, experience and mentoring they need in their early careers is key in creating the next generation of STEM leaders, both here on the ground, and hopefully in space.

Below: Jessica was the first female Australian scientist stationed in Antarctica. Enduring a grueling winter of frostbite and isolation, the intrepid astrophysicist ran the VIPER telescope to observe the faint, cold light from the afterglow of the Big Bang. Her work has contributed to understanding the overall makeup and shape of the Universe.

Below: Dempsey is the Deputy Director of the James Clerk Maxwell Telescope (JCMT) at the summit of Maunakea volcano. It is the largest, single-dish submillimeter telescope in the world.