Pacific International Space Center for Exploration Systems
PISCES
Newsletter

PACIFICSPACECENTER.COM
September 2017 | Issue 8 Vol. 5

Workforce Development

PISCES & Hawaii CC Launch Credit-based Internship Program

Photo: Hawaii Community College students Jack Andersen (L) and Andrew Hasegawa (R) will earn classroom credit through robotics work with PISCES during Fall 2017.

PISCES and Hawaii Community College have partnered to create a new credit-based internship program to offer college student high-tech learning opportunities while earning classroom credit. The collaborative program will provide real-world, hands-on experience in computer programming and robotics in an effort to develop Hawaii's skilled labor workforce as jobs increasingly shift toward high-tech industry positions.

"I am very happy to be working closely with Hawaii Community College to provide students the opportunity to practice and improve the skills they learn in the classroom," said PISCES Program Manager Rodrigo Romo. "At PISCES we are committed to providing Hawaii's youth with as many tools and opportunities as possible to meet the demands of the growing high-tech industry in the Islands."

"Hawaii Community College believes that preparing our students for the jobs of the 21st century goes beyond our classrooms," said Hawaii CC Chancellor Rachel Solemsaas. "Along with industry partners like PISCES, we can provide academic rigor in internship-based courses and programs."

Two Hawaii CC students who interned with PISCES this summer will participate in the program during the Fall 2017 semester. Andrew Hasegawa and Jack Andersen, both Electronics Technology majors, will earn hour-for-hour classroom credit towards their degrees by designing and implementing an autonomous navigation system for PISCES' planetary rover, enabling the 700-pound robot to drive itself. The students will also develop a delivery system for an unmanned aerial vehicle to mitigate

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Message from the Program Manager

Rodrigo Romo

Aloha kakou!

Summer has come to an end and I am glad to say that it was an amazing few months. Our two intern teams completed their 10-week internship program with exceptional results. The robotics team wrapped up their work with three days of field testing on Maunakea, assessing the new systems aboard the Helelani rover. The Materials Science team also joined in the field tests, designing and conducting a Geology Survey Lunar Mission with Helelani.

On their final day, four of our five interns presented their work to a large group of attendees which included Sen. Kai Kahele, Rep. Mark Nakashima, Hawaii Community College Chancellor Solemsaas, faculty members from both Hawaii CC and

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In this Issue:

Interns Present Final Results of Summer Space Tech Projects

Photo: Lawmakers, PISCES staff & interns celebrate after a final project presentation at Big Island Workforce Connection on Aug. 11. (Left to Right): Sen. Kai Kahele, PISCES' Christian Andersen, Interns Jack Andersen, Aaron Roth & Lily Leyva, PISCES' Rodrigo Romo, Intern Kyla Defore and Rep. Mark Nakashima.

How many interns does it take to pave the future of space exploration?

Just five, apparently.

Thanks to a grant from the Hawaii Department of Labor and Industrial Relations, a team of full-time interns delved into 10 weeks of Applied Research projects at PISCES this summer and concluded their work with a final presentation to an audience of lawmakers, industry representatives, educators and members of the community on Friday, Aug. 11, 2017.

The presentation, held at a conference room at Big Island Workforce Connection in Hilo, highlighted PISCES' ongoing planetary research and the accomplishments of interns Kyla Defore, Aaron Roth, Andrew Hasegawa, Jack Andersen and Lily Leyva.

Organized into two learning tracks—Materials Science and Robotics—the group of Hawaii-based students each shared an enthusiastic presentation outlining their summer learning experiences.

Under a NASA STTR grant, Lily (a Kea'au High School graduate Lily and Kyla (a University of Hawaii at Hilo graduate) set their minds to the challenge of creating ISRU (*in-situ resource utilization*) materials for space construction. Their main task involved developing an efficient technique for making "LEGO" building blocks made entirely of volcanic basalt fines.

Both Kyla and Lily, led by PISCES Operations Manager Christian Andersen, explained their research in basalt sintering and casting to make construction-grade materials using only heat and volcanic dust. The technology has potential applications for use in Hawaii and the future of space settlement.

Lily described how she assembled a 3D printer from a kit (instructions not included), then printed a new planetary building block prototype she designed herself based on a predecessor created during PISCES' VT/VL Landing Pad project in 2016.

As a third-year returning PISCES intern, Kyla discussed her role teaching Lily the fundamentals of planetary geology. Her thorough mentoring resulted in a successful site survey and mock lunar mission using the Helelani Planetary Rover at a planetary analog site.

Robotics team members Aaron (Arizona State University) and Jack (Hawaii Community College) talked on the intricate details of their work upgrading the Helelani rover with a new operating system and stereoscopic imaging camera.

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Former Intern Joins PISCES as Full-time Technician

PISCES is pleased to announce the addition of a new team member! Former intern Kyla Defore has joined the staff as a full-time technician and will continue the Materials Science project work she started as an intern. Working with Ops. Manager Christian Andersen, she will research basalt sintering and casting methods as part of NASA STTR project.

Kyla has interned with PISCES over three terms, demonstrating a consistent excellence and visible passion for her work. The UH Hilo Geology graduate and Hawaii native is particularly partial to rocks which makes her the ideal candidate for experimenting with molten lava to create ISRU building materials. "I'm excited about my new position. It's been a lot of work to get to this point," Kyla said.

Throughout her time as an intern, Kyla has played supporting roles in the PISCES Women's STARS Program, and participates in outreach events whenever possible. In 2016, she supported NASA's BASALT Mars research project on Hawaii Island to help develop protocols for a manned mission to the Red Planet.

Welcome to the team Kyla!

In Pictures: Helelani Rover Field Test

Photos: (1) Students pilot Helelani over a steep slope of volcanic cinder. (2) Kyla & Lily survey the site to prepare for a mock lunar mission with the rover. (3 & 4) Interns gather data and assess the rover systems at "mission control." (5) Night operations with Helelani assess sensor and system functions in the dark. (6) Helelani takes five with the students.

Interns Present Space Projects *cont…*

During three days of field, the trio of robotics students (including Hawaii CC student Andrew Hasegawa) assessed the rover's new software and hardware systems through a series of remote sensing tests, piloting Helelani across the lunar-like slopes of Maunakea from a mission control tent.

"This has been an amazing 10 weeks," Jack said during his presentation. "It's opened up a lot of new things for me to explore."

Attendees of the public presentation included Senator Kaiali'i Kahele and Rep. Mark Nakashima—both local advocates for high-tech and aerospace industry development in Hawaii.

Nakashima wrote in a Facebook post: "It was a pleasure to meet with this summer's PISCES Interns who spent the last several months working on projects to further PISCES' mission to increase the economic opportunities for the State of Hawaii."

Basalt Fabric adds Flair to an Island Tradition

PISCES is continuing to explore various applications for basalt-based products and the feasibility of creating a basalt manufacturing industry in the State of Hawaii.

Several months ago, Program Manager Rodrigo Romo sought out a local surfboard shaper to create a surfboard coated with basalt fabric—a material which mimics fiberglass. After creating a successful longboard partially covered with the novel material, Romo sought to create a custom outrigger canoe paddle with the fabric to add some flair to his stroke. He approached Ryan Tanner of Fluid Paddles with the idea, and together they designed a paddle reinforced with basalt fabric in place of carbon fiber. The resulting product is not only pleasing to look out, but performs flawlessly. Romo plans to put his new paddle to the real test during the Pailolo Challenge canoe race later this year.

Photos: Romo's outrigger canoe paddle is reinforced with basalt fabric on the back (above) and inscribed with a custom design and logo on the front (below).

Guest Spotlight

Philippe Giguere, PhD

Mobile Robotics Professor, Laval University, Quebec

Serendipity and Autonomous Navigation

Left (L-R): Prof. Philippe Giguere talks robotics and programming over lunch with interns Jack Andersen & Aaron Roth. Right (L-R) Intern Aaron Roth, Prof. Giguere and PISCES Program Manager Rodrigo Romo at the field test site with Helelani.

This past July, my family and I were spending some time in Hawaii, following my attendance at the Computer Vision and Pattern Recognition (CVPR) conference in Honolulu. Upon our arrival at Hilo airport, my eyes were instantly drawn to the PISCES banner posted inside the terminal. Being a roboticist by profession and a space enthusiast, I could not help but wonder if I would be able to visit the facility. After a few quick emails, and to my greatest delight, I was invited by Chris and Rodrigo for an impromptu field trial on Maunakea with the PISCES rover Helelani!

The trials were a success, both on a technical and human level. I tremendously enjoyed my time interacting with Rodrigo's two interns Jack and Andrew, telling them about the latest development in robotics and artificial intelligence. This brings me to my next point.

Unless you have been living under a rock (lunar or not), you have all seen the news about self-driving vehicles. Many challenges remain before they can be commercialized. Solving this will require two main ingredients: talent and trials. In some sense, the efforts of the PISCES team go towards solving both. Indeed, the unstructured environment of places like the test site on Maunakea is a formidable training ground for the next generation of scientists and engineers tackling this self-driving car challenge. And if anything was confirmed by the CVPR conference where more than eight self-driving car startup companies had booths for recruiting purposes, it's that there is a definite shortage of them.

I believe that PISCES also has the potential to serve as an international test ground for field robotics, ushering mining and other heavy industries into the fourth industrial revolution. For all these reasons, I wish nothing but a long life to PISCES!

Program Manager Message *cont...*

UH Hilo, members of the Dept. of Labor, as well as friends and family.

This program's success is bolstered by each of these students' pursuits in the coming semester. Kea'au High School graduate Lily Leyva is attending the University of Colorado at Boulder to pursue a degree in Aerospace Engineering; Kyla Defore has accepted a full-time position with us as a technician; Jack Andersen and Andrew Hasegawa will be the first students participating in our new credit-based internship program in partnership with Hawaii CC; and Aaron Roth will be working in Dr. Jim Bell's laboratory at Arizona State University. I'm proud of our students for all their hard work, and wish them the very best in their continuing endeavors!

On a related event, we had the good fortune of connecting with an outstanding Canadian professor during our field tests with Helelani. Philippe Giguere, a Mobile Robotics Professor from Laval University in Quebec, arrived at Hilo airport with his family on vacation and spotted our PISCES banner. With his interest piqued, he contacted us expressing interest in a tour, saying it would be the highlight of his trip. We invited him to spend a day at our test site with the interns and had a wonderful experience sharing his company. Philippe offered many useful suggestions and insights with our students on how to improve Helelani's systems and performance. We intend to collaborate with him in the future and look at the possibility of having Laval University students intern with us next summer.

Speaking of good timing, a delegation of diplomats from Luxembourg led by their Deputy Prime Minister came to Hawaii seeking investment opportunities in the Space Industry.

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Credit-based Internship Program *cont…*

little fire ant populations in tree canopies—a PISCES project funded by the County of Hawaii Dept. of Research & Development in partnership with the Hawaii Ant Lab.

Both students are already familiar with the Helelani rover's configuration since developing the robot's software and hardware systems during their 10-week internship program funded by the Hawaii Dept. of Labor this summer.

"Hawaii Community College is very proud of our two summer intern students, Andrew Hasegawa and Jack Anderson, who will also participate this fall in the credit-based internship program at PISCES," said Hawaii CC Electronics Technology Instructor Bernard "Chip" Michels. "Their work this past summer is a good representation of the new Electronics Technology curriculum the students were exposed to. I believe this new, revitalized Electronics Technology program that is focused on telecommunications and process and control industries will yield other fine examples of student work in the future. We hope to have more opportunities for our interns at PISCES and other interested organizations."

PISCES and Hawaii CC intend to make the credit-based internship an ongoing program to provide unique learning opportunities for Hawaii college students outside of the classroom.

"Although classroom learning is invaluable for foundational knowledge, it can at times be lacking in more realistic problem-solving scenarios," said Hawaii CC student Andrew Hasegawa. "This internship provides me with hands-on situations that I'm sure will serve me well in my overall education and future employment opportunities."

University of Hawai'i Hawai'i Community College

Left: Romo met with Gov. David Ige during a joint-DBEDT agency meeting last month. Right: PISCES Chair Henk Rogers hosted diplomats from Luxembourg at his Pu'u Wa'a Wa'a Ranch in August to discuss Space Industry opportunities in Hawaii.

About the Pacific International Space Center for Exploration Systems

PISCES is a state-funded aerospace agency under the Hawaii Department of Business, Economic Development, and Tourism. We strive to position Hawaii as a leader in space exploration while developing sustainable products and technologies that benefit the Islands. Through Applied Research, Workforce Development, and Long-term Economic Development, we provide hands-on experience to Hawaii's future scientists and engineers, preparing them to meet the demands of a highly competitive industry while improving the local economy through job diversification, product innovation and new industries.

Program Manager Message *cont…*

PISCES Board Chair Henk Rogers hosted the delegation at his Pu'u Wa'a Wa'a ranch house in Kona and we spent a couple days discussing various opportunities, including the upcoming International Moon Base Summit, a prototype lunar base concept on Hawaii Island, and other opportunities. It was a short visit, but one that opened exciting doors for collaboration with Luxembourg.

In other meetings in August, the Department of Business, Economic Development and Tourism (DEBDT) organized a full staff meeting to meet with Governor Ige in a "talk-story" format. That meeting was followed by an additional assembly attended by all DBEDT-attached agency directors. I had the opportunity to present to the Governor what PISCES is currently doing to advance the Economic Development agenda in the State of Hawai'i through our initiatives in Applied Research and Workforce Devleopment.

As I finish writing these words, Texas is still experiencing the devastating effects of Hurricane Harvey, and rescue and recovery efforts are just beginning. We send our thoughts and wishes for a safe and swift recovery to all those in affected areas.

R. Romo

Rodrigo Romo
PISCES Program Manager

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