PISCES
Pacific International Space Center for Exploration Systems

Issue #10 Volume #4

# PISCES HAWAII

www.pacificspacecenter.com

## Committed to Community

### *The success of our organization depends on the success of future generations*

***PISCES Program Manager Rodrigo Romo***

The Pacific International Space Center for Exploration Systems (PISCES) values the relationships it has with both the science and local community. Throughout the past three years our staff has been fortunate enough to establish meaningful relationships with numerous students of all ages in Hawai'i. We've also been blessed with many friends who have helped us with our community outreach program.

Community engagement is a vital part of our organization's mission, and this past month was no exception. On Sept. 24, PISCES brought out its robotic rover Helelani to Radio Bay in Hilo for a community workday event organized by representatives of the Perpetuating Unique Educational Opportunities (PUEO) organization and Keaukaha One Youth Development.

I would like to personally thank those who warmly welcomed us that day, and for the opportunity to watch and learn as community members worked together to restore an old wa'a (Hawaiian canoe) for Hōkūleʻa's return. While we were enthralled by the children's interest in our science (*see page 2*), we were equally impressed by the community's interest in joining together to restore the large canoe. It reminded us all that no matter what, we're all in this boat together and nothing would be possible without each other's support.

That same feeling was experienced later this month when Jane Horike, economic development specialist with Hawai'i County's Research and Development, stopped by our headquarters with Hawai'i Island Rep. Clift Tsuji and Rep. Mark Nakashima.

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*"Rock-it" Science*

*A Hi-SEAS Crew Member Talks about Living "on Mars" for One Year*

# KEAUKAHA COMMUNITY DAY

A group of kids join in for a photograph with PISCES' Helelani rover during a Sept. 24 community workday event organized by the Perpetuating Unique Educational Opportunities (PUEO) organization, and Keaukaha One Youth Development. Attendees of the event are seen in the background working on the Hawaiian canoe.

Richard Ha, president of Hamakua Springs Country Farms and PISCES supporter and friend, is seen here navigating the PISCES robotic rover on Sept. 24 in Keaukaha.

USING INTERTIA: Members of the Big Island community tried this science trick that used the individual's inertia to spin around in circles. The key was to slow down before it started spinning too fast!

***Letter Continued…***

The three of them kindly took time out of their busy schedules to sit in and listen to two of our summer interns explain their research on Moon and Mars analogue sites on the island. Both of these presenting interns are from Hawai'i and are studying Geology with an interest in Earth and space science. *(You can watch their entire presentation on our YouTube channel to learn more about the potential the Big Island has as a frontier for space exploration research.)*

It's this kind of community involvement and support that truly makes up the heartbeat of this organization. The support of our local community, county administrators, and State legislators help make PISCES the unique and outstanding organization that it is today.

While applied research and economic development are essential to the success of PISCES, creating opportunities to train the next generation of workers in aerospace science in our own backyard is just as, if not more important to the long-term vision PISCES holds for itself and the state of Hawai'i.

It is our goal to remain visible and accessible to the community and help in anyway we can. Mahalo to all of you for your support over the years and we look forward to continuing this exciting and inspiring journey forward to benefit people both at home on Earth, and in the far reaches of space.

*-Rodrigo Romo*
***PISCES Program Manager***

# INTERN PRESENTATIONS

LEFT TO RIGHT: UHH Astronomy student David Bennett, Hawai'i County's Research and Development Jane Horike, PISCES intern Kyla Defore, PISCES' John Hamilton, Hawai'i Island Rep. Mark Nakashima, PISCES' Rodrigo Romo, PISCES intern Ashley Garnett, PISCES' Christian Andersen, and Rep. Clift Tsuji.

Geology interns Kyla Defore and Ashley Garnett participated in a mock lunar rover simulation test with PISCES during the summer of 2016. This mission included two main objectives:

1. **Remote Operability Testing of PISCES Rover**
   a. Command and control rover from a remote location
   b. Test camera capabilities
   c. Battery capabilities
2. **Simulated Planetary Geology Mission**
   a. Characterizing a site remotely using the PISCES rover and how well that task can be done.
   b. Determine accuracy of observations by ground-truthing (making field observations of a particular site).

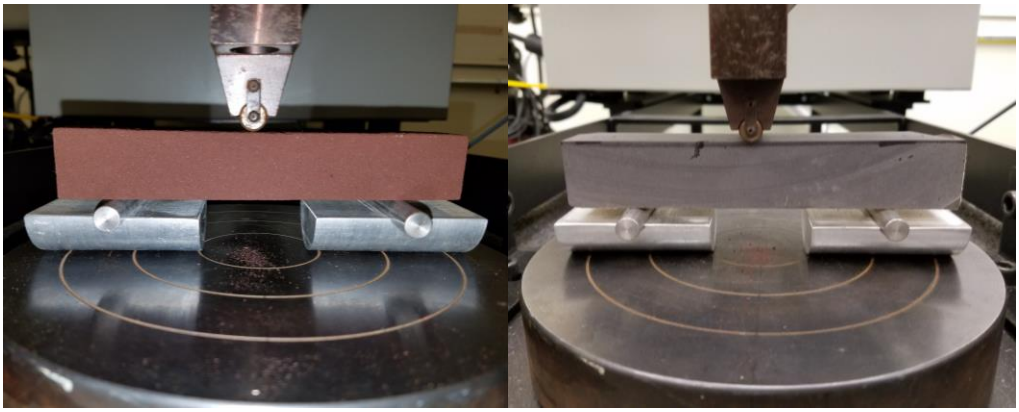
**Images: Observations made by PISCES Rover**

The PISCES rover was located in Ha'iwahīne Valley on the slopes of Mauna Kea but was operated remotely from PISCES headquarters in Hilo. Each intern was responsible for a task. For example, intern Kyla Defore was responsible for locating areas in the valley that seemed interesting for further investigation from the perspective of the rover. Where as intern Ashley Garnett was responsible for carrying out all ground-truthing observations from her own perspective. This was done to test viability of the rover's equipment as well as how accurate the observations were. This has great implications for future Martian rovers and what to expect when something unexpected happens.

***Continued on pg. 4***

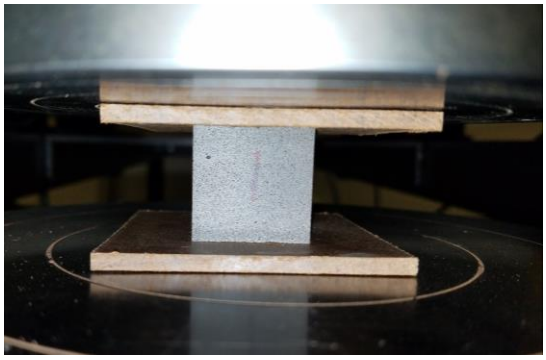
# *APPLIED RESEARCH*

## "Rock-et" Science



PISCES sent two samples of sintered basalt pavers to NASA's Engineering Directorate at Kennedy Space Center for testing. These photos show the samples being examined for flexural strength.

For PISCES' work with NASA, Honeybee Robotics and the County of Hawai`i Research and Development on the Vertical Takeoff Vertical Landing (VTVL) project, PISCES produced sintered basalt pavers that performed between the range of residential and commercial concrete in compressive and flexural strength. PISCES also produced a second type of paver during the production process using the same feedstock material, but with a modified heating profile. This second paver was analyzed (and re-analyzed) and performed with compressive and flexural strengths ten times stronger than commercial concrete and 3 times stronger than high-strength specialty concretes. This surprising result has opened up new opportunities for research and applications beyond the aerospace sector. PISCES is now applying for applicable grants and actively pursuing all opportunities.



A sintered basalt paver created by PISCES is tested at NASA for compression strength.

This recent work has garnered increasing interest from the public and private sectors. Currently PISCES has NDAs (non-disclosure agreements) with two companies that produce and supply basalt fiber and rebar to assess the feasibility and cost of producing basalt fibers here in Hawai`i. If implemented, Hawai'i would become the only source of basalt fiber in the United States.

Follow us online through social media and check out the latest updates on our projects and programs, plus cool news from the world of space exploration and technology!

- www.facebook.com/pisceshawaii
- Twitter: @PISCES_Hawaii
- Instagram: HawaiiPISCES

# PISCES GUEST SPOTLIGHT

## *One year on Mars…*

***Tristan Bassingthwaighte served as the Crew Architect for the longest HI-SEAS (Hawaii Space Exploration Analog and Simulation) mission to date, living for one year within the confines of a solar-powered dome on the slopes of Mauna Loa with five other crewmates. During his stay, Tristan got a first-hand look at the reality of living within an off-planet habitat, which is part of the focus of his doctoral work in architecture. Researchers studied the crew's interactions in isolation to assess group cohesion and support strategies in preparation for a potential Mars mission – a three-year round trip to the Red Planet and back. Here's what Tristan had to say about his experience on "Mars" that began in August 2015.***

The experience of living in the HI-SEAS Habitat for me was characterized by both opportunity and stress. It is of course a challenge to live in a confined, isolated environment for an entire year. But it is full of potential as well. The mission provided time to work on personal projects, get in shape physically, and learn more about myself. These activities also provided me with the opportunity to learn to deal with stress as well. I found that life in the dome had its tough points, but by being flexible and adapting to situations as they arose, it was a year in which I got a lot done and had a ton of great experiences. This mission has potentially set me on a very interesting path.

My doctorate focuses on the design of habitats in long duration, isolated, or extreme environments, and living in the dome gave me a huge personal insight into what I'm actually designing for. I sort of became a unicorn; the only space architect who's lived for an extended period of time in a simulated extreme environment. Now the possibility exists that I'll end up working on Antarctic base projects, space hotels, or something greater.

I think space holds a huge place in the future for everybody on Earth, directly or indirectly, and I'm hoping this experience and the work I do in the future will make a positive difference in the world.

***Intern Presentation Cont.***

The team recommended that a few changes be made such as:

1. Lowering the camera from the top of the rover closer to the bottom to ensure easier viewing of the valley floor.
2. Since GPS is not used on Mars it may be helpful to create a specific list of geologic features both teams should look for. This will make it easier to find each observed location.

An essential part of the mock lunar rover mission was to collect samples from the area to take back to the lab for analysis. This is so that geologists may learn as much about the area as possible as it is comparable to areas found on Mars. The PISCES interns found several varieties of rocks including:

1. Peridotite
2. Plagioclase rich xenoliths
3. Pyroxenite

Images: Rock Samples Found by Interns

These rocks may hold the key to understanding Ha'iwahīne Valley's past and may help us gain a better understanding of Mars for future exploration missions. The PISCES interns are currently running tests on these rocks to learn as much as they can about their composition and formation.