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Applied Research

HI-SEAS Exploration Research Resumes with 2-Week Mission

PISCES' planetary rover "Helelani" feels right at home in the Mars-like volcanic terrain of Mauna Loa where the Hawaii Space Exploration Analog Simulation (HI-SEAS) habitat lives.

The HI-SEAS habitat has resumed studies for human space travel with the launch of a two-week mission that began on Feb. 20. Six crewmembers from around the world are conducting experiments and research intended to support manned missions to the Moon and Mars.

Leading the crew is University of Hawaii at Mānoa's Michaela Musilova, chief investigator for HI-SEAS and the International Moonbase Alliance (IMA). The team consists of a geologist, anthropologist, journalist, systems engineer and geochemist. During their stay—which ends March 5—crew members will conduct geological and drone surveys, explore lava tubes and test space exploration instruments. They will also run an experiment designed by high school students in Slovakia who won a "Mission to Mars" competition organized by Musilova last year.

Under NASA funding, HI-SEAS has been focused on studying the long-term of effects of human isolation. Since 2012, five long-term studies have been completed—the longest was 12 months.

Now, the habitat's focus is shifting to shorter-term missions focused toward establishing a human presence on the Moon. Henk Rogers, the habitat's official owner, is the founder of the International Moonbase Alliance (IMA) envisions a prototype lunar base on Hawaii Island followed by an actual lunar base on the surface of the Moon.

The latest HI-SEAS mission is under the EuroMoonMars initiative, led by the International Lunar Exploration Working Group of the ESA, in partnership with IMA, European Space Research and Technology Centre and Vrije Universiteit (VU) Amsterdam.

(Continued on next page…)

Message from the Program Director

Aloha Kakou,

This year's government shutdown has had ripple effects from the mainland U.S. all the way to Hawaii. As a result, the NASA Robotic Mining Competition (RMC) held annually in May at Kennedy Space Center will unfortunately not happen this year. However, we are still planning the HI-SEARCh (Hawaii International Space Exploration And Robotics Challenge) event sponsored by Caterpillar in late February 2020 at NELHA's Hawaii Ocean Science and Technology Park in Kailua Kona.

HI-SEARCh will be based on NASA's RMC rules but take the competition outdoors to a realistic analog lunar environment. In addition to RMC participants, the event will be open to international universities. We expect to have about 21 teams and are currently seeking sponsors who would like to support STEM outreach events in Hawaii.

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Workforce Development

Former Intern Awarded NASA Space Consortium Grant

Christina Cauley interned with PISCES during the summer of 2014 characterizing planetary analog sites on Hawaii Island as part of the agency's Geology Team.

Former PISCES Intern Christina Cauley was among five Wesleyan University students to receive an award from the NASA Connecticut Space Grant Consortium (CTSGC) for Fall 2018.

Cauley was awarded an $8,000 Graduate Research Fellowship for her project "Chemistry and Biology of Giant Hydrothermal Mounds in Paulina Lake, Oregon." She is an environmental science grad student at Wesleyan in Hartford, Connecticut under the mentorship of Dr. Joop Varekamp, professor of Earth and Environmental Sciences.

According to her student profile, Cauley is specifically interested in applying geochemistry techniques to volcanology, focusing on geohazard studies on earth and related planetology research.

Cauley graduated from University of Hawaii at Hilo in 2015 with a double major in Geology and Anthropology, and a minor in Biology. During her undergraduate studies, she interned with the PISCES Geology Team to study and map planetary analog sites on Hawaii Island that are geologically similar to the Moon and Mars. The staff at PISCES wish Cauley a warm congratulations on her fellowship!

HI-SEAS Missions Resume *Continued...*

In a University of Hawaii (UH) news release, Musilova said: "These missions are open to researchers around the world to take part in, provided their research will help contribute to the exploration and colonization of the Moon and Mars."

Individuals interested in applying to become a crew member or propose a scientific project for future missions should contact Musilova at musilova@moonbasealliance.com.

Under NASA funding, a sixth HI-SEAS mission was unexpectedly cut short in late February 2018 after an accident prompted one crew member to withdraw over safety concerns. After UH and NASA reviewed the project, it was approved to resume.

NASA awarded a $1 million grant last December to begin detailed analysis of all the data—36 months' worth gathered since the project began in 2012. The data consists of observations on individual personalities, group dynamics, team cohesion, and cognitive function and behavioral health changes. The analysis is expected to be finished by the end of 2019.

Right: Michaela Musilova, chief investigator for HI-SEAS, suited up for Mars and hitched a ride on the PISCES planetary rover last month as part of a film shoot at the habitat. HI-SEAS sits at roughly 8,000 feet above sea level on the rugged slope of Mauna Loa.

Image courtesy of Michaela Musilova/HI-SEAS.

Director's Message continued...

There will be various forms of sponsorship opportunities for local businesses and organizations to support HI-SEARCh, which we intend to continue as an annual competition. Sponsors will be supporting STEM education for students while also increasing the visibility of their name, service or product. Please reach out to us if you might be interested in being a sponsor for this exciting event.

In Applied Research, we are currently seeking qualified small businesses to partner in the solicitation of a NASA SBIR/STTR grant. Solicitations are now being accepted for 2019. PISCES is recognized as a qualifying Research Institution (RI) under the Small Business Administration's (SBA) guidelines. We are interested in collaborating on In-Situ Resource Utilization (ISRU) projects to develop manufacturing feedstock using basalt and volatile extraction. We have access to raw basalt fines, high fidelity planetary analog testing sites and sintering equipment. We also have a planetary analog rover that can be controlled remotely via the Web to test hardware and software systems in the field.

In other news, we are in the planning stages of our 2019 STARS Program for Hawaii high school girls and we're anticipating an expanded program this year with more STEM subjects. Some of the activities will involve the Hawaii Space Exploration and Analog Simulation (HI-SEAS) habitat on Mauna Loa, Maunakea observatories and NELHA.

Finally, as we move through this year's legislative session, we will be reaching out to friends and supporters of PISCES to request testimonial support for PISCES-related bills that will secure funding for our operating budget. We hope to continue serving Hawaii with our projects to help provide more education and work opportunities in the community.

A hui hou,

R. Romo

Rodrigo Romo

Outreach & Education

Activities for the upcoming Women's STARS Program:

- Maunakea observatory summit tours
- Tour and overnighter at HI-SEAS Habitat on Mauna Loa
- Presentations by female astronomers, engineers, scientists and educators
- Tour and activities at NELHA's Hawaii Ocean Science & Technology Park
- Robotics and Rocketry workshops