



Pacific International Space Center for Exploration Systems



# NEWSLETTER

 **Happy New Year!**

## In this Issue

**Pg. 2:** HALO program offers remote testing simulations for Moon/Mars

**Pg. 2:** Registration open for 2nd annual FishTank STEM competition

**Pg. 3:** Helelani gets upgrades for new comm link system



@PISCES\_HAWAII

## New Sintering Method May Reduce Cost of ISRU Production for Earth, Moon and Mars



*Above: A durable new basalt tile uses a binding agent to reduce energy use.*

After nearly a year of research, PISCES scientists have developed a new ISRU (in-situ resource utilization) process that significantly reduces the time and energy needed to produce sintered basalt products. The sintering temperature required to fuse raw particles

into a cohesive material has been reduced by more than 20 percent.

The improved efficiency is attributable to the addition of an inorganic, nontoxic binding agent—a compound that in theory could be synthesized with lunar and Martian resources.

> Continued on [Page 4](#)

## Message from the Director

The year 2020 will go down in history as one of the hardest of our time. The COVID-19 pandemic created chaos around the world, crippling economies everywhere. Hawai'i was no exception. Going into 2021, we face a new series of challenges caused by the economic crisis of 2020, but we are

diligently working to find ways to secure the future of PISCES.

Despite the devastating effects of the pandemic, the space industry succeeded in a series of inspiring events that herald a bright and promising future for human space exploration.

> Continued on [Page 4](#)



Rodrigo Romo

## HALO Program Offers Remote Testing at Analog Site for Moon and Mars



**P**ISCES is launching a new program offering remote or on-site access to a lunar analog environment with a planetary rover. Called Hawai'i Analog for Lunar Operations (H4LO), the program includes an ODG Alpha Argo rover with open payload design, allowing interested parties to test various instruments and devices for lunar and Mars ex-

*Above: Helelani analog rover at NELHA's HOST Park analog site (aerial shown below).*



ploration. The rover can be operated by third parties anywhere in the world using high-speed internet.

The lunar analog environment is a rugged volcanic landscape on Hawaii Island located within the Natural Energy Laboratory of Hawai'i Authority's (NELHA) Hawai'i Ocean Science and Technology (HOST) Park. With a similar appearance and chemical composition to the lunar and Martian surface, the site provides a realistic testing arena for human and robotic space missions.

For inquiries and more information about the H4LO program, please contact us at [dbedt.pisces@hawaii.gov](mailto:dbedt.pisces@hawaii.gov) or call +1 (808) 935-8270.

## 2nd Annual FishTank Challenge Focused on COVID-19 Recovery

**R**egistration for NexTech Hawai'i's second annual FishTank Design Competition is still open for Hawaii Island students. FishTank is a STEM challenge for students in grades 6 to 12 aimed at solving locally relevant problems using engineering processes.

This year's event will be conducted virtually and focus on COVID-19 recovery efforts. Students will have the opportunity to work on solutions in a range of categories including health and life, education, vulnerable populations, community, and business and the economy. Working with STEM professionals, participants will learn problem solving skills, teamwork, and leadership with a chance to win cash prizes.

The deadline to register has been extended to Friday, Jan. 15. Up to 20 teams of two to four students each will be accepted. To participate, students must have access to high-speed internet, a computer and webcam.

For more information and to register, visit [nextech-competition.org](http://nextech-competition.org).

## Helelani Rover's Comm Systems Upgraded for Mobile Ops



The PISCES planetary analog rover *Helelani* got an upgrade to its communication systems last month with the help of an undergrad student, Blue Planet Foundation, Digital Evolution and NELHA. The upgrades will integrate the rover's operation with a new communications link at a planetary analog site within the Hawai'i Ocean Science and Technology Park at NELHA.

In addition to the upgrades, Helelani also has a new trailer that doubles as a command center. MOKU, or Mobile Operations Kommand Unit, enables the operation of Helelani at various testing sites—either on location or remotely from anywhere in the world. The system supports the Hawai'i Analog for Lunar Operations (H4LO) program launched by PISCES this month.

The upgrades were completed in collaboration with Joel Paye, an intern and University of Hawai'i at Hilo student, Paul Ponthieux of Blue Planet Foundation, Andrew Cox of Digital Evolution, and Keith Olson of NELHA.



**Top L&R:** The Helelani analog rover inside its new home, "Moku" or Mobile Operations Kommand Unit. **Above:** Undergrad student Joel Paye (left) and Andrew Cox of Digital Evolution test the rover comm link system at NELHA's HOST Park in Kailua-Kona.

## Cont: *New Sintering Method Reduces Cost of ISRU Materials*

> Continued from **Page 1**

“This technique can significantly reduce energy costs for making structures on the moon and Mars,” said Christian Andersen, PISCES operations manager and lead researcher for sintered basalt. “On Earth, it should make commercialization easier for sintered products with less overhead costs.”

In addition to saving energy and time for basalt products, the binding agent eliminates the need for molds during sintering. It also preserves the longevity of materials used in the sintering process, thereby reducing production costs over the long-term.

Though structural testing has yet to be conducted on the new tiles, they are likely comparable in strength to their predecessors made without the use of a binding agent. The previous generations of tiles have demonstrated structural properties exceeding commercial concrete.

PISCES is applying for research grants to develop the new tiles and hopes to widen the possibilities for additive manufacturing with cost effective, sustainable products for Earth and space construction.



*Above: Sintered basalt tiles made with a binding agent are structurally comparable with the previous generation of tiles (shown above).*

## Cont: *Message from the Director*

From the launch of NASA astronauts from the U.S. to the ISS in SpaceX’s Crew Dragon capsule, to Mars 2020 and the Perseverance rover, our country made great progress this past year. In other exciting missions, we also saw samples returned to Earth from an asteroid and the moon. Several U.S. companies secured contracts with NASA to deliver payloads to the moon and the Artemis program is advancing its mission to bring humans back to the moon in a sustainable manner.

Here at PISCES, we also had some significant breakthroughs in 2020 with our

basalt research. We are now applying for two research grants to advance the possibilities for additive manufacturing on the moon and Mars. Last year, we also joined a local group of organizations and individuals to help support health care providers, first responders and community service providers during the pandemic.

The PISCES ‘ohana wishes everyone a happy and prosperous new year. We enter 2021 with a new set of challenges ahead, yet we are confident it will be a good year.

Hau’oli Makahiki Hou,

Rodrigo Romo  
Program Director