

PISCES NEWSLETTER

Pacific International Space Center for Exploration Systems * Hilo, Hawai'i

FEBRUARY, 2014

VOL 2 ISSUE 2



Pacific International
Space Center for
Exploration Systems



Rodrigo Romo, PISCES Project Manager

MESSAGE FROM THE EXECUTIVE DIRECTOR PISCES ROLE IN 2014

Dear PISCES Friends and Family,

Given the legislative direction of PISCES and the increasing world-wide interest in planetary sustainability, PISCES has established strategic program tracts for the coming year.

These tracts outline dual-use technologies, designed for use both in space and here at home. Not only do they advance planetary surface systems technology, but they also can stimulate the growth of Hawaii's economy and workforce via strategic partnerships.

PISCES has six major strategic tracts:

1. Basaltic construction and fabrication
2. Integrated In-Situ Resource Utilization (ISRU): "PISCES Robotic Village"
3. PISCES Planetary Analogue Test Site (PPATS)
4. Implementation/operation of the NASA Laser Optical Ground Terminal
5. PISCES Lunar Surface Flight Experiment involving Hawaii High Schools
6. PISCES leading an international Robotics Mining Competition in Hawaii for Universities

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PISCES LEGISLATIVE BILLS

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WE ARE **LIVE!!!**

PISCES has a NEW website!



Visit us at

PISCES.HAWAII.GOV

2014 PISCES AWARD WINNER

SAGE DORESTE



Doreste with John Hamilton, PISCES Test Logistics/EPO Manager

Congratulations to Sage Doreste, this year's winner of the Hawaii District Science and Engineering Fair PISCES Award! The event was held on February 8 at Imiloa.

Doreste, a Junior at Connections Public Charter School, was awarded for her project, "Lunar Impacts", in which she observed meteor strikes on the Moon using the PISCES telescopes. Her mentor was Krystal Schlechter, a former Akamai Workforce intern who worked for PISCES last summer.

"This is a great example of the trickle down or multiplier effect from our intern in college to another in high school," said John Hamilton, PISCES Test Logistics/EPO Manager.

"I am honored to have won the PISCES award," said Doreste. "It was an astounding experience. Krystal is an awesome mentor and I am looking forward to continuing my research".

PISCES SUBMITS THREE BILLS FOR FY15

With the 2014 Hawaii legislative session now underway, PISCES has turned in a request for a total of \$2.1 million in FY15 funding as outlined in the three bills below:

PLANETARY SUSTAINABILITY BILL: HB 2150/SB 2584

PISCES is requesting \$250,000 in matching funds between Hawaii and California. This companion bill will allow both states to fund:

1. Technology Demonstrations
2. University Competitions – each contest must have at least one CA team and one HI team

The goal is to conduct joint research in the development of the following dual-use, planetary sustainability technologies:

- Basaltic construction
- Renewable energy generation
- Advanced water reclamation

NASA LASER COMMUNICATIONS GROUND STATION: HB 2151/SB 2583

PISCES is requesting \$500,000 in matching funds between Hawaii and NASA to conduct an engineering study for the proposed construction of NASA's very first laser communications ground station, to be located on Hawaii Island.

This laser technology will enable NASA to communicate with its spacecraft at a higher data rate – ten to 100 times more data than traditional radio systems.

Part of this proposal calls for the University of Hawaii to educate and train the technical experts needed to operate the laser communications ground station, thereby creating high-tech jobs in the State.

SUPPLEMENTAL BILL: HB 2152/SB 2585

PISCES is requesting a total of \$1,375,738 to fund operational and programmatic initiatives for the upcoming fiscal year. Of that, \$730,738 is for general and administrative tasks (e.g. salaries) and \$645,000 would fund five strategic planetary surface systems projects: (1) Basalt construction and fabrication (2) PISCES "Robotic Village", an In-Situ Resource Utilization (ISRU) facility (3) PISCES analog test site upgrades (4) Hawaii High School student lunar flight experiment and (5) PISCES Robotics International Space Mining Competition to be held in Hawaii during Summer of 2014.

Mahalo to our bill sponsors - Senators Will Espero, Brickwood Galuteria, Rosalyn Baker, Glenn Wakai, Josh Green, David Ige, Sam Slom and Representatives Clift Tsuji, Tom Brower, Romy Cachola, Isaac Choy, Cindy Evans, Faye Hanohano, Ken Ito, Nicole Lowen, Angus McKelvey, Mark Nakashima, Richard Onishi, Calvin Say, Gregg Takayama, Gene Ward and Kyle Yamashita for supporting PISCES!



Sen. Will Espero, one of PISCES's bill sponsors, with PISCES Executive Director Rob Kelso (Photo courtesy Sen. Espero's Office)

PISCES BASALT CONSTRUCTION & FABRICATION

MESSAGE FROM THE EXECUTIVE DIRECTOR

(CONT. FROM FRONT PAGE)

FEBRUARY, 2014

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PISCES STAR EMPLOYEE



POLLY ROTH

We are proud to announce that our Executive Administrator, Polly Roth, has been nominated for "Outstanding RCUH Employee of the Year"!

The Research Corporation of the University of Hawaii (RCUH) honored Polly and other nominees during an annual awards luncheon on February 7 in Honolulu. Though she didn't place, Polly says she felt like a winner.

"In my family, we had a joke catch phrase, 'I live to serve'," Polly said. "You can probably imagine the phrase and how it could be laced with sarcasm or lifted with a cheery voice depending on the circumstances. While it was always spoken in jest, the truth was that each of my parents' children were raised with the value that we should serve society in some way. My sisters chose more traditional routes - one was a teacher, the other is a nurse. I have been an administrator in non-profit organizations, where the mission rather than the bottom line is paramount. I am so glad to be reminded in such a special way that my service is valued."

Congratulations Polly! We are honored to have you on the PISCES team!



In this month's issue, I would like to focus on our first strategic tract: **Basalt Construction and Fabrication**. PISCES is partnering with the federal government and industry leaders to research the use of basaltic materials for fabrication and construction. This supports R&D (research and development) interests in planetary surface application for Moon/Mars, as well as uses in the basalt-rich state of Hawaii.

BASALT FABRICATION

3D-printing (additive manufacturing) is being used and adopted across a broad range of industries, including automotive, architecture, civil engineering, robotics and aerospace. PISCES is pursuing multiple technologies in additive manufacturing for rapid prototyping, parts production, construction, and new applications with novel materials. PISCES sees additive manufacturing as a platform for providing 21st century skills for 21st century jobs in Hawaii.

Hawaii Technology is Planetary Technology: Hawaii and the Moon, Mars, and Near Earth Objects are similar in that their most common and accessible resource is basaltic regolith. This shared resource provides research opportunities for PISCES and our strategic partners in the industry, government and academia. With our partners, PISCES is pursuing additive manufacturing technologies using fine-grained basalt rock dust for fabrication of heat-resistant materials, construction supplies, and more.

BASALTIC CONSTRUCTION

Cement is the traditional "glue" that holds aggregates together to form concrete. Producing cement is an energy-intensive process that is estimated to account for 5-7% of global CO2 emissions. Hawaii pays a premium for cement and imports over 300,000 metric tons per year to meet the demand. This poses large economic, environmental and social costs to the State.

PISCES & Sustainable Concrete: There has been much research done in utilizing alternative concrete binders. PISCES is collaborating with UH Manoa, NASA Ames, Stanford University and NASA Kennedy to characterize and mature alternative binder technologies to include:

- Polymers
- Alkali-Activated Fly Ash
- Biocomposites
- Sintering

These technologies utilize available materials (indigenous and "waste" byproducts) in Hawai'i. Their adoption and commercialization is one more step towards a sustainable Hawaii.

Sustainable concrete...it *IS* rocket science!

-Rob Kelso, PISCES Executive Director



MOU SPOTLIGHT



Memoranda of Understanding signal growing global interest in Hawaii's aerospace industry

In our inaugural newsletter, PISCES announced that it had signed six MOU's. Since then, that number has increased to eleven, with more on the way. We will feature one MOU per newsletter here.

WHO: *Hawaii TechWorks, East Hawaii Community Development Corporation*

WHAT: *A Community of Design & Tech Professionals*

WHERE: *Hilo, Hawaii*

GOAL: *To prepare the local workforce with the technical skills needed for Hawaii's ever-changing industrial and technological demands*

PROJECT(s) WITH PISCES: *Workforce Development*

PISCES Planetary Volcanism Workshop
May 28-30

Lunar Planetary Institute (LPI)
Universities Space Research Association Building
Houston, Texas

Click [HERE](#) for more information

MOU: a formal, written agreement that defines the roles and responsibilities of each party with respect to the program/project they are working on together.

WHY IMPORTANT: MOU's allow PISCES to form partnerships with both public and private sectors, thereby providing access to expertise and technical support from space agencies around the world. Such access is vital to the success of PISCES projects, and the expansion of Hawaii's economy and aerospace industry.



ABOUT US

PISCES is a Hawaii State Government Aerospace Agency located in beautiful Hilo, Hawaii. The research and education/training center is part of the State Department of Business, Economic Development, and Tourism (DBEDT), and conducts environmentally safe field demonstrations to test and validate innovative space technologies on Hawaii's volcanic terrain under the jurisdiction of the Hawaii State Department of Land and Natural Resources (DLNR).

REMEMBERING CLEMENTINE 20 YEARS LATER

After the completion of the Apollo lunar missions, it was commonly thought that the moon was in fact waterless. Today, we know it has vast amounts of trapped water/ice on its surface.

It was Clementine – the first spacecraft to globally map the Moon - that found for the first time indications of the presence of WATER on the lunar surface. The whole discussion of ISRU (in-situ resource utilization) subsequently followed from this mission, which launched in 1994.

Hence, PISCES may have never happened when it did had it not been for this crucial mission.



Engineering model of Clementine displayed at the National Air & Space Museum (photo courtesy Air & Space Smithsonian)

