

# PISCES HAWAII

## Message from the Program Manager

[PISCES.HAWAII.GOV](http://PISCES.HAWAII.GOV)



**Rodrigo Romo**

Aloha Kakou!

Summer is in full-swing and our interns have been making solid progress in our Robotics and Materials Science programs.

As a result, our Helelani planetary rover is getting a much-needed overhaul of its power, electronics and control systems. Helelani is also getting two new imaging systems that will enable 3D imaging (also called stereoscopic imaging) and autonomous navigation through the addition of lidar—a system that works like radar but uses laser light.

Meanwhile, our Materials Science team is working on the design and development of planetary building blocks for a NASA STTR-funded in-situ resource utilization project in partnership with Honeybee Robotics, Ltd.

I'm always impressed by the intelligence, success and passion that our student

interns bring to PISCES.

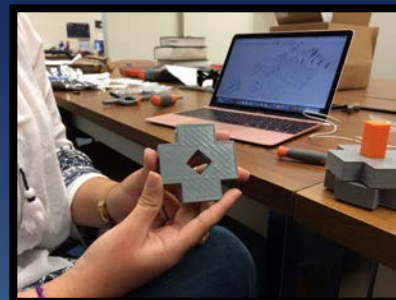
Next month both teams of interns will share their work and accomplishments in a final presentation to lawmakers, educators and other members of the community at the Dept. of Labor in Hilo. We look forward to seeing their results. For those who are interested, we will be streaming the presentations live online. Stay tuned!

In other news, we are now beginning a project funded by the County of Hawaii's Dept. of Research and Development. Through a grant award, PISCES will work with the Hawaii Ant Lab and University of Hawaii's College of Tropical Agriculture and Human Resources (CTAHR) to develop a fire ant bait dispersion system for tree canopies using unmanned aerial vehicles.

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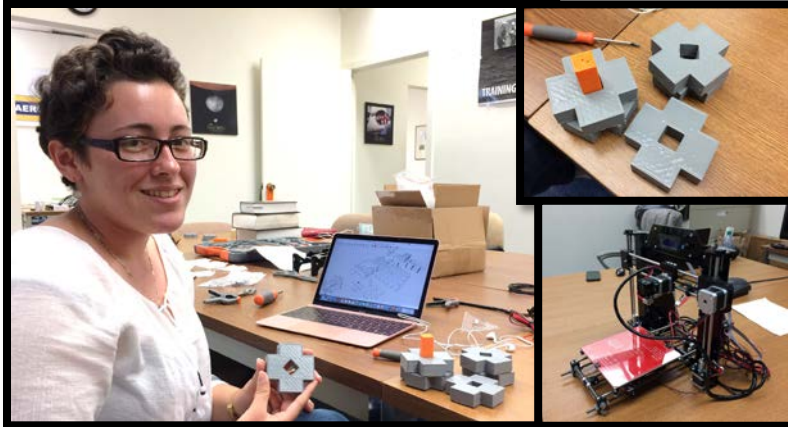
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## Intern Designs New 'LEGO' Block for Space Construction



*Waiakea High School graduate and PISCES summer intern, Lily Leyva, holds a 3D printed sample of her Planetary Building Block design.*

## Applied Research

### PISCES UAV Project Takes Flight



*PISCES will outfit a DJI drone with the bait dispersion system.*

PISCES recently received a grant from the County of Hawaii Dept. of R&D to build and test an integrated Unmanned Aerial Vehicle (UAV) system with a Little Fire Ant (LFA) bait dispersion payload. LFA populations in Hawaii have been growing rapidly. In addition to their painful sting, LFAs negatively affect the local nursery, agriculture, ranching and tourism industries. Current control methods primarily focus on ground nesting LFAs and largely neglect arboreal LFA populations. Arboreal populations can be reached by a variety of methods, but these tend to be time and labor intensive and/or expensive (e.g. via helicopter). An effective delivery method via UAV would provide a lower cost alternative for arboreal treatment of LFAs.

The primary goal of this project is to design a UAV with a LFA bait dispersion payload that can be shared and duplicated for wider use by other interested parties. PISCES' robotic interns and staff will work in consultation with the Hawaii Ant Lab to design and build the payload system during the summer and fall of 2017. Upon completion, PISCES will coordinate with the County of Hawaii and Hawaii Ant Lab to select appropriate sites for subsequent testing during the fall and winter months of 2017. If testing goes well, PISCES will catalog a detailed description and build-out of the integrated system with accompanying requirements and specifications for distribution to Hawaii Ant Lab and the County of Hawaii.

PISCES Intern Lily Leyva has innovated a new design for "Planetary LEGO Blocks," a NASA STTR-funded project in partnership with Honeybee Robotics to enable ISRU construction in space and on Earth. The design improves upon its predecessor by increasing structural integrity and providing more versatility in building applications like horizontal and vertical construction, as well as incorporating rebar posts.

In 2016, PISCES developed a prototype design of these blocks during its robotically built vertical take-off/vertical landing pad project, creating pavers made of volcanic basalt shaped with interlocking corners and edges. After a rocket firing test, the pavers showed favorable results but still needed significant improvements in their structure and design. Many cracked under the intense pressure and heat of the rocket blast. During the sintering process, these pavers were also prone to cracking at their corners and joints.

Lily decided the best solution to these issues would be to cut corners—but she didn't have any shortcuts in mind. Instead, she proposed eliminating corners entirely from the block design, creating greater structural integrity while reducing the chances of cracking during test firing and sintering.

After drafting her design idea with a software program, Lily used a 3D printer to make the blocks and evaluate their look and feel while trying out various building configurations.

"So far this is the simplest and most complementary design for sintering and static fire tests," she said.

Lily's new design simplifies the sintering process by using only a single casting mold to create blocks that can be used in multiple applications. They can also be used to build in a range of applications, including horizontal and vertical structures.

Meanwhile, the rest of the Materials Science Team—Intern Kyla Defore and Operations Manager Christian Andersen—are assessing various procedures for casting and sintering basalt fines to perfect the process of creating these blocks. While heat remains the key ingredient in the process, the team is now focused on determining a specific temperature and duration, in addition to identifying the exact tools and materials needed to create a consistent product.

## Program Manager's Message Cont...

I'm excited to announce that we've also been invited to participate in three research proposals involving autonomous horizontal robotic construction, water extraction from Martian regolith, and remote mapping of lava tubes. If any of these proposals materialize it will make for a very exciting year.

While these efforts are happening here at PISCES, other exciting projects are taking form. Henk Rogers, PISCES Board Chair and founder at Blue Planet Foundation, is organizing the first International Moonbase Summit here on Hawaii Island in October. Rogers' key goal is to "create a plan of action that will establish the world's first prototype lunar base in the State of Hawaii."

During the last several weeks, the importance of building a Moonbase prior to a manned mission to Mars has been a hot topic of discussion in the Space Exploration community. Elon Musk, Founder and CEO of SpaceX, recently pointed out that colonizing another planet (such as Mars) will have to be done in incremental steps. One of the critical first steps will be to build an extraterrestrial base here on Earth in lunar-like conditions to learn what challenges might lie ahead. Hawaii's volcanic basalt landscapes provide the ideal analog environments needed to take this important first step. We look forward to actively supporting this exciting project!

A hui hou,



Rodrigo Romo  
PISCES Program Manager

## #StudentAstronaut Contest Winner to Train like a Mars Astronaut in Hawaii

Xploration Station, a TV channel dedicated to STEM programming for teens, has announced Julia Valesquez as the winner of this year's #StudentAstronaut video contest. Julia is the first deaf contestant to win the nationwide challenge, and was selected based on her passion for aerospace and remarkable record of academic and community achievement.

Julia graduated from Gallaudet University summa cum laude with a B.S. degree in Biology. She has interned at the NASA Academy at the Goddard Space Flight Center and the SpaceFlight and Lunar Sciences and Technology Program (SLSTP) at Kennedy Space Center.

As the next Student Astronaut, Julia will be flown to Hawaii Island in the fall of 2017 to train like a "Martain astronaut." She will learn to operate planetary rovers with PISCES and UH Hilo's Robotics Team, stay overnight at the HI-SEAS Mars habitat simulator on Mauna Loa, and visit the CFH Telescope on Maunakea volcano.

Julia will be accompanied by Emmy-nominated TV host, Emily Calandrelli. Her adventure will be featured in a Season 4 episode of Xploration Outer Space.



*Julia Valesquez was surprised with the news of her selection while in class at UCSD.*

## Economic Development

### Hawaii to Host Moon Base Summit in October



Hawaii will host the first-ever International MoonBase Summit (IMS) from October 1 to 5, 2017, to create an actionable plan to establish the world's first prototype lunar base in the State of Hawaii.

Described as an "action-driven" event, the IMS will be held at the Mauna Lani Hotel and Bungalows on Hawaii Island's Kohala Coast. Registration is now open at [moonbasealliance.com](http://moonbasealliance.com).

Applications will be accepted from July 8 to 31 for the regular registration fee; August 1 to 30 for a late registration fee. Upon acceptance, applicants will receive further information and instructions. The IMS is sponsored by the International MoonBase Alliance, LLC

## Inspiring and Encouraging Girls in STEM

*Kimberly Stratton*

Senior Engineer, Caterpillar, Inc.

As a female aerospace engineer, I am acutely aware that men dominate the Science, Technology, Engineering, and Math (STEM) fields. In college, the guy/girl ratio in my Calculus III class was 40 to 1. I was the token female. At work, the ratio has improved some, but not much.

Growing up, I wasn't encouraged to enter a STEM field. When it came time to decide on a college degree, I narrowed it to veterinary medicine (since I loved animals) or aerospace engineering (since I was good at math and science and loved planes). Ultimately, my college choice boiled down to the ability to play collegiate basketball at one school versus my favorite Mexican restaurant at the other school. Yes, I admit, my career choice was decided by a simple question of which is more important to me: Mexican food or basketball? By this juvenile decision-making process, I stumbled into a STEM field. For these reasons, I am passionate about encouraging girls to enter STEM fields. I wish I had had the opportunities that students have now to be part of NASA's Robotic Mining Competition (RMC) or the PISCES Women's STARS Program, and to be inspired by an older generation that yes, there is a place for girls in STEM.

Events like the RMC, STARS, or the NASA Centennial Challenge are excellent events to encourage girls to enter STEM fields, inspire the younger generation – guy or girl – and teach these students vital skills that most folks learn on the job. What an opportunity it is to enter the workforce already knowing how to troubleshoot, explore different engineering avenues, communicate effectively within a team and plan for and keep deadlines.

I have had the pleasure of being a part of all these programs as a mentor, competition judge, guest speaker or coordinator. At NASA's RMC, I witnessed teams develop highly creative solutions to tackle the same challenge. They were also learning a lot of what I had to learn on the job.

The 2017 STARS program was a personal favorite of mine, and incredibly rewarding to participate in. I am sure that if more programs like this existed across the U.S., more girls would be encouraged and inspired to enter STEM fields. The STARS students experienced one week of presenters and hands-on projects covering a variety of topics including: geology, engineering, aerospace and robotics, to name just a few. Finally, the NASA Centennial Challenge is aiming to advance 3D printing technology to take steps toward NASA's long-term goal of having people permanently living on the Moon. This inspirational event will take place in August 2017. Tune in to the NASA Channel to observe these teams help us take the next great steps in space exploration.

Overall, what an exciting time for our youth to explore the wondrous world of STEM fields!



*Kimberly demonstrated her passion for inspiring youth in STEM by flying to Hawaii during the 2017 STARS Program to show participants what the real-life career of an engineer looks like at Caterpillar's automated machine controls division.*

### Follow us online!



Connect with PISCES on Facebook and Twitter for the latest news in space exploration, aerospace and technology development in Hawaii, and STEM education opportunities!

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