

PISCES NEWSLETTER

LETTER FROM PISCES PROGRAM MANAGER RODRIGO ROMO

Earth & Space 2016 and PISCES' new direction

I had the privilege to attend this year's ASCE's Earth & Space Conference in Orlando. Earth & Space is a biannual international conference where experts from Academia, Industry, Research Organizations and Government Organizations get together to discuss and share the work that is being done in different fields of space exploration with the goal to someday take us to the Moon, Mars or asteroids.

The conference was a valuable experience in many ways. There is no doubt that there is a race going on today to develop the technologies and methodologies that will lead us to the moon or Mars. Over 125 people from different countries and different disciplines attended the conference and presented technical papers. The conference was organized in four different symposiums covering everything from space mining/drilling technologies, advanced manufacturing for future space habitats, In-Situ Resource Utilization, Robotics and many other subjects.

During this conference I also had the opportunity to meet face to face with our partners in the Vertical Take off/ Vertical Landing Pad (VTVL) project: Rob Mueller from NASA, Peter Visscher from ODG-Canada and Kris Zacny from Honeybee robotics. Another very pleasant surprise was to see that PISCES is a well-known and respected name in this circle. Many people whom I've never met before approached me and told me that they were following us closely in our VTVL project and other activities.

After giving the presentation of the VTVL project, there were numerous questions and interest from the people in the room and several approached me during the day and following days to make comments, suggestions and just "talk story" about the project. One of the reasons, I believe, why the PISCES VTVL project stood out, and attracted so many people's attention is due to the nature of the project. In the conference there were many theoretical papers, many lab studies and then several presentations of how some envision future Lunar or Mars colonies will be built or will look like. However, there were very few presentations that showed the actual application of the technologies described, or the how we get from theory to implementation. The PISCES paper proved that, it showed that all the different components of an ISRU project (land preparation through robotic teleoperation, construction of basalt pavers using no aggregates, robotic deployment and construction of the landing pad and the actual testing under a rocket engine) can be successfully done here in Earth. And this, from the feedback I received was something that the audience truly appreciated.

As a result of our presentation, I came back with several good ideas on how to improve our paver manufacturing process as well as several parties interested in doing collaborative work with PISCES in Hawai'i including wheel traction studies, ISRU, robotic excavation and other projects.

So what does this mean for PISCES and how does it affect or shape our future? **LETTER CONT. PG. 2.**



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SPECIAL POINTS OF INTEREST

- High School Females ages 16 and up may now apply for the summer STARS program!



President of the Polynesian Voyaging Society Nainoa Thompson with Dr. Jacqueline Quinn, the project manager for the RESOLVE payload, which has been tested at the PISCES' test site.

HÖKŪLE'A VISITS NASA'S KENNEDY SPACE CENTER

In April, Hawaii's beloved voyaging canoe Hōkūle'a made a stop in Florida.

The crew made its way to the Telemar Bay Marina in Indian Harbour Beach and were honored with warm Aloha.

While stationed at the Titusville Municipal Marina, they took time to stop by NASA's Kennedy Space Center to honor Hawaii's own Ellison Onizuka and Lacy Veach.

According to an article published in *Florida Today*, Veach was the first person to suggest that Hōkūle'a sail around the world.

Hōkūle'a left Hawaii in May of last year as

part of the Mālama Honua Worldwide Voyage.



LEFT: President of the Polynesian Voyaging Society Nainoa Thompson is seen here with some members of NASA's Kennedy Space Center during a trip to Florida.

Make sure to visit www.pacificspacecenter.com for your latest news!

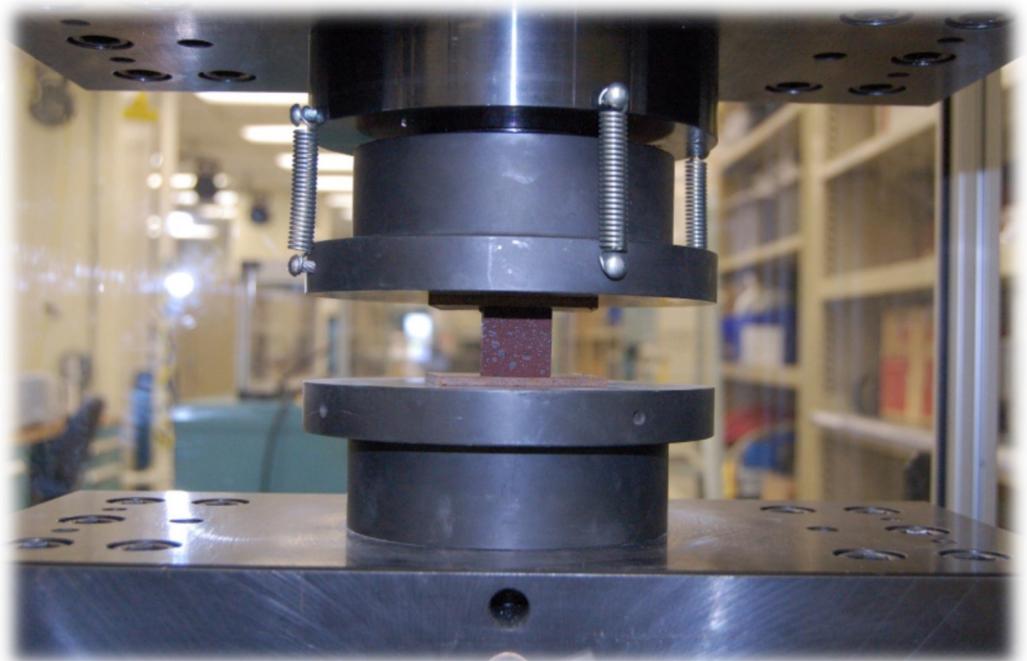
ABOUT:

As part of a PISCES-NASA Kennedy project to robotically build a vertical take-off & vertical landing (VTVL) pad, PISCES developed and matured a process for making pavers/bricks only using rock quarry waste (fine rock dust and sands).

This process requires no added binders (like cement) and can be manufactured using excess and/or off-peak energy.

NASA's testing of compressive and tensile strength showed that the PISCES' pavers exceed the strength of residential concrete and approach the strengths of commercial concretes.

PAVER STRUCTURAL ANALYSIS



Follow PISCES on social media by liking PISCES Hawaii on Twitter and Facebook!



PISCES Program Manager Rodrigo Romo took this picture while at the NASA Kennedy Space Center. The image shows the underside of the Space Shuttle Atlantis.

LETTER CONTINUED...

In the past 3 years, PISCES has built a name and reputation in the Space Exploration Community that is recognized by many. This has an enormous value that we need to use and leverage in our new challenge to promote Economic and Business Development for the State of Hawai'i. This is an asset that has taken time and dedication to build, and that will require to be maintained through continuing our efforts in applied research areas that could help the Economic and Business Development plan. In order to bring investors to Hawai'i to develop new technologies, applied research should be done to demonstrate the feasibility of those technologies. The areas in which we see a potential for Economic growth that can benefit the state and allow PISCES to continue its contribution in Space Exploration include: basalt manufacturing, basalt construction, renewable energy technologies, analog site test development and perhaps find a way to integrate tourism into some of the field testing done in Hawai'i.

There is still much to digest and assimilate from this conference, and how to apply these learnings into PISCES' future, but I believe that while we are faced with new and difficult challenges, there are some bright opportunities to take PISCES to its new stage in life.

"Sometimes you have to think outside the box when you're into space because the environment is so different out there" – Rob Mueller.



LEFT: GO ONLINE TO WWW.PACIFICSAPCECENTER.COM TO SEE A SHORT DOCUMENTARY OF OUR ROCKET ENGINE FIRING TEST COURTESY OF ENA MEDIA HAWAII. PHOTOGRAPH BY: ENA MEDIA HAWAII

ASTRODAY 2016!

On April 30th a large crowd consisting of families, students, scientists and more joined together at the Prince Kuhio Plaza in Hilo, Hawaii for the annual AstroDay event!

This was the 15th annual AstroDay celebration and was a complete success! The event brings together people all around the world to share in the joy of astronomy and space! There were more than 40 exhibits at this year's AstroDay event in Hilo, Hawaii, including yours truly!

This year PISCES brought out our robotic rover, Helelani, and showed the recent documentary filmed by Ena Media Hawaii of our lunar landing pad rocket engine firing test. Students and children alike were drawn to our table to check out the rover and asked many questions about space, science in Hawaii, and what it is that PISCES does for the community.

We had a blast! Below are some photographs of some children checking out our rover. Enjoy!



UNIVERSITY OF HAWAII AT HILO ROBOTICS CLUB

The Vulcan Space Robotics Team heads to Kennedy Space Center for inaugural appearance at the NASA Robotic Mining Competition event running May 16-20. The team of 6 students officially represent the University of Hawaii at this prestigious national event.

Their mining robot (named "Spock" after a famous Vulcan), will collect and navigate avoiding obstacles to scoop Mars regolith simulants then transport to the collection bin at the starting gate within a 10 minute competition heat. This open design event is crucial to NASA's Journey to Mars as it is the first step in ISRU (In-situ resource utilization) where materials found in space are processed into needed resources such as oxygen, water, rocket fuel and construction materials.

The team is comprised of UH-Hilo students Ethan Paguirigan, Carli Hand, Daryl Albano, Derek Hand, Stephane Mapes and Michael Weber with faculty team leader Marc Roberts. Ethan has worked with PISCES as our pilot Cooperative Intern, Derek was a field assistant with our Google Lunar X-Prize field test with Team Puli from Hungary, while Marc has also assisted with our MoonRiders field tests and recent Mars Landing Pad tests.

PISCES has been promoting college-level robotics at UH Hilo by sponsoring the Space Robotics Club for the past 4 years, and fielding an RMC team for the past two. John Hamilton, PISCES Logistics and EPO manager, is the club faculty advisor and an invited judge at the NASA RMC for four years.

PISCES IS NOW ACCEPTING APPLICANTS FOR THEIR SUMMER STARS PROGRAM!!!

The Pacific International Space Center for Exploration Systems is pleased to announce that applications are available online for their summer STARS (STEM Aerospace Research Scholars) program!

STARS was created to encourage Hawaii's young women in high school to pursue a space career or other STEM (science, technology, engineering, mathematics) related field via a four-day workshop on space exploration.

STARS begins this year on July 19 with a workshop at the Canada-France-Hawaii-Telescope Headquarters in Waimea. On July 20, the participants will take a tour of PISCES Headquarters and our various projects, and then visit the Canada-France-Hawaii Telescope Corporation again on Thursday for an overview on multi-

wavelength astronomy and search for Exoplanets and life in the Universe. The program will end on July 22nd with a sunset tour at the Summit of Mauna Kea.

The program is available for Big Island high school females ages 16 and up. They may visit our website at www.pacificspacecenter.com to download the application.



Participants of the 2015 STARS program



The image above depicts the University of Hawaii at Hilo's Space Robotics Club.

Photo credit: University of Hawaii

The team has come a long way from initial designs, testing various prototypes and learning associated skills like Auto CAD, linux/arduino programming, machining and electronics, mostly via their extra-curricular work. After a false start last year (their robot was not ready in time for RMC 2015 and did not make it to Florida), the plucky team regrouped and performed successfully at our PRISM event in July 2015 at a Mars Analog Site here in Hawaii. PRISM (PISCES Robotic International Space Mining) is an extension of the RMC with global participation, operations in a high-fidelity Planetary analog site, and remote control from Hilo over 50 miles away.