PISCES NEWSLETTER

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

APRIL, 2014 VOL 2 ISSUE 4

Max Kerr,
PISCES Robotic Technician

Max Kerr is the newest member of the PISCES team. The Hilo High grad joined the Center in March as a part-time Robotic Technician for PISCES. He works directly with PISCES Project Manager, Rodrigo Romo, who leads the Robotic Village project, the core of which centers around the newly acquired PISCES planetary rover.

Max is helping select hardware and software needed for the robotic spacecraft, as well as programming. His expertise stems from his time with the Hilo Viking Robotics club, where he was in charge of programming and wiring robots for the FRC and VEX competitions.

Max is a Computer Science Major at the University of Hawaii at Hilo who has maintained a 4.0 GPA through the two semesters he's completed so far (Summer and Fall 2013) and has 4.5 years of C++ experience.

His skills include FRC control system wiring and programming, Arduino systems and programming, and knowledge of motion control systems and algorithms.

MESSAGE FROM THE EXECUTIVE DIRECTOR

Dear PISCES Friends and Family,

In the last few months, I've been sharing with you PISCES's six major strategic tracts for the coming year:

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

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

In our March issue, I discussed the second one on the list - Integrated In-Situ Resource Utilization (ISRU): "PISCES Robotic Village". In that regard, we are SO excited and proud at the April 9th arrival of the 726-pound rover into our laboratory in Hilo. This was an eventful day for our program!

The third strategic area within PISCES is our focus on Planetary Analogue Test Sites. A main theme within our agency is the maturing of planetary surface systems technologies - machines that will operate on other planetary surfaces, like the moon and Mars. *(cont. on page 3)*

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PISCES ROVER OFFICIAL HAWAII DEBUT HIGHLIGHTS

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ISLAND OF OAHU

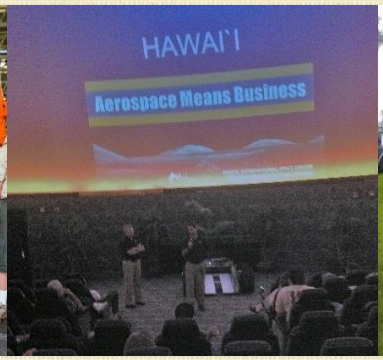
PISCES SHOWCASED TO THE PUBLIC FOR THE VERY FIRST TIME ITS NEWLY ACQUIRED ROVER AT THE PACIFIC AVIATION MUSEUM PEARL HARBOR'S "DISCOVER YOUR FUTURE IN AVIATION" EVENT ON SATURDAY, MARCH 29. THE OFFICIAL PUBLIC DEBUT WAS THE GRAND FINALE OF OAHU EVENTS SET FOR THE PISCES ROVER, FROM A SURPRISE VISIT TO STUDENTS AT STEVENSON MIDDLE SCHOOL IN HONOLULU, TO A PRIVATE RECEPTION AT THE PACIFIC AVIATION MUSEUM, LIVE NEWS COVERAGE ON KHON AND KITV'S MORNING SHOWS, A DEMONSTRATION AT THE HAWAII STATE CAPITOL FOR LEGISLATORS, AND A SPOT ON THE FRONT PAGES OF THE MAIN AND LOCAL SECTIONS OF THE HONOLULU STAR-ADVERTISER…IT WAS A BUSY AND EXCITING WEEK FOR THIS SPACE VEHICLE!

BIG ISLAND OF HAWAII

THEN, ON APRIL 9TH, THE PISCES ROVER ARRIVED AT ITS FINAL DESTINATION - ITS HOME BASE ON THE BIG ISLAND WHERE, SO FAR, IT HAS MADE APPEARANCES AT `IMILOA'S MAUNAKEA SKIES TALK AS WELL AS THE MERRIE MONARCH PARADE.

TOP (L-R): Stevenson Middle School, Pacific Aviation Museum Executive Director Ken DeHoff & PISCES Executive Director Rob Kelso at the Museum's private reception, Star-Advertiser article featuring Sen. Will Espero at the Hawaii State Capitol, driving the rover dressed in a spacesuit PISCES loaned from the Heinlein Prize Trust, and PISCES Project Manager Rodrigo Romo and Rob Kelso on KITV's morning show with reporter Ashley Moser.

BOTTOM (L-R): Boy Scouts posing with the rover at "Discover Your Future in Aviation" Day (photo courtesy Pacific Aviation Museum), Rob Kelso and Rodrigo Romo's "Living off the Land" Maunakea Skies Talk at `Imiloa, Hawaii County Mayor Billy Kenoi and PISCES Cultural Advisory Committee member Kimo Pihana, as well as Miss Hawaii 2013 Crystal Lee at the Merrie Monarch parade.



PLANETARY ANALOGUE TEST SITES

MESSAGE FROM THE EXECUTIVE DIRECTOR CONT.

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HEINLEIN PRIZE TRUST LOANS PISCES THREE SPACESUITS

As part of its mission to strengthen STEM education in Hawaii, PISCES has loaned three spacesuits from the Heinlein Prize Trust.

The first is an authentic NASA Launch Entry Suit (LES), also called the "pumpkin suit", worn by NASA Administrator Charles Bolden. This is the first time this spacesuit has been in Hawaii. Bolden was nominated by President Barack Obama and confirmed by the Senate in 2009, making him the first African-American to head the space agency on a permanent basis.

The second spacesuit is from the Heinlein Prize Trust's "Have Spacesuit, Will Travel" educational program. It is a white Sokol (a type of Russian spacesuit) that has been modified with a velcro back so that kids (and kids at heart) can easily wear it. This program is based on the book "Have Spacesuit – Will Travel" by science fiction writer Robert A. Heinlein.

The third spacesuit is also a Sokol suit – this one was worn by Dr. Leroy Chiao, a former NASA astronaut and the first Asian-American Mission Commander.

The spacesuits have been used/featured at:
*Hawaii's "Journey Through the Universe"
*Imiloa's "Camp IMI-Possible"
*Stevenson Middle School
*Pacific Aviation Museum's "Discover Your Future in Aviation" Day
*PISCES Rover Demo, Hawaii State Capitol
*Prince Kuhio Plaza's AstroDay Display
*Merrie Monarch Parade
*KITV/KHON morning shows
*Honolulu Star-Advertiser

The spacesuits' final event will be AstroDay, which is on May 3rd in Hilo.
Mahalo to the Heinlein Prize Trust for allowing us to share these spacesuits with Hawaii!

The island of Hawaii (Big Island) has a multitude of favorable planetary analog sites that are significant to technology development for planetary surface operations. The variety of terrains, year-round favorable weather conditions, and accessibility offers a unique and convenient means of access to high quality analog sites. Successfully gathering data from these sites make research in Hawai`i valuable to organizations interested in testing and validating advanced technologies in preparation for going to planetary surfaces.

Interestingly, PISCES supported testing of an instrument called CHEMEN. After testing, the instrument was fitted on the NASA Curiosity Rover that now roams the surface of Mars. When the rover arrived, CHEMEN sampled the volcanic soil at Gale Crater and found it to be exactly like the basalt of Mauna Kea on the Big Island - another validation linkage between Hawaii and the stars!

Additionally, lunar pits, skylights and caves are hole-like features with volcanic and seismic origins. Only recently have incredible planetary features like skylights and lava tubes been discovered on planetary surfaces. The first of these was discovered by Junichi Haruyama during the Kaguya mission using NHK's (Japan Broadcasting Corp.) HDTV from orbit.

Recent discoveries made by LRO (Lunar Reconnaissance Orbiter) and MRO (Mars Reconnaissance Orbiter) further confirmed the existence of features that resemble lava tubes on Mars and on the Moon. Pits and caves are becoming an increasingly hot topic, with many new discoveries occurring. These features have produced new areas of interest and the need for data that will allow for new types of exploratory technologies. Hawaii offers high-fidelity science analog sites to these features.

These discoveries have also heightened discussions relative to robotic technology for scientific exploration of lunar pits, skylights and caves. From a technical point of view, so much is known about traditional roving, but little is known about descent, traverse of bouldered floors, or autonomy for caving.

From a scientific point of view, many questions can be investigated by landing and roving around and into these pits. Pit chains have also been observed on Phobos, Gaspra, Ida and possibly the asteroid Steins. Some potential formation mechanisms for the pit chains on these bodies have been discussed, but given the resolution of the observations, no detailed geomorphic analysis has been undertaken to date.

PISCES has begun a program to expand its existing data base on planetary analogue sites to now include high-quality skylights, lava tubes and pit craters located on the Big Island of Hawaii.

Last summer (and again for the summer of 2014), PISCES hired college students from UH Hilo to form a unique team of skills in sampling, measuring, and assessing the many planetary surface test sites on the Big Island. Their contribution has gone a long way to building a comprehensive database for world class research.

Until then, RES GESTA PER EXCELLENTIUM (Achievement Through Excellence).

-Rob Kelso, PISCES Executive Director

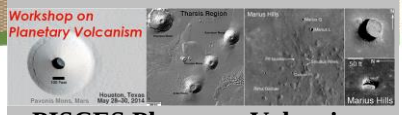
MOU SPOTLIGHT

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 14, with more on the way. We will feature one MOU per newsletter here.

WHO: *ACSER, Australian Centre for Space Engineering Research*
WHAT: *Research and education center designed to support Australia's space activities and develop space technologies*
WHERE: *University of New South Wales, Australia*
GOAL: *To develop joint research on planetary and terrestrial infrastructure development and construction*
PROJECT(s) WITH PISCES: *Polymer Binders & Basalt Casting/Sintering*

POSTPONED



PISCES Planetary Volcanism Workshop
May 28-30
Lunar Planetary Institute (LPI)
Universities Space Research Association Building
Houston, Texas
NEW DATES TO BE DETERMINED…STAY TUNED!

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).

NASA'S LADEE CRASHES INTO MOON| MISSION OFFICIALLY ENDS

LADEE – short for Lunar Atmosphere and Dust Environment Explorer – has officially completed its suicide mission as planned. NASA confirmed that the lunar orbiter crashed into the far side of the Moon on April 17.

PISCES was involved with the mission right before the space probe's launch.

Last summer, University of Hawaii at Hilo student Krystal Schlechter spent her Akamai Workforce Initiative internship working for PISCES, collecting data for LADEE.

To further enrich her internship experience, PISCES in September sent Krystal and her mentor, PISCES's John Hamilton, to witness LADEE blast off into space from Virginia.

LADEE was a $263 million project designed to unlock the mysteries of the Moon's fragile atmosphere. Studying and understanding the Moon's environment is key to figuring out how to live there.

Artist rendering of LADEE orbiting the Moon (image courtesy NASA)