PISCES NEWSLETTER

Pacific International Space Center for Exploration Systems •Hilo, Hawaii

SEPTEMBER, 2015 VOL #3 ISSUE #9

NASA'S DEPUTY CHIEF TECHNOLOGIST VISITS PISCES

Here at PISCES we were thrilled to have a visit by NASA Chief Technologist Jim Adams last month.

Mr. Adams stopped in for a visit during a trip to Hawaii and joined our interns and our staff for a brief talk story. During his time at the PISCES headquarters in Hilo, Mr. Adams gave a presentation on the latest in NASA technology.

Following the presentation, we took Mr. Adams on a specialized tour that included a visit to PISCES' Laser Lava Lab and a journey to the PISCES robotics high bay. *See pg.2.*

Pacific International Space Center for Exploration Systems (PISCES)
Phone: 808.935.8270
99 Aupuni Street, Suite 212-213
Hilo, HI 96720
Pisces.Hawaii.Gov

MESSAGE FROM THE EXECUTIVE DIRECTOR

Technology Development – Testing in Hawaii, Validating on the Moon

Aloha all,

As our PISCES' summer program comes to a close for 2015, PISCES has much to celebrate. Our PISCES' women STARS program (STEM Aerospace Research Scholars), designed to encourage Hawaii's young high school women to pursue science, engineering and math careers, tripled in growth from 3 participants in 2014 to 10 in 2015.

Our technical university program hosted nine summer interns for 2015 working in two groups: planetary surface characterization of Hawaii test sites similar to Moon/Mars, and the other team in engineering development for the PISCES planetary robotics program.

A main focus of PISCES is in the area of applied research in planetary surface robotics: rovers, power systems, communications system and more. PISCES believes in a phased-approach to human exploration beyond low-earth orbit (LEO)…by using robotic precursor technologies at the Moon to develop/prove the capabilities that feed-forward to ultimately exploring Mars with humans. As such, our approach in robotics has been one of "*testing*" robotic technology in Hawaii in harsh test site that simulate the conditions of the Moon and Mars, then ultimately leads to "*validating*" these technologies on the Moon's surface.

But PISCES has not limited itself to only testing these technologies in Hawaii. We have expanded our vision to now testing advanced technologies on the surface of the Moon!

A major accomplishment in FY15 was the introduction by PISCES of an inspiring and innovative lunar surface flight test program called MoonRIDERS for the testing of key technologies on the Moon. If technology development never gets out of the laboratory, it is difficult to incorporate it into future flight systems when it has never been tested in space. This is the case with a number of key NASA technologies. NASA has been working on electrodynamic dust shield for 4-5 years in the laboratory but has never been able to flight test the technology on the Moon.

PISCES put together the innovative partnership between the State of Hawaii, NASA and two Hawaii high schools to jointly develop a flight program to test the technology on the Moon in 2017….something NASA was unable to do alone. PISCES continues to become a world-leader in innovative research and testing in planetary surface systems.

-Rob Kelso, PISCES Executive Director

NASA TECHNOLOGIST CONT.

We were incredibly excited to hear about Mr. Adams' involvement with NASA and space exploration during, as well.

He has more than 35 years of aerospace engineering and management experience, both in the private sector and as a civil servant at NASA. He has significant program and project management experience and is currently serving Senior Executive in the Office of the Chief Technologist as the Agency Deputy Chief Technologist.

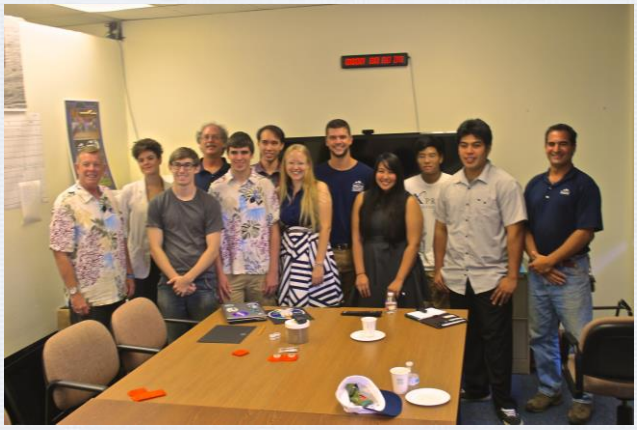
He has an extensive background in design, development and operations of both large and small-scale spacecraft missions as well as ground systems and infrastructure.

His skills range across program and project management, acquisition, planning, implementation and execution.

Thanks for stopping by, Jim!

PISCES Executive Director Rob Kelso is seen here with NASA Technologist Jim Adams and PISCES Operations Manager Christian Andersen.

PISCES Summer Interns 2015



This summer the staff at PISCES had the pleasure of working with several very talented university students from Hawaii and elsewhere through our 2015 summer internship program.

Our summer interns included Theodore DeRego, Ernesto Esparaza, Colin Milovsoroff, Valerie Wasser, and Karlin Yeh.

Casey Pearring, Eric Bouchet, Nicollet Thomas and Larissa Belcic, a master's candidate from Harvard University, assisted with the summer projects as well.

Through our 10-week summer internship program, our students acquired hands-on experience in two areas- site characterization and robotics.

PISCES Project Manager Rodrigo Romo led the robotic interns while PISCES Test Logistics/EPO Manager John Hamilton oversaw the team that surveyed planetary analogue test sites on Hawaii Island.

Student interns Milovsoroff, Wasser, Thomas and Bouchet were involved with site characterization. They traveled to Kaumana Caves and Kula Kai Caverns on the eastern side of the island along with various other locations to help identify new skylights, lava tubes, and other sites that could serve as useful planetary analogs for pre-spaceflight testing. The students also collected information at each site and hope to build a database from their research to be used by future studies.

As for the robotics crew, DeRego, Esparza, Pearring, and Yeh assisted Romo with outfitting the PISCES' *Helelani* planetary rover with three integrated mechanical systems. The software they added will enable robotic control of the rover so that it may help build the basalt-landing pad. The system involves a leveling blade, polymer spray system, and Paver Deployment Mechanism and sintering technology.

The robotic interns also worked on time delay emulation hardware that is needed for all planetary rovers. The hardware mimics the time delay that exists between the Earth and the Moon, or the Earth and Mars. Congrats everyone!

AN APOLLO 50TH ANNIVERSARY MOMENT
AUGUST 21, 1965

Photo credit: NASA

Eight Days or Bust- Gemini V

By John Holst, Space Foundation Research Analyst

Fifty years ago, high above the Earth, a Gemini V astronaut noticed pressure was going down in a fuel cell oxygen supply tank of his spacecraft. The astronaut, Charles Conrad, was one of two piloting the Gemini V spacecraft. The loss of pressure was a problem for him and fellow astronaut Gordon Cooper.

The fuel cell on Gemini V was a "new thing" for the astronauts, but it was also important. The fuel cell converted electrical energy from a chemical reaction between hydrogen and oxygen, and replaced almost all of the Gemini V spacecraft's batteries. It generated nearly all the spacecraft's electrical power during the Gemini V mission, powering the spacecraft's computer and maneuver systems.

Decreasing oxygen tank pressure meant the Gemini V spacecraft wouldn't have enough power to operate. Hours into the eight-day Gemini V mission the astronauts faced the very real possibility of cutting the mission short by about seven days—a bust.

The astronauts first noticed the pressure loss about two hours after their launch on August 21, 1965. The pressure continued to fall afterwards, and nearly five hours into the mission, Cooper switched off electrical power in an effort to conserve whatever energy the fuel cell might still be able to provide. Once powered off, the pressure in the tank began to stabilize. 100 to 300 miles above the Earth, the astronauts orbited without power as flight directors and their teams on the ground discussed what to do. The astronauts continued to monitor the pressure in the tank, noting it was remaining steady, but low.

The astronauts could still re-enter the Earth's atmosphere with the spacecraft and land safely—there were dedicated batteries with enough power to do that. Once that was established, NASA engineers focused on how to get the fuel cell operating normally again so the astronauts could continue their mission. After seven and a half hours, the astronauts were finally told to switch on the power. As the astronauts rebooted electrical power, the oxygen supply tank's pressure held steady. Subsequent tests of the electrical system gave the astronauts some measure of assurance as the pressure continued to remain stable during the tests. The pressure stability within the fuel cell oxygen supply tank meant the mission could continue.

Eight days later, on August 29, 1965, Cooper and Conrad returned safely in spite of the initial pressure problem, the mission was considered a success! Fuel cells continued to be used on other missions and spacecraft. They supplied power to Gemini and Apollo spacecraft, and then the Space Shuttle. They might also be used for storing energy for a Moon or Mars colony.

Cooper and Conrad.
Photo Credit: NASA

Stay connected with PISCES via Facebook & Twitter:

- www.facebook.com/PISCESHawaii
- @PISCES_Hawaii

WE ARE LIVE!!!

Check Out PISCES on the Web!

PISCES.HAWAII.GOV

PISCES AQUIRES THE MARSOKHOD ROVER!

PISCES recently acquired the historic Marsokhod Rover.

The machine was a joint U.S. and Russia effort. During the early part of 1993, prototypes of the rover were brought to NASA Ames Research Center from Russia.

The rover has made several missions around the world traversing Mars-like terrain, including Kamchatka Peninsula, the Mojave Desert, and the Kilauea Volcano in 1995.

The following image shows the Marsokhod Rover in one of the PISCES workshops.

The Marsokhod Rover came to PISCES from NASA.

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).

PISCES WELCOMES NEW COMMUNICATIONS SPECIALIST

Megan Moseley will be handling PISCES news, communications and all things media related. With a solid background in news reporting and media, Moseley is well equipped for the task and brings a wealth of experience in storytelling, photography, digital, radio and television news formats.

"I'm excited to join the team at PISCES and am looking forward to highlighting their incredible efforts," she said.

Moseley earned a Bachelor of Science degree in Journalism at the E.W. Scripps School of Journalism at Ohio University. She is filling the vacancy left by Chris Yoakum, who left Hawaii to go globetrotting.

Megan Moseley