PISCES
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Newsletter
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Workforce Development

Akamai Intern Completes PISCES Basalt Research Project

Intern Kylie Higaki (left) and PISCES Ops. Manager Christian Andersen grind up locally sourced basalt aggregate to prepare samples for chemical analysis.

PISCES wrapped up an intensive summer internship last month with Akamai intern Kylie Higaki, an Oregon State University student from Oahu who is majoring in Environmental Engineering.

During seven weeks, Kylie worked with PISCES to research Hawaii Island basalt samples and determine their usefulness as feedstock for basalt sintering construction. Under the mentorship of Geology Technician Kyla Defore and Ops. Manager Christian Andersen, she learned the fundamentals of planetary geology and applied that knowledge to catalog the mineral and chemical compositions of basalt found at three locations on Hawaii Island. Kylie then applied sintering techniques to these samples to determine which worked best as an ISRU construction material.

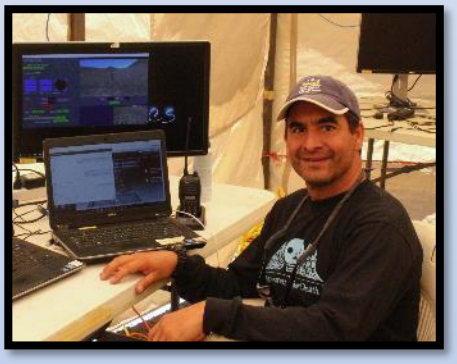
On Aug. 8, Kylie previewed her final presentation of the project with two special guest visitors at PISCES headquarters: DBEDT Deputy Director Mary Alice Evans and the Office of Aerospace Development's new Coordinator Chung Chang.

On the following day, Kylie was among 38 college student interns who presented the results of their Akamai Internship projects at the program's annual symposium held in Hilo.

Other organizations that provided students with work in the program included HELCO, NELHA, University of Hawaii at Manoa's Institute for Astronomy, Liquid Robotics, Akabotics, University of Hawaii at Hilo and the Thirty Meter Telescope (TMT). TMT provided significant funding support toward the program.

(Continued on page 3…)

Message from the Program Director



Rodrigo Romo

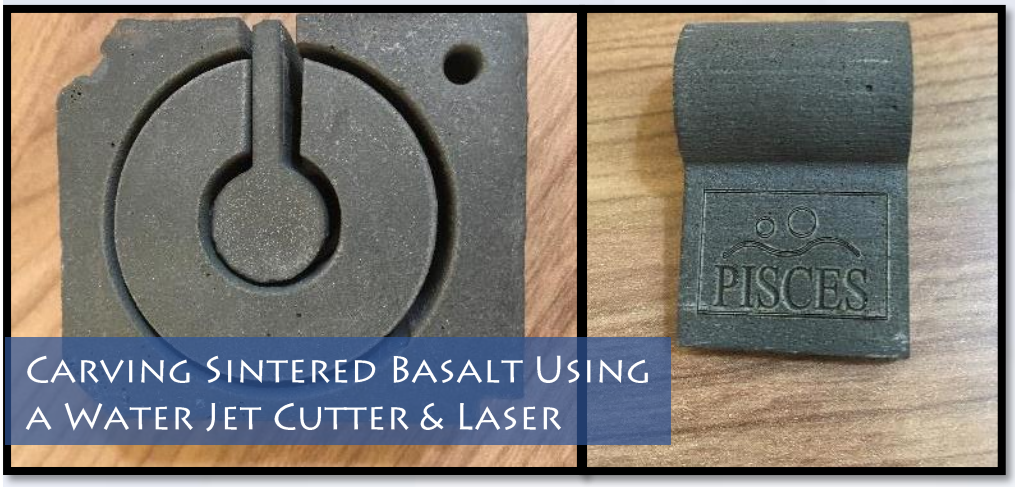
Aloha Kakou,

The past two months here on Hawaii Island have been a wild ride. After some 100 days of continuous volcanic activity in Puna's lower East Rift Zone, Kilauea's eruption finally came to a standstill. The lava flow claimed many homes, farms and businesses, but also created new land and coastline. Just as the volcanic activity subsided, Hurricane Lane brushed dangerously close to the islands during the week of Aug. 20, bringing record amounts of rain, landslides and heavy flooding. Despite these forces of nature, we've maintained diligent progress here at PISCES and have some exciting new prospects on the horizon.

(Cont. on page 3…)

In this Issue:

Applied Research



Carving Sintered Basalt Using a Water Jet Cutter & Laser

What do you get when you combine the extreme density of sintered Hawaii basalt with a high-powered water jet cutter? Extreme precision.

Last month, PISCES sent a sample of its strongest sintered basalt to Bear Machinery, a compact manufacturing facility in Honolulu that produces high quality components for the medical, scientific, military, commercial, astronomy and aerospace industries—including instruments for many of the Maunakea observatories.

Technicians at Bear aimed an in-house, 55,000 psi water jet cutter to the block, producing perfect cuts in a variety of shapes (shown above left). They also branded a piece of the sample with the PISCES logo using a laser engraver (above right).

Test results of have shown PISCES' sintered basalt samples exceed the structural integrity of specialty concrete, yielding compressive strengths of 30,000 psi and flexural strengths of 6,000 psi.

Combining these blocks with precision cutting technology could produce an extremely durable, non-corrosive and sustainable building material.

PISCES and Bear Machinery now plan to form a Memorandum of Understanding (MOU) to explore further possibilities for collaboration.

*The **Advanced Maui Optical and Space Surveillance Technologies** (AMOS) Conference will be held on Maui Island from Sept. 11 to 14, 2018. Known as the top scientific conference in the field of space situational awareness (SSA), AMOS is attended by more than 700 scientists, engineers and space experts from around the globe. Learn more and register online at www.amostech.com.*

PISCES Welcomes New Materials Science Intern

Kye Harford

PISCES is pleased to welcome Kye Harford to the team this month as a Materials Science intern. Kye will work with Geology Technician Kyla Defore to research basalt sintering techniques for ISRU construction.

Originally from Okinawa, Japan, Kye graduated from the University of Hawaii at Hilo in May 2018 with a major in Geology and minor in Agriculture. Kye will be handling much of the basalt sample analysis work needed to create a comprehensive catalog of Hawaii's volcanic rock for use in basalt sintering construction. He will intern with PISCES through December this year and contribute to the eventual publication of a scientific research paper outlining Hawaiian basalt compositions and their usefulness in sintering.

Outside of work and study, Kye enjoys surfing, hula and watching movies. He said he is both surprised and excited to be working with PISCES. Welcome to the team, Kye!

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Akamai Intern Cont...

PISCES/Akamai intern Kylie Higaki opened her final presentation at the Akamai Symposium in Hilo on Aug. 9 with a clever acronym: Martian CHRISTMAS (Characterization of Hawaiian Regolith In-Situ for Thermal & Material Analysis & Sintering).

Akamai Workforce Initiative was recently recognized with a Presidential Award for Excellence in STEM mentoring to help develop skilled labor for Hawaii's world-class astronomy facilities. The program aims to advance local college students in STEM fields, and to provide more opportunities to underrepresented groups—goals that align with PISCES' mission of providing unique STEM and aerospace research opportunities to Hawaii-based students.

Applied Research

PISCES Geology Tech Kyla Defore holds a bag of Mars regolith simulant that she will analyze and test for use as a basalt sintering feedstock.

Speaking of Martian CHRISTMAS (referenced in the top photo caption), PISCES Geology Technician Kyle Defore received a gift in the mail last month from Mars (well, almost). The package contained a bag filled with Mars MGS-1 regolith simulant from the CLASS Exolith Lab. This fine, rust-colored dust was carefully mixed to look and feel like the real stuff found on the surface of Mars. Kyla will be comparing the chemical composition of this sample with Hawaii's volcanic basalt before experimenting with sintering techniques to see how it works as an ISRU building material.

Program Director's Message continued...

In August, we accepted an invitation to attend NASA's Federal Small Business Summit Road Show in Honolulu where we networked to establish new partnerships for our Workforce Development and Applied Research initiatives. We learned about HUB Zone opportunities in Hawaii and I met with the VP of Bear Machinery, Blair Stultz. I also met with two University of Hawaii Manoa professors and a founder at the Hawaii Space Flight Lab to discuss research collaborations.

In other news, SpaceNews reported in their July 30th issue on the growing demand for small vehicle launch systems and facilities. The UK is looking to build a small satellite launch facility in Scotland like Rocket Lab's facility in New Zealand, and has contributed $3.3 million in government funding to begin construction. Small launch vehicle companies like Rocket Lab are looking to capture the growing small satellite market. According to SpaceNews, 43% of future small satellites (<50kg) have yet to secure a launch contract, and the small satellite launch services market for 2017—2026 is estimated at $1.1 billion (a total of 2,784 satellites).

While small vehicle development continues, the number of launch sites serving the industry is very limited. Hawaii's prime geographic location for small satellite equatorial launches creates a valuable opportunity to meet this growing market which could significantly benefit the local economy.

Our work in basalt sintering and ISRU manufacturing is continuing this year with a focus on creating a comprehensive catalog of various basalt sources on Hawaii Island. The catalog will index chemical compositions of various sources for use in our basalt sintering work.

In Workforce Development efforts, we are creating new partnerships with UH Hilo and UH Manoa. I am pleased to welcome a new basalt research intern this fall, Kye Harford. Also this fall, the PISCES/RISE VexIQ Keaukaha Robotics team will resume to join the regional competition league.

On a final note, the PISCES 'ohana extends a warm welcome to Chung Chang, the new Aerospace Coordinator for the Office of Aerospace Development under DBEDT. We look forward to working with you!

A hui hou,

R. Romo

Rodrigo Romo, PISCES Program Director