



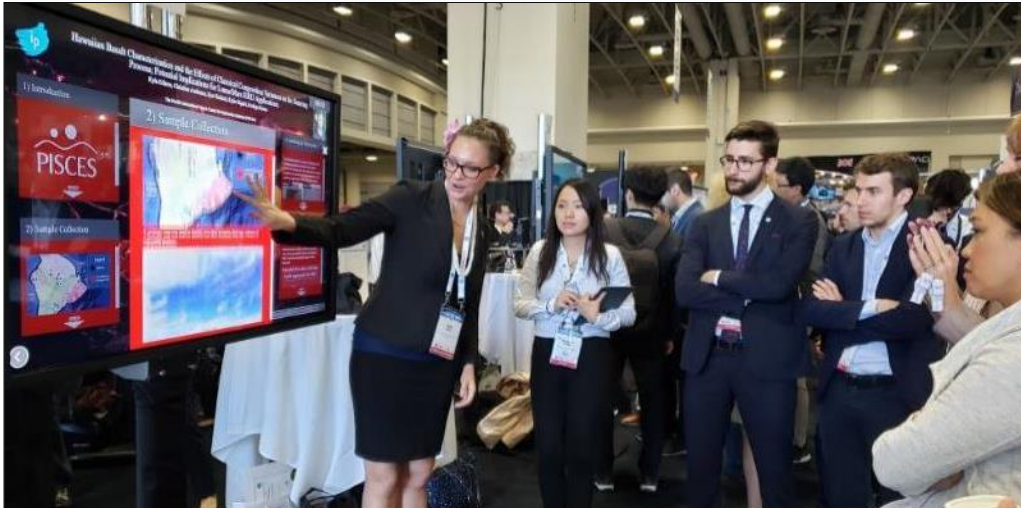
Pacific International Space Center for Exploration Systems



NEWSLETTER

APPLIED RESEARCH

MESSAGE FROM THE DIRECTOR



PISCES Presents Basalt Research at 70th IAC Conference

Above: PISCES' Kyla Edison presents the latest findings of her Hawaiian basalt research using an interactive visual presentation at IAC in Washington D.C. last month.

PISCES attended for the first time last month the International Aeronautical Congress. Considered the world's premier global space event, IAC has been bringing together experts, innovators and industry pioneers each year since 1950 to share knowledge, forge new partnerships and continue pushing the boundaries of the final frontier.

The event was hosted in Washington, D.C. from Oct. 21 to 25, featuring a week-long intensive of more than 2,000 technical sessions, as well as dozens of keynote speeches by distinguished space professionals. The presenters included a diverse array of authors, researchers and speakers from academia, industry and government. Their topics explored new scientific and technological breakthroughs, advances in space science, research, technology and education.

Among the presenters was PISCES Geologist and Materials Science Technician, Kyla Edison, who created an [interactive visual presentation](#) based on her research paper, "Hawaiian Basalt Characterization and the Effects of Chemical Composition Variances on the Sintering Process." Through images, graphics and video, Kyla presented her basalt characterization research, showing how Hawaii's basalt varies in chemical and mineral composition, and which compositions present the ideal conditions for sintering a durable construction material. The sintering process could be applied to lunar and Martian regolith as the composition of these off-world deposits is extremely similar to Hawaiian basalt.

(Cont. on page 3 ...)



Rodrigo Romo

Aloha kākou,

Last month, two of PISCES' staff attended the 70th International Astronautical Congress (IAC) in Washington D.C. to present research in ISRU (in-situ resource utilization) and seek out new partnerships to advance Hawaii's role in the space exploration industry.

Kyla Edison, our Geologist and Materials Science Technician, presented the latest results of the research she is leading in basalt sintering. The results of her work are drawing a lot of attention in the space exploration community, providing valuable data on the varying chemical compositions of basalt and identifying the ideal compositions for sintering. Christian Andersen, Operations Manager, sought out collaborative agreements with various agencies and organizations that are developing hardware for lunar exploration.

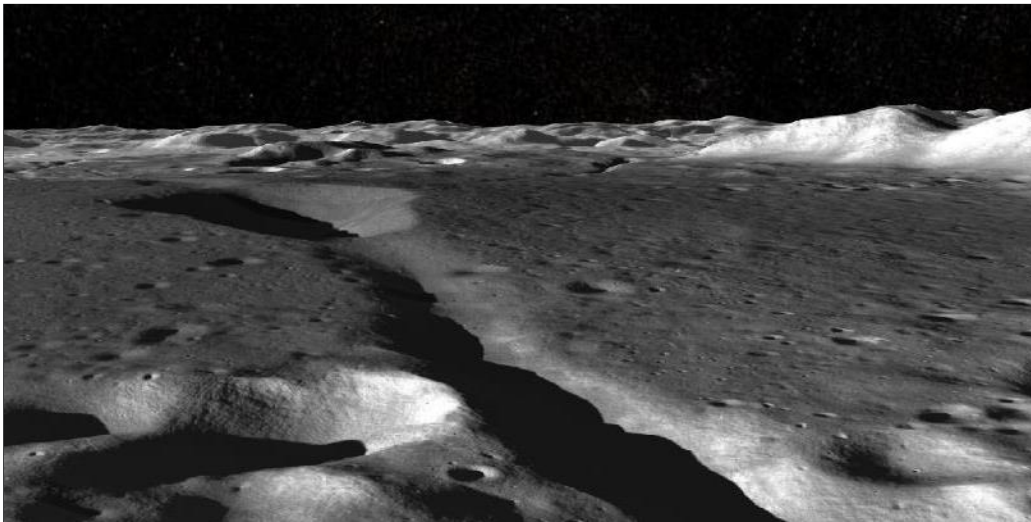
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GUEST SPOTLIGHT



Exploring Planets with NASA's Solar System Treks Portal

By: Brian Day, NASA SSERVI, and Emily Law, NASA-JPL

Above: The floor of the Moon's Schrodinger Crater as visualized with NASA's Moon Trek portal. **Right:** Project Science Lead Brian Day of NASA SSERVI (left) and Engineering Lead Emily Law of NASA-JPL. Photo courtesy of NASA-JPL.

NASA's Solar System Trek [online portals](#) provide web-based suites of interactive visualization and analysis tools enabling mission planners, scientists, students and the public to explore planetary surfaces as seen through the eyes of many different instruments aboard many different spacecrafts. The project is managed by NASA's Solar System Exploration Research Virtual Institute (SSERVI) and developed at NASA's Jet Propulsion Laboratory. The portals present a vast collection of mapped data products from past and current missions for a growing number of planetary bodies. As web-based toolsets, the portals do not require users to purchase or install any software beyond current web browsers. The interactive and immersive capabilities of these portals are being used for site selection and analysis by NASA and its international partners supporting upcoming missions. They are also being used by formal and informal educators, students from elementary through

university levels of study, and members of the public engaged in the excitement of solar system exploration.

The portals provide easy-to-use tools for browsing, data layering and feature search including detailed information on the source of each data product. Interactive maps include the ability to overlay a growing range of data sets including topography, mineralogy, elemental abundance and geology. They provide analysis tools that facilitate measurement and study of terrain including distance, height and depth of surface features, and allow users to easily find and access the geospatial products that are available. Users can drill down to find the PDS data used to produce geospatial products. Data products can be viewed in 2D or 3D and can be stacked and blended, rendering optimal visualizations revealing details that no single data set can show. Data sets can be plotted and compared against one another. In addition to keyboard and mouse control, standard gaming and 3D mouse controllers

allow users to maneuver first-person visualizations of flying across planetary surfaces. The portals also provide users the ability to specify any area of terrain for generation of STL/OBJ files that can be sent to 3D printers to make 3D models.

The new Virtual Reality Extension is an exciting addition to the Solar System Treks. Users can draw a path across the surface using the browser interface. A QR code is then generated which is read by the user's smart phone. Placing the phone in an inexpensive set of Google Cardboard-compatible goggles, the user then flies along their specified path in virtual reality.

The current list of released portals allows users to explore the Moon, Mars, Mercury, the dwarf planet Ceres, the asteroid Vesta, Saturn's largest moon Titan, and seven of Saturn's smaller icy moons. More portals are in development including the near-Earth asteroids Ryugu and Bennu and Mars' largest moon, Phobos. Unified access to all the portals along with supporting content is provided through the project's home site at <https://trek.nasa.gov>.

DIRECTOR'S MESSAGE *cont ...*

OUTREACH & EDUCATION

Hawai'i's high fidelity lunar analog test sites will play an important role in the next phase of lunar exploration under NASA's new Artemis Program. PISCES intends to take a leading role in this effort.

Overall, Hawai'i was well represented at IAC. In addition to PISCES, members of the Maui Economic Development Board (MEDB), Hawai'i Island Economic Development Board (HIEDB) and the Office of Aerospace Development (OAD) maintained a presence at the Hawai'i booth.

In outreach last month, the PISCES-RISE VexIQ Robotics team for elementary students competed in their first competition of the season. This year we have a smaller team of students, but I feel inspired seeing their dedication and enthusiasm for building their robot kits and testing them out in competition.

In economic development, we are continuing to seek commercialization opportunities for our sintered basalt products, as well as investors to develop a continuous basalt fiber manufacturing plant in Hawai'i.

On a final note, the Hawai'i International Space Exploration And Robotic Challenge (HI-SEARCH) is moving forward, tentatively scheduled for September 2020. This will be an unprecedented collegiate robotics competition for local and international students. We will soon begin soliciting sponsors for this event, including large corporations and small businesses. Stay tuned for more information on this exciting project!

A hui hou,



Rodrigo Romo
PISCES Program Director



Science Magic at DeSilva Elementary School

PISCES Geologist Kyla Edison (above right) stirs up some magic with a science activity for students at DeSilva Elementary School. The activity was part of a Harry Potter-themed fall break camp organized by Hawai'i Science and Technology Museum. The camp is held each year to provide a fun and engaging STEM experience to local youth.

PISCES Presents Research at 70th IAC *cont ...*

PISCES Operations Manager Christian Andersen focused on forming new partnerships with companies developing lunar hardware—technologies in high demand with the new push to return to the Moon. Andersen found several parties interested in collaborating on NASA STTR grants that could bring federal funding to the state of Hawai'i while advancing PISCES' basalt research and related projects.

PISCES was also present at the Hawai'i aerospace booth, helping present the valuable contributions the Aloha State continues to bring to the global astronomy and aerospace communities. Also attending the Hawai'i booth were members of the Maui Economic Development Board (MEDB), Hawai'i Island Economic Development Board (HIEDB) and the Office of Aerospace Development.

IAC is hosted each year by a member of the International Astronautical Federation (IAF), a nonprofit nongovernmental organization. IAF was formed six years after the Cold War ended to reconnect scientists from Eastern and Western Europe. It includes more than 340 members from 68 countries who work for space agencies, private companies, universities, governments and other entities. IAC is organized by IAF together with the International Academy of Astronautics and the International Institute of Space Law.

This year, IAC commemorated the 50th anniversary of the Apollo 11 moon landing, celebrating the first human lunar surface mission and tipping a proverbial flight cap to NASA's new Artemis program which plans to return humans to the moon in less than five years.

OUTREACH & EDUCATION



3rd Hawai'i Explorations Expo Showcases Innovation, Inspires Youth

Above: 1) Students play Tetris. 2) The Tetris Company and Blue Planet Foundation founder Henk Rogers gives the keynote speech. 3) PISCES Director Rodrigo Romo talks with visitors about Hawai'i basalt research and ISRU. 4) An elementary student controls a Vex IQ robot traversing a map of Mars.

Several hundred people from the East Hawai'i community turned out for the 3rd annual Hawai'i Explorations Expo on Oct. 27 to celebrate the latest science and technology innovations in Hawai'i and enjoy hands-on activities in robotics, programming, astronomy and other STEM disciplines.

Organized by Hawai'i Science and Technology Museum (HSTM), the event featured a keynote presentation by the founder of Blue Planet Foundation, Henk Rogers. A serial entrepreneur, Rogers also serves as the board chair for PISCES. In 1996, he co-founded The Tetris Company, making the now-classic video game a worldwide phenomenon. Rogers talked about his personal missions to fight climate change, end war and advance space exploration efforts to find a "backup" for Earth where humans can live and thrive.

"I'm a computer science guy," he said. "You always create backups."

Among the many attendees at HEE was Alexey Pajitnov, the Russian video game designer and computer engineer who created Tetris. The event also featured Jason Tom, an

O'ahu native and beatbox phenomenon. Also known as "The Human Beatbox," Tom is a Kapiolani Community College alumnus and math tutor who uses his passion, skill and charisma as an entertainer to advocate for STEM education.

"For me, it's a bridge to uplift people, to encourage them about perseverance," he said in a University of Hawai'i news article quoted on his website.

Other guest speakers also inspired perseverance, including Amber Imai-Hong, an avionics engineer at Hawai'i Spaceflight Laboratory and a UH Mānoa alumnus. Sitting on a discussion panel about STEM issues in Hawai'i, she encouraged youth in the audience to follow their hearts and never give up.

Tying the event's innovation theme back to cultural tradition, master navigator Kalepa Baybayan presented an overview of Polynesian navigation, highlighting the value of continuing the journey of discovery in Hawai'i into the 21st century. Baybayan has circled the globe on



multiple expeditions, serving as captain aboard the iconic voyaging canoe, Hōkūle'a.

HEE was attended by more than two dozen organizations including the Maunakea observatories and local STEM organizations. It was largely supported by donations to HSTM—many were made in memory of the late Barry Taniguchi, KTA Superstores CEO and philanthropist.