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# Hawai'i Aerospace News

## 50 Years After Apollo 11: Remembering Hawai'i's Supporting Role in the Moon Landings

***Above**: In December 1970, Apollo 15 crew members survey "Apollo Valley" on Hawai'i Island during a geology training exercise in preparation for a lunar surface mission. Photo: NASA.*

Last month, July 20th marked the 50th anniversary of the historic Apollo 11 lunar landing, an event that defined a generation and established a groundbreaking precedent in the world of space exploration. Among the many contributors that made this historic accomplishment possible, Hawai'i played an important role in the Apollo Program, preparing astronauts for their journey to the moon and actively supporting the missions as they happened.

Between 1965 and 1972, Apollo astronauts training in the barren volcanic landscapes of the Big Island of Hawai'i—otherworldly terrain that resembles the lunar surface and continues to support space missions bound for the moon and Mars. Crewmembers conducted exercises in nine locations on the Big Island including the slopes of Hualalai, Mauna Loa and Maunakea, as well as a variety of craters at the summit of Kīlauea. During the Apollo 11 spaceflight, Koke'e Tracking Station on Kauai Island relayed communications, maintaining contact between astronauts and mission control in Houston, Texas. When Neil Armstrong, Edwin "Buzz" Aldrin and Michael Collins had safely returned to Earth from their lunar expedition, Hawai'i was the first land they set foot on. After splashing down in the Pacific Ocean about 800 miles southwest of the islands, they were retrieved along with their command module spacecraft by a U.S. Navy aircraft carrier and brought to Pearl Harbor (though they remained quarantined to prevent the possibility of spreading any unknown moon germs).

*(Cont. on next page . . .)*

## *Message from the Program Director*

*Rodrigo Romo*

Aloha Kakou,

We are living in difficult and complex times here in Hawai'i. Earlier last month, construction for TMT was scheduled to begin on Maunakea. A group of Native Hawaiians and other community members opposing the project blocked the access road to the mountain, halting construction. Despite the opposition, many people still support the project but there is uncertainty about how to proceed and find a solution that recognizes the concerns of everyone involved.

While PISCES does not operate on the summit of Maunakea, nor are we a telescope operation, we are close to the astronomy community. Many of the telescopes participate in our Women's STARS Program for Hawai'i high school girls and provide many other education, mentorship and internship opportunities to local youth. *(Cont. on page 5...)*

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# Economic Development

## Sintered Basalt Tiles to be Tested for Commercialization

*Sintered basalt tiles made by PISCES.*

PISCES' applied research work in basalt sintering is turning up a product that has investors interested in commercializing it. Last month, PISCES Materials Science and Geology Tech Kyla Edison completed a batch of 25 sintered basalt tiles that will be tested by a company seeking durable construction materials.

By touch and feel, the tiles seem indestructible. Essentially, they are recomposed volcanic lava rock. The lab work will determine their exact strength through impact, porosity and slip testing, confirming whether they are the sturdy building material the company's clients are seeking. If so, the company may invest in manufacturing sintered basalt on a large scale.

Made entirely of raw basalt aggregate sourced from local quarries on Hawai'i Island, the product has the potential to spawn a sustainable new industry that benefits the state's economy and utilizes local resources. Sintered basalt products could be used as construction materials for tile, countertops, sidewalk and many more applications, significantly reducing dependency on imported concrete.

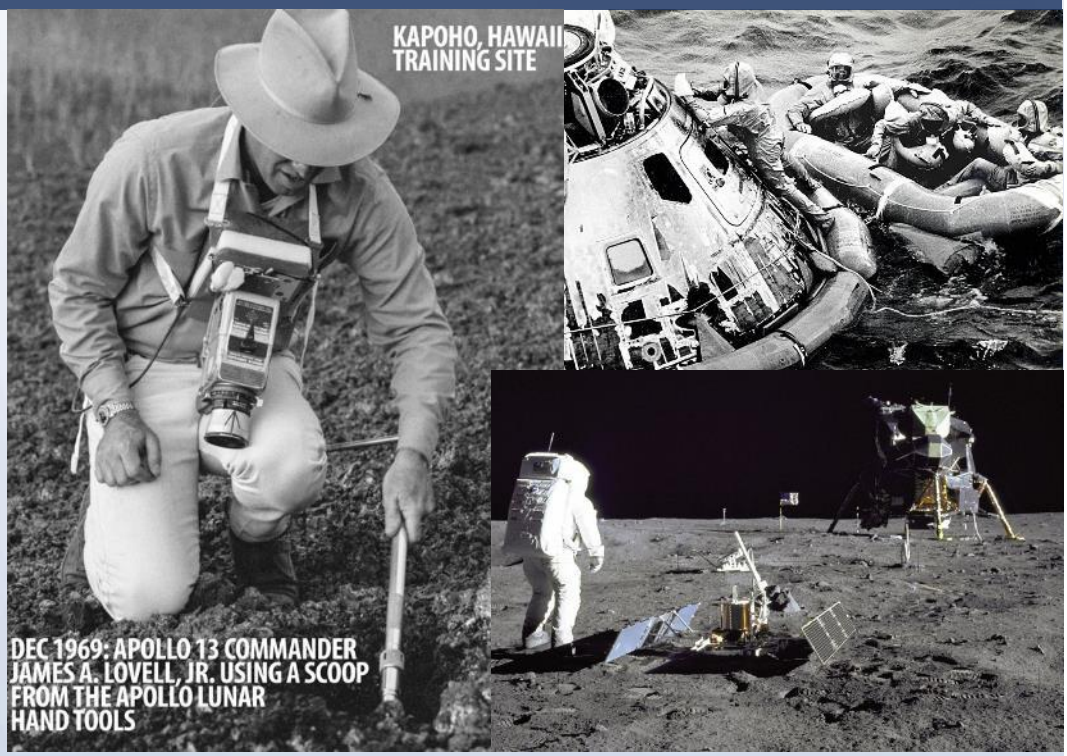
Previous incarnations of these tiles were tested by NASA's Kennedy Space Center and demonstrated three times the strength of specialty concrete. The newer tiles are likely to show similar, if not improved, results.

## Remembering Apollo *Continued…*

Hawai'i's supporting role in Apollo 11 was highlighted in 2014 by SCR 82, a resolution initiated by PISCES that recognizes Hawai'i's contributions to the Apollo program. Passed by lawmakers, the resolution deemed July 20, 2014, as "Tranquility Base Day"—named after the historic site where astronauts first set foot on the moon.

Fifty years later, NASA is now planning a new program to return to the lunar surface in the 2020s called Artemis—this time to build a permanent human settlement and infrastructure that can support deep space missions to places like Mars and beyond.

Hawai'i's lunar-like terrains and unique geography may once again support the next great space exploration missions undertaken by humans, continuing the quest of exploration and discovery that led the first Polynesian voyagers to the Hawaiian Islands.




***Above left**: Apollo 13 commander James. A Lovell, Jr. gathers samples of the volcanic terrain in Kapoho on Hawai'i's Big Island. Photo: NASA. **Top right**: On July 24, 1969, crewmembers of the USS Hornet retrieve Apollo 11 astronauts and their spacecraft from the Pacific Ocean about 800 miles southwest of the Hawaiian Islands. Photo: U.S. Navy. **Bottom right**: Astronaut and lunar module pilot Edwin 'Buzz' Aldrin stands outside the Eagle lunar lander at Tranquility Base on the surface of the moon. The photo was taken by mission commander Neil Armstrong. Photo: NASA.*

# Guest Spotlight

## Maunakea: Many Viewpoints, One Community

*By: Miriam Fuchs, Telescope Systems Specialist at EAO/James Clerk Maxwell Telescope*

Having dreamt about working for the Maunakea Observatories as a teenager, I feel lucky to be employed at East Asian Observatory as a Telescope System Specialist for the James Clerk Maxwell Telescope (JCMT). I spend many nights atop Maunakea working with visiting scientists to obtain pristine observations of the cold dust and gas in the universe that forms stars and planets. Additionally, I help support community outreach and educational programs on the Big Island of Hawai'i. A highlight of my year was recently staffing the PISCES STARS (STEM Aerospace Research Scholars) Program for Hawai'i high school women.

On the first day of the program, we participated in an interactive workshop led by Hōkūle'a voyager and Navigator in Residence at 'Imiloa Astronomy Center, Kalepa Baybayan. We learned about the 32 houses of the night sky that denote the location of rising and setting stars; we learned how to align the canoe to interpret which direction to venture towards. Having navigated using their knowledge of the skies and seas, the people of this island established their scientific legacy long before there were telescopes on Maunakea. It was incredibly inspiring for me to explore the unique, interwoven history of science and culture here in Hawai'i alongside the STARS students.

Today, we face a difficult situation as protests against the Thirty Meter Telescope (TMT) have become a platform for voicing legitimate concerns about systematic injustices against the Hawaiian people. Regardless of your opinion on the TMT, it's hard to imagine it being built under such an untenable situation on our island. For some, a sacred mountain should be undeveloped; for others, it should help us seek greater knowledge. A scientific endeavor such as an unprecedented new telescope can bring unparalleled opportunities for jobs, internships and educational opportunities for our keiki. Yet for many, that is beside the point.

*Above: Miriam Fuchs (left) leads a tour of the SMA Observatory on Maunakea for students of the STARS Program during Summer 2019.*

While the issue has resonated around the globe, it is deeply personal for those of us living on island. It is certainly not an argument between scientists and native Hawaiians—for there is crossover on all sides—but rather one between family, friends and neighbors.

To the amazing participants I've worked with in the PISCES STARS program over the last few years, please know that I understand how difficult it might feel in the current climate to be enthusiastic about pursuing science careers here on island. I encourage them to reach out to others and listen to every person's vision for the future of Maunakea. I hope the STARS students' experiences during the program have encouraged them to express their own ideas about the future of science in Hawai'i and allowed them to feel more comfortable making their voices heard.

Folks go up to Maunakea to pray and practice their culture, to do science, to hunt, to snowboard, to hike, and to witness incredible sunsets and the world's clearest night skies. I believe if we can continue to listen to one another and approach each other with mutual respect and a shared reverence for the mountain, there is hope to find a solution everyone on our island community can embrace.

*Above: Kalepa Baybayan, Navigator in Residence at 'Imiloa Astronomy Center, leads an introduction to Polynesian Navigation for Hawai'i high school girls during the PISCES STARS Program.*

# Workforce Development

## EMER-GEN Program to Mentor Youth Interested in Space Careers

***Above left**: The EMER-GEN Program includes mentoring by leaders in the space industry including Doug Loverro, former deputy assistant secretary of defense for space policy, DoD (center of table). **Right**: A panel of space industry leaders and young professionals discuss communication in multicultural, generationally diverse and team settings during the EMER-GEN program in 2018. Courtesy photos.*

The EMER-GEN™ program organized by Maui Economic Development Board (MEDB) will return for its second year at the Advanced Maui Optical and Space Surveillance Technologies (AMOS) Conference from Sept. 15 to 17 on Maui. A joint initiative of the conference and the Space Generation Advisory Council (SGAC), EMER-GEN is designed for young professionals and students who are enthusiastic about careers in space.

The EMER-GEN Program offers professional development opportunities through presentations, panel discussions and mentoring with renowned space leaders from the public sector (military and civil), private sector, academia and NGOs. Participants will be exposed to technical short courses that serve to expand technical job skills and help them stay informed about recent developments in their respective fields. The program also includes networking opportunities with other young professionals. The mentoring and professional development sessions will guide discussion on key questions and challenges to space cooperation and help future leaders meet and connect with current leaders and professionals.

"EMER-GEN was a great opportunity to learn from renowned space specialists, network with industry peers and learn professional skills," said planning committee member, Robert Kalei Miler, a geospatial information analyst with Pacific Disaster Center. "The knowledge and experiences I gained from EMER-GEN will help me with my continued career growth."

To ensure the program stays relevant to its young audience, MEDB is drawing on the input of young professionals. The planning committee includes two alumni of the 2018 EMER-GEN cohort, along with two members of SGAC.

"We received valuable, constructive feedback from the 2018 cohort, what worked, what didn't, and that has helped us to shape the 2019 program," said Sandy Ryan, conference director, MEDB. "It's important to engage the young professionals in the planning to find out what they want and need for their own professional development. As a joint initiative with SGAC, we are looking forward to tapping even more into their experience in coordinating similar events."

SGAC is a global, nonprofit NGO and network that aims to represent university students and young space professionals at the United Nations, space agencies, industry and academia.

EMER-GEN is limited to 40 participants to maintain an intimate setting for the program. For more details on the EMER-GEN program and to register, visit https://EMER-GEN.com.

Young professionals and students are also invited to attend the 20th annual AMOS Conference from Sept. 17 to 20 at a special rate. Considered the premiere technical conference in the nation devoted to space surveillance, participants include a cross-section of military, contractor and academic personnel engaging in dialogue and collaboration on a national and global scale. The continued growth in attendance and participating countries reflects a growing interest in Space Situational Awareness as national governments, start-up companies, universities and non-governmental entities become more involved in space activities.

The conference will be held at the Wailea Beach Resort on Maui from Sept. 17 to 20. Learn more and register at: https://amostech.com/category/amos-2019/.

# Outreach & Education

## Apollo 11 Spacefest Event Celebrates 50th Anniversary of Moon Landing

***Above left**: A lunar rock retrieved by Apollo astronauts sits above a miniature Hawaiian flag that was brought to the surface of the moon. Both items were gifted to the people of Hawai'i by NASA astronauts. **Right**: PISCES Technician Kye Harford helps a visitor with "extraterrestrial space crafts."*

Last month, a public celebration recognizing the 50th anniversary of the historic Apollo 11 moon landing drew about 2,500 people to Windward Community College for activities, exhibits and talks.

The Apollo 11 Family Spacefest was highlighted by moon rocks preserved by the state archive that were brought from the lunar surface by Apollo 11 and Apollo 17 astronauts. Also featured were two Hawaiian flags that were taken to the Moon and back, then gifted to the people of Hawai'i.

In addition to rare lunar memorabilia, the event included aerospace exhibits, 3D models of the Apollo spacecraft, 360-degree movies about space exploration and astronauts, and bottle rocket launches with students of the Project 'Imua team.

PISCES' Materials Science team, Kyla Edison and Kye Harford, set up an exhibit featuring "extraterrestrial crafting" for keiki, as well as examples and information on PISCES' research in basalt sintering technology.

## Message from the Director *Continued…*

These programs include Journey Through The Universe, Astro Day, the Maunakea Scholars Program, and dozens of other community outreach events and activities that the Maunakea observatories are dedicated to supporting. They are valuable, contributing members of the community and it is difficult to see them going through these hard times.

Outside of what is happening on the mountain, our interns are making excellent progress on their projects. This year we have four students who are working on three robotics-related projects and one materials science project. Their work will significantly contribute to our projects planned for later this year.

Our research in basalt characterization is getting more and more attention in the in-situ resource utilization (ISRU) community. This year, after presenting at the Space Resources Roundtable, we were invited to collaborate on five separate research proposals. We are currently working with two teams at NASA and a private company in preparing these proposals.

I am keeping a positive spirit and hope that our leaders find a solution that provides a positive outcome for parties on both sides of the issue on Maunakea.

*A hui hou,*

R. Romo

Rodrigo Romo
PISCES Program Manager