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The Voyages

From Space Grant to Space Craft

By: Brendan Hermalyn, Assistant Researcher, UH Mānoa HIGP/SOEST

I arrived in Hawai'i a direct product of several space grants. Connecticut Space Grant helped fund an experiment I ran as an undergraduate onboard NASA's DC-9 microgravity plane that lead me to pursue a career in aerospace and planetary science. During graduate school, I won a graduate fellowship through the Rhode Island Space Grant, which enabled my participation in NASA's LCROSS mission to the Moon. My current work at the University of Hawai'i at Mānoa is an interdisciplinary combination of aspects from both science and engineering alongside projects for Hawai'i Space Grant Consortium and Hawai'i Space Flight Laboratory (HSFL).

On the science side, I spend a lot of time trying to understand impact events and how they have affected planetary bodies such as the Moon, Mars, and Earth in the past, and how they continue to shape our lives today through the constant stream of micrometeoritic bombardment and the threat of larger events. A lot of this work has been carried out at the NASA Ames Vertical Gun Range, a unique facility in Mt. View, CA that permits hypervelocity impact experiments

Brendan setting up an impact experiment at the NASA Ames Vertical Gun Range. Lasers (seen here in red) are used to illuminate and measure the ejected material from a hypervelocity impact event.

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into planetary materials at very high velocities—up to about 6 km/s or a bit over 13,000 mph. Speeds like that would get you to New York from Honolulu in about 20 minutes.

On the engineering side, I am extremely interested in pursuing the future of space missions with small, low cost satellites and their instruments onboard. This is a unique time in our space faring history: even though larger missions and funding have become strained for resources, access to space has become ever easier and more attainable for the right kind of missions. HSFL is uniquely poised to be a leader in this area as we buildthe exciting combination of low-cost launch capability with our Super Strypi rocket and novel approaches to small, adaptable spacecraft with HiakaSat1 and several upcoming cubesats. Cubesats are a particular form-factor of small spacecraft (currently up to about the size of a shoebox) that can be launched as secondary payloads on larger rockets or from the International Space Station—several hundred have flown in the last decade. I am particularly focused on developing the next generation of cameras and spectrometers that can not only produce high-quality results, but can also fit well within the cost and space thresholds for this new type of mission. These systems have been deployed in space applications and on Earth from Mauna Kea to the Antarctic Dry Valleys.

My favorite work comes from the combination of these interests. In particular, I have been lucky to be a part of several NASA missions that used impactors to probe the subsurface of planetary bodies—comet 9P/Tempel-1 for Deep Impact and the volatile-rich floor of the South Polar crater Cabeus on the Moon with the Lunar Crater Observation and Sensing Satellite (LCROSS). These missions have both revealed the character of these bodies and have revolutionized our understanding of water in our Solar System. Future missions are in the planning stages to continue this effort at more locations. I also was happy to contribute to the recent

A "selfie" taken in the HSFL clean room with the Separatuin Imager Payload onboard HiakaSat1.

low-cost Lunar Atmosphere and Dust Environment Explorer (LADEE) mission, which orbited the Moon for about half a year to characterize the tenuous lunar dust and gas environment—much of which is delivered to the lunar exosphere by impact events.

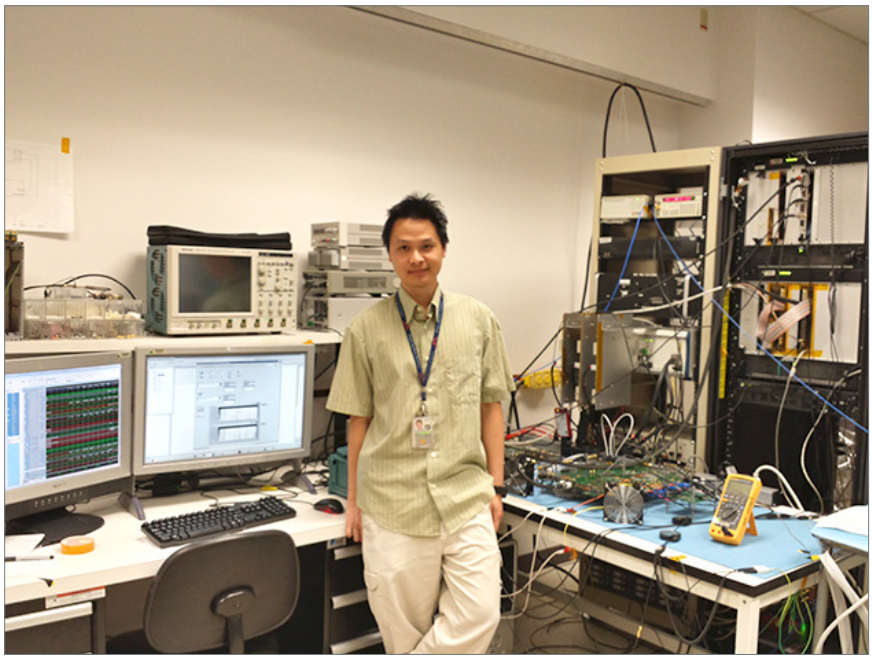
Closer to home, I am the principle investigator for the DISCOSAT-1 cubesat being built and developed in house at HSFL. This mission will help characterize the debris often correctly called “space junk”) environment in low Earth orbit by measuring the impacts of small chunks of stuff onto the spacecraft. This is particularly important to understand and monitor as we send more and more crafts—some carrying the precious cargo of humans—to the edge of space and beyond. With HSGC and HSFL I am grateful for the opportunity to enable and inspire our future scientists and engineers through the cool stuff we can do in space. Θ

Brendan installing a visible-wavelength time-lapse camera system in the Antarctic Dry Valleys.

The View from the Pipeline:

"Employment at the NASA Jet Propulsion Laboratory"

By: Chester Lim, JPL Engineer



Chester at JPL's DESDynI's digital subsystem prototyping testbed.

My career success could not have been possible without the opportunities provided to me by the Hawai'i Space Grant Consortium (HSGC). Ever since high school, I have aspired to work at NASA's Jet Propulsion Laboratory (JPL). JPL is known for its successful rover missions to Mars and various satellites including Voyager and Cassini. In 2007, I discovered that HSGC offered a 10-week summer program at JPL. I applied and was admitted into the program shortly afterward. This turned out to be an opportunity of a lifetime; the key I needed to open the door to my way into JPL. Due to this opportunity, I was able to return to JPL every summer from 2007 to 2012.

My time at JPL allowed me to develop industry skill sets that would be otherwise difficult to obtain in an academic setting. It also broadened my knowledge of engineering and its practices. With each summer at JPL, I was able to build up a reputation and credibility. These opportunities allowed me to network with other engineers and ultimately, landed me a full-time position. I like to think that 10-week HSGC program at JPL in 2007 was like a pebble rolling down a snow-capped mountain triggering an avalanche; creating many other opportunities for me.

Currently, I am working on a project called DESDynI (Deformation, Ecosystem Sctructure and Dynamics of Ice). I started as a developer for a control timing board that was responsible for the commanding and telemetry gathering of the entire digital subsystem. Due to the reputation I built over my various summer internships, I was given a promotion in a few short months after being hired. In addition to my initial responsibilities, my job now involves being a board lead for both the control timing board and housekeeping telemetry board. I am also responsible for the digital subsystem architecture; this task involves ensuring that no single faults will inhibit the performance of our subsystem, which may lead to a mission failure. Furthermore, I am the team's testbed and ground support equipment coordinator; responsible for scheduling time and boards to various developers so they may conduct their tests.

My future aspiration is to become a technical lead or cognizant engineer who is responsible for an entire subsystem. I know I have many more steps to achieve this goal but it can be done with one small step at a time. I am very grateful for the opportunities that HSGC has given me and I hope that others take advantage of all HSGC has to offer to further develop their career goals. Θ

→ "KCC CanSat Team takes 1st in Competition"

By: Dr. Hervé Collin, CanSat Faculty and Mentor, Kapiʻolani Community College

The annual CanSat competition offers participating undergraduate and graduate student teams the opportunity to design, build, and launch satellite-like systems in a space-related mission (www.cansatcompetition.com). In 2013, Kapiʻolani Community College (KapCC) Science, Technology, Engineering, and Mathematics (STEM) CanSat team was comprised of seven KapCC physics students. The team included undergraduate students McClyde Gaborno, Kelsey Kawaguchi, Taylor Viti, Rae-Zan Belen, Logan Tamayo, Diamond Tachera, and Joshua Tamayo, along with faculty mentor Dr. Hervé Collin. Six of the seven students were recruited through the college's STEM Summer Bridge Program, and the three female members were Native Hawaiian students who participated in the college's Engineering program.

(Clockwise from bottom left) Taylor Viti, Logan Tamayo, Rae-Zan Belen, Kelsey Kawaguchi, Joshua Tamayo, McClyde Gaborno, team lead Diamond Tachera, and mentor Dr. Hervé Collin, of the 2013 KapCC STEM Program CanSat Team.

For 8 months, KapCC STEM Program students designed a payload with specific sensors to measure various readings including positioning (using GPS), atmospheric pressure, temperature, and acceleration. In addition, a telemetry system was required to transmit all of the data collected by the sensors continuously to a Ground Control Station (GCS) and display the information in real time. Also, as part of the competition, their satellite had to first be deployed from the rocket at apogee and then from its envelope at exactly 400 meters above the ground while descending at a specific rate. From apogee to 400 meters, a passive control system was implemented to maintain the descent velocity of the Cansat. At 400 meters, once the payload separated from its envelope, an aero-braking system was employed for the active control descent mechanism in order to ensure a different descent rate than the one above 400 meters. As if that wasn't difficult enough, the last aspect of the CanSat competition involved creating a compartment to hold an egg that had to descent safely and survive impact upon touching down. The sudden deceleration of the payload had to be recorded. If any portion of the launch or descent rates were not within the required limits as stated by the competition committee, points would be deducted from the team.

Throughout the life of the entire project, the students learned how to work in a team setting and were able to experience a complete engineering process. In order to complete the CanSat on schedule, the students organized into specific subsystems: programming, electronics, telemetry, physical layout, descent, and deployment.

In a field of over 20 participating universities from all over the world, KapCC was only one of two community colleges. Despite these odds, the KapCC STEM Program team, dubbed "Team Mod 6," came out on top with an impressive score of 93.34 out of 100. This success would not have been possible without our strong collaboration with the Center for Aerospace Education at Windward Community College (WCC). Through the Rocketry program, Dr. Jacob Hudson provided the team with the experience and the opportunity to test their payload twice by launching it at several hundred feet elevation. Students not only learned about safety regulations pertaining to rocketry but also obtained vital information concerning the reliability of their system, which helped them prepare for the competition.

We would like to congratulate the winning team for all their hard work and dedication. We would also like to thank all of the contributing faculty and staff members at KapCC and WCC for their assistance and guidance along the way. Θ

"Maintaining Equipment for HSFL at KauaiCC"

By: Kolby Javinar, 2013 Summer Fellowship Recipient, Kaua'i Community College

Kaua'i Community College (KCC) students have been working on a number of projects in support of the Hawai'i Space Flight Laboratory (HSFL). At the Daniel K. Inouye Technology Center, the KCC team is focused on the goal of creating low-cost methods of exploring and understanding space activities and technology. KCC's Technology Center hosts the Satellite Ground Station antenna and the e-CALLISTO spectrometer antenna. Two other antennas currently in design and installation are the S-Band antenna and the Super Discone Broadband antenna. Two computers run the e-CALLISTO station and Satellite Ground Station. We also have two Yaesu Rotors and power controllers, an e-CALLISTO Receiver for the e-CALLISTO spectrometer antenna, and a Kenwood TS-2000X frequency radio communicator for the Satellite Tracking System. The Center also maintains the DAVIS Vantage Pro 2 Weather Station.

The Satellite Ground Station is used to track satellites and communicate with them using the Kenwood radio communicator. The SatPC32 software application allows us to track these satellites by uplink and downlink signals. We can track any satellite if we have the Keplerian data or two-line element. These types of data are composed of two lines of code data that uniquely identify a satellite; every satellite has different Keplerian data.

The DAVIS Vantage Pro 2 Weather Station is a multi-functional station that gathers wind speed, rain rate, temperature, and humidity. Data are uploaded and displayed on the DAVIS Weatherlink website. Maintaining the weather station is a simple process of cleaning any rust or residue off the wire connections; however, it's very crucial to keep up the maintenance to avoid breaking any sensors.

Kolby at work in the Daniel K. Inouye Technology Center at KCC.

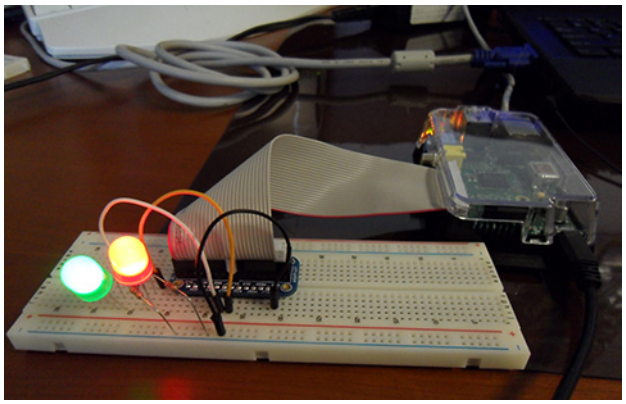
The e-CALLISTO spectrometer station gathers data from the Sun to track the occurrence of solar flares. We can use the data gathered by the antenna and receiver to see how the flares affect the functionality of our electronics. Graphs showing frequency in megahertz versus time let us measure spikes in frequency. The graphs are uploaded and stored on a website where we can also see data from other places and countries using an e-CALLISTO receiver.

Throughout the summer of 2013, I worked on maintaining the equipment for HSFL at KCC. Hawai'i Space Grant Consortium has been extremely helpful in broadening my outlook on space related education. Working with my mentors Dr. Georgeanne Friend, Mr. Tom Ellis, and Mr. Stu Burley over the summer on these projects has been fun and insightful on many levels. The experience that Space Grant has given me is one that anyone with interests in exploring space-related technology should experience. Θ

(Left to Right) Team of students that participated in the Traineeship Program with Mr. Stewart Burley in front of the Daniel K. Inouye Technology Center at KCC.

"Investigating the Potential Use of a Raspberry Pi Computer in a Modular Open-Architecture Radar System"

By: Shaun Koide, Summer Internship recipient at General Dynamics AIS, Waimea, Kaua'i

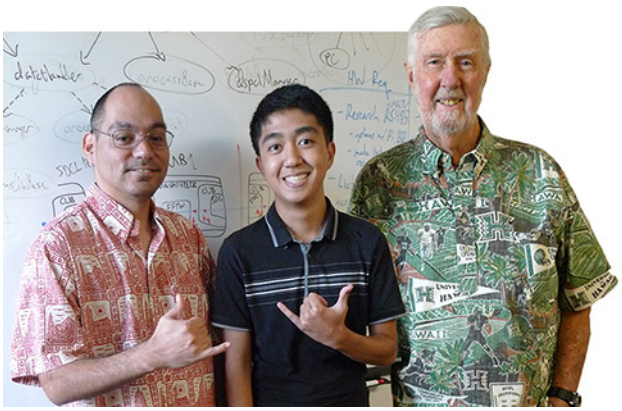


Testing the general purpose input/output (GPIO) capabilities of the Raspberry Pi device.

Modern radar systems require both analog and digital signal processing. The Affordable Common Radar Architecture (ACRA) is a project of General Dynamics Advanced Information systems (GD AIS) that has goals of being a radar system that is much more modular, open, flexible, and affordable than conventional radar systems in use today. Such a system can be split into an analog front end, which includes the antenna, transceiver, RF filtering, etc., and a digital back end, which handles data storage, and other digital signal processing subsystems. Related to ACRA, and sharing much of the same goals, is another project called the Modular Open Systems Architecture Back End (also known as MBE, or MOSA-Compliant Back End).

As a summer intern at GD AIS in Waimea, Kaua'i, I was tasked to determine whether a Raspberry Pi (a credit-card sized, single board computer) could replace the traditional, rack mounted hardware that runs the System Control Interface (SCI) in the MBE system. Accomplishing such a goal required a general understanding of the MBE system. Following that, I set up the Raspberry Pi to build the entire MBE system on it. Debugging project compilation errors followed next, then testing and evaluating the modified system. The investigation turned out to be a success, though some limitations were encountered when implementing and using the Raspberry Pi in the MBE system.

Building the MBE system was simple in concept, but troublesome and time consuming in practice. While the Raspberry Pi consumes much less power and takes up much less space than the rack-mounted servers GD AIS uses to run their MBE system, it has a relatively slow processing speed. It takes about 5 minutes to compile the entire MBE project on GD AIS's development servers, but it can take up to three hours to do the same thing on the Raspberry Pi. It became apparent that the ARM processor (a type of computer processor with a specific type of architecture, developed by ARM Holdings) on the Raspberry Pi is relatively slow compared to those of a standard rack-mounted server at GD AIS. As briefly mentioned before, the MBE system needs to be flexible, meaning it can run on a wide array of hardware platforms. Since the project is still in progress, I found MBE, primarily designed to run on 64-bit architecture systems, could not build seamlessly on the 32-bit Raspberry Pi system. The issue is a lack of 32-bit software support for the high resolution timekeeping software that is used to keep the system's modules running in sync with each other. Despite this, the MBE was successfully built on the Raspberry Pi using a "brute force" solution. Such a solution involved excluding the time keeping software from the list of things built into the MBE system. When tested, the MBE system ran successfully on the Raspberry Pi; however, without the high resolution timekeeping software, it cannot potentially run in sync with other subsystems at high speeds. Nevertheless, the Raspberry Pi running the SCI module can still successfully receive and pass on radar status and control messages to other modules in the MBE system, but at a lower rate. Because it did not fit into the scope of my internship, implementing a cleaner and more seamless solution to the incompatibility issue is on the to-do list for my co-workers in Waimea.



(Left to Right) Mr. Neil Young (General Dynamics Manager and Mentor), Shaun Koide, and Mr. Stewart Burley (HSGC Liaison and Industry Partner).

In addition to successfully testing the Raspberry Pi implementation, I created documentation that shows how the Raspberry Pi, as a potential hardware platform for the MBE system, measures up against conventional hardware used in government radar systems. Furthermore, I created a set of instructions that step through my entire process of getting the Raspberry Pi to run the MBE system.

I also created a working demo that consisted of 2 Raspberry Pi computers, a network switch, and Ethernet cables. Each Raspberry Pi ran a different module of the MBE system, one being the SCI. Through the local network, the two modules proved successful in passing test messages between themselves. Neil Young, one of the systems engineers overseeing the MBE project who served as my mentor, was impressed with the performance and simplicity of the test setup, and demonstrated it to his colleagues in Dayton, Ohio. Bringing me back positive feedback from his colleagues, my efforts felt all the more rewarding.

This multistep project was successful in showing that the Raspberry Pi can, in fact, run the SCI module in an MBE system, although it has its shortcomings in processing speed. Completing this project required me to familiarize myself with a large software system and its modules. During the first week of my internship, I knew next to nothing about both the software written and the hardware. Nevertheless, under the guidance of my mentor and other coworkers I learned a lot and gained new skills during my 10-week experience at General Dynamics AIS, Waimea. The fact that I had a part in the research of new ideas and technology that may be used in future radar applications was very rewarding. Θ

ERN Emerging Researchers National Conference in STEM

Image Courtesy of http://www.emerging-researchers.org/

"HSGC Fellow takes 1st Place in ERN Conference"

(Left to Right) Tatiana Oje, Roberto Ramilo Jr., Dr. Hervé Collin (Mentor), and Mitch Mikami

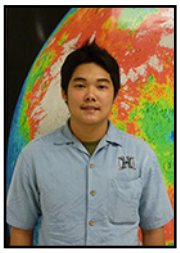
Congratulations to Roberto Ramilo Jr., a junior in Kinesiology and Rehabilitation Science at U.H. Mānoa and Spring 2014 Hawai'i Space Grant Consortium Fellow who won the First Place Oral Presentation Undergraduate Award in the Social and Behavioral Sciences category at the 2014 Emerging Researchers National (ERN) Conference in STEM held in Washington, D.C. Roberto presented preliminary results of his project "Estimation of Daytime Sleepiness in Hawai'i College Students." By combining qualitative data with his new approach of measuring fluctuations of pupil diameter, Roberto is collecting quantitative data from student test subjects to establish benchmarks for problematic sleepiness, which could someday be applied to fitness assessments of astronauts on duty. Previously, as a student at Kapi'olani Community College, Roberto received funding from a National Science Foundation TCUP grant. Also presenting posters at the ERN Conference were Kapi'olani Community College students Tatiana Oje on "Summer Wind Analysis on the Kapi'olani Community College Campus" and Mitch Mikami on "Time Series Analysis of Pupillometry Data to Estimate Daytime Sleepiness." Dr. Hervé Collin served as mentor. Θ

UNDERGRADUATE FELLOWSHIPS & TRAINEESHIPS

Fellowships ***are awarded to U.S. citizens who are full-time students at the University of Hawai'i campuses at Mānoa and Hilo. Awards are given for space-related research with a mentor and provide a stipend of up to $4,000 per semester to the student. Fellows are also eligible for travel and supply funds. In previous semesters, these funds have been used for activities including observing runs at Mauna Kea telescopes, fieldwork to collect ground-truth information for interpreting satellite data of the Hawaiian Islands and other locations, and travel to meetings to present project results.***

Mānoa Fellows - Fall 2013

Eric Caldwell, a senior in Mechanical Engineering, worked with mentor Dr. Aaron Hanai of the Kapi'olani Community College Math and Sciences Department and Fellow Lee Do on an autonomous rover. Eric's work included the design and construction of the rover as well as electrical circut modeling in his project, titled "Design, Analysis, and Manufacturing of a Hardware-in-the-Loop (HIL) Simulation for the Modeling of an Autonomous Traction Control Apparatus."

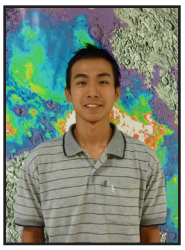


Lee Do, a junior in Mechanical Engineering, worked with mentor Dr. Aaron Hanai of the Kapi'olani Community College Math and Sciences Department and Fellow Eric Caldwell on an autonomous rover. Lee's project, "Design, Analysis, and Manufacture of an Active Control Panel with Vibration Suppression on an Autonomous Interplanetary Rover" focused on reducing vibrations between the rover chassis and electronics board for optimal performance.

Jessica Lee, a junior in Computer Science and Korean worked on a project titled "Tools for Infared Imaging on Mauna Kea" with mentor Dr. Norbert Schörghofer, the Institute for Astronomy. Jessica's project combined programming and instrument building as part of an infrared remote sensing project on microclimates and permafrost in cinder cones near the summit of Mauna Kea. The Hawaiian sites may serve as terrestrial microclimate analogs for Mars.

Jeffrey Murl, a freshman in Geology and Geophysics, studied space weathering, one of the fundamental physical processes of the space environment on airless bodies. Using pulsed laser shots on mineral powders mixed with sulfur, Jeffrey studied the spectral changes caused by the simulated space weathering under vacuum conditions in the lab. The project, titled "Sulfur Composition Effects on Space Weathering" is relevant to remote sensing studies of the Moon and Mercury. Dr. Jeffrey Gillis-Davis of the Hawai'i Institute of Geophysics and Planetology served as mentor.

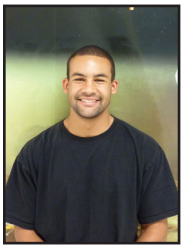
Heidi Needham, a senior in Global Environmental Science, continued to use high-resolution orbital lunar images to map lava flows on the Moon in a project titled, "Investigation of Layered Lunar Mare Lava Flows through LROC Imagery and Terrestrial Analogs." Working with mentor Dr. Sarah Fagents of the Hawai'i Institute of Geophysics and Planetology, Heidi used her ArcGIS mapping skills combined with field work on layered Hawaiian basaltic lava flows. This work was related to previous Fellows' projects studying layered lava flows and characteristics of buried regolith deposits on the Moon.



Liem Nguyen, a senior in Physics, led the mechanical design of a regolith collection, storage, and deposit system for the Kapi'olani Community College's rover entry to NASA's international Lunabotics Mining Competition at Kennedy Space Center. Liem conducted his project titled, "Design of a Regolith Collection-Storage-Deposit System for Hawai'i Lunabot" with mentor Dr. Hervé Collin of Kapi'olani Community College Math and Sciences Department.

Melissa Onishi, a sophomore in Mechanical Engineering, worked on a project titled "Precision Landing System Design Algorithms" with mentor Dr. Dilmurat Azimov of the Department of Mechanical Engineering. In order to increase the landing accuracy of robotic rovers

on planetary surfaces, Melissa wrote and tested algorithms to simulate landing trajectories for autonomous, powered descent that were as fuel-efficient and precise as possible.



Brayden VanAckeren, a senior in Economics and Political Science, worked on his project titled, "Analysis of the Formation of Central Mounds within Martian Craters." With his mentor Dr. Peter Mouginis-Mark of the Hawai'i Institute of Geophysics and Planetology, Brayden collected and analyzed details of the global distribution and sizes of Martian craters and their associated central mounds in relation to the geological history, to ultimately answer how and why central mounds form.

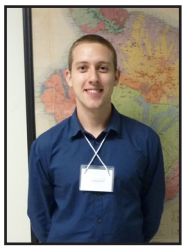
Daniel Wukelic, a senior in Mechanical Engineering, worked with mentor Dr. A. Zachary Trimble of the Department of Mechanical Engineering on the project titled "Feedback Control for Cold Gas Propulsion System." Expanding on the work of former Fellow John Furumo (2012-13), Daniel equipped the system with a new microcontroller and inertial measurement unit, and developed code to allow the system to actively determine its attitude and control its maneuvers.

Hilo Fellows - Fall 2013

Travis Reardon, a junior in Geology, worked with mentor Dr. Jené Michaud of the Department of Geology on a project related to the grand challenges of mitigating natural hazards associated with global climate change, including rare and extreme events. Travis' project titled, "Application of LIDAR Topographical Data for Mapping of Climate-related Sea Level Rise," incorporated remote sensing data to create coastal inundation maps for selected regions.

Hilo Fellows - Fall 2013 to Spring 2014

Andrew McNichols, a senior in Physics and Astronomy, worked with his mentor Dr. Jesse Goldman of the Department of Physics and Astronomy to assemble a detector of elementary subatomic particles and used it to measure the energy and angular dependence of cosmic-ray muons on the slopes of Mauna Kea. The title of his project was "Variable Altitude Muon Detection: Energy and Angular Dependence of Cosmic-Ray Muons."



Robert Pipes, a senior in Physics and Astronomy, set up and calibrated a muon detection system and used it to investigate the angular dependence of cosmic-ray muon lifetimes as a function of altitudes between sea level and the top of Mauna Kea. Working with mentor Dr. Jesse Goldman of the Department of Physics and Astronomy, Robert's project was titled "Variable Altitude Muon Detection and Angular Dependence of Cosmic Ray Muon Lifetime at Medium Altitude."

Geoffrey Rehders, a senior in Geology, worked on a project titled "Hyperspectral Mapping of Alteration in Halemaumau Crater and Kilauea Caldera" using data from airborne and portable field instruments to characterize the spatial distribution of alteration minerals. Building on previous fellows' projects, this project was relevant to ongoing work on the possible ways sulfates and associated alteration deposits formed on Mars. Dr. Kenneth Hon of the Department of Geology served as mentor.

Application Deadlines

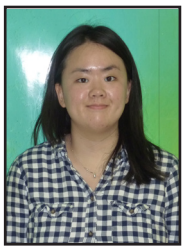
Application deadlines for undergraduate fellowships and traineeships are December 1 for Spring semester and June 15 for Fall semester. Download fillable application forms and get additional information from the HSGC website at: www.spacegrant.hawaii.edu/fellowships.html.

Mānoa Fellows - Spring 2014

Eric Caldwell, a senior in Mechanical Engineering, continued working with mentor Dr. Aaron Hanai of the Kapi'olani Community College Math and Sciences Department and Fellows Lee Do and Arvin Niro on an autonomous rover. Eric's work included the design and construction of the rover as well as electrical circuit modeling in his project, titled "Design, Analysis, and Manufacturing of a Hardware-in-the-Loop (HIL) Simulation for the Modeling of an Autonomous Traction Control Apparatus."

Lee Do, a junior in Mechanical Engineering, continued working with mentor Dr. Aaron Hanai of the Kapi'olani Community College Math and Sciences Department and Fellows Eric Caldwell and Arvin Niro on a rover project. Lee's work on the , "Design, Analysis, and Manufacture of an Active Control Panel with Vibration Suppression on an Autonomous Interplanetary Rover" focused on reducing vibrations for optimal performance.

Steven Ewers, a senior in Electrical Engineering, led the design of the electrical and power-monitoring systems for the Kapi'olani Community College's rover entry to NASA's international Robotics Mining Competition at Kennedy Space Center. Steven conducted his project, "Robotics for the Design of a Competition Mining Robot with the Purpose of Excavating Simulated Martian Regolith" with mentor Dr. Hervé Collin of the Kapi'olani Community College Math and Sciences Department.



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Liam Nguyen, a senior in Physics, led the mechanical design of a regolith collection, storage, and deposit system for the Kapi'olani Community College's rover entry to NASA's international Lunabotics Mining Competition at Kennedy Space Center. Liem conducted his project titled, "Design of a Regolith Collection-Storage-Deposit System for Hawai'i Lunabot" with mentor Dr. Hervé Collin of the Kapi'olani Community College Math and Sciences Department.

Arvin Niro, a junior in Mechanical Engineering, worked with mentor Dr. Aaron Hanai of the Kapi'olani Community College Math and Sciences Department and Fellows Eric Caldwell and Lee Do on an autonomous rover. Arvin's work included the design and construction of an efficient suspension system in his project, titled "Design and Development of a Suspension System used in Rough-Terrain Vechicle Control for Vibration Suppression in Planetary Exploration."

Melissa Onishi, a sophomore in Mechanical Engineering, continued to work with mentor Dr. Dilmurat Azimov of the Department of Mechanical Engineering. With the aim of increasing the landing accuracy of robotic rovers on planetary surfaces, Melissa wrote and tested algorithms to simulate landing trajectories for autonomous, powered descent. Her project is titled, "Analysis of Landing Trajectory Using Backward Propagation."

Roberto Ramilo Jr., a junior in Kinesiology and Rehabilitation Science, worked on a project titled "The Estimation of Daytime Sleepiness for Astronauts" with mentor Dr. Hervé Collin of the Kapi'olani Community College Math and Sciences Department. By combining qualitative data with his new approach of measuring fluctuations of pupil diameter, Roberto collected quantitative data from student test subjects to establish benchmarks for problematic sleepiness, which could someday be applied to fitness assessments of astronauts on duty.

Traineeships ***are awarded to U.S. citizens who are full-time students at University of Hawai'i Mānoa and Hilo campuses, Community Colleges, and the University of Guam. Awards provide lab training and practical experience with a mentor in any space-related field of science, technology, engineering or math. Trainees receive a stipend of up to $1500 per semester and may be eligible for supply funds.***

Mānoa Trainees - Spring 2014

Brian Chan, a sophomore in Electrical Engineering, worked on a project titled "Orthorectification of Infrared Images" with mentors Dr. Norbert Schörghofer of the Institute for Astronomy and Dr. Brendan Hermalyn of the Hawai'i Institute of Geophysics and Planetology. This project involved geometric image manipulation and processing of remote sensing infrared data aimed at understanding the microclimates in craters on Mauna Kea, which may be analogous to craters on Mars.

Lauren Froberg, a junior in Geology and Geophysics, worked with mentor Dr. Michael Garcia of the Department of Geology and Geophysics on her project titled, "Submarine Lavas Discovered off Diamond Head—New Honolulu Volcano?" Lauren investigated the mineralogy and trace element chemistry of rocks to help determine if these are from a known or previously unidentified eruption. This work contributed to NASA's goals of characterizing the dynamics of Earth's surface and interior and forming the scientific basis for the assessment and mitigation of natural hazards.

Jamal Garcia, a sophomore in Physics, learned to operate the Terra X-ray diffraction & X-ray fluorescence instrument and investigate the mineralogy and chemical composition of core samples taken from the shore of a pond in Antarctica. Jamal's project, "Don Juan Pond: A Terrestrial Study of Mars Analogs" helped to evaluate hypotheses of how this pond formed, which may lead to further insights to water action on Mars. Dr. Peter Englert of the Hawai'i Institute of Geophysics and Planetology served as mentor.

Kihaakeanu Sai, a sophomore in Sociology, gained experience with satellite remote sensing data and image processing techniques in his project titled "Geology of Moons of Jupiter and Saturn." Serving as mentor for this work was Dr. Peter Mouginis-Mark of the Hawai'i Institute of Geophysics and Planetology.

Kimberly Teehera, a freshman in Pre-Psychology, worked on a project titled "Lava Tube Microclimates on Mauna Loa" with mentor Dr. Norbert Schörghofer of the Institute for Astronomy. Kimberly gained experience with basic data analysis techniques as well as with cave science. Studies of these ice-filled lava tubes are relevant to the fields of astrobiology and climate of Mars.

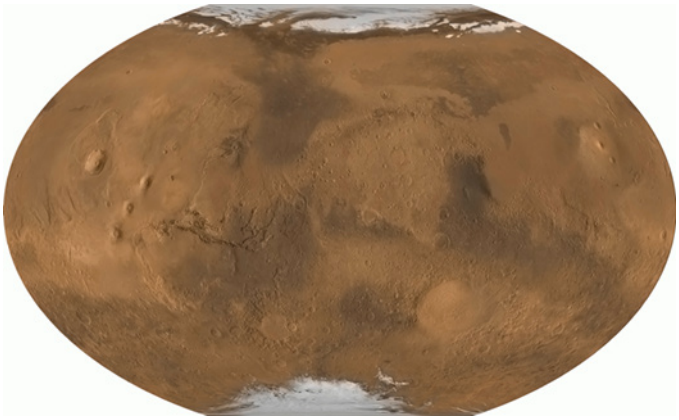


Image of Mars from MOLA laser altimeter measurements and MOC images created by the National Geographic Society, MOLA Science Team, MSS, JPL, NASA.

KauaiCC Fellow - Spring 2014

Marcus Yamaguchi, a sophomore in Liberal Arts worked on "Modification of UV Spectrometer into a Neutron Detector Using Neutron-Sensitive Scintillating Material." His mentors were Dr. Georgeanne Friend and Mr. Michael Hannawald of the Electronics Technology Department.

(Left to Right) Kepa Fernandes, Marcus Yamaguchi, Dominique Boeder, and Bransen Agu

KauaiCC CanSat Trainees

Bransen Agu, a sophomore in Electronics, worked on the "Design and Programming of a Microcontroller for Collection of UV Data for CubeSat Payload." Dominique Boeder, a sophomore in Electronics Technoloy, worked on the "Mechanical and System Design of a UV Spectrometer CubeSat Payload." Kepa Fernandes, a sophomore in Electronics Technology, worked on "Signal Conditioning and Analog to Digital Conversion of Photodiode Array Signals for a UV Spectrometer." Dr. Georgeanne Friend and Mr. Michael Hannawald of the Electronics Technology Department mentored the trainees.

KapCC CanSat Trainees

William Kaeo, Michael Lee, Mitch Mikami, Robert Landgraf, Shane Spencer, Lundy Wyre, Benjamin Barker (LCC), Brandon Fukada (LCC) are the Kapi'olani Cansat team. The mentor is Dr. Hervé Collin of the Math and Sciences Department and KCC STEM Program.

WindCC CanSat Trainees

(Left to Right, front) Lyra Hancock, Kristen Schupp, Cale Mechler, (back) Kevin Lee, Gavin Nall, and Nick Herrera.

Lyra Hancock, Kristin Schupp, Cale Mechler, Kevin Lee, Gavin Nall, Nick Herrera, and Ada Garcia are the NASA Student Launch Project (ARLISS) team. Mentors are Drs. Jacob Hudson and Joe Ciotti of Windward Community College.

Summer 2014

Internships at Local Industries & Companies ***are awarded to U.S. citizens who are full-time students at either a Hawai'i University or Community College or on the mainland. The main objective of the program is to promote use of NASA technology and educational science goals. In pursuit of the creation of a high-tech workforce, the HSGC Internship Program encourages all intern opportunities relating to the more general STEM disciplines.***

Erik Wessel, an Oahu resident and sophomore in Engineering at the University of Illinois at Urbana-Champaign, worked with the Hawai'i Space Flight Lab at the University of Hawai'i at Mānoa.

Kolby Javinar, and Jacob Matutino, Kaua'i students, worked at the Pacific Missile Range Facility on Kaua'i on a NASA project coordinated by NASA's Wallops Flight Facility.

K-12 EDUCATION

"A variety of K-12 education projects bring hands-on experiments, gadgets, and the excitement of space exploration to thousands of participants."

By: Arthur Kimura, HSGC Education Specialist

"Future Flight Hawai'i"

http://www.higp.hawaii.edu/futureflight/

Above: The Kimura's grandson, Ethan, and his dad show their completed Kinetic Horse during the FFH program.

Below: Father and daughter helping each other tackle an assignment.

Future Flight Hawai'i hosted the Family Exploration Program for children and their parents, June 7-8, 2014, at the University of Hawai'i at Mānoa, with a theme of Next Stop: Mars. Over the past 23 years, over 9,000 students and parents have participated in one or more of the Future Flight Hawai'i residential and non-residential programs exploring the Moon, Mars, and Earth. Learning modules for the young space explorers and their families included programmable push button robotics, how lenses work, Earth-Mars ABCs, designing and testing windmills, rocketry, learning genetics through the Mars Reebop, Brushbot Olympics, and science is fun. The program was fully enrolled since late October 2013. Θ

Astronaut Rex Walheim speaking at Astronaut Ellison Onizuka Science Day in Hilo, Hawai'i on January 25, 2014.

"Astronaut Ellison Onizuka Day of Discovery"

http://www.spacegrant.hawaii.edu/OnizukaDay

The 14th annual Astronaut Ellison Onizuka Science Day held on January 25, 2014 at the University of Hawai'i-Hilo, featured keynote speaker, Astronaut Rex Walheim, who was a crew member of the last space shuttle flight, 20 workshops, 19 displays, a VEX IQ robotics demonstration by Hilo schools, and a space science show by Future Flight Hawai'i's Dale Olive. Sponsored by the Onizuka family, the Astronaut Onizuka Space Center, the University of Hawai'i-Hilo, American Savings Bank, and the Hawai'i Space Grant Consortium, 600 participants and 200 volunteers joined together in honoring the legacy of Ellison Onizuka and the Challenger crew.

HSGC Day of Discovery Coordinators, Rene and Art Kimura, were fortunate to have one of the crew of the last space shuttle flight, Astronaut Rex Walheim, at the event.

Workshops included adaptive optics, rocks, minerals, nano technology, aircraft simulators, marine science, circuits made with dough, solar powered boats, programming robots, using hardware to do science projects, spooling DNA from strawberries, studying energy in kukui nuts, solving crime with forensic science, Hawai'i herbal medicines, using math and science to bake a cake, experimenting with logic circuits through computer simulation, and driving Moonbots.

Keynote speaker, Nainoa Thompson, speaking at the assembly, with a background slide showing Astronaut Veach.

"Astronaut Lacy Veach Day of Discovery"

http://www.spacegrant.hawaii.edu/Day-of-Discovery

The 12th annual Astronaut Lacy Veach Day of Discovery, held on October 26, 2013 at Punahou School, featured keynote speaker, Nainoa Thompson who shared the dream of the world voyage of the voyaging canoe, Hōkūle'a, a dream initially inspired, in part, by Astronaut Lacy Veach. The day also highlighted the new VEX IQ robotics program, industry sponsored displays, and workshops. Workshops to inspire the next generation of explorers included the making of hydroelectric devices, launching water-powered bottle rockets, optical illusions, racing bristlebots, programming push button robots, solving the mystery of color using electronic art, making instant ice cream, testing earthquake resistant structures, hydraulic arms, adaptive optics, designing skydiving devices, seeing what happens to food after you eat, 3D printing for astronaut food, making a pinhole camera, and dissecting cow eyes.

The event was sponsored by the Hawaiian Electric Company, Punahou School, the family of Lacy Veach including the Chatlos Foundation, and the Hawai'i Space Grant Consortium. Two hundred volunteers supported the registration, workshops, and displays for the 600 registered students, parents, and teachers. The concluding afternoon assembly included the ever popular Science-is-Fun program by Future Flight Hawai'i's Roger Kwok and Matt Duarte.

"....Nainoa Thompson's stories about his experiences with Mr. Veach gave us all inspirational insight as to how determination, passion, and dedication to making this small world we live in a better place can affect others in a positive way for generations to come... it has given me a renewed sense of duty, to instill in my daughters, a sense of responsibility, passion, and most importantly, taking action to ensure that resources we currently enjoy are sustained, and to make a difference in leaving this world a better place for all generations to come. " -Parent

"....Being here in Hawaii, I believe that my students miss out on the opportunity to see what the world has to offer as far as science goes. They really enjoyed the different workshops and being hands-on with all things science. I think it really pushed their limits on creativity and made them think deeper about how science is applied to their everyday lives. "
-6th Grade Science Teacher

Nainoa with wife and children who participated in a workshop about how eyes work that involved dissecting a cow's eye; led by Dr. Neal Atebara.

Mr. Roger Kwok performing his Science-is-Fun demonstration.

"...I had as much fun as the boys. I highly recommend it to anyone with a child with even a glimmer of interest in science."
-Boy Scout Group Leader

"On behalf of the Pacific Aviation Museum-Pearl Harbor, I want to thank you again for including us in this day of discovery. It's always a pleasure!"

Participants having fun with science activities.

"VEX Robotics"

http://www.vexrobotics.com

VEX Robotics is the fastest growing middle and high school robotics program in Hawai'i and around the world with over 8,000 teams including 150 in Hawai'i. Transitioning to a required State Championship model, eight qualifying tournaments were held on Oahu, Maui, and the Big Island, with 40 teams qualifying for the first Hawai'i State VEX Championship, held at the Honolulu Community College (HCC) on December 20-21, 2013. Sponsored by Hawaiian Electric Company in collaboration with HCC, and with the support of the Hawai'i Space Grant Consortium, the College of Engineering, McKinley High Robotics and Team Hawaii Robotics (university robotics), seven Hawai'i teams qualified through the competition for the World VEX Championship in April 2014 at the Anaheim Convention Center.

Hawai'i teams duke it out at the first Hawai'i State VEX Championship.

"VEX IQ Robotics"

http://www.vexrobotics.com/vexiq

Hawai'i Space Grant Consortium helped facilitate the introduction to Hawai'i of a new scholastic robotics program called VEX IQ during the 2013-2014 school year for students in grades 3-8. Introduced to the world during the 2013 VEX world championship in Anaheim, VEX IQ provides an exciting, engaging lead in to robotics through the kit of parts and the competition game. Team challenge, skills challenges (both driver and autonomous), and the STEM research project provides relevant opportunities to apply science, math, technology into a hands-on experience to design and build a robot to meet competition goals. Forty- five elementary and junior high school team competed in one or both qualifying tournaments hosted at Pearl City High School and Island Pacific Academy, with 24 teams advancing to the first Hawai'i State VEX IQ Championship hosted at Pearlridge Center and sponsored by the Hawai'i Council of Engineering Societies. Seven teams representing Waialua Intermediate School, Island Pacific Academy, Hale Kula Elementary School, Hawaii Technology Academy, Molokai Middle School, and Mililani Mauka Elementary School qualified to compete in the World VEX IQ Championship at the Anaheim Convention Center in April 2014.

"...We are still in a dream-mode....thinking...."did that really happen?" Tammy and I are so glad that we decided to go for "participation" and let all the kids on the team have a turn in driving yesterday - that was well worth it since they all had a hand in contributing to their victory!"

-Leanne Watanabe, Kaneohe Elementary School
(Teamwork Award Recipient)

Participants drew crowds from shoppers and passersby at the first inaugural Hawai'i State VEX IQ Championship hosted at the Pearl Ridge Center Mall.

"Congratulations to everyone in your group who organized and put this on - it's a unique and great model that I'm sure many others haven't even thought of yet."

-Jason Morrella, President,
Robotics Education and Competition Foundation

"Mahalo. We have had our share of obstacles, but by far this has been one of the most gratifying bot for Akamai Ma'alahi! To see how the students rose above each obstacle (from ordering the bot to getting it, programming, etc. in the short amount of time) was absolutely amazing! You wouldn't believe some of the obstacles we had :) What an AWESOME experience so far for my students! Life skills learned! No, we're not the fastest or the highest scoring, but just to see how they persevered, progressed, and improved! I love the collaborative working together, etc. Matt has been ABSOLUTELY AWESOME!"

-Alicia Hui, Haili Christian School

"Science FESTival"

FEST = Families Exploring Science Together

Schools in Hawai'i are hosting Future Flight Hawai'i's Science FESTivals. These free programs offered by Hawai'I Space Grant Consortium feature science demonstrations, information about NASA-supported educational opportunities, and selected hands-on activities for students and parents. Two versions are currently offere: MarsFEST features living in space, Newton's Laws, and microgravity. The BrushBot FEST features the science of designing and building toothbrush robots. These evening, family science programs encourage children and parents to work together, foster home/school partnerships, engage parents and students in thinking and working scientifically, assist parents to encourage an interest in science in their child, and help students to learn through active engagement in educational experiences.

Everyone enjoys the hands-on activities at the FESTival night.

"Thanks again for an awesome experience in promoting science, space, and engineering to our young students. Like you said—we may have future scientists, engineers, or astronauts in our midst. It was truly a valuable experience for both parents and students to create together."

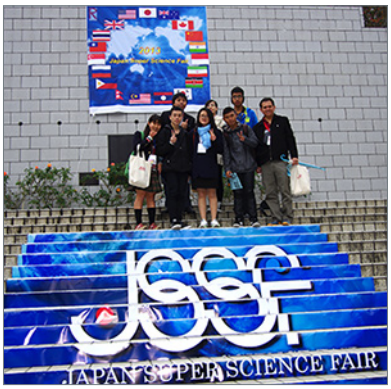
-Hawaii Baptist Academy

"Thank you very much for all your support, and especially for the Science FESTival last night. The children and parents thoroughly enjoyed themselves and learned many science concepts in the process. I am in awe of your expertise, and continue to learn from you. I will definitely "pass on" the knowledge to future generations-- your impact will be greatly felt. Thank you again for all that you do for science education!"

- Mililani Mauka Elementary School

Art and Rene Kimura help children discover the fun of science.

"Japan Super Science Fair"



http://www.ritsumei.ac.jp/fkc/html/jssf2012/index.html

In November, 2013, 13 Waiakea and Iolani students and teachers along with HSGC educational specialists, Art and Rene Kimura participated in the Japan Super Science Fair, hosted at Ritsumeikan University and High School in Kyoto, Japan. The goal of the fair is to foster a global perspective in how to work together as scientists and engineers to solve problems. Forty-six schools from 19 countries participated in this global exchange of science presentations and collaborative activities. Only five schools were invited from the United States.

HSGC received a grant from the Thirty Meter Telescope to sponsor the BrushBot Olympics in which the global teams competed in an Olympic style atmosphere. We also coordinated three workshop presentations, two sponsored by the Thirty Meter Telescope. Ritsumeikan High School is one of 140 designated Super Science High Schools and one of five Core Super Science High Schools in Japan and has already invited Waiakea and Iolani Schools and the Kimuras to the fall 2014 Super Science Fair. Sessions are conducted in English and the host pays for all ground expenses during the week-long program that includes visits to local science and technology industries and historic cultural sites.

Group diversity photo!

Participants cheering encouragement at a solar boat race.

Bird's eye view of the 2013 JSSF poster session.

"Pacific Astronomy & Engineering Education Summit"

Gathering at the Hawai'i Volcanoes National Park.

As a result of the experiences at the Japan Super Science Fair, and through a grant from the Thirty Meter Telescope, the Hawai'i Space Grant Consortium initiated along with partners, the University of Hawaii-Hilo and the 'Imiloa Astronomy Center, the first Pan Pacific Astronomy and Engineering Education Summit in July 2013. Students and teachers from Japan, China, India, and Canada along with those from Hawai'i, participated in the five-day experience sharing science and technology. We also included field trips to star gaze at Onizuka Visitor Center, Mauna Kea, and the Hawai'i Volcanoes National Park. Workshops provided by the Subaru Telescope Project (Dr. Saeko Hayashi), Gemini Observatory (Dr. Peter Michaud), PISCES (Dr. Christian Andersen), the Institute for Astronomy (Dr. JD Armstrong and Dr. Paul Coleman), and the Hawai'i Institute of Geophysics and Planetology (Dr. Robert Wright) provided engaging hands-on workshops for the participants.

Master Polynesian navigator, Kalepa Baybayan, Dr. Ravinder Bhatia (Astrophysics and Aeronautical Engineering), Stephanie Nagata (Mauna Kea Management Board), and Janet Babb (USGS Hawaii Volcano Observatory), provided inspiring keynote addresses. Students provided presentations on science or engineering projects and cultural presentations. Field trips included sunset viewing and star gazing at the Hale Pohaku mid-level facility on Mauna Kea, and crater viewing and Halemaumau night glow viewing at the Hawai'i Volcanoes National Park. The second Pacific Astronomy and Engineering Summit in 2014 will be planned by the 'Imiloa Astronomy Center with the Hawai'i Space Grant Consortium providing consulting support.

Buildings and grounds of the 'Imiloa Astronomy Center in Hilo, Hawai'i.

Japanese students and chaperone pose next to a small replica of a traditional Hawaiian Ali'i feather cape ensemble.

"Elwood's Adventures in Hawai'i"

http://www.elwoodsadventures.com/

By: Arthur Kimura, HSGC Education Specialist and Linda Martel, HSGC Communication Specialist

Elwood, the Dream Big Doll, has returned to his home in Illinois after a two-month visit to Hawai'i with HSGC's Art and Rene Kimura (Directors of Future Flight Hawai'i) as his island hosts. According to Art, the 33-gallon Dream Can, which Elwood travels in, is filled to the brim with souvenirs of Hawai'i, including school booklets and letters, an Aloha shirt, leis, macadamia nuts, and BrushBot robotic kits. The Dream Can will be opened by a second-grade class in Illinois.

During his visit, Elwood was a guest at the Astronaut Ellison Onizuka Science Day, six FESTival science family nights, a robotics teacher workshop, the Pan Pacific VEX Championship, and the Hawai'i Council of Engineering Societies/Pearlridge VEX tournament. Elwood visited many classrooms on the Big Island and Oahu, visited the 'Imiloa Astronomy Center and the summit of Mauna Kea–visiting the Subaru Telescope with Subaru astronomer, Dr. Hayashi. Elwood was in several hundred photos, TV news segments on KITV and KGMB, and met NASA Astronaut Sunita "Suni" Williams and Miss Hawaii USA, Brianna Acosta. We are sure Elwood would welcome a return visit to our islands!

Elwood, the Dream Big Doll was created by 5th grade teacher, Doug Hand, in October 1980. They both set out on an expedition to teach kids to dream big. "All children follow their dreams. If I can do it, anyone can." Elwood has traveled to many parts of the world as well as to outer space! We are excited that in 2013, he came down to Hawai'i!

"Unfortunately, Mr. Hand died in December 2013 of pancreatic cancer, at Serenity Hospice & Home in Oregon. As the community mourned the loss of Hand, they still managed to revel in the improbable story of a wildly creative educator who (almost by accident) made himself and a 4-foot, 4-inch doll iconic figures on an international scale. But even in the last weeks of his life, Hand tried to deflect attention from himself." -- www.elwoodsadventures.com)

Elwood on his mobile transport trash can posing in front of a Mars map mural.

"HSGC Education Specialists Receive Living Treasures of Hawai'i Recognition"

The HSGC ohana extends our heartfelt congratulations to Art and Rene Kimura (pictured on the left) upon being named Living Treasures of Hawai'i. The Kimuras were recognized as visionary educators and proponents of science. Bestowed by the Honpa Hongwanji Mission of Hawai'i, the Living Treasure Award recognizes and honors individuals "who have demonstrated excellence and high standards of achievement in their particular fields of endeavor, and, through their continuous growth, learning and sharing, have made significant contributions towards enriching our society."

Attending the 39th annual recognition ceremony and luncheon were the Kimuras' sons and their families, Art's mother, Hawai'i Governor Neil Abercrombie, and colleagues including Luke Flynn (HSGC Director) and Marcia Rei Sistoso (HSGC Executive Director and Program Coordinator). In remarks to friends, Art and Rene shared, "We are so so humbled to stand in this circle of honorees, who have made amazing contributions to our society/community. With our deepest gratitude to you all."

Both are educational specialists with HSGC and coordinate the now 24-year-old Future Flight Hawai'i program, which includes summer camps, and an extensive outreach program of family science nights. They also helped initiate the Astronaut Ellison Onizuka Science Day and Astronaut Lacy Veach Day of Discovery, and have been instrumental in the initiation of scholastic robotics in Hawai'i.

Art was formerly a biology teacher at McKinley High School, and served as vice principal at Keaau Elementary and Chiefess Kapiolani Elementary Schools, before retiring from the Hawai'i Department of Education. Art also retired as a lieutenant colonel from the Hawai'i Air National Guard. He represented Hawai'i in the NASA Teacher in Space Project and has received recognition as a recipient of the Presidential Award for Excellence in Science Teaching, the Civil Air Patrol national Crown Circle Award, the Air Force Association Christa McAuliffe Award, and Biology Teacher of the Year.

Rene received the national Women in Aerospace Educator Award after being nominated by Educator Astronaut Barbara Morgan. Art and Rene were named to the VEX Hall of Fame as Volunteers of the Year at the World VEX Robotics Tournament and were honored by the Board of Education with a special recognition certificate. They also initiated a global exchange program that includes Hawai'i students and teachers attending annually the Japan Super Science Fair where participants from 19 countries convene in Kyoto, Japan for a week of inspiration and collaboration. Θ

The Kimuras are the first couple to be honored together. They are pictured with their fellow award recipients.

Gravity: Hot or Not?

Movie Review courtesy of: Jaimie Kim, MidWeek Posted: October 16, 2013

Art Kimura, Education Specialist, Hawai'i Space Grant Consortium, University of Hawai'i at Mānoa

Where and with whom did you see the movie?

My wife, Rene Kimura, and I experienced Gravity in 3-D at Consolidated Theaters at Kahala Mall.

Overall, what did you think?

Very, very cool … visually stunning views of Earth, tension, survival, reminding us all of the dangers our astronauts are prepared to encounter, terror not caused by aliens or terrorists but the reality of physics and physiology, a reminder that space is a dangerous place. It also reminded us of numerous conversations we have had with astronauts about their space experiences and seeing the launch of the space shuttle at Kennedy Space Center. The movie provides a great tool for science teachers to discuss with students the reality of science and the movie action.

Without giving away the ending, what was one of your favorite scenes?

There were several, including the joy of riding the Manned Maneuvering Unit around the space shuttle and the unselfish act of survival by the unhooking of the tether linking the two astronauts.

On a scale of one to four stars, what would you rate this film? ★★★★☆

What did you think of the cinematography?

Stunning achievement to not be able to see any hint of the stitching together of animation, robotics and live acting.

Was the message/theme clear?

For me, it was another reminder of the harsh and unforgiving environment of being in space, similar to what we saw in the space shuttle Columbia re-entry, the recent astronaut EVA (extra-vehicular activity) in which water was leaking into the space suit, and the reality of the thousands of pieces of space junk orbiting our Earth.

Did it remind you of any other works of film?

The Dream is Alive (views of Earth), Space Cowboys (personal sacrifice, problem solving), Apollo 13 and The Right Stuff (the human spirit to explore).

To whom would you recommend this movie?

Those who can enjoy a movie without the scrutiny of questioning the physics portrayed, who appreciate the wonder of exploration and the unknown, and the human spirit to survive.

Did any of the actors stand out?

Sandra Bullock (who played Ryan Stone) … having to "act" with only her face in a helmet showing and her voice and breathing to express the emotions needed for the moment, and imagining the hours she had to spend in a space suit to create the film, perhaps setting the record for the longest EVA by anyone in the history of the space program.

Did you identify with any of the characters?

Matt Kowalski (George Clooney), whose joy of "flying" around the space shuttle in the Manned Maneuvering Unit and stopping to appreciate the Earth and sunrise … We would all like to have that experience of flying free, not tethered by any emotional or physical constraints.

Did the soundtrack contribute significantly to the film?

The producers tried to address the "science" of being in soundless space but used the sound track (in addition to the astronauts' speaking and breathing) to override the absolute silence of space.

What's your favorite movie snack?

We always get popcorn and a soft drink (and a hot dog when Rene gives me permission).

On a different note, what's new with you?

It has been a 27-year journey since the Challenger accident, filled with new opportunities for students and teachers, collaborating with new partners in the community. Our Future Flight space camp, now in its 24th year, space-themed family science nights, the Astronaut Onizuka and Astronaut Lacy Veach recognition days, participating in global science conferences in Japan and in Hawai'i, initiating this year a new robotics program for elementary and middle school students called VEX IQ, and sharing radish and sunflower seeds that spent the month of April in Earth orbit in a Russian bio satellite, with schools … the educational journey of Challenger mission 51-L continues. And, yes, the most frequently asked question we still get from students and parents: How does an astronaut use the bathroom in space? Θ

"STU"

Article Courtesy of: Steven Alford, Writer for PMRF *Within Range* Publication

Stu Burley, circa 1957.

Stewart Burley, HSGC Industry Affiliate and Kaua'i Associate Director, is highlighted in the October 2013 issue of *Within Range*, the newsletter of the Pacific Missile Range Facility Barking Sands. The article recounts Stu's work at PMRF from 1957 onward, and includes this quote, "My dream, for the longest time, has been to launch a satellite out of Hawai'i." We hope you enjoy reading the article below.

In 1957, Elvis Presley was leading a musical revolution and had yet to be drafted into the Army, "I Love Lucy" was the most watched show on television, Dwight D. Eisenhower began his second term as President, the Soviet Union launched the first satellite into space, and Hawai'i was still two years away from becoming a State. On January 4th of that year, the first contingent of Navy personnel arrived at Bonham Field, Barking Sands (the precursor to PMRF). Among that initial group of seven was a tall, young Seaman Apprentice (E-2) from upstate New York named Stewart Burley––and he's been here ever since.

From 1957 until his retirement from civil service in 2004, Stu (as he's more commonly known) was a Sailor, a contractor and a government service employee at Barking Sands. These days, as the president of the Navy League's Kauai Chapter, he's still very much a presence at the base––he has attended every single one of the 25 change of command ceremonies for the base's commanding officers and continues to observe major Missile Defense Agency launches from the range.

He's literally a walking, talking history of the Navy's earliest days at Barking Sands and the service's evolving mission in testing and training––many of the programs which he helped bring here through marketing the range's assets during his tenure as a supervisory program analyst. But back in '57, there was only a runway surrounded by a vast expanse of ocean and a lanky, displaced Sailor with a vision.

"My dream, for the longest time, has been to launch a satellite out of Hawai'i," he said. "And of course it should be launched out of PMRF because we have range safety, radars, telemetry… we have it all."

"It all" started with the Regulus missile operations that Stu and the first group of Sailors came in to set up. He was a guided missileman –– "the elite of the Navy they called us."

Stu with a Regulus I missile, by the Bonham Field tower, Barking Sands, in May 1957.

In 1959, when his enlistment was up, Stu wasn't sure what he wanted to do, but he said he was having fun in the Navy and was dating a local girl, so he extended a year. And after that year, he wound up staying yet another year at Barking Sands, until finally separating after six years of service in 1961. By then, he was married and not looking to leave Kauai.

After leaving the Navy, he found a temporary job on base as a supply stockman at $50 a week. Then he heard of an opening for the operations coordinator position (equivalent to the current range operations officer). "So I went from supply stockman, which is the lowest guy on the totem pole, to way up there in charge of everything––every operation, every launch, every mission we did. I mean, we had a general manager, but I came right under him as a civilian contractor. All of the sudden I'm coordinating operations, timecards, work schedules…" In 1968, the Navy created the range scheduling officer position and Stu moved into the civil service career field to fill that job and the role of program manager for fleet operations.

Stu Burley speaks with a delegation of Japanese forces about PMRF in 1977.

During the next 20 years, he would be instrumental in shaping the course of PMRF. He helped establish the first underwater range in the Pacific, he became program manager for submarine operations and initiated the "Hollywood" series of submarine commanding officers qualifying courses conducted semi-annually off PMRF, and he kicked off "some little" fleet exercise called Rim of the Pacific in 1971. "They asked me if I wanted to be program manager for this thing they were putting together called RIMPAC, so I said 'Sure, why not?'" He recalled, "I started that by getting New Zealand and Australia involved, along with the U.S., United Kingdom and Canada for the first one." RIMPAC has since grown to 22 nations as of the last exercise in 2012. It's held biennially in June and July of even-numbered years and is the world's largest international maritime warfare exercise. Despite all of those accomplishments, Stu never lost sight of his dream to launch a satellite into space from PMRF.

Stu with a new generation of model rock enthusiasts.

The intervening years from 1994–2004 kept Stu busy as not only PMRF's supervisory program analyst and head of the fleet division, but also taking on the responsibilities of the newly established director of marketing to support business development and bring new customers to the range, such as MDA and the Aegis programs.

Since his retirement almost 10 years ago, he's kept active and kept pursuing his dream through involvement as an associate director with HSGC and the Hawai'i Space Flight Lab, as well as being appointed to the Governor's Aerospace Advisory Committee, while founding his own consulting firm Strategic Theories Unlimited (with the appropriate abbreviation of STU).

He remembered Sen. Inouye telling him to come back and see him about the satellite idea after leaving government service, so he did. "When I retired, I asked him again and he said, 'Well, I can't just give you the money, we'll have to get a sponsor.' So he looked around and finally decided we'll go through the University of Hawai'i, so he started to fund them and the dream started to come true." That dream looks to become reality next spring when UH in conjunction with NASA plans to launch a micro-satellite from the launch pad being constructed at PMRF's southern end as part of the Super Strypi program.

Preparing to launch.

So, through seven decades since the Soviet Union sent the first satellite into space and Stu Burley first arrived at Barking Sands, a satellite will be going up from the place Stu helped position toward that goal. Rest assured, he'll be here to watch. Θ

Coastline of PMRF's southern end. Image 2014 © Digital Globe-Google Earth.

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Chartered under the National Space Grant College and Fellowship Program in 1990, the Hawai'i Space Grant Consortium develops and runs interdisciplinary education, research, and public service programs related to space science, earth science, remote sensing, human exploration and development of space, small satellites, and aerospace technology. We accomplish this through a variety of projects: Undergraduate research fellowships and traineeships, innovative college courses, workshops for educators, educational web sites, public exhibitions, lectures, tours, primary school programs, space-themed evening programs and summer camps for families, and more.

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