

# Nā Hūakāi

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## The Voyages

# STEM Internship Program

-- Kapi'olani Community College (KapCC)

By: Keoki Noji, STEM Marketing Coordinator

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The KapCC STEM Program is an organization dedicated to advancing science, technology, engineering, and mathematics (STEM) education in the State of Hawai'i. It was created in 2005 through a National Science Foundation (NSF) Tribal Colleges and University Program grant.

The main goals of KapCC STEM are to:

- Improve the quality of education in the STEM fields
- Increase STEM student enrollment
- Increase STEM student diversity with an emphasis on Native Hawaiian population
- Increase STEM student transfer rates to four-year institutions
- Provide students with workforce skills for successful careers in STEM fields

KapSTEM has grown significantly since its inception in 2005, with over 500 students coming through the program. This includes both students that have received assistance with their coursework through the program as well as students who have received financial assistance. The program has been able to provide funding for students through various paid positions, such as student tutors and undergraduate research positions, and scholarships, such as the new STEM Scholars Program.

### The Hawai'i Space Grant Consortium (HSGC) Partnership

HSGC has been a close partner of the KapCC STEM Program from its beginnings, helping to establish the student research model upon which the STEM Program is built. HSGC's continued funding of Undergraduate Traineeships supports Undergraduate Research Experiences for KapCC students participating in faculty-mentored research projects that are relevant to NASA's goals. At the end of each project, students produce a scientific poster or an oral presentation for HSGC's Fellowship and Traineeship Meeting. Additionally, HSGC has provided travel scholarships for KapCC students, including funding for a STEM undergraduate team to attend and compete in the 2010 Can-



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Left: KapCC STEM Program Summer Bridge students taking measurements during the CricketSat activity.

Satellite (CanSat) competition. This international competition challenges college students to design, build, and launch a can-sized satellite with various mission-specific requirements such as telemetry, communications, and autonomous operations. The competition includes all aspects of an aerospace program, starting with a preliminary design review and ending with a post-mission flight review.



*KapCC STEM student CanSat team makes some final changes before their launch in Amarillo, TX.*

## 2010 KapCC STEM Program Internship Expo

On November 30, 2010, the KapCC STEM Program hosted its first annual Internship Expo. Modeled after a college career fair, the objective of the Expo was to connect students with internships early in their academic careers, thereby improving the quality of their education experience and increasing the likelihood of professional success. With over 500 students participating in the KapCC STEM Program and KapCC's enrollment approaching nearly 10,000 students, there is great potential for the students to positively impact the future of Hawai'i's STEM workforce.

Eighteen Hawai'i-based organizations were represented at the Internship Expo. Organizations in the fields of engineering and technology sciences included 3D Innovations, Akamai Workforce Initiative, Engineers Surveyors

Hawai'i, Hawai'i Space Grant Consortium, Ke'aki Technologies, Oahu Transit Services, and Sopogy. Ecology and biology-related organizations included the UH Mānoa Botany Department C-MORE, Ka'imi'ike Program, EPSCoR Hawai'i's ECOGEM Team, Hui o Ko'olaupoko, NSF Advanced Technological Education Program, Undergraduate Research and Mentoring Program, and the University of Hawai'i Sea Grant Program. Support organizations for Native Hawaiian students included the Alaka'ina Foundation and UH Mānoa Kua'ana Student Services. ☺



*STEM students and peer mentors with Outreach Coordinator, Keolani Noa.*



*STEM student Ricky Tso speaking with Marcia Rei Sistoso, HSGC Program Coordinator.*

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# Higher Education

## "The View from the Pipeline"

By: Reid Yamura, HSFL Graduate Student, UH Mānoa

After looking back at my undergraduate experience at the University of Hawai'i (UH), I can say that I am grateful that the x96 projects are a part of the curriculum. Also known as the sophomore, junior or senior design project, the x96 projects help students prepare for the real world by providing them hands-on experience, teamwork skills, leadership experience, and most importantly, teaching students what every engineer must know how to do--solve problems. In a group, the students work to design

a widget that can range anywhere from a custom circuit board to a piece of computer software, an autonomous robot, and even a satellite.

In the spring of 2008, I spoke to several classmates to see what types of projects they were working on. A classmate of mine, Jeremy Chan, told me about the ambitious project he recently joined called the Kumu A'o CubeSat. Jeremy invited me to a meeting with the team to learn more about CubeSats and the project. They were working on designing a 10x10x10-cm small satellite that would be used to gather remote sensing data. After meeting with the team, I decided to join the project and the following semester I was able to become a fellow for the Hawai'i Space Grant Consortium.

The Hawaiian name Kumu A'o was chosen because it is loosely translated to 'the source of learning' and that is exactly what this project was all about. Since UH does not have an aerospace program, almost everything about spacecraft design was self-taught and self-learned through the Internet and reading textbooks. The team spent countless days and nights learning spacecraft design as we worked with each other leveraging our different strengths and skills to complete the project. I spent most of my time on designing the Electrical Power Subsystem (EPS), which used solar cells and Li-ion batteries to distribute power to the satellite. I learned about circuit design from component selection to fabrication, improved my programming skills, wrote numerous technical papers, and attended a small satellite conference. I was also given an internship at Raytheon in Tucson, AZ because of my experience on CubeSat.

I worked on the project for about a year and a half before I graduated with my Bachelor's of Science degree in electrical engineering. Some of my teammates went to work in industry and a couple of others decided to continue their education in graduate school at UH; I was one of them. I was offered and accepted a teaching assistantship at UH to teach lab sessions. A year later in graduate school, I was approached by my former team members, Zach Lee-Ho and Jeremy Chan, about an open position they had on a satellite project they were working on called Hawai'iSat at the Hawai'i Space Flight Laboratory at UH. They needed an electrical engineer to design their EPS and thought of me because of my previous experience on the CubeSat project. Hawai'iSat is a much larger satellite but a lot of the concepts from CubeSat still applied. In addition, the work required me to spend several months at NASA Ames in California to develop the satellite design and learn from their engineers. I knew it was going to be a lot of work, but it was an opportunity that I could not turn down.

If the experience I gain from working on Hawai'iSat is anything like Kumu A'o, I will be able to further improve my skills and make myself a better engineer. With graduation creeping quickly around the corner, I am excited to begin work in industry. I know that the experience and knowledge I have gained through the years will definitely prepare me for what is in store for me in the future. ☺



*(Photo Courtesy of Mālamalama, University of Hawai'i)  
Mission Coordinator Jeremy Chan (left), and Electrical Power Systems Engineer Reid Yamura  
(right) with a model of the Hawai'iSat-1 they are readying for launch.*

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## Master's Apprenticeship Program

By: Zachary Lee-Ho, HSFL Graduate Student, UH Mānoa

I am a second-year graduate student in Mechanical Engineering at the University of Hawai'i at Mānoa. My thesis research focuses on designing a controller for a reaction wheel for small satellite applications. I am currently working as the co-lead for the Attitude Determination and Control Subsystem (ADCS) on the Hawai'i Space Flight Laboratory (HSFL) microsatellite project Hawai'iSat. In collaboration with NASA Ames Research Center, my responsibilities include implementing the Control and Estimation Scheme developed by Dr. Amit K. Sanyal into Hawai'iSat and serving as chief programmer for the ADCS.

I worked at NASA Ames in accordance with the Space Act Agreement between the state of Hawai'i and NASA. Tasks performed while at NASA Ames included generating C code for ADCS, delegating tasks to interns at the center, setting up lab equipment, and assisting in solar panel fabrication and testing.

In addition to my research, I serve as one of the key personnel for the Kukui Aerospace Program (KAP). The mission of KAP is to motivate and encourage underrepresented students (i.e. students of Native Hawaiian and Pacific Islander descent) in engineering and science to excel in their careers in the Aerospace field. I assisted in the development of the KAP structure and had a key part in the recruitment of mentors and students for the KAP program. My major responsibilities are coordinating and developing the curriculum for the summer

and semester KAP workshops for incoming Freshman and transfer students. I am also responsible for organizing the KAP Undergraduate Design Research Projects for small satellites. ©



*(Photo Courtesy of Mālamalama, University of Hawai'i)  
Zachary Lee-Ho tests the Hawai'iSat-1 attitude control system.*

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## ARLISS & USLI Updates

By: Windward Community College Students

It started off as a Gentlemen's bet between two Engineering professors, Bob Twiggs of Stanford University, and Shinichi Nakasuka of the Tokyo Institute for Technology. The bet was to see who had the better engineering design students. The challenge was to have their students design and build an electronic payload that in all respects was to emulate a planetary probe. The payload would have to gather atmospheric data and, either store that data on-board, or send it via telemetry to a passive ground station. The twist was that payloads would have to autonomously make their way to a specified GPS location after being deployed. How were they to determine which was the best? Have a trial by fire! The final payload projects would be put to an operational test; they would be inserted into high-powered rockets, which would then boost them to altitudes of greater than two miles up, and see which ones satisfied the mission criteria the best. Because of the limited space of the payload sections of these rockets, there was a spatial constraint imposed on the projects; they had to fit inside a cylindrical volume with a diameter of 5.8 inches, and a length of 11.5 inches. The payloads were also assigned a mass limit of 2.0 kg. And so began a lively exchange of ideas between students and a competition designed to instill the necessary skills that an engineer would need to survive in the 'real' world.

That was thirteen years ago, and was the kick-off event for ARLISS - A Rocket Launch for International Student Satellites!

For the first seven years, no team satisfied all the mission parameters. Some came close, but how close do you have to be to count? To satisfy the 'come-back' criteria, the payload had to get within 6 meters of the target, the team had to present their obtained data, and they had to show proof that the payload did indeed work to get to the target (as opposed to just falling out of the sky next to the target). The first University to win the competition was Tohoku University in 2006. Since then there have only been two other winners -- only now the prize money has blossomed from \$200, offered by the betting professors, to more than \$20,000 offered by private aerospace industries.

Now ARLISS has grown into a truly international affair. Last year, institutions from around the Pacific, all over the United States, some from Europe, and Windward Community College (WCC) gathered to test their electronic payloads. The annual launch, hosted by AeroPAC (the local chapter of the Tripoli High Powered Rocketry Association), takes place at Black Rock desert in Nevada. WCC has represented the Hawai'i Space Grant Consortium at ARLISS for the last 5 years, and in 2010 came in second overall.

There are two things that make WCC's entry in ARLISS unique. The first is our strategy. Many of the participating teams make use of ground traversing technology wherein the payload is deployed from the rocket and parachutes safely to the ground. Upon landing, the cord attaching the chute is cut, and the unit then rolls to the target area. There are many pit-falls to this approach; rough terrain, hard landings, limited battery life, large cost, etc. WCC's approach has been much more basic. We make use of a steerable parasail. This approach allows a simpler design (really only one moving part) and much lower cost. Its main problems are head winds, which can blow a project as much as 17 miles off course, and chute failure. Recent WCC designs have broken the payload descent phase into two parts: a free-fall descent to 1100 feet, and then a much slower controlled descent phase after the parasail has been deployed. This year the head winds were stronger than normal, and the parasail was deployed too early in the descent of WCC's first attempt. Nevertheless, the payload got to within 1000 meters of the target. Which was close considering that several times during the controlled descent phase, the unit had to double back on itself as the winds tried to blow it in the wrong direction. The second flight was not so successful; the parasail failed to deploy and the payload impacted the play floor.

The second reason why the WCC team unique is that we are the only institution that not only supplies a payload project, but also supplies its own rockets as well. The ARLISS



*The ARLISS TEAM (l to r): Jasmine Maru, Jim Green, Jacob Hudson, Joleen Iwaniec, and Patrick Lancaster.*



*(l to r): Joleen Iwaniec and Patrick Lancaster.*



*(l to r): Joleen Iwaniec and Jasmine Maru.*

competition requires that each of the payload-carrying rockets go through a rigid inspection. Not only must it be demonstrated that the rocket can withstand the 5-g stress of launch, and is capable of carrying the payload to height, but it must also be safe. This last requires separate, but redundant chute deployments. Because of the development of a payload, and a rocket to carry it, it was suggested that the ARLISS team consider taking part in the University Student Launch Initiative (USLI). USLI tasks students to design and build a scientific payload to gather data or perform an experiment, and a rocket to take that payload to a height of one mile (no higher or lower). Additionally, students are introduced to the design protocols that NASA would require of any subcontracting entity. Students are required to submit reports for a Preliminary Design Review (PDR), a Critical Design Review (CDR), a Flight Readiness Review (FRR), and a Post Launch Assessment and Review (PLAR). This is the second year the WCC ARLISS team has entered USLI. ©

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## NASA Opportunities at the Jet Propulsion Laboratory

By: Chester Lim, JPL Intern, Graduate Student, UH Mānoa

I consider myself lucky to have found a desired career path early. As a child, I was always fascinated with space, and like most young children, I wanted to explore it. In 1996, the Jet Propulsion Laboratory (JPL) launched their Mars rover Sojourner and I thought it was the coolest thing ever. A person can explore space without ever having to leave Earth!

As I grew older, I started taking my fascination more seriously and wanted to do hands-on projects involving robotics. During my sophomore year at McKinley High School, I was involved in the FIRST (For Inspiration and Recognition of Science and Technology) Robotics Competition. That year, we competed in the San Jose and Seattle regionals and for the first time, our school placed first. While participating in FIRST Robotics, I was exposed to NASA's ideals and mission statement, "To pioneer the future in space exploration, scientific discovery, and aeronautics research." This was very inspiring to me since my passion was to explore the space frontier with robotics.

During high school, I was fortunate to take a tour of JPL. The coolest thing I saw was an actual test of JPL's Mars Exploration Rover (MER). I knew then and there that this was definitely what I wanted to do. I imagined someday my children will be reading a science textbook, fascinated by pictures of space, and knowing that I helped take those pictures. I envisioned that one day, I would like to work at a place like JPL.

Through Hawai'i Space Grant Consortium (HSGC) and JPL, I learned three key lessons that helped me greatly to further develop my career goals. During my junior year in college, I found that UH had a Space Grant Consortium. Moreover, JPL was one of the NASA sites that offered an internship program. I immediately applied, and was accepted to participate in their 10-week summer internship program. When I arrived at JPL, I was a bit disappointed because my project did not involve robotics. My task involved prototyping a test bed for an orbiter called SPACES (Submillimeter Planetary Atmospheric Chemistry Exploration Sounder), which was to be used to find water vapor on distant planets. However, the experience made me realize that my view on robotics was only a subset of an even larger set. I learned that there are many aspects to a robot, and even if my project did not relate directly to JPL's current Mars rovers, the technology that I helped to develop might one day be used on one. Therefore, the first lesson I learned was that projects, big or small, are always significant. You may not always get the project you want, but work hard on it because



*JPL summer team (back, l to r) Duane Clark, Kevin Ortega, Daniel Ko, Charles Wang, Ayman Jabri, Carson Umstead, Ohanes Dadian. (front, l to r) Yutao He and Chester Lim.*

you never know when it might be the next biggest project. I applied the following year for an internship to JPL through HSGC and was accepted. I had a different mentor and worked with a team of engineers to develop a highly capable, reusable embedded system. It was a different experience from my first when I worked alone. While working with the team, I realized that school is not the only great source of knowledge. Experts in their fields have vast amounts of knowledge about the field and one has to pick through their brains to learn it. The second lesson I learned is that you should always ask questions. It is always more meaningful to know the underlying rationale than to memorize equations because real world applications do not

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always follow theories exactly. My mentor contacted me the following summer to offer me an internship position to participate in performing an architectural trade study for a future Mars sample return rover. Without HSGC's support in the previous years, I would not have gained the relationship and experience to obtain this position. My assignment involved performing explorations for the command and data handling system architecture. The third lesson I learned is that projects do not happen in an instant. It takes many years of research and proof of concept before the project can be taken seriously.

This year HSGC has supported me once again for an internship at JPL. My project this year is to develop a suite of on-board, adaptable, real-time image processing algorithms for balloon-based aurora observations. Without the support of HSGC, my career goals would have been just a dream that I wish I had the chance to fulfill. HSGC provides a great way for students to learn about industry practices while still maintaining their status as a student. Students who participate in HSGC will find that they are ahead of most students in their respective college year, and tend to better realize what they want to achieve. ☺

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## 2010 HSFL Summer Internship

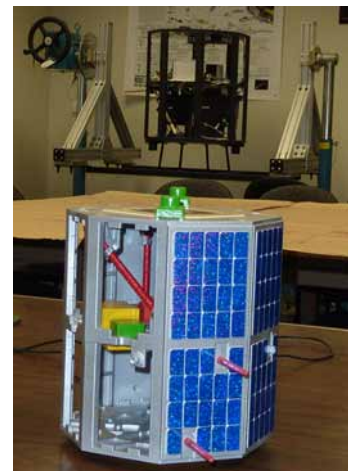
By: Kelsey Auten, Undergraduate Student from the University of Notre Dame

For the past three months this summer, I have been interning with Hawai'i Space Flight Laboratory (HSFL), helping the team with their Hawai'i Sat-1 project. The first two months of my internship were spent building a full-scale mock-up of the satellite to test the placement of components and wiring. Building the mock-up involved forming boxes out of foam core for each piece of the satellite, making those boxes magnetic, attaching certain connectors to each box for cabling and wiring the satellite. While all of these steps in creating the mock-up were tedious tasks, the greatest and most challenging parts were cabling and assembling the satellite.

On the first day, I was shown a diagram with a picture of each piece of the satellite and how they would all be wired together to create a system. The diagram looked so complicated; I thought there was no way I would ever come close to understanding it. However, with the support of the HSFL team and countless hours pouring over the diagram, my satellite system knowledge grew steadily. Eventually, I became very familiar with all the components and their respective functions. I also learned how to solder wires to connectors and how to crimp them for an ethernet connection. After getting all the wires connected to the right places, it was time to assemble the satellite. This was no small task and having so many wires made it hard to put the boxes in the chassis without tangling everything up. Once it was assembled, the mock-up looked great!



*Kelsey Auten*



*Demonstration model of the satellite sits in front of the full-scale mock-up.*



*Left: Kelsey working on the full-scale mock-up of Hawai'iSat-1.*

All of the time and effort I put into building it was definitely worth it after seeing the final product. I had a lot of help working on this mock-up, but I am proud to say the majority of the work was my own. I had a wonderful experience working with everyone at HSFL, and I am very grateful to have had this opportunity! ☺

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## 2010 Summer in Colombia

By: Michael Andonian, Graduate Student, UH Mānoa

*“It’s very easy working with Dr. Chyba, since she knows exactly what I am interested in. If it wasn’t for the Fellowship program, we might fumble around all semester looking for a topic, whereas now we’re off and running.”*

This past summer, the Pan-American Advanced Studies Institute (PASI) held a two-week conference on dynamics and control of manned and unmanned marine vehicles. For a fortnight, researchers and engineers throughout the Americas met in Colombia to present their research, brainstorm, and develop professional relationships with the crowning goal of progressing each continent’s contribution to the advancement of marine vehicles. My journey to Colombia actually began in 2008 when my professor, Dr. Monique Chyba [UH Dept. of Mathematics], simply asked, “Are you interested in space research?” The rest, as they say, is history. After Hawai’i Space Grant Consortium accepted my undergraduate fellowship application, I spent the 2009-2010 academic year learning about new mathematical techniques, programming, and control of autonomous underwater vehicles (AUVs).



*ROV in action in the Sea Perch competition during the PASI conference in Colombia.*

My project focused on geometric control theory and how it is useful for the control of AUVs. By regarding the AUV’s position and orientation as a point on a mathematical object, a manifold, one could describe global properties of the AUVs position, orientation, and speed. Other significant contributions of this approach include the fact that controllability of a rigid body becomes moot, global properties of the mechanical system are not lost, and motion planning of an AUV can be interpreted as a “path” on the manifold. HSGC opened the doors for me to study, learn from, and contribute to Dr. Chyba’s research, as well as present my project with Dr. Chyba at the conference in Colombia.

The first week in Colombia was spent in Barranquilla, an industrial city where the Universidad del Norte is located. Following the first week, we drove from Barranquilla southwest to the coastal town Cartagena. Along the way, we stopped by a popular tourist destination, the Volcan El Totumo, a mud volcano where visitors can bathe in the cool mud. In fact, the mud was so viscous that when submerged, one would literally be propelled upwards.

The second and final week was spent in a beautiful hotel on the coast of the Caribbean Sea. By day, we’d listen to presentations about control of AUVs at the Naval Academy, Almirante Padilla, and explore the area, including a day at the Castillo de San Felipe de Barajas. By night, we would enjoy the Colombian nightlife and, the best part, sample as much food as possible. The final official day of the PASI conference ended with a Sea Perch competition. For the previous two weeks, we’d split into groups of 3-5 and built our own ROVs out of kits of polyvinyl chloride pipe and basic wiring. Upon completion of a race and maneuverability contest, our team was victorious!

Completing my HSGC fellowship was absolutely integral to the goals I have set for myself. Thanks to HSGC, I was rewarded with the opportunity to engage in undergraduate research on a topic of interest and to contribute, in the tiniest of ways, towards the advancement of math, science and humankind. With support from HSGC, I attended the PASI conference, where I presented our project to experts familiar with AUVs, developed great relationships with wonderful individuals, and collaborated with brilliant minds and future researchers. The experience and knowledge I gained from the conference and time as a Fellow are irreplaceable cornerstones for any success I have in the future. The HSGC fellowship program certainly helped me realize the possibilities available to an aspiring young scientist and I am grateful for the opportunities they provided. ☺



*On top of the Castillo de San Felipe de Barajas (left to right): Pete Buckland, Michael Andonian, and Michael Martin.*

Hawai’i Space Grant Consortium

# Undergraduate Fellowships, Traineeships, & Internships

**Fellowships** are awarded to 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 \$3000/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.

## HSGC Spring 2010 Symposium



Front (l to r): Todd Esposito, Jasmine Maru, Zachary Lee-Ho, Samantha Jacobs, Dana Johnson, Nicole Wade, Sophie Milam, Premitivo Ames II. Back (l to r): Patrick Lancaster, Jeff Griffith, Corey Shimabukuro, Asael Temple, Michael Andonian, Bao Jun Lei, Matthew Markley, Jonathan Bauer, Michael Erorita.

## Mānoa Fellows - Spring 2010

Michael Andonian, a senior in Mathematics worked on the issues of control theory being developed for autonomous underwater vehicles and how they can be applied to robots in space, specifically vehicles that will someday explore the oceans under the icy crust of Europa, Jupiter's moon. Michael was working on his project titled, "Guidance and Control of Autonomous Underwater Vehicles" with mentor Dr. Monique Chyba of the Dept. of Mathematics.

Yu Ming Cai, a senior in Mechanical Engineering expanded on a project he began as a Space Grant Trainee (Spring, 2009) on thermal modeling and analyses relevant to all small satellite projects. Yu Ming was using advanced simulation tools during his project titled "Design and Analysis of the Thermal Control Sub-System of Hawai'iSat." Served as mentor was Dr. Marcelo Kobayashi of the Dept. of Mechanical Engineering.

Samantha Jacob, a sophomore in Physics worked with mentor Dr. Norbert Schorghofer of the Institute for Astronomy on a project titled "Are Martian Slope Streaks Triggered by Dust Devils?" Samantha used digital imaging processing techniques on orbital remote sensing images of Mars to identify dust devil tracks and slope streaks, to document the timing of their appearance, and try to determine cause/effect relationships.

Bao Jun Lei, a senior in Electrical Engineering worked with mentor Dr. Wayne Shiroma of the Dept. of Electrical Engineering on nanosatellite technology. With his project titled "Design of Electrical Power Subsystem using the CubeSat Stackable Interface," Bao planned and tested a modular design that can be integrated within any type of CubeSat payload for optimum performance.

Matthew Markley, a senior in Geology and Geophysics worked on a project titled, "Characterization of Temperature Dependent Macrostructure and Internal Elastic Properties of Boron Nitride Coated SiC Fibers." This work was relevant to improving the performance of ceramic-composite materials for use in aerospace vehicles. Serving as mentor for this work was Dr. Murli Manghnani of the Dept. of Geology and Geophysics.

Adonara Mucek, a sophomore in Geology and Geophysics worked with mentor Dr. Katharina Pahnke of the Dept. of Geology and Geophysics on the role of oceans in the climate system. Adonara combined laboratory analyses of the isotope geochemistry of North Atlantic Ocean sediments with satellite sea-surface data in her project, titled "Changes in Deep Ocean Circulation from Last Glacial Maximum to Present."

Nicole Wade, a senior in Mathematics worked on an Astrobiology project with mentor Dr. Eric Gaidos of the Dept. of Geology and Geophysics. Nicole's project, titled "Microbial Population Analysis of a Volcanic Subglacial Lake" involved the use of the epifluorescence microscope to analyze terrestrial microbes from the extreme environments of an Icelandic perennial lake that may be possible analogs to environments on Mars or icy satellites.

## Hilo Fellows - Spring 2010

Jonathan Bauer, a senior in Political Science worked with mentor Dr. John Barnes, NOAA Scientist at the Mauna Loa Observatory, combining local weather station and NOAA regional data for improved understanding of weather patterns that could negatively affect operations at a coastal observatory. His project title was "Weather Modeling for Astronomy Observations at Kilohoku Observatory, Pearl City, Hawai'i."

Sophie Milam, a senior in Astronomy and Physics, researched methods to alter the chemical composition of lunar regolith simulant for possible future applications in greenhouses on the Moon. Her project titled "Bioremediation of Lunar Regolith Via Microbial Metabolism" was a continuation of her NASA Ames Academy (Summer 2009) experience. Serving as mentors were Drs. John Hamilton and Christian Andersen of the Dept. of Physics and Astronomy.

Asael Temple, a junior in Computer Science tested image processing software used for the compression and improved performance of satellite and aerial reconnaissance data. Asael worked on his project titled, "Validation Techniques for Satellite Image Compression Algorithms" with mentor Dr. Michael Peterson of the Dept. of Computer Science and Engineering.

**Traineeships** *are awarded to full-time students at U.H. Mānoa and Hilo, U.H. 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 \$1000 /semester and may be eligible for supply funds.*

## Mānoa Trainees - Spring 2010

Dana Johnson, a sophomore in Mechanical Engineering worked on the descent control system for the CanSat small satellite being constructed at Kapi'olani Community College. The CanSat team competed in the June 2010 launch competition in Texas. Mr. Herve Collin of the Dept. of Math and Science at Kapi'olani Community College served as mentor.

Corey Shimabukuro, a senior in Electrical Engineering worked with mentor, Dr. John Rand of the Dept. of Math and Science at Kapi'olani Community College, on all aspects of command handling and data control for the Underwater Remotely Operated Vehicle being constructed at Kapi'olani Community College. The team competed in the June 2010 competition in Hilo.

## Kapi'olani Community College Trainee - Spring 2010

Jeff Griffith, a sophomore in Electrical Engineering worked as the team leader and system engineer of the Cansat project for the Kapi'olani CC team. He helped to coordinate the sub-systems, and ensured that all components of the project (sensors, programming, physical constraints) were successfully integrated into their Cansat system and compliant with the competition requirements. He also led his team to the June 2010 International competition in Amarillo, Texas.

## Kaua'i Community College Trainees - Spring 2010

Michael Erorita, a freshmen in Electronics Technology, participated in the set-up of an antenna tower and ground station at the Kaua'i CC Electronics Building. The presence of a ground station at Kaua'i CC will help support the Hawai'i Space Flight Laboratory's missions. Dr. Francis Takahashi served as his mentor.

Kathryn Massaro, a junior in Language Arts with an interest in meteorology worked on a project titled "Kaua'i Community College Weather Station." She worked on the installation of a weather station at the Kaua'i CC campus, which will lead to more accurate representations of the microclimates found on Kaua'i. She was mentored by Dr. Matthew Cochran.

## Windward Community College Trainees - Spring 2010

The University Student Launch Initiative (USLI) is a NASA-hosted contest that tasks students to design, build, and launch a rocket and scientific payload to an altitude of exactly one mile.

The University of Hawai'i has been represented at USLI by a team of students from Windward Community College. Premitivo Ames II, Todd Esposito, Joleen Iwaniec, and Patrick Lancaster flew payloads with help from Dr. Joe Ciotti and Dr. Jake Hudson of Windward CC, and Helen Rapozo from Honolulu CC. The team web site is: [www.windward.hawaii.edu/usli](http://www.windward.hawaii.edu/usli).

### Application Deadlines

Application deadlines for undergraduate fellowships and traineeships are December 1 for Spring semester and June 15 for Fall semester.

[www.spacegrant.hawaii.edu/fellowships.html](http://www.spacegrant.hawaii.edu/fellowships.html)

## Mānoa Fellows - Fall 2010

James Bishop, a junior in Geology and Geophysics, worked with mentor Dr. Jeffrey Gillis-Davis of the Hawai'i Institute of Geophysics and Planetology on lunar geology and remote sensing. In his project titled "Testing the Relationship Between Radar Data and  $\text{TiO}_2$  Content of the Lunar Maria" James compared radar, neutron spectrometer, and spectral data sets from multiple missions to try to identify trends, anomalies, and correlations in lunar surface titanium concentrations.

John Furumo, a senior in Mechanical Engineering, worked with mentor Dr. Weilin Qu of the Dept. of Mechanical Engineering on continued experiments to improve spacecraft thermal control. In his study titled, "Two-phase Micro-Channel Heat Sink Cooling Loop Spacecraft Thermal Control" John concentrated on system assembly and determining the effects of gravity on the thermal performance of the cooling loop.

Samantha Jacob, a junior in Geology and Geophysics, used lunar images and multispectral data to map and date overlapping lava flows on the surface of the Moon in her project titled, "Solar Wind Volatile Preservation." Working with mentor Dr. Sarah Fagents of the Hawai'i Institute of Geophysics and Planetology, Samantha compared her mapped units to numerical models of heat transfer into buried regolith deposits to help find ancient regolith with preserved solar wind particles.

Amanda Yamamoto, a sophomore in Mechanical Engineering, worked on a robotics project titled, "Underwater Sampling System for High Temperature Extremophiles" with mentor Dr. Brian Bingham of the Dept. of Mechanical Engineering. Amanda designed, built, and tested a prototype, autonomous sampling device that can be appended to a small ROV to collect seawater samples in hot shallow waters near volcanic activity. This work complements the broad goals of NASA's Astrobiology program.



## Hilo Fellows - Fall 2010

Ryan Bishop, a junior in Geology, worked on a project titled, "Mineralogical Study of Volcanic Sublimates from Halema'uma'u Crater, Kilauea Volcano" using lab spectrometers and microscopes for element and mineral analyses. This work was relevant to current research on the possible formation mechanisms of sulfates and associated alteration deposits on Mars. Dr. Kenneth Hon of the Dept. of Geology served as mentor.

Toby Horner, a sophomore in Mathematics and Computer Science, put his skills to work to improve the performance of image processing algorithms for remote sensing data. Toby's project was titled "Evolving Matched Filters for Satellite Image Compression." Serving as mentor was Dr. Michael Peterson of the Dept. of Computer Science and Engineering.

Briana Hurley, a junior in Astronomy and Physics, worked with mentor Dr. David James of the Dept. of Astronomy and Physics on stellar mixing and evolution. With her project titled "Photometrically Re-Imaging the Pleiades Open Cluster using the Hoku Ke'a 0.9 meter Telescope" Briana studied the masses and lithium abundances of Sun-like stars in the young star cluster.

Jamie Scharf, a senior in Geology, Astronomy, and Physics, worked on a project titled, "The Calibration of the CCD for Hoku Ke'a." Obtaining observations under varied sky conditions, Jamie characterized the spectral and performance of the new science camera on the telescope, and created an exposure time calculator for the facility. Dr. David James of the Dept. of Physics and Astronomy served as mentor.

## Honolulu Community College Trainee - Fall 2010

Thumy Webb, from Honolulu CC, titled her project "Effect of Varying Light Cycles on Opae Ula and Microalgae in a Closed System." Her goal was to determine the periods of light and darkness that produced a balance between oxygen and  $\text{CO}_2$  in a closed system with opae ula shrimp and an algae solution. Variations in light cycles simulated work and rest cycles. She was mentored by Dr. Gregory Witteman.

### Photo on left: HSGC Fall 2010 Symposium

*Front (l to r): Toby Horner, Amanda Yamamoto, Eric Fune, Daryl Domingo, Charles Agcaoili, Ryan Bishop, Briana Hurley, Jamie Scharf, Zachary Lee-Ho, Todd Esposito, Thumy Webb, Kristi Ross. Back (l to r): John Furumo, James Bishop, Dr. Francis Takahashi, Dr. Weilin Qu, Dr. Ken Hon, Dr. Jacob Hudson, Mr. Michael Peterson, Dr. Gregory Witteman, Patrick Lancaster.*

## Kaua'i Community College Trainees - Fall 2010

Five trainees received funding for the Fall 2010 Traineeship Program at Kaua'i CC. Cy Bagano, Shawn Mercado, Evan Agor, Charls Agcaoili, and Daryl Domingo all worked under the guidance of Dr. Francis Takahashi assisting with the development of a CanSat satellite and its rocket for a launch and landing on Kaua'i.

## Windward Community College Trainees - Fall 2010

The team of students from Windward CC: Todd Esposito, Joleen Iwaniec, Patrick Lancaster, and Jasmine Maru participated in the ARLISS competition under the guidance of Dr. Joe Ciotti and Dr. Jake Hudson of Windward CC, and Helen Rapozo from Honolulu CC.

## About the Community College CanSat Program

Hawai'i Space Grant Community College campuses offer engineering programs for students to design, build, and test CanSats. A CanSat is a scientific experiment package, the size of a soda can and commonly launched by a weather balloon or small rocket, designed to retrieve photographic, temperature, pressure, and altitude data for near-Earth low-atmosphere experiments. The CanSat students from the different campuses have been working together and participated in several ARLISS competitions (A Rocket Launch for International Student Satellites) in Black Rock, Nevada. In the past summers of 2009 and 2010, both the Kapi'olani CC and the University of Hawai'i at Mānoa CanSat teams entered successful devices at the annual CanSat competition in Amarillo, Texas. Kapi'olani CC placed in the top 5 in 2009 and the UH Mānoa team placed 3rd in 2010. The Windward CC CanSat team has participated in four consecutive ARLISS competitions to date. Community college students have benefited from the mentorship of HCC professors, WCC professors, HECO engineers and industry affiliates to accomplish their goals and the mission of the CanSat Program.



*Landsat image of the island  
of O'ahu.*

## Summer Programs

**Summer Fellowships** are awarded to undergraduate students who are registered as full-time students for the Fall semester at one of the University of Hawai'i Community Colleges. Awards are given for space-related research and provide a stipend of \$2000 per summer to each recipient.

## Kaua'i Community College Fellows - Summer 2010

Four fellows were funded for the 2010 Summer Fellowship Program at Kaua'i CC. Kelan Adachi, Shaun Koide, Daryl Domingo, and Charls Agcaoili presented their Fellowship project at the Fall symposium. These students worked under the guidance of Dr. Francis Takahashi.

## Summer Internships

Full-time undergraduates enrolled at either a university or community college in Hawai'i or on the mainland are eligible to apply for Summer Internships.

*The main objective of the program is to promote the use of NASA technology and educational opportunities in Hawai'i, and internships focusing on NASA's science goals are especially encouraged.*

## Kaua'i Community College Interns - Summer 2010

Seven interns were funded at three companies on Kaua'i for the 2010 Summer Internship Program. David Herr worked at Manu Kai at the Pacific Missile Range Facility on Kaua'i. Tiffany Eliana, Eric Fune, Melissa Peck, and Geoffrey Tran also worked at the Pacific Missile Range Facility. Crystal Whitehill and Mark Guirao worked at General Dynamics.

*Landsat image of the island of Hawai'i.*



Hawai'i Space Grant Consortium

# 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.*

## Future Flight Hawai'i

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

Future Flight Hawai'i will be hosting a Family Exploration Program for children and their parents, June 11-12, 2011, at the University of Hawaii at Mānoa, with a theme of Next Stop: Mars. Over the past 20 years, over 8,500 students and parents have participated in one or more of the Future Flight Hawai'i residential and non residential programs in exploring the Moon, Mars, and Earth. Learning modules related to energy, geology, robotics, and rocketry will be among the activities provided for the young space explorers and their families.



## Astronaut Ellison Onizuka Science Day

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



Twenty-five years after the last launch of the space shuttle, Challenger, the 11th annual Astronaut Ellison Onizuka Science Day held on January 22, 2011 at the University of Hawai'i-Hilo, paid tribute to the crew of the Challenger. Among the highlights were keynote speaker, Astronaut Daniel Tani (a veteran of two space shuttle flights and a four-month stay on the International Space Station), 22 science workshops, 13 displays, and the closing 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 Challenger while paying tribute to the space shuttle program. Workshops to inspire the next generation of explorers included making paper robot hands, using flight simulators, making and launching various rockets, astronomy, use of 3-D software to simulate an astronaut landing on the Moon, making a mini wind turbine, how to live and work in space, volcanoes, extraction of DNA from fruits, making a planetarium, making and testing robots, forensics, solar boat racing, and studying animal skulls. ☺



*Front (l to r): Michael J. Smith, Francis "Dick" Scobee, Ronald McNair. Back (l to r): Ellison Onizuka, Christa McAuliffe, Gregory Jarvis, Judith Resnik.*



*NASA Astronaut, Daniel M. Tani, was keynote speaker at the 2011 Ellison S. Onizuka Science Day.*

# Astronaut Lacy Veach Day of Discovery

<http://www.spacegrant.hawaii.edu/Day-of-discovery/>

The 9th annual Astronaut Lacy Veach Day of Discovery held on October 16, 2010 at Punahou School featured keynote speaker, Chad Kalepa Baybayan, a cultural and content specialist at the 'Imiloa Astronomy Center and a master navigator who trained with Polynesian navigator, Nainoa Thompson. Having met Lacy during Lacy's voyage to Moloka'i onboard the Hōkūle'a, and having been a part of the historic radio linkup with Hōkūle'a and the space shuttle Columbia, Kalepa gave an inspirational talk on voyaging to an enthralled audience. 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. Workshops included learning about rockets, robots, computer programming, life on other worlds, the Moon, comets, GPS, aeronautics and flight testing, oceanography, food preservation, our Solar System to scale, and circuitry and pneumatic robot arms. The concluding afternoon assembly included robotics demonstrations by three high school teams and the ever popular Science-is-Fun program by Future Flight Hawai'i's Dale Olive and Roger Kwok. ©



*Workshop participants.*

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## Grants Support Micro-Robotics Programs in Hawai'i

Hawai'i Space Grant Consortium assisted Waiakea High School in acquiring \$59,000 in grant funds over two years (deposited in the Waiakea High School Foundation) from the Thirty Meter Telescope. These funds were used to support teacher workshops and other outreach activities, including school family nights and workshops at the Astronaut Onizuka Science Day. The grants also helped to support Waiakea's fourth consecutive participation in the International Micro Robot Maze Contest at Nagoya University, Japan. HSGC also is coordinating the implementation of a grant award of \$90,000 (deposited in the Waiakea High School Foundation) for statewide micro-robot outreach and the hosting of a micro-robot conference, including the first bipedal workshop. HSGC is coordinating a third grant award of \$120,000 (deposited in the Hawai'i Island Economic Development Board) for statewide robotics workshops and establishment of robotics camps. These funds were awarded by the Friends of Hawai'i Robotics, which received stimulus funds from Governor Lingle. ©



*High school students soldering micro-robots.*



Hawai'i Space Grant Consortium

# BrushBots and Letry Robots

<http://blog.imiloahawaii.org/general-information/2nd-annual-brushbot-and-lerty-robotic-tournament/>

Although there has been a rapid increase in participation and access to scholastic robotics programs in Hawai'i (<http://www.hawaiiroc.org/>) with now over 400 teams representing over 50% of the schools in Hawai'i, less than 5,000 students have had opportunities to participate in one or more of the scholastic robotics programs. In seeking opportunities for less complex and expensive programs to introduce robotics to many more students, the Hawai'i Space Grant Consortium supported the initial and expanded use of BrushBots by the Waiakea High School's micro-robotics program. Made from a toothbrush head and a miniature vibrating pager motor, the BrushBot has been widely accepted as a simple-to-learn tool for participation in competition robotics. Over 300 teachers attended workshops and many participated in informal and formal tournaments held on the Big Island and Oahu including a tournament at the State Capitol as part of the annual Youth and Children's Day. A Microrobot Conference was hosted at the 'Imiloa Astronomy Center and coordinated by the HSGC, with funding from the County of Hawai'i Research and Development Branch, the Thirty Meter Telescope, the UH College of Engineering, and the Friends of Hawai'i Robotics. The three day conference incorporated BrushBots, the Letry Robot, an EasyBot, and bipedal robots. Japanese robotics educators from Kagawa University and the Meinan Technical High School along with the CEO and other corporate officers from Innovation FIRST International participated in the conference along with teachers, students and industry representatives. The Letry robot has been identified by educators as a tool to introduce basic electronics to students as young as grade 3. BrushBot and Letry-robot teacher workshops are being conducted in spring 2011 on the Big Island, Oahu, Maui, Kaua'i and Moloka'i. ☺



*Students from Farrington High School participated in the Summer 2010 MicroRobot Conference held in Hilo at the 'Imiloa Astronomy Center.*

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## 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. Participation increased to 140 Hawai'i middle and high school teams during this season. With eight regional and one state tournament, 24 Hawai'i teams have already qualified for the VEX World Championships coming to Walt Disney World in April 2011. Hawai'i Space Grant Consortium played an integral part of coordinating and contributing to the success of the Big Island VEX Tournament at the 'Imiloa Astronomy Center and the Pan Pacific VEX Championship at the Hawai'i Convention Center, which was the largest regional tournament in the world with 112 teams, including 12 teams from China and three from the U.S. mainland. With sponsorship from the Hawai'i Council of Engineering Societies and Pearlridge Shopping Center, HSGC coordinated an 18 team VEX tournament at Pearlridge on Feb. 20, 2011, to celebrate Engineering Week. ☺



*Waialua High School, Kamehameha Kapalama School, and Honoka'a High School competed in the quarter finals at the 2010 Pan Pacific VEX tournament in Honolulu, Hawai'i.*



# Space Explorers Science FESTival

## (FEST=Families Exploring Science Together)

Schools in Hawai'i are hosting Future Flight Hawai'i's Space Explorers 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. In 2011, the activities and demonstrations are based on the Space Shuttle and Space Station in celebration of the 29-year history of the shuttle program, and feature activities about Newton's Laws, microgravity, and living in space. 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. ☉

*"On behalf of our students and staff members, I just wanted to thank you and Rene and the team of volunteers for inspiring our students last week. If you noticed, there were many diligent parents in our audience who enjoyed the wonders of science and robotics. I am grateful that an opportunity opened up for our school so that you could share your enthusiasm and wisdom with this generation of students."* ~Michael Miyamura, Principal, Kapolei Elementary School

*"Thanks again for the fantastic out of this world workshop!!  
I learned sooo much and really enjoy learning about science!!  
It was sooo awesome to see how much learning and fun went on!!"*  
~Tina Matsuo, Campbell/Kapolei Complex STEM Resource Teacher



*Learning together about motion and friction.*



*Teachers racing BrushBots.*

*"Thank you very much for creating the "magical" science night for our Kapalama families and staff. I know you said, "It's not magic, it's science," but the excitement in the faces of the students was like magic. Like I mentioned, often science in school is reading the book and answering questions. I think it was like that for many of the parents there, too. That certainly was the science curriculum in my elementary years. The parents commented on how much fun they had. We overheard some students talking about the evening the next morning. Now you know it must have been engaging if the kids have something to share !"*

~Atsuko Sakumoto, Librarian, Kapalama Elementary School

## International Super Science Fair

<http://www.ritsumai.ac.jp/fkc/rssf2010/>

In Nov. 2010, Waiakea and Iolani students and teachers along with HSGC educational specialists, Art and Rene Kimura, participated in the 8th annual Ritsumeikan Super Science Fair, hosted at Ritsumeikan University and High School in Kyoto, Japan. The goal of the fair was to foster a global perspective in how to work together as scientists and engineers to solve problems. Forty-five schools from 19 countries were invited to participate in this global exchange of science presentations and collaborative activities. Only five schools were invited from the U.S. The keynote speaker was Tomotaka Takahashi of RoboGarage, who shared his development of humanoid robots for future use in homes. Future Flight Hawai'i's Dale Olive of Waiakea

Hawai'i Space Grant Consortium

High School led one of the five science workshops. In addition, he was asked to do science demonstrations for 120 visiting 7th grade students and teachers, and a robotics workshop with teams of international students. Art and Rene Kimura hosted a workshop for visiting 6th graders on space exploration. The NASA astronaut office provided each Japanese student with a set of autographed lithographs of Japanese astronauts who have flown to the International Space Station onboard space shuttles.

Waiakea and Iolani hosted Ritsumeikan students and teachers for two weeks in Hawai'i in July 2010. Ritsumeikan High School is one of 100 designated Super Science High Schools in Japan and has already invited Waiakea and Iolani Schools and the Kimuras to the fall 2011 Super Science Fair. All 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. ☺



*Left: Overview of Ritsumeikan Super Science Fair. Center: Students mingle during the poster session. Right: Waiakea and Iolani students with Japanese group outside the auditorium.*

## Faculty Perspective

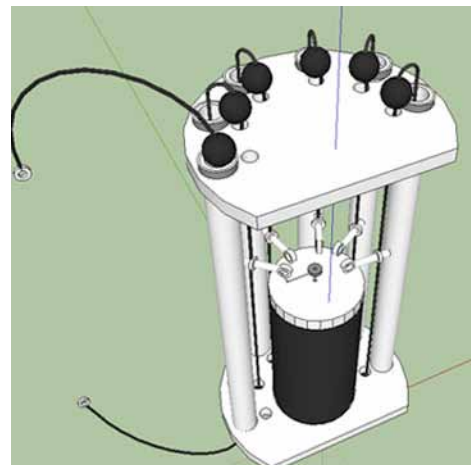
### -- Searching for Extraterrestrial Life Here at Home

By: Dr. Brian Bingham, Assistant Professor of Mechanical Engineering, UH Mānoa

One of our best chances for finding extraterrestrial life in our solar system may be on a small moon of Jupiter---Europa. Many consider the hypothesized liquid water oceans beneath Europa's icy crust as a possible repository for undiscovered microbial life. The similarities between Europa's ocean and Earth's own extreme aquatic environments has lead NASA to support ambitious endeavors to explore the origins of life on our own planet.

Amanda Yamamoto, an undergraduate mechanical engineering student at UH Mānoa, is contributing to this search by developing a new tool for biologists to sample organism in some of the most challenging environments. Amanda's Space Grant Fellowship project focuses on developing a water sampler capable of collecting microorganisms in the hot water plume generated by lava entering the ocean near Hawai'i Volcanoes National Park. As a key part of a robotic mission to this unique environment, Amanda's sampler will provide scientists with direct evidence about the habitable environments here on Earth, and, by analogy, evidence about how life might evolve in an environment such as Europa.

The fact that life could even exist under such harsh conditions is a relatively recent discovery. It was only in 1977 that scientists discovered the first hydrothermal vent communities in the Galapagos Rift where the basis for life is completely unlike what was known previously. The basis for most terrestrial life is solar energy captured through photosynthesis. The food chain of a hydrothermal vent is independent of the Sun, instead relying on chemical compounds as they emerge from the Earth's crust.

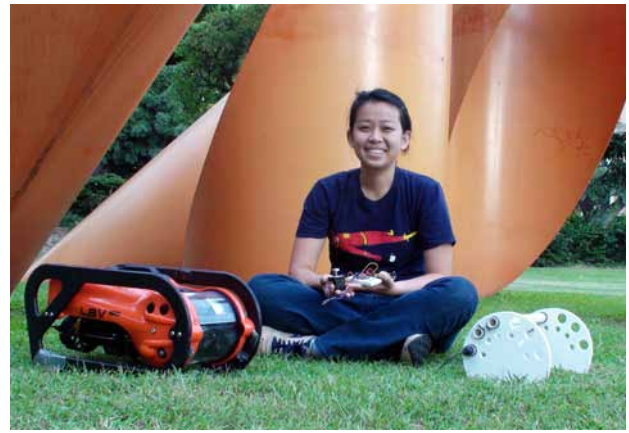


*Water sampler in development.*

The discovery of this new foundation for life on our own planet expanded our concept of how life may exist on other planets. Astrobiologists began to study hydrothermal vents miles deep in the Earth's ocean (and other extreme underwater habitats) to better understand these new limits to life beyond the Earth. Amanda's project has brought together Eric Gaidos, a professor in Geology and Geophysics, and Brian Bingham, a professor in Mechanical Engineering, to explore some of these possibilities by studying microbial life right here in Hawai'i.

Currently Amanda is deep in the design process. In her first semester she developed a prototype water sampler consisting of off-the-shelf mechanical components, a microprocessor and a stepper motor. The device is designed to be integrated into a small remotely operated vehicle that will carry it to within just a few feet of the lava as it enters the ocean. Amanda's final device, just like the extremophiles she hopes to collect, will need to withstand seawater temperatures that can exceed 100 degrees Centigrade. By the time you are reading this Amanda will have tested her initial prototype here in Oahu and begun the design of a second prototype, refining the design and hardening the components for deployment.

The Space Grant fellowship has provided Amanda with an opportunity to take on an authentic, real-world engineering challenge situated on the boundary between technology and science. She has been challenged to apply what she is learning as an engineering student and expand her knowledge to areas not typically part of her mechanical engineering curriculum, such as programming a microcontroller or understanding the preparation of microbial samples. This experience has been an invaluable part of her education and preparation as one of the next generation of engineers here in Hawai'i. ☺



*Space Grant Fellow, Amanda Yamamoto, with equipment.*

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## Strategic Planning

To foster continued success of our programs and enhance STEM education in Hawai'i, the Hawai'i Space Grant Consortium (HSGC) has created a new grants program for minority-serving affiliates of HSGC. Known as the New Horizons Innovation grant, its purpose is to provide significant funding to create new, lasting opportunities at UH Hilo and the Community Colleges. Funds come from the NASA allocation to the Consortium. The new projects will represent significant enhancements to existing programs.

### *-- Aerospace Opportunities for Underrepresented Learners and Instructors (AOULI)*

By: Dr. Joseph Ciotti,  
Windward Community College, HSGC Associate Director

Funded through a New Horizons Innovation grant, Windward (WCC) and Honolulu Community Colleges (HCC) are collaborating to expand the rocketry endeavors undertaken by students from both these UH campuses. Known as Aerospace Opportunities for Underrepresented Learners and Instructors (AOULI)—Hawaiian for the firmaments, this project aims at enhancing STEM-based undergraduate learning experiences in aerospace science, while simultaneously providing professional development opportunities for the project mentors and offering an outreach component to encourage more underrepresented high school graduates to pursue higher education.

AOULI relies on a holistic approach based upon the philosophy that both students and their instructors profit from hands-on enrichment activities that align with and augment their formal educational programs. AOULI also recognizes that articulation strategies are essential for recruiting students into courses and programs that are traditionally perceived as challenging.

To achieve this comprehensive vision, the AOULI project prescribes specific activities that are integrated across learning outcomes and intended audiences. These include advanced aerospace projects and internships for undergraduate community col-

lege students (including rocketry, planetarium and observatory experiences); professional development support for community college faculty/staff; and outreach support for high school students and teachers (including a proposed summer workshop).

## Undergraduate Student Support

The AOULI project offers undergraduate support by expanding the rocketry initiatives already conducted at WCC and HCC. In particular, AOULI supports student participation in payload and high power rocketry design through stipends, supplies and travel costs to various national rocketry events. This is especially important, since flight restrictions and space availability in Hawai'i severely restrict high power rocketry locally. This fall, WCC entered ARLISS (A Rocket Launch for Student International Student Satellites), an international competition that requires a data-acquiring payload to autonomously track to a pre-designated target after a two mile-high deployment. WCC placed second at this year's ARLISS held at Black Rock, Nevada. Students are currently preparing for the USLI (University Student Launch Initiative) competition in spring that challenges university-level students to design, build and fly a reusable rocket with scientific payload to an altitude of one mile. Over its three-year award period, AOULI will permit students to engage in additional design and launch opportunities, including NARAM (National Association of Rocketry Annual Meet) and LDRS (Large Designed Rocket Symposia), both national rocketry events held annually.

AOULI also provides internships at the WCC's Imaginarium (planetarium) and Lanihuli Observatory. Currently, WCC students are collaborating with Williams College on a KBO occultation event by conducting photometric observations at the college's observatory. Another student is interning at WCC's Imaginarium where he is employing scientific visualization techniques to assist with the production of a planetarium show called Zero-G Whiz and Beyond: The Exhilarations of Space Flight. Funded by AOULI, this show will integrate the work done by our students in high-power, high-g rocket flight with the video experiments captured by WCC students who had participated in the NASA Reduced Gravity Student Flight Opportunities Program.

## Community College Faculty Support

AOULI provides opportunities for professional development for WCC and HCC faculty to stay current on space science technology and instructional deliveries determined as best practices in the field. WCC and HCC instructors and staff will participate in the summer RockOn! Workshop offered at Wallops Flight Facility in Virginia, where the team will build a sounding rocket payload that will be launched to an altitude of 41.5 miles on a two-stage Terrier-Orion sounding rocket.

Teacher involvement in the college's astronomy curriculum is also supported through AUOLI funds. This support includes attendance at astronomy workshops and conferences on the mainland and overload pay to improve and develop new courses in space exploration, rocket propulsion design and advanced astronomical observation techniques.

## Outreach Support

To encourage more high school graduates to enroll in STEM-based college courses, the AOULI project is promoting opportunities for HS students to engage in space-related activities similar to those conducted by college students. AOULI provides for the establishment of the Windward Aerospace Academy (WAA), a one-week hands-on summer workshop for high school students and their teachers to learn about rocketry, payload design, planetary astronomy and space exploration.

The AOULI project will also provide funds to send one team of three high school students and their teacher to the Student Launch Initiative (SLI) competition near Marshall Space Flight Center. This HS counterpart of USLI tasks middle and high school students with designing, building and testing reusable rockets with associated scientific payloads. By engaging pre-college students at this advanced level, it is anticipated that more HS students will enroll at community colleges and take STEM-related programs. Currently, HS teams may only qualify for SLI by placing in the top level at mainland-based competitions. To encourage local participation in SLI, AOULI will establish a local qualifying rocket competition called A Rocket Contest in Hawaiian Skies (ARCHS) that is sanctioned by the SLI sponsors.

By integrating these hands-on learning opportunities for both students and faculty in high power rocketry and observational astronomy, the AOULI project incorporates an innovative strategy to support the national Space Grant agenda of preparing a workforce of space scientists and engineers. ☺



# Calendar

## October 2010

- 2 Maui County Fair VEX Tournament
- 3 Children & Youth Day: BrushBot Tournament at State Capitol
- 15 SpaceFEST family night at Manoa Elementary School
- 16 Astronaut Lacy Veach Day at Punahou School
- 22 SpaceFEST family night at Lincoln Elementary School
- 31 to Nov. 11 Ritsumeikan International Super Science Fair in Kyoto, Japan

## November 2010

- 2 to 6 International MicroRobot Maze Contest at Nagoya University in Nagoya, Japan
- 7 ASIJ Japan VEX Tournament in Tokyo, Japan
- 20 Undergraduate Fellowship & Traineeship Symposium and HSGC Associate Director's Meeting at Honolulu Community College
- 22 Math Science Partnership workshop at Coconut Island

## December 2010

- 1 Spring 2011 Fellowship & Traineeship Program Application Deadline
- 2 SpaceFEST family night at Kapalama Elementary School
- 2 to 4 Pan Pacific VEX Tournament at Hawaii'i Convention Center
- 9 Math Science Partnership workshop at RLS Library
- 9 Last Day of Instruction for University of Hawaii'i at Manoa students: Fall Semester 2010

## January 2011

- 8 FIRST Robotics National Kickoff at McKinley High School
- 10 First Day of Instruction for University of Hawaii'i at Manoa students: Spring Semester 2011
- 19 SpaceFEST family night at Mililani Mauka Elementary School
- 20 BrushBot FESTival workshop at Ala Wai Elementary School
- 21 Undergraduate Fellowship & Traineeship Orientation
- 22 2011 Astronaut Ellison Onizuka Science Day at University of Hawaii'i at Hilo
- 27 Math Science Partnership workshop at RLS Library
- 29 Middle School VEX Invitational at Stevenson Middle School

## February 2011

- 10 SpaceFEST family night at Manoa Elementary School
- 15 Math Science Partnership workshop at University of Hawaii'i at Manoa campus
- 16 SpaceFEST family night at Stevenson Middle School
- 19 to 21 Engineering Week promotes VEX & BrushBot programs at Pearl Ridge Mall

## March 2011

- 3 to 5 National Space Grant Director's Council Spring Meeting in Washington, D.C.
- 8 Math Science Partnership workshop at RLS Library
- 24 to 26 FIRST Robotics Competition Tournament at University of Hawaii'i at Manoa Stan Sheriff Center

## April 2011

- 29 SpaceFEST family night
- 30 Future Flight Hawaii'i staff training
- Undergraduate Fellowship & Traineeship Spring Symposium and HSGC Associate Director's Meeting at University of Hawaii'i at Manoa

## May 2011

- 4 Last Day of Instruction for University of Hawaii'i at Manoa students: Spring Semester 2011
- 6 to 7 Botball Robotics Regional Tournament at Hawaii Convention Center
- 12 Math Science Partnership workshop at RLS Library
- 23 to Jul. 1 Summer Session I

## June 2011

- 11 to 12 21<sup>st</sup> Annual Future Flight Hawaii'i: Next Stop, Mars!
- 15 Fall 2011 Fellowship & Traineeship Program Application Deadline

## July 2011

- 5 to Aug. 12 Summer Session II

## August 2011

- 22 First Day of Instruction for University of Hawaii'i at Manoa students: Fall Semester 2011
- 23 to 25 Western Region NASA Space Grant Conference in Alaska

## September 2011

- 21 to 23 National Space Grant Director's Council Fall Meeting in Wisconsin