

The Green Flash

HPA'S ENERGY LAB MONTHLY NEWSLETTER

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Full moon rising over Energy Lab.
Photo credit: Phong Hoang and Mariko Thorbecke

Elab News:

<http://www.hpa.edu/academics/energy-lab/in-the-news>

- HPA Energy Lab named as finalist in [APEC Business Innovation Showcase](#)
- Elab collaborates with Keck on Virtual Reality project
- Elab hosts Stanford soils project, expands wireless sensor network
- Elab developing energy audit pilot project with local resort complex
- Greentech students enter phase II of energy monitoring project
- Elab partners with UH astronomy group to develop remote data connections
- Elab to stream live video from Eva Parker Woods lectures
- Greenhouse installed as part of aquaponics/field research program
- Students submit to present at 2012 MacWorld conference

Director's Notes:

This summer, we saw the Energy Lab blossom into a thriving research facility, with students in the lab every day, working on projects they were passionate about. Five of these are outlined in this issue, the first of which is our [Polymerase Chain Reaction \(PCR\)](#) project. PCR is a process usually reserved for graduate school labs with equipment costing tens of thousands of dollars. PCR is to biology what the particle accelerator is to physics, and is a sort of microscope for DNA, amplifying DNA samples for visual inspection. It is our vision that these PCR tools will become as ubiquitous in the classroom as microscopes, and perhaps change the way we teach biology. We will use these tools in our biology classes, investigating genetic variations in biofuels, and tracing the Hawaiian field system adjacent to the lab. Our equipment is the first of its kind, developed by [Tito Jankowski '04](#) as part of the OpenPCR project.

Our second project is the [Emotiv](#) sensor headset, which will enable students to develop ADA smart buildings. This headset actually reads brain waves, and as our students program the system, one can direct any action by thought. Students are already able to play simple video games with the device. This should be an incredible leap in programming for our students, and might be showcased at the 2012 [MacWorld](#) conference in San Francisco.

At the MacWorld conference, our students hope to share their work with [Aerohive](#), an experimental wireless platform that enables teachers to survey, monitor, and interact with iOS devices, such as the iPad and iPhone. These tools will make classroom integration possible and enable teachers to send tests, links, and resources to entire

classes as never before. We also are testing the use of these devices as long-range data links to the Mauna Loa Observatory, part of an Institute for Astronomy project with MLO and UH Manoa.

This network already extends to several locations on the coast, one of which is a large resort complex we are working with on a pilot energy audit project, where data will be relayed via our wireless network to our Energy Lab brain telemetry, control, and monitoring system for analysis and to enable conservation steps. This is a great example of community outreach, forward thinking instrumentation, and the extension of the Energy Lab's capacity beyond our walls.

Speaking of walls, our students recently completed an enhanced Rich Virtual Reality (RVR) [tour](#) of the Energy Lab. Visitors from near and far can tour the Energy Lab, and click on sensors and other instruments to see real-time data about energy, environment, and weather. Some of our students extended this project to the [Isaacs Art Center](#) and to the [Keck](#) Observatory and base station in Kamuela.

So many other things are happening here—work with the Stanford team on GIS and field soil surveys, the solar cart emergency broadcast system project, the LabView automation team, RFID for student access, and streaming live video from the Eva Parker Woods lecture series with Kaniela Akaka, to name a few. If you are interested in any of these developments, keep an eye on our Web page, or e-mail me at bill@hpa.edu.

Thanks for your interest. Let me know if I can help.

Dr. Bill Wiecking
Director, HPA Energy Lab

Mariko Thorbecke '12

After bouncing around between American public and private schools, Japanese public school, and homeschool, Mariko finally found her home at HPA. Arriving as a junior this past year, she soon found herself spending most of her time at the Energy Lab, including weekends, to help with projects that needed to be completed. "I was just happy to be able to spend time up at the Energy Lab, to absorb whatever information I could." Mariko was ecstatic to work at the Energy Lab as a student intern for the summer, and dove right into several projects all at once as soon as she started. "The opportunities and resources available to students up here at the Energy Lab are immense, and I'm trying to make the most of my time here."



Left: Mariko configures the PCR machine.

Right: Phong offers Mariko advice on configuring the PCR machine.

Incredible opportunities continued to open up for Mariko; soon after starting her internship at the Energy Lab, she was offered an internship at the W.M. Keck Observatory headquarters in Waimea. She currently splits her days between working at Keck and working on Energy Lab projects.

Bo Bleckel '14

Having lived in two of the prettiest places in the world, Bo has had a very eventful life. Living in Switzerland for four years, his entire education from third to sixth grade was in French. The rest of his school years were spent at HPA. Also growing up on the HPA campus, he has been a part of the HPA community for more than 11 years. On the day of the soft opening of the Energy Lab, Bo was invited to see the amazing new building. Immediately he knew what he wanted to do during his high school days. As a freshman Bo spent one semester in Green Tech class and definitely learned a lot.

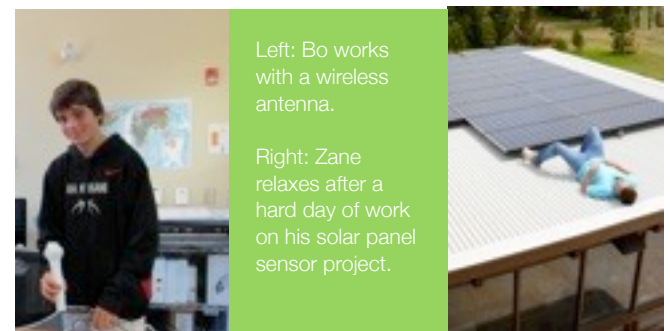
After the school year ended, Bo's days at the Energy Lab kept going. Working on projects that began during Green Tech, such as wireless networks from the lab to his house to Dr. Wiecking's house and an emergency broadcast network throughout the campus.

He also worked on the virtual reality tour. This was very exciting because HPA now has requests from hotels and others to do virtual tours for them. The team also got to show off their virtual tour in a video conference that the teachers did with hundreds of teachers worldwide. The students provided them with the link to the tour and they checked it out. Bo also walked around with a webcam on a hat as a point-of-view type of tour. Along with that, Dr. Wiecking and all of the students showed off all of the features to the world. "I love the things that we have the chance to do and be a part of here at the Energy Lab. It really is a key to the future."

Phong Hoang '12

A Vietnamese national born in Germany and raised in the United States. Phong has been an active and contributing member of the HPA community since his freshman year, bringing with him his international perspective on the world. "Between all the places I've been since I was little, I can certainly say that HPA's the most diverse of them all. There is no doubt that the opportunities that are available here, especially with the Energy Lab, are some of the most unique that are available to students anywhere in the world."

He first became a summer intern at the Energy Lab to help complete and add functionality to the virtual tour project, but has since joined and participated in many other projects at the lab. "A couple of other students have been working here since the beginning of the summer, but I was brought in later to help complete the virtual reality tour of the Energy Lab. Much of the troubleshooting with the software and



Left: Bo works with a wireless antenna.

Right: Zane relaxes after a hard day of work on his solar panel sensor project.

other tweaks with the tour had already been done, but I also was behind the curve compared to everyone else with regards to using the software and experienced gained putting a tour together so I had to learn quickly."

Phong plans to complete as much as he can while he has the opportunity to be at the Energy Lab and plans to pass the torch to other students. "Our overall goal for this summer is to establish a platform that can be developed or built upon by other students in

subsequent years. As summer interns, we hope to lay foundations for opportunities that are possible with the Energy Lab and inspire others to follow."

Zane Moran '12

Born in Hilo, Hawai'i, Zane has been living in the islands all of his life. He first came to HPA his seventh grade year and as a long time student, his contributions to the school have been numerous. Zane's first experience at the Energy Lab was in Dr. Wiecking's AP Environmental Science course, which included visiting the Mauna Loa Atmospheric Observatory (where they are best known for their

measurements of rising anthropogenic CO2). Seeing the larger scale real-life applications of things as simple CO2 monitoring really make the Energy Lab a good place to gain experience. Since then, Zane has become highly involved with many projects at the lab, such as the Polymerase Chain Reaction (PCR) machine, and plans to continue to work on them during his senior year at HPA.

Zane volunteers his summer vacation to come and work on these new and exciting projects. "Working at the Energy Lab has given me experience in fields that are going to be extremely important in the future."

Student Projects

By Mariko and Phong

Energy Lab Virtual Reality Tour

This was one of the summer student team's projects. Students took 360° degree photos all around the Energy Lab, and used software to stitch these photos into panoramic images. The images were then put into another program that rendered the photos into a 3D virtual tour, and allowed the team to add "hotspot links." By clicking on these hotspot links, viewers can find real time information on the

"The opportunities and resources available to students up here at the Energy Lab are immense."

Mariko Thorbecke

energy input of the solar panels, the levels on the CO2 sensors, and the video feed from cameras around the building. Students now are working on adding links to more sensors around the building, including the control panel, which allows users to control the lights, window louvers, and fans right from the Virtual Tour. Not only will this project serve as a Virtual Tour for people around the world to see and experience the Energy Lab from the comfort of their own computers, but it also



serves as an interactive way for HPA's own students to get excited about energy monitoring.

The student team is looking into the possibility of collaborating with a hotel resort on a virtual reality / energy monitoring project.

Aerohive

This is the latest technology on network monitoring and security. With a number of different ways to set up and configure, Aerohive will

"Working at the Energy Lab has helped to give me experience in fields that are going to be extremely important in the future."

Zane Moran

change the way people look at wireless technology. It has advanced

"As interns for the summer, we hope to lay down the foundations for opportunities that are possible with the Energy Lab and inspire others to follow."

Phong Hoang

internal security options to separate "guest" traffic from "registered user" traffic, so schools and businesses can be sure that their internal documents are safe.

The software also can be configured to monitor and set browsing parameters on iOS devices. This will enable teachers to



use iPads in the classroom without having to worry about their students browsing to other sites. On the hardware side of things, Aerohive allows for multiple configurations with all of their wireless units. Different antennas allow for different speed configurations and options to optimize both indoor and outdoor use. Working with Aerohive is giving HPA a head start on what the future of wireless networking holds.

Polymerase Chain Reaction

Up until now, Polymerase Chain Reaction (PCR) research was mainly reserved for college-level students and above. Now, with the innovation of HPA alumnus Tito Jankowski '04, HPA is using this technology at the high school level. While students aren't quite cloning anyone here, they can use this machine to sequence the DNA of the Koiaia trees above the Energy Lab to compare the genetic map and see whether the trees are related.

Energy Monitoring

Dr. Wiecking and his students recently installed temperature sensors on the top and bottom of the three different arrays of solar panels located on the Energy Lab roof with the help of Stanford senior Alex Luisi. After configuring the ControlByWeb box, which inputs the sensor data and exports it to the brain of the Energy Lab, Alex has been using the graphical data to make inferences on the efficiency of

solar panels based on the outside temperature and the temperature difference between the top and bottom of the solar panels. He is looking for a way to economically reduce the temperature of the solar panels to increase their efficiency.

Emotiv Headset (a future project)

After watching the TED talk with Tan Le discussing her newest project, the Emotiv Headset (http://www.ted.com/talks/tan_le_a_headset_that_reads_your_brainwaves.html), the student team knew this was a project they wanted to work on. After discussing different applications of how this could be used in the Energy Lab, students, under the direction of Dr. Bill Wiecking, ordered the headset and software developer kit (SDK). Students brainstormed programming ideas for this device and currently are testing and calibrating the device to the lights, window louvers, fans, and other features using brain waves. Students hope to demonstrate how even disabled people could run the Energy Lab using the Emotiv headset.

Projects In Works

LabView: LabView is a visual programming language that allows scientists to create their own graphical user interfaces (GUI) to direct and automate a stream of data and define sets of parameters based on the properties of the data. XML

support in LabView currently is limited and as the Energy Lab data from sensors, etc. are based on XML, a programming language similar to HTML, HPA is not running any LabView systems at the moment. But, students currently are working on creating a LabView interface that would pull data from our sensor boxes in XML, allowing them to automate experiments in energy monitoring that would help students use the resources of the Energy Lab to a fuller extent!

iOS Programming: The student team has downloaded X-Code, a popular code compiler, and read through an iOS programming book. With a huge percentage of students, and even teachers, carrying some form of an iOS device (iPad, iPod, iPhone), being able to program HPA-specific apps could be a huge asset to a boarding school. Whether it be a check-in app to keep track of the boarding students, or an attendance app to streamline the attendance process for teachers, app programming allows HPA students to be as creative as they want, with endless, practical possibilities!

Brett Evans '07

B.S. Computer Science & M.B.A. University of Denver

While studying in Denver over the past four years Brett had the fortunate opportunity to visit the Energy Lab multiple times. It has been an interesting experience to see the progress and evolution of the Energy Lab. Brett has seen the Energy Lab evolve from an idea into an incubator of ideas. This summer, Brett was able to give a helping hand in cultivating projects and opportunities.

When Brett attended HPA, independent science and technology projects were strummed up in the infamous lab of classroom 41a. He knows firsthand what a resource like the Energy Lab can be for students. The small room of 41a allowed him to pursue projects related to his major. Along with the mentorship of Dr. Bill Wiecking, to attend Macworld Expo his junior and senior years to assist in wireless security workshops.

This summer, Brett tackled a new project: OpenPCR, a system with the ability to amplify sections of DNA to enable easy reading; similar to the way a magnifying glass amplifies words from an article. Brett hopes to continue to foster interest in this project and



“The Energy Lab has finally reached its milestone of becoming a place where students and faculty can work together on new and innovative projects with the proper resources”
Brett Evans

mentor current students who are interested. The Energy Lab has finally reached its milestone of becoming a place where students and faculty can work together on new and innovative projects with the proper resources, and Brett intends on sticking around to provide his help and expertise.

Brett Evans Teaches Robotics Class

Summer @ HPA

Along with mentoring students and helping with new projects, this summer, Brett accepted the opportunity to work as a member of the summer faculty teaching robotics class for middle and high school students. He’s currently pursuing his M.B.A. in college and while he had never given much thought to pursue teaching, Brett gladly took the opportunity to try his hand at it. He’s always been interested in the learning process and jumped at the opportunity to experience education from the other side.

In the short four weeks of the summer session, Brett had the opportunity to work with six brilliant students. They came to class with a passion for building, an interest in robotics, and a creativity with respect to new technology. Now that the summer session is over, Brett feels as though he attended the session as a student. Teaching was a new experience for him and it opened his eyes to the very intricate workings of a classroom. If given the chance to teach again, Brett would gladly accept; he hopes to take this new experience with him as he begins his own career.



Ming Wei

Sustainability Curriculum Facilitator

Koh Ming Wei respects the Chinese tradition of the family name first and follows the placement of it as the surname. The strong sense of name being tied to place has led her on the path she is on today. Koh means intellectual farmer, and Ming Wei's work in sustainability, school garden based, and Waldorf education is training both her mind and body, and has positioned her well to be HPA's new Sustainability Curriculum Facilitator.

Ming Wei graduated from Berea College, Berea KY, with a double major in music and biology. She jointly, achieved her masters degree in curriculum and instruction from the University of Detroit-Mercy and Waldorf Teaching Certification from the Waldorf Teachers Development Association. She currently is working on her Ph.D. in sustainability education, writing her

dissertation on the effect of an interdisciplinary standards based school garden education on student learning. Ming Wei has been teaching all ages and levels, in public and private schools, for the past 20 years.



"I am very honored and excited to be here, in an environment where I can use the skills learned in the practice of education in combination with those gained in the practice of agriculture as an art. The support and encouragement for my work here at HPA is a dream fulfilled and an external scaffold for my inner desire to *be the change.*"
Ming Wei

Ming Wei believes that education for sustainability in balance with education about sustainability is imperative to ensure that our planet and community thrive. Sustainability is not just about ecological health, the practice and process also is about

social justice, and economic transparency. Having these three realms as the "triple bottom line" will influence how we make decisions with the Earth in mind.

Ming Wei believes that HPA is the perfect laboratory in the grand experiment of creating thriving, rejuvenating, and equitable communities. The school has the willingness of faculty, administration, staff, parents, and students to work on projects involving renewable energy, food self-sufficiency, water conservation, waste reduction, and eco-literacy. HPA has the expertise of highly-trained and educated faculty members who are innovative thinkers able

to integrate subjects into interdisciplinary, experiential curriculum. This school has the sensitivity of the staff and administration to demonstrate care and concern for those less fortunate and so guide the service learning of its students.

Summer Session Classes

This summer, students from around the world took classes at HPA. The robotics class and the sustainability class were regularly held in the Energy Lab, while a few of the other classes came to the lab for tours or worked on projects for a day. The art classes worked on environmental art in the surrounding area of the lab and the ESL classes wandered up to the building to take a tour and work on a writing project.

Clockwise (from top left): Student works on solar 'car.' Students use paints for their projects. Students with their completed art projects. A student with his completed environmental art project.

