Hawaii Preparatory Academy Magazine >>> FALL 2004

@ SCHOOL

MA KE KULA

HANDS>ON SCIENCE

NMFS + HPA turtle research program

THE WONDERFUL WORLD OF SCIENCE AT HPA > >

Making the Most of a Unique Location, High Tech, and High Touch

By > Phyllis Kanekuni

Science at HPA is a world of fabulous possibilities. With the Big Island as an extension of the classroom, students explore and learn about diverse ecosystems—13 of the earth's 15 climate zones exist here—and work alongside scientists from the world's foremost observatories, Hawaii Volcanoes Observatory, and the National Marine Fisheries Service (NMFS), to name a few. They also have an opportunity to use cutting-edge tools in innovative ways.

"We're really leading the country in a lot of the work that we're doing with technology," says Dr. Bill Wiecking, who teaches physics, AP Physics, and Advanced Computer Technology. He previously was the educational programs and networks manager for the Maui High Performance Computing Center on Maui, responsible for going to every school in the state, public and private, to help them integrate technology into education.

"Our kids are doing such advanced work here; there are just a handful of schools that are doing what we're doing with technology," he says. Wiecking is well-known in the technology world and was recognized as one of Hawaii's Top 50 High Tech Leaders by PacificNews.Net. He will be a keynote speaker at the MacWorld conference next January. "It's a chance for us to showcase the work of our science and computer tech students," he says. "I'll be talking about how we use wireless in education."

Last school year, HPA students worked on testing and evaluating a wireless bus for Maui, a third in a series of mobile science and technology labs. The first bus was completed about five years ago for Tutu's House in Waimea. The second bus, completed last summer, is in Alaska's Denali National Park being used in conjunction with the Denali Borough School District. "Some of the tools we used in the Alaska project were 'Beta' software, which we got from developers before they were even released," says Wiecking.

"The strength of the wireless bus concept is not that it's just a computer lab that moves around on wheels; it's wireless and has a huge antenna with a 45-mile range," he explains. "What this means is that you can drive this bus down to the beach and still have it connected to the school's Local Area Network so kids at the beach can videoconference with kids in the classroom, and even talk to other schools at the same time they're talking to each other. The bus is an umbilical cord back to the classroom but also to the rest of the world because it's using Internet technology."

The use of this technology will revolutionize the way fieldwork is done. In the "old" model of doing fieldwork, students went out, took photos, gathered data, estimated and plotted locations, came back to the classroom, and analyzed information. Now, with global positioning system (GPS) capability, digital and video cameras, and wireless connections, students can go out in the field, talk to each other and to experts at universities, and gather and synthesize data at the same time. "It makes for a very unique, rich, educational experience," says Wiecking.

The next extension of the wireless bus concept is the "Mauka-Makai" program, a statewide virtual science fair. Wiecking is heading this effort with funding support from the Office of Naval Research. "Students will 'adopt' a body of water, use cutting edge tools [videoconferecing cameras, GPS, digital still cameras] to study the ecosystem, and develop a lesson that will be judged. "We're putting together kits for every island that will include all the tools needed," says Wiecking. "This will enable kids from all over the state

Tom Goodspeed (left) and archaeology students (l to r) Wailupe Diaz, Beck Pierce, Trel Mollier-Mangarin, and Eric Lee study petroglyphs at Puako Petroglyph Preserve at Holoholokai Beach Park.

Science at the Lower School

By > Hope Soo

While at the National Leadership and Assistance for Science Education Reform (LASER) Conference last spring, HPA educators from all divisions learned about a variety of best-practice, hands-on, inquiry-based K-8 science programs, reviewed each program, experimented with specific lessons, and brought samples back to our classrooms. At the end of last school year, Lower School teachers met to design a comprehensive K-5 science curriculum rich in inquiry and discovery for our students.

The focus of inquiry-based science cultivates habits of mind that cross into every subject area. For those of us who teach young children, that premise is essential to our knowledge and understanding of how children learn. It is imperative that from a young age, children understand and practice each of the facets of the scientific method and are able to ask critical questions to gather essential information. Providing a smooth transition for all and helping children understand what scientists do, regardless of the specific scientific investigation or experiment being conducted, is at the forefront of our teaching.

The scientific method is described as a series of steps that scientists use to help find answers. The cycle includes a series of questions: PURPOSE: *What do you want to find out?;* HYPOTHESIS: *What do you think will happen?*; MATERIALS: *What materials do you need?*; PROCEDURES: *What steps will you take?*; DATA COLLECTION: *What things can you count and measure? How did you organize the data?*; RESULTS:*What happened when you did your experiment?;* CONCLUSION AND REFLECTION: *What did you learn from your experiment and how is it related to your everyday life?* and finally, *What's next?*

This year we are piloting several different nationally-acclaimed programs, including GEMS, FOSS, and INSIGHTS to provide a seamless exposure to earth and space, life, and physical science experiences in grades K-5. Curricular units will provide investigations in Living Things, Myself and Others, Solids and Liquids, Senses, Balls and Ramps, Weather, Plants, Heavy Things, Changes, Microscopic Explorations, Earth, Moon, and Stars, Terrarium Habitats, Sound, Circuits and Pathways, Structures of Life, and Oceans and Tides, to name a few.

Special attention has been given to our unique island environment. Each investigative unit has been adapted and designed to include exploration rich in materials and resources from our specific location to provide developmentally appropriate, challenging, and exciting scientific exploration for K-5 students. Literature, social studies, and mathematical connections provide enriched opportunities to extend learning and discovery in all areas. Science Notebooks, used in grades K-5, provide a consistent method for recording and sharing observations and findings, and also serve as a portfolio of year-long scientific experiences.

On any given day, Lower School students might be exploring with tuning forks, microscopes, and floating and sinking devices, or planting terrariums, dissecting cow hearts, hatching chicks in incubators, observing with magnifying glasses and prisms, traveling to learn about tidepool habitats firsthand, solving forensic science mysteries, plotting the navigational course of the voyaging canoe, Hokulea, video conferencing with scientists from the French Frigate Shoals, and more!

Above left: Third graders Sierra Schmitz (left) and Olivia Kurtz work on a sound experiment.

Above right: Fourth graders Justin Macy (left) and Iosefa Rocha-Tufaga work through a series of microscopic explorations.

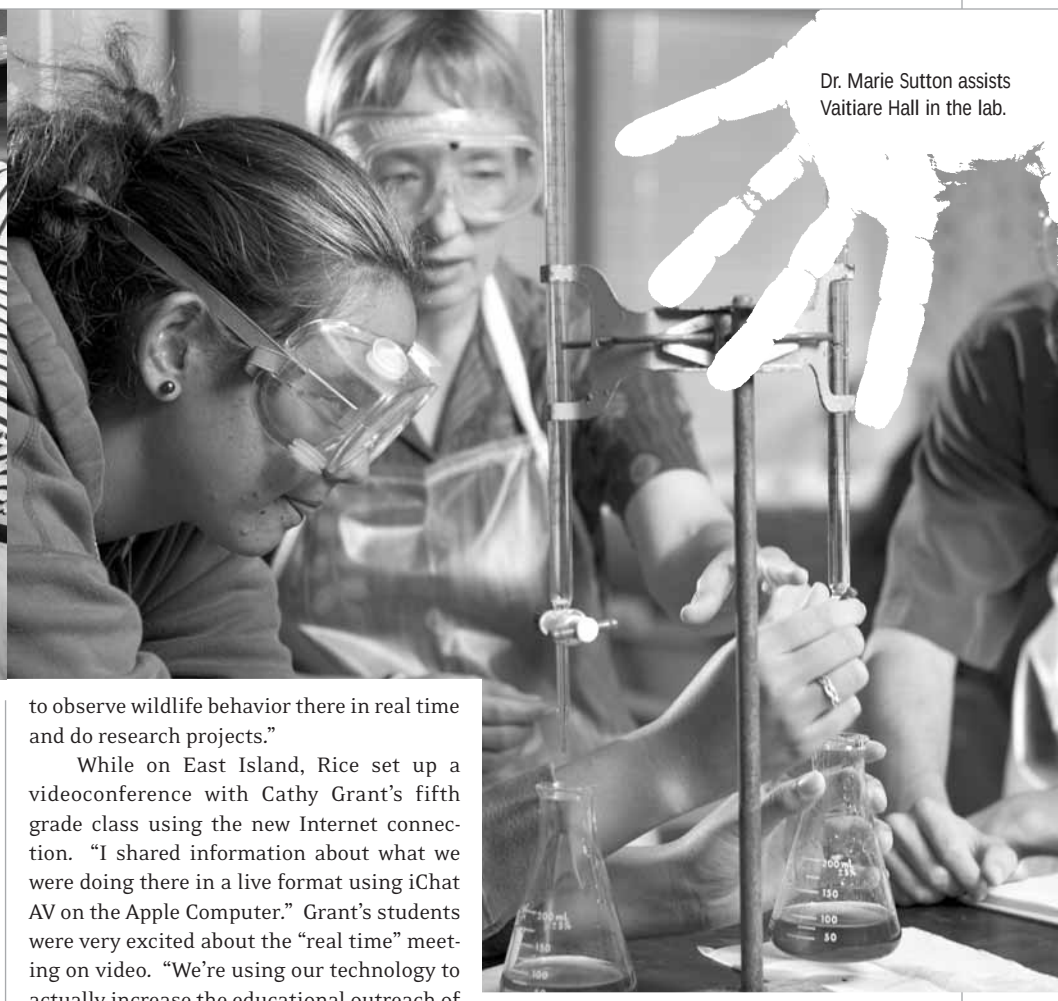
L to R: Conrad Schaad, George Balazs, Daniel Zatz, and Marc Rice stand in front of the newly-installed 2.5-meter satellite dish on East Island.

to participate. We want to encourage students to develop their own unique solutions to tough problems."

"Our hands-on approach to science education really sets us apart," says Marc Rice, who joined the HPA science department in 1972. He currently is director of the school's sea turtle research program and also heads the school's science outreach and technology programs. "That might be a cliché, but in our case, it's very appropriate."

Since 1987, HPA has had a close working relationship with NMFS, Pacific Islands Fisheries Center of NOAA Fisheries Protected Species Division, in conducting turtle research and conservation activities. Middle and Upper School students assist with the safe capture, measuring, health assessment, and tagging of many hundreds of sea turtles at various Big Island sites supervised by Rice and George Balazs, leader of the Marine Turtle Research Program for NMFS. The work has grown over the years in scope, magnitude, and importance to overall species conservation.

"HPA's assistance has been absolutely critical in gaining a better understanding of the sea turtle population along the west coast of the Big Island," says George Balazs. "The consistent hard work and good cheer of the students during these research expeditions have been exceptional and highly praiseworthy."



Dr. Marie Sutton assists Vaitiare Hall in the lab.

Top left: Steve Ryan (left), a physical scientist at Mauna Loa Observatory, shares information about a new vog machine prototype with science teachers Deighton Emmons (right) of HPA, and Jim Wiley of Konawaena High School.

Balazs credits the "talents, time, and remarkable leadership" of Rice, whom he describes as the "founding father" of the program. "He continues to be the bond that makes this program an outstanding success," states Balazs. "Mr. Rice truly is a friend of Hawaiian Sea Turtles–a 'honu hero' of our day."

Upper School students also have co-authored research papers under the direction of Rice and Balazs, which have been presented at the annual international Sea Turtle Symposium, which attracts about 1,000 of the world's top researchers and conservationists. HPA students have been the only high school students at this conference. Jill Quaintance '02, who presented at the conference in 2002, currently is studying tropical marine science at the University of Queensland.

"George has been a mentor and teacher to hundreds of HPA students," says Rice. In spite of his extremely busy schedule and global research obligations, he has taken time to share his knowledge and skills with our students. We are truly fortunate to be associated with such a person."

Rice recently returned from the French Frigate Shoals (FFS), an atoll about 700 miles northwest of Hawaii. There, he assisted Balazs and SeeMoreWildlife staff Daniel Zatz and Conrad Schaad with the installation of a 2.5-meter satellite dish, which will receive signals from the Starband satellite and connect the FFS to the Internet and the rest of the world.

"This will allow us to stream video from two cameras on East Island that are used to monitor wildlife there," says Rice. "Both cameras can be controlled from across the Internet and our students will actually be able to observe wildlife behavior there in real time and do research projects."

While on East Island, Rice set up a videoconference with Cathy Grant's fifth grade class using the new Internet connection. "I shared information about what we were doing there in a live format using iChat AV on the Apple Computer." Grant's students were very excited about the "real time" meeting on video. "We're using our technology to actually increase the educational outreach of the students," said Rice.

SeeMoreWildlife, which also installed a "turtle cam" at a Big Island site, is fine-tuning the East Island camera operation. "Once things are up and running for the next nesting season in April or May, we'll be looking at nesting turtles and the number of 'crawls' [turtles that come out of the water] on a given evening," says Rice. "Since this is a place that's routinely studied, we're trying to get around having to send someone out there for extended periods."

Rice hopes to continue to incorporate the natural environment in the school's science program as much as possible because "that's what makes us unique."

Deighton Emmons, who currently is on sabbatical, has been making use of the natural environment through VOGNET, an island-wide air monitoring project that involves students from six public and private schools on the Big Island–HPA, Kau High School, Keakealani Outdoor Educational Center, Konawaena High School, Pahoa High School, and West Hawaii Explorations Academy. HPA has been the "lead school" coordinating communication among the schools, collecting and processing data over the Internet, and hosting workshops and study sessions. Emmons and Steve Ryan, a physical scientist at the Mauna Loa Observatory, are the project coordinators.

"VOGNET gives students a valuable hands-on, real-world lesson about how science works," says Emmons. Network members collect data that ultimately might be used to affect the lives and health of island residents. The collected data show how particle concentration varies around the island as a function of prevailing wind direction and time of day. Several students have used the data to analyze the effect on people's health. The project also has attracted the attention of researchers at the Harvard School of Public Health who want to study the effects of vog on resident populations.

Tom Goodspeed's students currently are studying a natural phenomenon on the Big

Island. HPA is the only North Hawaii location for seismic monitoring through the Massachusetts Institute of Technology (MIT) in conjunction with Hawaii Volcanoes Observatory. "They're studying the shape and nature of the mantle plume, or hot spot, under the Hawaiian Island chain," says Tom Goodspeed, who teachers biology, geology, and archaeology. "This is especially important now with Mauna Loa inflating and the increased seismic activity." MIT will share the research with Goodspeed's students, who will get readouts once a month and use the data to study seismology in their geology class. "This is an example of project-based research done at the college level," says Goodspeed.

Another example of a college-level course being taught at HPA is Harold Frobisher's Sports Science class. Students learn about oxygen analysis, lactic acid analysis using photospectometry, and body composition through somatotyping. The class uses an oxygen (or metabolic) analyzer, two treadmills and a Computrainer (for biking), which analyzes an athlete's power output per pedal stroke, pedal technique, and absolute power of output.

"We can use the equipment for sport analysis or we can actually measure energy balance [number of calories a person ingests vs. calorific output]," explains Frobisher, who coaches the girls cross country team and is an avid athlete. He was a member of Great Britain's track and field team, the masters triathlon team, and was a national masters Ironman champion in 1995 and 1996.

Frobisher's goal is to get into the community with a weight control and diet plan, which would be especially helpful to diabetics. "Right now, I'm training students on the equipment so they can use those skills to do a community research program," he says.

"Our students already have applied what they've learned here to the field. Last year, I had 10 students in this class; four were on the track team and three of those four made the top two in the state. The fourth student came in fifth in the state.

"This is a new area for us and funding is a challenge; however, we have the interest and expertise to make this an unbelievable program."

Physical science students are taking science concepts and applying them to the real world through the "Cash for Trash Company," conceived by Kawika Lynn '98 and science department chair Matt Hughes. For the first unit on motion and forces, students worked in teams to design and manufacture a "product" in a mock environmental awareness competition based on "The Apprentice."

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Harold Frobisher conducts an oxygen analysis on Lucy Pollard.

Bill Wiecking sets up the wireless network in Denali National Park. Photo courtesy Bill Wiecking.

Kawika Lynn (second from left) with members of this year's electric car team.

Middle School Science

Students at the Middle School are being well prepared for Upper School science courses by two people who have worked as "real world" scientists. Laura Jim, who teaches sixth and seventh grade science, previously was an aquaculture extension agent in rural Africa and also worked at the Marine Environmental Research Institute of Pohnpei. Dr. David Sutton, who is in his first year teaching eighth grade science, was a senior scientist with Procter & Gamble for 14 years. Both teachers are passionate about science and share their enthusiasm for the subject with their students.

"The goal is to get students excited about science and to help them look at questions through a scientist's eye," says Sutton. "There are different ways to approach a problem and I want students to think through questions with scientific rigor; to get beyond learning from lectures and textbooks; to expand their resources and apply scientific critique to the information they gather. "We want to give students a good foundation they can build on at the Upper School."

Jim agrees. "We're focusing more on inquiry-based, hands-on science and moving toward student-driven experiments to develop an independence in doing science," says Jim.

Sixth grade science covers health and the properties of matter. Seventh graders study life science through an inquiry-based program Jim developed that studies the diversity of life on earth and includes an in-depth look at Hawaii marine invertebrae and vertebrae zoology. Her students volunteer and participate with the Upper School turtle tagging program to support their studies. Jim also gets her students into the community to learn about science through planting native species at the Waimea Nature Park, working with pre-schoolers from Small World preschool to plant bean seeds, Science on Saturday beach clean-ups, and the science fair. Theme Week provides another opportunity for science; last year, Jim took students on a Rapture science cruise.

In eighth grade, the focus is on earth science, which includes units on topography, minerals and rocks, plate tectonics, volcanoes, the earth's waters, pollution, climate, and astronomy. Sutton gives assignments that encourage students to work in teams because "when they're out in the real world, they'll be in a team environment. The earlier they can do this, the better."

Keali'i Cecil, Sean Paisley, and Gary Carothers-Patterson study convection currents.

During the year, he hopes to collaborate on some Upper School projects, possibly in environmental science or astronomy. His wife, Marie, teaches Upper School science. "One of the great things about HPA is that we make use of the natural environment we're in," he says. "I want to make sure I'm also a big part of that." ■ –P.K.

tag team partner NOLIE JOHNSON, and they're back in business as they explore UH-Manoa together. LEE MULLINS, JAMIE ROSENFIELD, and JENN JACOBSEN hang out a lot together, and are enjoying the luxury of going to a college where the finest beaches in the world are within a 15-mile radius. Just arriving at University of Oregon, JACKIE MORRIS, MAU'AE PURDY, ERIC CLARKE, and SEUNG YUP HAN have ended their summer that stretched into September. MAX UNGER went up early for football camp. MATT MARTIN sends his greetings to everyone from the Bay Area. Matt, TIMO SULLIVAN, and Nathan Burkland '05, members of the band "The Gatsbys" just finished recording their first album entitled, "Cities Will Die, And Two Bottles of Ale." ANDY BLEILER is working at The Gant, "Aspen's finest condominium resort," and plans to visit JOEL GOLLAHER to check the place out in anticipation of heading to USD next year. BREANA MILLDRUM is at Puget Sound where she finds her classes are interesting and lectures exhilarating. She's trying out for women's rugby and is thrilled about it. In Colorado, JENNELLE POLLETTE writes that school has been going well. At her college, students study so much that they have to close the library on Friday nights. JUSTIN REY LUZON is fifteen minutes away and enjoying his gigantic, spacious dorm room, and when it comes to class, it is business as usual. MARISSA FAYE is enjoying her first month at Regis. She travels a lot with the soccer team and is "representing" *Ka Makani* soccer. Division II level is a bit tougher, but she is excited to be a part of it. Here in "Bahstin," RANDIE GITTELMAN's school is hectic because her program is "wicked" hard and requires her to take extra classes. She has joined the ballroom dancing club and is on an intramural volleyball team. She is only four subway stops away from me, so I see her often. I also see CAROLYNE MCGEE regularly on Chestnut Hill. We've both joined the Hawaii Club and are excited to meet the rest of the crew from the Islands. For those of you not in this entry, I'm sorry. Please send your e-mail address so I can write to you. JUST DO IT!

Tara Bray Smith '88
Reads from her debut novel *West of Then*
November 22, 2004, 7 p.m.
Dyer Memorial Library

SCIENCE continued from p.11

"I love the science teachers here—like Mr. Rice. I'm not even in one of his classes and he's helping me big time. I also thank Mr. Hughes for helping me and being my mentor. We have all the regular [science] courses but whatgives us the advantage is that we can take an independent course and pursue something that is interesting to us personally. Going outside the classroom to learn is one of the best things; it's hands on. I'm a science guy and science is wonderful here." **—Chris Strahle '05**

Strahle is working on an independent science project with Marc Rice that focuses on "Changes in Marine Habitat at Pelekane Bay, Hawaii." Strahle is redoing studies that were done in 1977 and 1996 by the University of Hawaii—Hilo to see how corals and fish in the bay have changed since 1996.

"We're incorporating business, environmental, and physical science models into one idea," says Hughes. "We'll be using the same idea as a culmination for each unit of study." Other study units will include heat, light, sound, and electricity.

The "product" in this competition was an attractive, portable table made of cardboard that can be quickly and easily assembled by the "customer" and capable of supporting 10 pounds or more. For each "product," students must consider cost, target market, develop packaging, promotional ideas, relevant data, e.g. using study of forces to determine table strength, and provide a description about the team organization. The teams present their finished product to a panel of judges and dollars raised from the sale of products benefit the science department. "The goal is $100 per unit," says Hughes. "An ambitious goal is $1,000 per unit!"

Hughes also is a mentor for the school's robotics program, which is in its fourth year. This year's team will compete in the Colorado FIRST Robotics Regional Competition March 24-26, 2005 in Denver. Lynn is mentoring a team of students, along with Mark Evans, as they construct a mini-electric vehicle to compete in Hawaiian Electric's Electron Marathon on Oahu's Ford Island next March. Lynn was captain and driver of the school's first team in 1998; the team placed eighth overall in the endurance race.

Al Honey, a parent, mentor, and software engineer at W.M. Keck Observatory, will take the school's Botball team to the Hawaii regional competition on Oahu next April.

Dr. Marie Sutton's Regular Environmental Science class is working on a project, developed by the students, to determine whether or not it is possible to have a self-sufficient household locally. "This is their sole assignment for the quarter," says Sutton. "It's challenging for them to be largely self-directed and have this opportunity to get into great depth and detail." Each student is responsible for one of the major areas of the project, which include energy supply, green architecture, food supply (for domestic consumption and income generation), and water supply. Students are conducting interviews, going on site visits and field trips, and doing research to gather information and obtain feedback on their ideas and plans. Community resources include Parker Ranch, Hawaii Gateway Energy Center, and HELCO.

While the natural environment, technology, and experiential opportunities are unique pieces in the science puzzle, the human element is the piece that makes the puzzle whole. HPA science faculty members are highly credentialed, qualified, and passionate about their subjects. Wiecking sums it up well. "We're big enough to be able to support very talented, very well credentialed faculty and small enough to care about individual kids.

"One of the biggest gifts that we can give our students through our enthusiasm for the subject is to show them that 'science is really cool.' Another gift we can give them is the big message, 'I can.'

"Even if my students forget all their physics by the time they get to college, I hope they will take with them the self-confidence and ability to tackle something they haven't seen before because that's what college is all about."

Above left: Hans Fellhauer, Beau Cantyne, and Tammy Surtees test the strength of their cardboard table as part of a unit on motion and forces.

Above right: Matt Hughes (left) shares information about the school's robotics program at the Waimea Festival.