HUMBOLDT STATE UNIVERSITY

Student Chapter American Society of Civil Engineers

ERE MESSENGER

Environmental Resources Engineering

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Designing a System to Photograph Tall Trees

The Marty Reed Story

by Brendan Byrd, ERE Junior

As you walk into Science D for one of your labs, you may notice a flanned-clad fellow enjoying a soda from a pint glass while sitting out front of the building. If you know him, it is probably because of one of those pesky engineering projects your group didn't have the proper tools to complete. If you don't know him, I am happy to introduce you to Marty Reed, Equipment Technician for the College of Natural Resources and Sciences (CNRS) here at HSU.

Marty graduated from Humboldt State University with a degree in Zoology. After additional electronics training at College of the Redwoods, he got a job at a local stereo shop. Shortly after, a former chemistry professor told him about an opening at HSU for an electronics technician in the Biology Department. This position offered the promise of diversity and creativity in his work, which was irresistible for the self-proclaimed "poor assembly-line worker." Now, 36 years later, Marty still loves his job. If something needs building, fixing, or designing, whether it be electrical, mechanical, or a block of wood, Marty is the guy. It is through this diverse array of talents that he landed one of his most noteworthy jobs to date, aiding in the design, fabrication and operation of a camera dolly system to be used for photographing the tallest trees in the world.

Camera Dolly System, set up and ready to go. From right to left: Marty Reed, Jim Campbell-Spickler, and an unidentified person.

HSU Forestry Professor Steve Sillett, wildlife biologist Jim Campbell-Spickler, and cinematographer Andy Shillabeer were faced with the difficult task of filming and photographing an enormous redwood tree for National Geographic's documentary, *Climbing Redwood Giants*. When the promised use of a camera system from the UK

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FROM THE EDITORS

Hello from the Messenger staff! We hope you enjoy this Fall 2013 edition.

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"You cannot step twice into the same river, for other waters are continually flowing in."

Heraclitus
Greek philosopher
500 B.C.

Alumni Profiles

Jay Bower, PE
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I am fortunate to have spent a lot of time in the outdoors while growing up, backpacking with the Boy Scouts starting at age 11, and then with friends all through high school. I knew that I wanted a career that was connected in some way with the environment, and HSU was perfectly suited.

At HSU, I initially tried forestry and wildlife management, but neither program was the right fit. The career center sent me over to talk with Mike Anderson about the ERE program, and it was exactly what I was looking for.

My first job out of college was with the Vallejo Sanitation and Flood Control District, reviewing sewer and storm drain blueprints for new residential subdivisions. It wasn't particularly exciting work, and within a year I took a job with Pacific Gas & Electric Company to work on groundwater-related projects. I had the opportunity to work on projects throughout the state, from a natural gas compressor station in the desert south of Needles to Humboldt Bay Power Plant in Eureka. The work ranged from hydrogeologic studies for permitting of hazardous waste surface impoundments to characterization of groundwater containing dissolved hexavalent chromium released from cooling tower recirculation ponds. This was a career turning point for me, as I've been working on groundwater-related projects ever since.

After a few years at PG&E, it was on to graduate school at University of Nevada, Reno. It was a short stay, about 16 months for a non-thesis masters, but I had the opportunity to take some great classes and also teach the environmental analysis and hydraulics lab classes along the way.

From graduate school, it was north to the Seattle area to start the consulting part of my career. As a consultant, I've continued to work for industry, helping my clients operate their businesses in a manner that complies with environmental regulations. Frequently this involves proper management of process wastes, or cleaning up wastes that may have been released into the environment, and it is usually necessary to learn something about the processes that generated the waste; this contributes a lot to the fun of being a consultant. Along the way, I've had the opportunity to learn about a number of industries, including aluminum smelting, circuit board manufacturing, investment casting, and nuclear fuel fabrication.

Consulting has also given me the opportunity to manage staff and, eventually, to help manage the firm's business. I was chief operating officer of our company for 10 years before recently taking over the CEO role. It's been almost 30 years since I graduated from HSU, and I've had a great career. HSU, and particularly the ERE program, played a very large part in preparing me for it.

Alumni Profiles

Jonathan Bishop

BS ERE 1983
Chief Deputy Director
State Water Resource Control Board
Sacramento, CA

When I arrived at HSU in 1976 I had no idea what I wanted to do. After one botany course I realized that a major in forestry was not in the cards. After talking to a scientist at Ames Research Center, I changed my major to engineering. The Environmental Resources Engineering (ERE) program was more challenging and rewarding than I could have imagined. It was exactly the right fit for me.

I graduated in Spring 1983 and spent a year sending out resumes and working in a restaurant in Arcata until I accepted a job as an entry level Water Resource Control Engineer with the Los Angeles Regional Water Quality Control Board. Over the next 23 years I took on different assignments as I moved up in the Los Angeles Region.

After spending a year updating waste discharge permits, I took on a new assignment: identifying the sources of contamination impacting drinking water wells. At the time, this was thought to be a small problem in the Los Angeles area, but the program grew to include a staff of more than 30 and received a multi-million dollar grant from the U.S. EPA Superfund. After managing the program for 12 years, I was asked to take over the development of a comprehensive computerized environmental monitoring and tracking system, and implementation of a local area network for the Los Angeles Region.

In 1998 I agreed to head a new team, tasked with the development of Total Maximum Daily Loads (TMDLs) within the Los Angeles Area. The U.S. EPA had just entered into a consent decree with a group of environmental organizations, which required the Los Angeles Regional Water Quality Control Board to produce more TMDLs at a faster pace than had been done before. Among the TMDLs we developed were the first urban trash TMDL in the nation and a wet and dry weather bacteria TMDL to protect Santa Monica Bay beaches.

In 2004 I was selected by the nine Governor-appointed Board members to be the Executive Officer for the Los Angeles Regional Water Quality Control Board. I served in this position until 2007, when I accepted the position of Chief Deputy Director of the State Water Resources Control Board. I currently have responsibility for water quality, financial assistance, monitoring and assessment, and information technology.

My roommate during my last two years at Humboldt was a river guide who introduced me to the world of whitewater rafting. Beginning in 1988 I started working weekends and vacations as a river guide. I continued to guide regularly until my daughter was born in 2000.

HSU provided me with not only the technical knowledge I needed to become an engineer, but also the understanding that it takes more than technology to solve environmental problems.

Gian Pauletto, PE

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I left HSU and the Schatz Energy Research Center proud of my ERE degree, ready to do PV systems engineering. However, after years of eking out a living in this industry, I gave up because of unreliable employment. I decided to pursue a graduate degree at the University of Idaho through distance learning, and in 2012 I earned a Masters of Engineering in Electrical Engineering.

I am currently a system protection engineer, which has nothing to do with security according to the common definition. I work for Vermont Electric Power Company, the electric power transmission utility in the state of Vermont. The electric power network contains more than 1100 km of lines operating at the HV and EHV levels. Transmission is considered the backbone of the electrical system, moving large blocks of power. For a small utility we have some elaborate components, including a 225MVA back-to-back HVDC converter for the interface with Canada (which is not synchronous with the U.S.), a

Alumni Profiles

100MVAR synchronous condenser system for reactive power control, a 75MVAR Flexible AC Transmission System (FACTS) for the same purpose, and several phase shifting transformers for power flow control with the neighboring U.S. states. It makes for an interesting system from both a steady-state perspective (power flow) and a transient perspective (faults).

I set and analyze the operation of protection relays – devices that monitor the transmission equipment (lines, transformers, buses, machines, converters) – for abnormal operating conditions, such as short circuits, low and high voltages, and frequency deviations. These devices, in about 20ms, determine which sections of the transmission system to open, consequently preventing equipment damage and further reduction in power quality on the healthy circuits. To set the relays with the various electrical and logical parameters, I perform short-circuit simulations on a large electrical network model, which I also help to maintain. Primarily, I use algebra and programmable logic, but for really interesting problems I use linear algebra and calculus. Complex number math allows me to transform what would otherwise be cumbersome time-domain analysis into straightforward algebra problems in the phasor-domain. This transformation, by Euler's identity, accelerated our understanding and development of electric power systems into what some consider today to be the world's largest and most complicated machine.

My wife Rebecca and I have lived in Vermont for nine years. This has been a new and interesting experience for me, since I lived my previous 40 plus years in the coastal regions of California. When I'm not doing something technical, I can be found commuting to work usually by bicycle, and in the winter by foot or bus. Ω

Welcome New ERE Instructors

Dr. Chike Monwuba

Instructor in ENGR 322, 435 and 680

I was born and raised in Ibadan, Nigeria. After completing my primary and secondary education, I went to the University of Ibadan for a Bachelor's Degree in Civil Engineering, graduating with first class honors (summa cum laude) in 2004.

After completing the mandatory one-year national service in 2005, I left for the U.S. to continue my education. In 2007 I earned an M.S. from Mississippi State Univ. in Civil Engineering with an emphasis in Environmental Engineering, and then began my doctoral studies at Purdue Univ. In 2003 I obtained a Ph.D. in Civil Engineering, with a focus on Geoenvironmental Engineering.

Here at HSU I am currently teaching Environmental Data Modeling and Analysis (ENGR 322), Solid Waste Management (ENGR 435), and Professional Development in Engineering (ENGR 680).

My research interests include monitoring and assessment of water quality, fate and transport of geoenvironmental pollutants, and sustainability and conservation of energy resources. In my spare time I enjoy playing and coaching soccer.

Joaquin Wright

Engr 435 lab instructor

I received my B.S. in ERE from HSU in 2001 and worked as a construction manager and landfill designer in the environmental engineering consulting field until another ERE graduate and I started our own engineering consulting firm, Kennec Inc. We built and operated this successful venture, which included five offices on the west coast, from Long Beach to Seattle. After a great run of seven years we closed the doors at Kennec, and I joined GHD in Santa Rosa.

One of my speciality areas involves recycled material research and the associated management of that research for the state of California. This has allowed me to work with universities and their esteemed professors. I am currently working closely with researchers and professors at UCSD, UCD, Fresno State, Chico State, and, of course, here at HSU in the ERE department!

As with the circle of life, or perhaps more appropriately the circle of recycling, I have come full circle and am re-purposing knowledge gained through my training at HSU to help educate and encourage another class of ERE students! We are the answer; the world is ours for the fixing! Ω

My Life-Changing REU in Costa Rica

by Simeon Haynes, ERE Senior

I had a goal to be part of an overseas summer Research Experience for Undergraduates (REU), and in 2013 I applied to the LSAMP Costa Rica Summer Research program. I gladly accepted their offer to conduct research in the tropical forest of Costa Rica. Of the 14 students in the program, three of us were from HSU. Our hands-on experience and great letters of recommendation made us very attractive to the selection committee.

The program was going to be six weeks long, all in Costa Rica. We were leaving at the end of May, and I was extremely nervous. This was my first REU, as well as my first time traveling outside the U.S., and I was concerned about being able to finish a research project in less than six weeks. But, I knew I had to accept this exciting opportunity. Also, my engineering professors gave me positive reinforcement, telling me that I was going to have a great time and would be successful in my research. I love my engineering professors.

Early in the program we visited the San Miguel Biological Research Station in the Cabo Blanco Absolute Reserve, a tropical forest on the coast that has been protected for 50 years. They took us to a remote beach where we spent the morning making a list of research topics of our interests. It was a very enriching experience. No city sounds, no internet, no cell phone, no iPod... no distractions of any kind… just the sound of the ocean as we imagined our research.

I was on a two-person stream investigation team with an environmental science major from CSU, Monterey Bay. We collected water quality data (pH, turbidity, temperature and flow) for eight streams in Santa Teresa, Malpais, and Cabo Blanco Nature Reserve area, and we also identified and recorded the macroinvertebrates in the streams' leaf packs. This was the first time water quality data had been collected or macroinvertebrates investigated in these streams. Also, our research was of use to the Costa Rica National Parks Service, providing evidence that the 50 years of habitat protection in Cabo Blanco actually made a positive impact on the environment and ecosystem. Data of this kind can help justify protecting pristine areas from development.

Simeon with stick-bug in Tenorio Volcano National Park, Costa Rica.

The program did an excellent job of scheduling in fun time and breaks from research and lectures. We hiked through several national forests, snorkeled in a lagoon (I swam with four sea turtles), and took a surfing class (I discovered a love for surfing).

The home-stay experience I had with my Costa Rican family was life changing! Though far from rich, they were one of the happiest families I have ever encountered in my life. They took the time to show me their way of life, and patiently taught me Costa Rican Spanish. It was always a happy atmosphere in their house, and their main interest was being around their family and friends.

The Costa Rica summer research was an invaluable experience. I learned so much about life outside the U.S., about a culture other than my own. I also learned a great deal about conducting research, writing technical papers, and developing meaningful research topics in a short period of time. I now feel confident in my ability to do rigorous work in a harsh and foreign environment. The ERE program has done an outstanding job of preparing me to do real-world work, and I was well prepared for all the tasks required of me. I am very proud of conducting my own research under the guidance of my research professor to better the lives of a community in Costa Rica, and I will remember the experience for the rest of my life. Ω

Tall Trees

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failed, the team had to start over from scratch. Andy began building a new system, working out of his living room. However, limited time, tools and manpower quickly presented their disadvantages. Knowing Marty through the college, Steve suggested that Andy meet with him to help with the design and fabrication challenges they had encountered. Given Marty's overall technical background, he was perfect for the job.

With Marty now part of the team, they set out to finish the design and build the camera frame system. The final design starts with a dolly as a frame, with a pulley attached at the top. Three cameras are mounted to the frame below; one camera is aimed right, another left, and the last directly on center. This allows for similar shots from multiple angles, providing for greater shot variety. The lower portion of the frame is geared, which enables the frame to tilt and move. The function of movement leads to one of the most important components of the system, the gyroscopes. With such a large, "pretty unbalanced" weight hanging from essentially one rope, the stability of the frame becomes an important issue. By providing for movement in the lower half of the frame, the upper half would tend to rotate in the opposite direction. If this were a new dance move, that would be great; however, when trying to capture still shots of a magnificent redwood, it's not so great. The solution to this problem was gyroscopes, which are essentially circular masses rotating at high speeds. Gyroscopes operate on the principle of angular momentum (similar to a turning bicycle wheel), and resist the effects of outside forces. Additionally, any disturbance the frame experiences from movement up or down the rope is damped out quickly. Two gyroscopes were installed on the upper portion of the frame, one on each side of the pulley. They were made out of 20-inch bicycle wheels, fashioned with 5 pounds of lead rotating at 700 RPM. This provided the stability necessary for the movement of the cameras, as well as the movement of the frame as a whole. With the camera frame system now usable, filming of the documentary could be completed.

After completion of the documentary, National Geographic decided to do an article featuring a composite photograph of the giant redwood. This project was led by National Geographic photographer Nick Nichols, who used the camera system designed by Marty, Andy and Jim. Marty was given the task of pulling the camera system to the top of the tree using a rope and pulley system, a task he noted was "way too much work." The cameras, as well as the gears and adjustments on the system, were operated from the ground using a laptop computer. Originally, this was supposed to be done wirelessly. However, when that didn't work out, an alternative was created. They made a custom 350-foot-long USB cable to run from the laptop on the ground to the camera frame system. With this in place, every picture, movement, and mechanical operation was simply a click away. After three weeks of hard work, they finally had enough individual photographs to be made into a whole tree. A total of eighty-three pictures were "stitched" together to form the final product, the awesome photo you see above, stretched across two pages.

Composite photograph of a 1500-year-old, 300-foot-tall redwood. Stitched together from 84 individual photos taken with three cameras mounted on the camera frame system.

No job, no matter how well you prepare, goes exactly according to plan. In engineering, designs must be changed, kinks have to be worked out, and unexpected conditions have to be overcome. As we all know, redwoods are tall trees. Add to that a cold-spell, and suddenly you can have quite a temperature gradient over the height of a tall tree. What do you do when, because of the conditions, the camera lens fogs up? In this case the solution came from someone who had previously faced this same dilemma. While photographing Stonehenge in the UK, another photographer had come to the same impasse, and his solution was hand warmers and rubber bands. By wrapping the lens with hand warmers and holding them in place with rubber bands, fogging was eliminated. Like magic, you suddenly you have a fog-proof, temperature-proof camera. How about when a vine gets caught in the gyroscope while filming in Borneo? Although Marty was not there to correct the mishap on site, he made sure the team left town with all of the necessary replacement parts in case of an emergency. When the vine became caught in the wheel, the motor spinning the gyroscopes burned up. The solution to this problem came in two steps. First, they had to climb up to the frame, set up a safety net, and swap out a new motor to make the entire frame functional again. Second, they swapped out the homemade gyroscopes for commercial enclosed models. Not only did this modification now make the camera apparatus vine proof, but the compact size, reduced noise, and increased RPMs allow for even greater camera stability and function. Finally, what happens when pulling an 80 to 100-pound camera dolly system on a rope and the pulley has aged (thus becoming less efficient)? For the next project, photographing the "President" (largest of the giant sequoias) in the Sierra, they decided to switch to a motorized pulley system. As mentioned previously, this was close to Marty's heart because he had been given the task each time of pulling the system to the top of the tree. So, adaptability was the key to success (and ultimately "less work").

Now that the incredible achievement was behind the team, I asked Marty how he felt about his experience. He said simply, "If the entire project had been a failure, I still met two people, Andy and Jim, who will be great friends forever." It is through this friendship and working relationship that the three men started their own company, Spider-Cine, which has since done work for the BBC, Nova and Discovery. As a group, they are working on a more compact version of the camera system, allowing for more portability with less stuff to carry. This modification includes a Lidar camera, which enables rendering of three-dimensional images. Also, they have designed a rail camera system to do moving, time-lapse photography. Although there are no current plans for more work with National Geographic, they remain ready for the next challenge.

Mechanical and electrical aptitude aside, the real take-away characteristic about Marty is that he is a truly great guy. He is always willing to talk and help, and every interaction with him seems to leave a smile on your face. For those of you who know him, you're already familiar with this. For those of you who don't, you may want to wander into his office in Science D and say hello! Ω

Hybridized Membrane Systems

Professor Andrea Achilli Directs ERE Student Research Projects

Introduction

by Lianna Winkler-Prins, ERE Senior

In the Spring 2012 edition of the ERE Messenger, Dr. Andrea Achilli introduced himself to HSU students and faculty, as he was scheduled to become an ERE assistant professor the following fall. He wrote of his plans "to develop a research and education program based on hybridized membrane systems for desalination, water reuse, and power generation" and said he looked forward to expanding his research "through teaching and collaborating with the respected faculty and dedicated students here at HSU." Dr. Achilli has been true to his word and has involved a considerable number of ERE students in membrane-related research projects. The following pieces describe the projects and opportunities that Dr. Achilli has brought to Humboldt State engineering students.

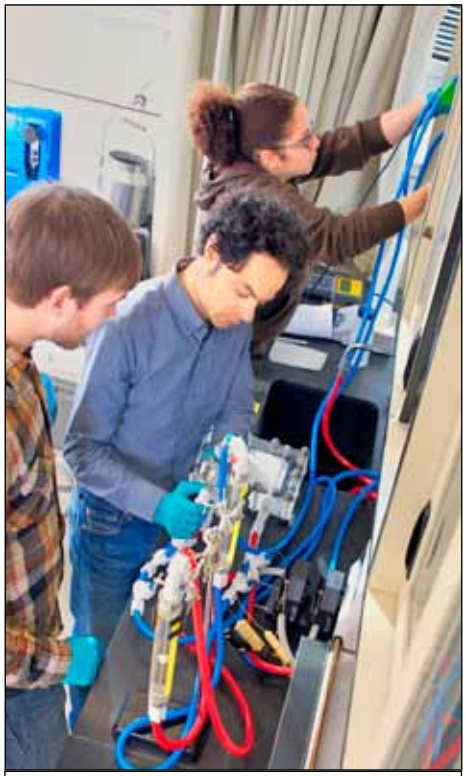
Direct Contact Membrane Distillation Research Project

by Ryan Gustafson, ERE Senior

In the summer of 2012, I participated in an exciting Research Experience for Undergraduates (REU) program that left me looking for more research experience. When I heard that Dr. Andrea Achilli was looking for assistants for his research on membrane technologies, I jumped at the opportunity. I immediately began reading his published articles on membrane technologies, and I went to his office to introduce myself and inquire about the opportunity. He offered me a position on his research team, and I eagerly accepted.

The research is focused on direct contact membrane distillation (DCMD) and its use with an osmotic membrane bioreactor (OMBR). The OMBR system uses the osmotically-driven forward osmosis (FO) and the thermally-driven membrane distillation (MD) processes to treat wastewater from military forward operating bases. In an OMBR system, wastewater is pumped into a bioreactor containing a submerged FO membrane, through which relatively clean water passes to a concentrated draw solution. The draw solution is circulated to the DCMD membrane, through which water passes to produce a high quality effluent.

I have worked with fellow ERE student Joanna Murphy to help establish the membrane research lab, perform experiments, and model the DCMD process. After visiting the University of Nevada, Reno for training at their membrane research lab, we began designing the DCMD system under Andrea's guidance. We were in charge of purchasing parts, constructing and troubleshooting the bench scale system, and running experiments. After the system was constructed, I focused my efforts on modeling mass and heat transfer in the DCMD process, utilizing many of the concepts and skills from the transport phenomena and computational methods classes. The model will be used to inform design decisions regarding DCMD operating conditions and configurations for the OMBR system.



Constructing a bench-scale direct contact membrane distillation system. From left to right: Ryan Gustafson, Dr. Achilli, and Joanna Murphy.

Joanna and I presented our research at the North American Membrane Society conference last summer. We participated in the poster session, where we discussed our research with industry professionals and other researchers. The conference provided us with a great opportunity to learn more about other membrane technologies and to see how other researchers were approaching the topic of MD. We also had a great opportunity for networking within the membrane technology community, which will be of great benefit to me in the future, as I plan to focus my graduate studies in this area.

Fouling Reversibility and Prevention in a Forward Osmosis Pilot-Scale System

by Matthew Jackson, ERE Graduate Student

Dr. Andrea Achilli is my graduate advisor in the ERE program, and under his guidance I am evaluating the effects of biolgical, chemical and physical contaminants on the performance of a pilot-scale forward osmosis (FO) system. In addition, I

am investigating the reversibility and prevention of these effects. Before we could begin research, another ERE graduate student, Heidi Halverson, and I designed and constructed the FO system as part of an independent-study class taught by Dr. Achilli. ERE technicians Marty Reed and Colin Wingfield also provided significant support during the design and construction phase.

Forward osmosis is the movement of water across a selectively permeable membrane from a solution of lower concentration to a solution of higher concentration. This results in the concentration of one solution and the dilution of another. Many applications of FO technology are currently being investigated, including seawater desalination, wastewater treatment, energy generation, and controlled drug release in internal medical devices. While the amount of research is growing related to the applications of FO technology, the performance of the currently available membranes is still not completely understood. For many FO applications, one or both of the streams is from a source with an uncertain makeup, and some constituents may negatively impact the performance of the membrane. Fouling is the physical blocking of the membrane surface by contaminants. It results in a reduced flux through the membrane, which increases the energy demand of the system and reduces its output of product water. Developing technologies for preventing and reversing membrane fouling is important for further integrating the technology, and is the goal of our research.

The Society of Women Engineers' PRO Project

by Leabeth Peterson, ERE Junior and President, SWE, HSU Section

In the fall of 2012, Professor Andrea Achilli approached the Society of Women Engineers (SWE) Humboldt State Section with a project to develop and build a device that would educate the community about Pressure Retarded Osmosis (PRO), a potential source of renewable energy that may help reduce dependence on fossil fuel combustion. Power is generated in PRO by the interaction between saltwater and freshwater through membrane permeation.

With help from Andrea, SWE designed and constructed a small-scale model PRO device to perform the initial experiments. Andrea also encouraged SWE to submit an abstract to present the project at the Association of Environmental Engineering and Science Professors (AEESP) Conference in Golden, Colorado, scheduled for July of 2013. Our abstract was accepted, and we were invited to present at the poster session of the conference. SWE members spent time developing the project and fundraising for the trip to Colorado. The group developed a larger-scale device using AutoCAD and SolidWorks, a solid modeling CAD program. The plans were sent to the Biology Core on campus to utilize the 3D printer. Experimentation and a good deal of troubleshooting followed. As the conference approached, we made a poster that displayed information about PRO, the project and the experiments we had performed.

Poster presentation at the 2013 AEESP conference in Golden, Colorado. From left to right: Leabeth Peterson, Lianna Winkler-Prins, Chandler Ichikawa, and Brian Wallace.

Four members of SWE went to the conference in Colorado. Our trip was one week long, with lots of time spent driving in our rental van. During the drive we camped in the Ruby Mountains, traveled through four states, and stayed in an amazing house in Estes Park, Colorado, overlooking the Rocky Mountains. Finally, we arrived in Golden and spent the following three days at the conference. We attended interesting environmental engineering workshops, presented our poster and project, and met many engineers, professionals, and students from all across the country. Professors Andrea Achilli and Margaret Lang also set up a tour for us at the Bureau of Reclamation in Denver. It was an educational and beneficial trip for everyone involved.

SWE is very thankful to Professor Achilli, the ERE department, and the College of Natural Resources and Sciences for making the trip to the AEESP Conference possible. Professor Achilli is now SWE's club advisor, and he is working with us to improve the device design and expand our outreach to the community. SWE is excited about the future of the PRO project and continuing to work with Andrea.

EWB-NCP in Camoapa, Nicaragua

by Gabe Salazar, ERE Senior

"Sopa de Huevo de Toro." Bull Testicle Soup. Tyler Duncan and I looked at each other over our menus, and we both smiled and chuckled aloud. "Let's do it," we said to each other. "You know what they say," he exclaimed: "When in Rome!" But, of course, we were not in Rome. We were having dinner with fellow ERE students and Humboldt-area practicing engineers under a palapa, smack in the middle of Nicaragua in a little town called Camoapa. Later, we danced to cumbias and salsa music. And, this would not be our last encounter with Bull Testicles.

In August 2011, representatives of the North Coast Professional Chapter of Engineers Without Borders (EWB-NCP) traveled to Camoapa, Nicaragua, to assess the challenges Camoapa faces regarding its water distribution system. The visiting EWB "brigade" was comprised of three engineering professionals: Antonio Llanos (Michael Love & Associates), Carlos Diaz (Philip Williams & Associates ESA), and Tyler Duncan (GHD); and four ERE students: Sterling Wallstrum, Emily Wortman, Shira Wedemeyer, and me.

Carlos and Antonio had previously visited Camoapa and had established a great rapport with members of the Hermanamiento (the Camoapan side of the Arcata-Camoapa Sister City Commission). We were treated like celebrities during our trip and were humbled by the generosity of the Nicaraguan families who took us in and gave us beds to sleep in and home-cooked meals, for some of the families were not so well off.

A short, dark, stocky, and jovial fellow named Ramon was our liaison, tour guide, concierge, rental car agent, bodyguard, and purveyor of fine straw hats and ice-cold beverages. He treated us like family. Ramon connected each of us with our host family, escorted us everywhere, introduced us to countless Camoapan "VIPs," and arranged for our transportation. We all considered Ramon a close friend by the time of our departure.

Camoapa's water distribution system is fed by one of two sources, depending on the season. Nicaragua, like other tropical regions, has two seasons: wet and dry. During the wet or rainy season, water is diverted from Mombachito, a healthy stream about 15 miles northwest of Camoapa. A manually controlled headgate diverts a portion of water from the wooded stream into a pipeline and through a sedimentation basin before it is gravity-fed to the storage tank. During the dry season, water is supplied by a reservoir fed by three point sources and contained by a 30 foot tall dam. Our visit occurred during the wet season, so we were able to witness Mombachito in action.

EWB-NCP "brigade" in Camoapa.
Top left to right: Shira Wedemeyer, Sterling Wallstrum, Tony Llanos, Tyler Duncan. Bottom left to right: Gabe Salazar, Carlos Diaz, Emily Wortman.

The Hospital de Camoapa was our main challenge, because water from the distribution system did not reach the hospital's booster pumps, which pump water from the gravity-fed system to three water tanks located on a 30-foot tower. We surveyed the transmission line route from the well to the hospital and determined that our main project would be the construction of a well and pump house for the hospital. We are currently focused on completing the first phase of this hospital well project.

Tony and Carlos gave an interview on the local Camoapa television station. We all attended a going-away lunch provided by Tyler's host parents' family that featured Sopa de Huevo de Toro as the main entrée. And, after many hugs and thank yous were exchanged, we headed west toward the Pacific Ocean. We had a short debriefing session on the north central Pacific coast in a sleepy fishing village, Jiquilillo near Chinandega. Upon arrival in Jiquilillo we witnessed the most incredible electrical storm any of us had ever seen.

We worked hard to make this trip a reality, and the effort really paid off. It was an unforgettable experience from both an engineer's and a traveler's perspective. We acquired some hands-on engineering experience and met incredibly kind and generous people. A few of us were also able to explore other parts of Nicaragua on the way home. We hope to head back in 2014 for Phase 1. To learn more, please visit: www.northcoastewb.org. Cheers!

ERE Clubs Information Board

Compiled by Lianna Winkler-Prins, ERE Senior

Organization	Fall 2013 Activities	Spring 2014 Planned Activities
Environmental Resources Engineering Student Assn (ERESA) **Email:** *eresa@humboldt.edu* **Webpage:** *http://www.facebook.com/hsu.eresa*	• Monthly Meetings: Announcements Networking Snacks • Coffee Table • Pizza with Professionals • Fall Follies • All Clubs Meeting	• Monthly Meetings: Announcements Networking Snacks • Coffee Table • T-Shirt Design Contest • Mock Interviews • ERE Rafting Trip • Graduation Reception
Engineers Without Borders (EWB) **Email:** *humboldtewb@gmail.com* **Webpage:** *http://www.humboldt.edu/ewb/*	• Sister City Project's I-Block Party • Continue projects in Camoapa, Nicaragua (with North Coast Professional EWB) • New Ram Pump Design Party • Re-design and re-build the demonstration Rope/Ram pump • Wiyot Tribe Project	• Continue projects in Camoapa, Nicaragua (with North Coast Professional EWB) • Re-design and build demonstration Rope/Ram Pump • Wiyot Tribe Project • Poker Party Fundraiser • Volunteer at Humboldt Homebrew Festival (with North Coast Professional EWB)
Renewable Energy Student Union (RESU) **Email:** *resu@humboldt.edu* **Webpage:** *http://www.humboldt.edu/resu/* **Mailing List:** *renewable_energy_student_union@google.com*	• SORMS data collection • Bike-powered blender project • Cummings Landfill project • Manila anemometer project • RESU Professional Lectures • Write HEIF proposal • Solar thermal cell testing • ElectricSun Frost tour • Ruth Lake tour	• SORMS data collection • Anemometer repair • Solar thermal system design for Jefferson Project site • RESU Alumni Outreach event • RESU Professional Lectures • Pyranometer calibration for Blue Lake Rancheria • Yurok PV array study
Society of Women Engineers (SWE) **Email:** *swe@humboldt.edu* **Webpage:** *http://humboldt.edu/clubs/club_sites/society_of_women_engineers1/*	• PRO project • Brown Bag Lunches • Annual SWEshi • STEM (Science Technology Engineering and Math) advocacy in local elementary school	• Attend 2014 Region A SWE Conference in Sacramento • PRO project • Brown Bag Lunches • Girl Scout Day • 4th annual SWE Social • ERE end-of-year BBQ

Get Involved: Learn, Lead, Help, Enjoy

Scholarships

On The Search for More Money

by Karen Stufkosky, ERE Senior

Money, money, money. As the pop group ABBA sings, it's a rich man's world. And, college seems to have become more and more of a rich man's world, with increasing tuition and book costs, and hardly any student going through school without having to take out student loans, borrow money from their parents, work several jobs, and/or live the life of a starving college student.

But, don't despair. Look into scholarships for some extra financial help for getting through college. Even though you may feel like you have applied for scholarships a million times, don't stop now. While many scholarships are based on academic performance, some have different criteria including your heritage, your financial need, the county you were raised in or graduated high school from, or your or your parents' membership in an organization (i.e. Rotary or Soroptimist Clubs).

First, fill out the Free Application for Federal Student Aid (FAFSA) at this website: *http://www.fafsa.ed.gov/*. Once you have submitted your FAFSA, HSU can offer a financial award package in the form of grants (another form of free money that you don't have to pay back) or loans. The FAFSA opens for students to begin filing on January 1st of each year. To get grants, students should generally submit the FAFSA before March 2nd. Grants, such as Pell Grant and Work-Study, are sometimes pulled from a limited fund, so it is important for students to submit the FAFSA early in order to get grants.

For Humboldt State students, there is now a scholarship database called Scholarship Tracking and Review System (STARS) that can be accessed at *https://scholarships.humboldt.edu/stars/default.aspx*, or through every student's 'myHumboldt' account. The STARS database is a collection of more than 200 scholarship applications that vary by several criteria including major and year in school. In addition to traditional scholarship applications on the STARS database, there are also some easy scholarship applications that are as simple as checking three boxes: yes, I filed a FAFSA; yes, I am of a certain class standing or have a certain GPA; yes, I am a this-or-that major. So, go there and fill them out!

Many opportunities for scholarships exist outside of HSU. Many engineering societies such as American Society of Civil Engineers (ASCE), Society of Women Engineers (SWE), and Engineers Without Borders (EWB) offer scholarships to engineering students. PAY ATTENTION to application deadlines! They are usually in early January or February. The following are links to the aforementioned societies' scholarship lists (check on them later if they are not up-to-date):

-SWE application process: *https://scholarships.swe.org/applications/login.asp*

-SWE scholarship list: *http://societyofwomenengineers.swe.org/index.php/scholarships#activePanels_0*

-EWB scholarship through CH2M Hill: *http://www.careers.ch2m.com/worldwide/en/why-ch2m-hill/community-service/engineers-without-borders-ewb/ewb-ch2m-hill-scholarship.asp*

-ASCE scholarship list: *http://www.asce.org/scholarships-fellowships/*.

Like anything worthwhile (and FREE money is definitely worthwhile!), scholarship applications require patience and persistence. Most require a personal statement/essay, a resume, current and past transcripts, financial need statement, and two or three letters of recommendation. It is helpful to have one basic personal statement that you can adjust for each application. Remember to check that all the names on the applications match precisely on your forms and your personal statement. Similar to job interviews, you have to show the scholarship acceptance committees that you are the best and most worthy candidate for the scholarship. Your application needs to reflect your motivation and reason for being in school, so make your application interesting for people to read while conveying the essence of who you are as a student and person. With respect to your letters of recommendation, get to know your professors and instructors! Do not be afraid to ask them for letters of recommendation. More often than not, they will be glad to help.

So, with all these tips, good luck with your search for more money! Ω