



# BIOLOGY

## DEPARTMENT NEWSLETTER



Greetings, and welcome to another edition of the annual PUC Biology Department Newsletter. We continue to bring you updates from our students who are involved in high-impact learning practices. Many of our students enjoy “getting their hands dirty” as they engage in internship and research projects. I think you will enjoy reading about their experiences.

We are pleased to welcome a new, full-time faculty member to our department with the arrival of Dr. Backil Sung, Ph.D., M.D. We are confident that Dr. Sung will enhance PUC’s already-strong reputation for preparing students for pre-professional programs and biomedical research.

We also welcome back Dr. Floyd Hayes to campus. Dr. Hayes won a prestigious Fulbright teaching scholarship to Paraguay, in fall 2012.

Recently we put out a fundraising request for a new autoclave. We requested \$10,000 and within just a few months you, our loyal alumni, contributed \$20,215 in restricted and unrestricted funds to this project. We are so grateful that you have answered this call so quickly and generously. Thank you!

God continues to bless us. We think of you, our former students, often and we are always happy to hear from you. Please drop us a note if you have time or visit Clark Hall and relive some of your glory days.

“Now faith is being sure of what we hope for and certain of what we do not see. This is what the ancients were commended for. By faith we understand that the universe was formed at God’s command, so that what is seen was not made out of what was visible.” Hebrews 11:1-3, NIV

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Visit [www.puc.edu/biology](http://www.puc.edu/biology) to view this newsletter in color and to see more pictures of current biology students and faculty.

## DEPARTMENT HIGHLIGHTS



*Dr. Backil Sung is our newest biology faculty member and is pictured here with his family. Standing from left to right: son Hyukje, daughter Youngjae, daughter Kyungje, and wife Hyunsuk Yang. Dr. Sung's mother is sitting in the front.*

### **Biology Department Adds Seventh Faculty Member**

The Biology Department is pleased to welcome our newest faculty member. Backil Sung, Ph.D., M.D., comes to us from the Boston area, where he taught at the former Atlantic Union College. Dr. Sung has a Ph.D. in biotechnology and a Doctor of Medicine degree from Korean University. After teaching at Sahmyook University in Korea for several years, he came to the United States in 1999 as a research fellow at the University of Minnesota. In 2000, he became a research fellow (and eventually an instructor) at the Harvard Medical School Department of Anesthesia and Critical Care, a position he held until moving to Atlantic Union College in 2010. Dr. Sung and his wife Hyunsuk Yang have three children: their eldest daughter Kyungje is a sophomore biology major at Andrews University, his second daughter Youngjae is a freshman biology major at NYU, and his youngest son Hyukje is a high school junior at PUC Prep.

Dr. Sung has published numerous scientific articles primarily in the area of neural and molecular mechanisms of neuropathic pain and opioid tolerance. Dr. Sung is currently teaching our courses in neurobiology, general microbiology, medical microbiology, biotechnology laboratory and biological foundations. He plans to continue his research at PUC beginning this coming summer. Our students will have the opportunity to conduct research and gain experience with a very fine and experienced research

mentor. Dr. Sung also hopes to enhance our current biotechnology program with the goal of helping interested students prepare for a career in the biotechnology field. In addition to his strong academic and research abilities, Dr. Sung has a strong commitment to help our students grow spiritually. Students from his classes have expressed appreciation for his daily incorporation of a Bible verse that relates to the day's topic. We know our alumni will join with us in welcoming Backil, his wife, and children to our PUC biology family.

### **Floyd Hayes a Fulbright Scholar to Paraguay**

In early 2012 I was honored to be selected as a Fulbright Scholar for the 2012-2013 academic year. The Fulbright Program is the flagship international educational exchange program sponsored by the U. S. government and is designed to increase mutual understanding between the people of the United States and the people of other countries. Approximately 1,100 American professors and professionals traveled abroad as Fulbright Scholars during 2012-2013. I became the third professor from PUC to be selected as a Fulbright Scholar.

From September to December 2012, I spent four months as a Fulbright Scholar in Paraguay, where I taught a short three-day undergraduate course in ornithology at the National University of Asunción in San Lorenzo and also co-taught a longer 10-week undergraduate course in environmental management at the San Carlos University in Asunción. I had previously spent three years in Paraguay as a Peace Corps Volunteer (1987-1989), married a Paraguayan, conducted my doctoral research on the birds of Paraguay, and returned to Paraguay on several occasions in the 1990s, so it was fun to return again to Paraguay. My previous experiences in the country undoubtedly gave me a competitive edge over other applicants.

In addition to my teaching duties, I also accompanied colleagues from Guyra Paraguay, a non-government conservation organization in Paraguay, on several field trips and presented the results of my research at two scientific meetings organized by Guyra Paraguay. One of the field trips in which I was asked to be a bird guide, a diplomatic birding trip sponsored by the American Embassy, turned out to be my most auspicious day of birding ever. A police escort with flashing



*Floyd Hayes with the US Ambassador to Paraguay on a diplomatic birding trip during Dr. Hayes' time in Paraguay as a Fulbright Scholar.*



Ecology students planted blue oak and live oak acorns at several shoreline sites at Lake Berryessa. This work is part of ongoing restoration directed by the local U.S. Bureau of Reclamation.



Ecology students went tide-pooling along the Sonoma Coast at Salt Point. The -1.4 foot tide provided ideal conditions for uncovering some amazing organisms.



Flowering plants students conducted a vegetation survey within Linda Falls Preserve and prepared a report submitted to the Land Trust of Napa County. This data will help the Land Trust identify management priorities..

lights led a five-vehicle caravan including the Mexican, French, and American ambassadors, plus armed body guards and news reporters. What fun!

As much as I enjoyed my professional duties, I especially enjoyed traveling to various parts of Paraguay, Argentina, and Brazil, usually with my wife Marta, observing and photographing a diversity of wildlife, including caimans, whales, sea lions, elephant seals, guanacos, penguins, rheas, and toucans. In Paraguay we were often accompanied by my wife's nephews and nieces, who especially enjoyed camping and rock climbing with us. We also enjoyed fellowshipping with members of a local church that we often attended

and we assisted them financially with a few infrastructure projects.

Becoming a Fulbright Scholar was the most satisfying professional experience of my life. I am eternally grateful for the support of PUC's administration and my colleagues in the Biology Department, and especially Professor Aimee Wyrick who taught one of my courses during my absence. And, of course, I am especially grateful to God for the opportunities of traveling and living in South America and providing for our safety and well-being.

#### **PUC Offers Summer Biology**

For the first time in many years, the Biology

Department will offer the full sequence of Biological Foundations (BIOL 111-112-113) during the 2013 summer months. The full sequence will be taught in nine weeks with each individual class taking three weeks to cover. We encourage students to take the entire sequence but this is not required. If you know someone who is not already at PUC that needs these classes, please pass on the information. Classes start in mid-June.

#### **High-Impact Learning**

As any PUC graduate already knows, the college is situated in one of the most beautiful areas of the world. Our unique location in Northern California affords us the oppor-

# DEPARTMENT HIGHLIGHTS

tunity to bring biology and environmental studies students out of the classroom to do actual field work. In the past year students from many classes have participated in a variety of projects and fieldtrips, typically no more than a few minutes of walking or driving from campus.

The department also now offers an annual Field Biology course (BIOL 338). Last year, Dr. Floyd Hayes led a group of students to Trinidad where they studied the plants and animals of the area. A number of lectures were given in advance of the tour so students were knowledgeable about Trinidad biology. This year the Biology Department has teamed up with the Office of Service, Justice, and Missions to lead a trip to the Brazilian Amazon during spring break. This trip will be a mission trip that also focuses on tropical biology.

## Biology Club

A continuing focus of the Biology Club is to inspire others to love biology! We do this by providing fun opportunities for students that are related to the biological process that surround us. This year, the Biology Club has attempted to reach out to even more of the PUC student body by offering more options for students to get involved.

This past October, the Biology Club sponsored a trip up to Albion, which more than 20 students attended. Initially, we were a bit skeptical about participation because of wet weather forecasts but the weekend turned out to be clear and provided us a wonderful experience. We took advantage of this to connect with the beautiful nature that surrounds the field station. During their stay most students opted for a canoe ride up the Albion River, a



Biology club members visited the Glass Beach tidepools.

five-mile hike through the Pygmy Forest and Fern Canyon, and tide-pooling at the famous Glass Beach.

We have also been involved with other campus clubs to further our goal of reaching out to an even more diverse group. We recently participated in the Science Club Reunion in which three other science clubs joined with us to host a New Year's party!

Although we are still finalizing plans for the activities in 2013 we definitely plan to revisit Sky High, a local trampoline arena. Based on the huge turnout for this event last year we felt we could not miss out on the chance to provide this opportunity once again to our club members and the greater PUC student body.

## Albion Field Station



Students enjoyed a great weekend at Albion in late October. This trip was sponsored by the Biology Club.

A number of upgrades to Albion have occurred and are currently in the works. We are excited about the progress. In quick succession I will enumerate the key changes:

1. Our new manager, Tim Dexter, came on board July 1 and has been running "flat out" since arriving. Taking over the manager's position carries with it a steep learning curve. Tim Dexter and Wil Cook make a good team.
2. The emergency generator that will carry us through power outages is functional.
3. A state-of-the-art water purification system will be installed by the time you read this newsletter. Although the water has been safe to drink, it will now be crystal clear year-round.
4. During the summer a 25-foot Cobalt boat with a brand-new engine was donated to the station. We outfitted it for the ocean with radar, GPS, sonar, etc.
5. About November a nearly new 25-foot Bay-

liner was also donated to the station. It also is currently being outfitted for the ocean and will be ocean-ready by mid-January.

With the two donated boats, our boat fleet is complete, with the two ocean boats and the pontoon boat (patio boat) that we have had for several years. The patio boat gives us great river viewing and the Cobalt and Bayliner are great for the ocean. In addition, we still have all the canoes and kayaks for the personal use of our guests.

In other related good news, the follow-up eelgrass study that was completed in June 2012 concluded no negative impacts of the new dock on eelgrass abundance and density. In fact, according to the data, there is actually more eelgrass growing now than before the dock was built! This report was filed with the Coastal Commission and should be the last hurdle relating to the permitting process. A big thank you to biology majors Brandon Noyes and Marcus Carty who completed the fieldwork and report the week after their college graduation!

## Recent Graduates

In 2012 we graduated 15 biology majors and five environmental studies majors. Graduates of this class have gone on to graduate school (Loma Linda University, University of Miami), veterinary school (UC Davis), medical school (Loma Linda, Rocky Vista University, and Western University of Health Science), and dental school (Loma Linda University). Others have successfully transitioned into the workforce securing good jobs that, in our current economy, are hard to come by. One of our graduates even joined the Peace Corps (see more about this below). We are proud of each of our graduates no matter the path that he or she pursues.

## A letter home: Brian Lee joins the Peace Corps

Four months ago, I left the USA to serve as a Peace Corps Volunteer in Sub-Saharan Africa, Rwanda to be exact. As a biology/pre-medicine major at Pacific Union College, I realized quite late that perhaps medicine wasn't for



*Pictured from L to R: John Duncan, Bryan Ness, Jon Eilers, Mindy Nelson, Brandon Noyes, Brian Lee, Marcus Carty, Dustin Baumbach, Jordan Higa, Stephanie Lao, Kevin Deoso, Alba Hernandez, Tim Welser, Henry Garci, Rob Frey, Robin Vance, and Floyd Hayes. Graduates not pictured: Michael Chang, Steven Chung, Peter Han, Elizabeth Roe and Doug Weidemann.*

me. I found myself drawn more to botany, ecosystems, and conservation than bone structure, epidermal layers, and cancerous cells. Instead of applying to graduate schools like most of my colleagues, I decided hold off on the inevitable future and to apply for the Peace Corps, which has been a life-long dream of mine.

We were recently sworn in as Volunteers, but prior to that, we had to endure three months of grueling training. This involved intensive language, cultural, and technical training. During this time period, I lived with a great host family. My family was adamant about me learning Kinyarwanda (the local language), and even insisted that I learn Kiswahili (the local language of my site). They also taught me the absurdly difficult skills of bathing with a single cup of water

(during the dry season, water is a serious issue), living without electricity, and cooking on an Imbaburo, which is the local charcoal stove they use to cook. Thanks to them, I can do all of the above, and I was able to pass the Language Proficiency Exam as an Intermediate-Mid speaker.

Having a background in biology, I was originally intended to serve in Senegal as an Environmental Volunteer, but at the last minute, I was switched to Education Volunteer in Rwanda. My primary job here will be to teach sciences, math, and English at the secondary level. My secondary job will be to work in community development. I already have some promising projects that I am looking forward to. These projects include assisting a co-op that manufactures menstrual pads for schoolgirls by producing them from banana

leaves (students missing school due to their menstrual cycles is a major issue in my area, and the third world in general). Another project includes working with my counterpart at the Sector headquarters to advocate for and assist in creating more efficient terra-forming practices (mudslides during the rainy season have destroyed scores of houses).

Although I just recently started my service, I am very excited for the potential that it holds. Although it has been tough at times, I've already made life-long friends and learned many valuable life lessons. My hardships here are also alleviated by the fact that I have the support of family and friends back at home. Please keep me in your thoughts and prayers and wish me luck!

## STUDENT RESEARCH & INTERNSHIP REPORTS

### Amanda Schaff



*Amanda Schaff spent the 2012 summer in South Africa with the African Conservation Experience.*

**Who are you?** I'm Amanda Schaff, a junior biology/pre-veterinary science major. I plan to go to veterinary school and work with wildlife as a wildlife veterinarian.

**What did you do?** I went to South Africa with a conservation organization called the African Conservation Experience for the summer. I applied to be placed on two projects in South Africa, a wildlife rehabilitation center, Care For Wild Africa, and the

Nsikazi Wildlife Vets. At the rehab center I hand-reared lion cubs and caracal cats, and did daily husbandry tasks for the rehab's occupants which included white rhinos, lions, zebras, bushbabies, a baby baboon, owls, and other wild animals. During my second placement I worked alongside two wildlife vets darting wildlife, giving injections, taking blood samples, relocating, capturing and treating injured wildlife.

# STUDENT RESEARCH & INTERNSHIP REPORTS

## When and where did you work this summer?

I volunteered for two months in the summer 2012 in northern South Africa, in the province of Mpumalanga.

**What did you learn:** The rehab center taught me the general care for wild animals, hand-rearing techniques, nutritional care, and how to reduce the amount of stress on the center's occupants. Working with the wildlife vets I learned how to chemically immobilize African animals, which sedatives to use for each species and how to shoot a variety of dart guns. I learned to properly give intravenous, subcutaneous, and muscular injections, and how to draw blood and analyze the samples microscopically for diseases. I was taught how to perform post-mortems and find the cause of the animal's death.

## How did your experience at PUC help prepare you for this experience?

While there are not many classes at PUC related to non-human animals, Animal Behavior, Vertebrate Biology, and the basic background in biology contributed to my preparation for this experience. Animal Behavior helped prepare me for working with wildlife and having a basic understanding of their behavior. Vertebrate Biology and Biological Foundations also contributed with understanding the biological functions of an animal while I was treating an animal or helping with a surgical procedure.



Jose Chavez interned with the U.S. Forest Service and spent time working in the Tahoe National Forest.

## Jose Chavez

**Who are you?** I am Jose Chavez and I am a senior environmental studies major. I plan to go on to graduate school and enter into a career with a land management agency.

**What did you do?** This summer I performed a student internship with the U.S. Forest Service. As a Forestry Technician working for the Recreation Department, I was responsible for aiding in the operation and management of various recreation areas and trails around the Tahoe National Forest. Some of my tasks included maintaining trails and campgrounds, educating and informing the public, protecting sensitive areas, and aiding in law enforcement in the forest.

**When and where did you work this summer?** My internship was for three months in summer 2012 for the U.S. Forest Service on the Tahoe National Forest.

**What did you learn?** There are many aspects of public service that working for a federal entity has taught me. First, I learned that working for the public can be a very rewarding task. In addition to this, public service requires lots of accountability and record keeping. I appreciated working with a staff of employees who were dedicated to protecting the land and serving the public. Among the things that I learned while performing the internship were techniques for balancing land protection with public use. This balance is difficult to achieve, because factors on both sides of the issue are pressing for resources and attention.

## How did your experience at PUC help prepare you for this experience?

Taking Pollution and Environmental Quality helped me understand some of the rules that go along with federal management of land. Also, taking Natural History of California helped me know the landscape and natural environment of the area I was working in within California.



Chloe Dillion, shown here with finches, interned with the Sierra Wildlife Rescue organization.

## Chloe Dillion

**Who are you?** I am Chloe Dillion and currently a senior going for my biology degree, which focuses on pre-veterinary medicine. I plan to go on to veterinary school and become an exotic wildlife veterinarian.

**What did you do?** During this past summer, I had the pleasure of working with an organization called Sierra Wildlife Rescue. Their goal is to rehabilitate wounded and or orphaned songbirds in El Dorado County. I was able to feed, hydrate and clean almost a hundred songbirds ranging from hour-old infants to mature adults. Along with basic care/rehabilitation, I was able to participate and learn about medicinal care for infections, pain and parasites. I watched as the director, Mike Mattox, explained the process of creating a splint for a broken leg or wing, and held many beautiful birds, along with the occasional hawk.

**When and where did you do this work?** My internship was for two months during this past 2012 summer in Placerville, CA.

**What did you learn?** Alongside learning about medical procedures, I learned about the species of songbirds and their dietary needs. I was cultured on the importance of being vigilant for the local wildlife, and most notably the importance of keeping the animals wild. It's fantastic caring for the animals and learning all these medical procedures,

but it would be futile if the animal became accustomed to humans. Overall, Sierra Wildlife taught me that I am on the right path for my future. I am happiest when caring for wildlife, and this internship revealed a great deal to me, both educational and emotional.

**How did your experience at PUC help prepare you for this experience?** Taking classes like Animal Behavior and Ecology with professor Hayes greatly prepared me with insight on animal behavior and their environmental roles. I was able to better understand avian species thanks to his passionate love of birds which he regularly shared in class. Overall, PUC has taught me to take my scientific endeavors seriously, and the importance of securing experience in the field you wish to pursue.



Daniel Yu (pictured on the far right) conducted research at the Uimyung Research Institute of Neuroscience.

#### Daniel Yu

**Who are you?** My name is Daniel Yu and I am a junior biology major. I hope to get into an M.D./Ph.D. or Ph.D. program in the future. **What did you do?** I participated in a research study that examined the effects of psychostimulant abuse in the animal model of ADHD, the Spontaneously Hypertensive Rat. At the time, the lab was focused on the reinforcing effects of the drugs amphetamine, atomoxetine, and zolmitriptan. I conducted impulsivity tests, prepared and administered drugs to the rats, extracted brain tissue, and measured catecholamine levels using gas chromatography.

**When and where did you do this work?** My research internship was nearly two months long. I worked at the Uimyung Research Institute of Neuroscience at Sahmyook University in Korea.

**What did you learn?** Robert J. Lefkowitz, 2012 Nobel Prize Winner in Chemistry, basically summed up what I learned during my research internship: "Most of what we do in research fails...you need to be prepared for failure." Besides the humbling experience, I also learned a lot about drug discovery, pharmacokinetics, and the neurobiology of ADHD. I also studied the dangers associated with using ADHD drugs when one does not have ADHD.

**How did your experience at PUC help prepare you for this experience?** PUC did a great job of preparing me to work in the lab. The Biological Foundations sequence gave me the basic understanding of biology so that I could understand the scientific literature on ADHD. Introduction to Psychology gave me a great background in understanding how the behavioral experiments worked. General Chemistry helped me when I had to prepare drugs with specific dosages. Introduction to Statistics gave me all of necessary statistical tools to analyze the error in my data.



Daniel Stoppelmoor (shown here in the middle seat of the canoe) studied the breeding behavior of two grebe species that nest at Clear Lake.

#### Daniel Stoppelmoor

**Who are you?** My name is Daniel Stoppelmoor and am an environmental studies

major. I plan on pursuing a career in naturopathic medicine.

**What did you do?** I assisted in research to assess the status of Western and Clark's Grebes nesting colonies. I surveyed the colonies along the perimeter of Clear Lake, counting birds, nests, and eggs. I also assisted in a survey of all shore birds of Clear Lake.

**When and where did you do this work?** My research was conducted for three months in summer 2012 at Clear Lake in Northern California. Dr. Floyd Hayes is the principal investigator and the project is funded by the Redbud Audubon Society.

**What did you learn?** Throughout this internship I learned that field biology can be very time-consuming work! I spent six to nine hours each day on the lake, while canoeing from one colony to another, which took a lot of patience and endurance. Taking frequent count of grebes, nests, and eggs was also quite tedious work. The whole experience was also very rewarding because I was able to observe grebe behavior in colonies. It was gratifying to see how well the grebes are doing today when not so long ago their population numbers were much lower. Being able to observe the relationship between human impact, the environment, and the birds I also gained a deeper appreciation for wildlife.

**How did your experience at PUC help prepare you for this experience?** As an environmental studies major I took a few biology courses that helped me with conducting this research. Animal Behavior allowed me to be able to recognize and understand the observed grebe behavior. Ecology was one course that helped me to analyze the surrounding habitat to see why the grebes might be nesting in certain areas and why they might abandon colonies as well. Vertebrate Biology was another course that gave me an introduction to the grebe species found at Clear Lake.



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