

PUC BIOLOGY NEWSLETTER

ISSUE 6

WINTER 2009

Greetings from PUC!

As we compose our letter to you, several students are outside enjoying the beautiful weather down the hill from Clark Hall. Several biology faculty have office windows that face west and we can watch the sun just now setting behind the hills. What a beautiful place PUC is!

We are all settling into winter quarter. You might remember sitting in the same winter-quarter classes that these students now enjoy...Cell and Molecular Biology, Histology, Philosophy of Origins, Vertebrate Biology... Our current biology faculty continue in the tradition of those professors that came before us. You might not recognize all of our faces, but you will recognize the quality of instruction, and our love for students and for God.

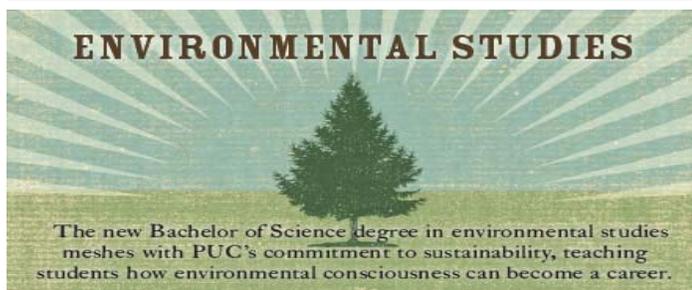
We hope that this Newsletter finds you and your family well. Our students and faculty are keeping busy! Please enjoy the updates that are included in the following pages (particularly the student research reports).

We invite you to keep in touch with us—tell us what you're up to. We'd love to inform our current students of your successes.

Kind regards,

Aimee Wyrick-Brownworth, Brian Wong, Bryan Ness, Diana Chung, Floyd Hayes, John Duncan, and Robin Vance

WHAT IS NEW IN THE BIOLOGY DEPARTMENT?



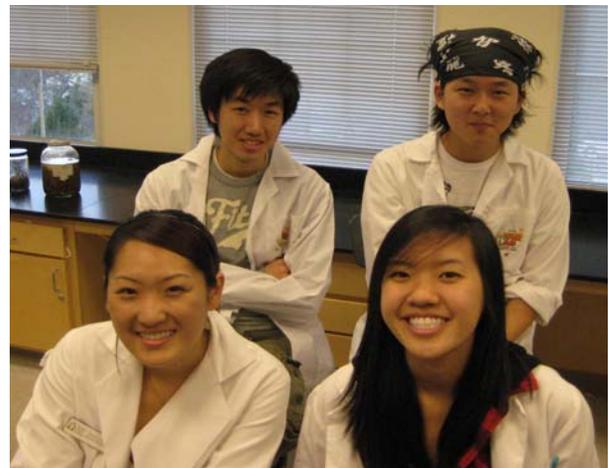
The Biology Department is pleased to announce the addition of a major in Environmental Studies, which began in the fall of 2008. Given PUC's location in a relatively rural area of environmentally conscious California and the recent trend of colleges and universities to add environmental programs to their curriculum, the Biology Department decided that the time was ripe for PUC to add an Environmental Studies major. We believe the new program is consistent with the divine mandate to be responsible stewards of God's creation. We look forward to educating students about the many threats to our environment and what steps we can take as individuals to minimize our impact on the environment.

Four new 4-credit courses were added as core classes required for the major: ENVR 360 Conservation Biology, ENVR 361 Energy and Climate Change, ENVR 362 Pollution and Environmental Quality, and ENVR 450 Internship. Other new courses include ENVR 396 Seminar (0.5 credits) and RELT 240 Ecotheology (2 credits, taught by the Religion Department). A variety of science courses already being offered by PUC comprise the remaining core and elective credits required by the degree. The new program is directed by Dr. Floyd Hayes.

Meet Diana Chung (pictured below) the new Biology Lab Coordinator. Diana joined our department in July 2008. Diana has a Spanish degree from PUC and is spending this and next year working in the biology department before continuing on to dental school.

Diana is responsible for numerous labs each quarter including; Biological Foundations, General Microbiology, Physiology, and Introduction to Biology. Diana's effort has brought a new level of professionalism and cohesiveness to our department.

The biology faculty and lab students feel blessed to have Diana as part of the biology department team.



Biology Lab Coordinator Diana Chung (bottom left) pictured with Biology TAs, Brian Kim, Kevin Jin, and Grace Jung.

HIGHLIGHTING STUDENT RESEARCH

The biology department has always encouraged students to participate in research. More recently, with the arrival of several new faculty, we have been able to offer research options not only during the summer but also during the school year too. Students have been responsive to these opportunities and many have received undergraduate research assistantships from the Biology Student Research Fund.

Throughout the school year, students receive research stipends and earn research credit. During the summer, the research assistantship also pays for academic credits, room/board, and travel expenses. In many cases, the Biology Department is also able to cover travel costs to attend research conferences.

We are thrilled to provide these scholarships, but with an increase in student participation, our research fund has dwindled. We ask your help in keeping this important program alive in the Biology Department and hope that upon reading the student reports included in this newsletter, you will decide to give to this important fund. You can make an online donation by visiting <https://www.puc.edu/alumni/give-online> and select "Other" under fund priority or make a check out to Pacific Union College and send to the PUC Advancement, One Angwin Ave, Angwin, CA 94508. Be sure to indicate that your donation is for the Biology Student Research Fund. Thank you for your support!



James Lee poses with several preserved birds on display in Clark Hall's Donald V. Hemphill Vertebrate Museum.

I first learned about student summer biology research by word of mouth and I became interested in it by discussing it further with my professors. I was going to be in Angwin that summer and I was looking to do something interesting and career building. I was surprised to find that I actually had several options of different projects with different professors. Of the three that I was presented with, the research with Dr. Hayes seemed the best fit for me because I would be spending time outdoors, and it was a project that was already well underway. My direct research mentor was Dr. Floyd Hayes of the PUC biology department. Dr. Hayes had worked with Dave Woodward, a man who had been collecting data on the project for 4 years prior to our involvement.

The research focused on the Purple Martin (*Progne subis*), a bird that is on the "species of special concern" list for California. This bird is one that also lives in Brazil and flies all the way to the States to breed and raise their young. We gathered data on their seasonality (exactly when in the summer they arrive, breed, etc), behavior

patterns, and factors associated with their breeding success. We conducted our research along the shores of Clear Lake, in Lake County, California. The research sites are within an hour drive of the PUC campus!

In October of 2008, I accompanied Dr Hayes to the Western Field Ornithologists conference in San Mateo, California where we presented some of our results to the other biologists present. This was a very interesting experience for me—to be in the same room with so many great biologists and be a part of their community. They were all very gracious to me and it seemed like everyone knew who Dr Hayes was! The conference attendees seemed interested in our research. Purple Martins are interesting to most all ornithologists because of their rare status in California. We have not yet published a paper but are working on compiling a large mass of data. We are making progress.

This research experience enriched my life because it made biology real to me. I consider myself a student of biology before I consider myself a pre-medical student, although the latter is my future career path. This research project brought to life my interest in biology by allowing me to actually take an active role in the biological community and to contribute a little to it. Working with such accomplished biologists like Dr Hayes and Dave Woodward was also a pleasure because I witnessed, firsthand, their passion and love for biology.



A Purple Martin, the bird species studied by James in the summer of 2007.

I would recommend this opportunity to anyone who has a summer to spend doing something special and has an interest in biology. This is an experience that I will value for a long time to come.

By James Lee, Senior Biology major

HIGHLIGHTING STUDENT RESEARCH

Born to an entomologist dad, I grew up chasing butterflies through the fields and looking at bees under the microscope. I was constantly surrounded by professional bug chasers and fossil diggers who were friends and colleagues of my dad and fed my interest in science. The summer between high school and college I worked for an ecologist in Flagstaff, Arizona, continuing in my bug chasing endeavors. Now I'm chasing bugs for my own research.

While talking to my boss in Arizona about research options he suggested the possible effects of allelopathy on native bee pollinators (non-honey bees). In the spring of 2008 I began to sample on Chamise (*Adenostoma*), an allelopathic plant in the Angwin area. I also set up artificial plants (silk baby's breath flowers) in clay pots with concealed Chamise leaves to see if the chemicals in the leaves would alone attract bee pollinators. Unfortunately, I found no pollinators on the artificial flowers and have since had to revise my experiment.

Apart from being allelopathic, Chamise attracts significant proportion of known specialist pollinators. However, there is indication that the number of specialist bees decreases as one moves out from the center of the flower's range. Angwin is along the fringes of the Chamise range. This next spring I will take the data I obtained from specimens I caught on real Chamise last spring, combine it with more data obtained this spring, and compare the proportion of specialists and generalists found here along the fringes of the plant range to data of specimens collected toward the center of the Chamise range. I hope to find if there is indeed a correlation between numbers of specialists and plant location within the range. I will be using data from the US Department of Agriculture Bee Biology and Systematics Lab and will be sending collected specimens to this same lab for identification.

There are several people who I have to thank for advice on this project. In choosing the project I consulted Dr. Muth who used to teach in the biology department at PUC and still lives in the area; Gretchen Lebuhn who is a professor at the University of San Francisco and has studied bees in the Napa Valley area; Larry Stevens, my former boss and current curator for the Museum of Northern Arizona as well as a private ecological consultant; our very own Aimee Wyrick; and of course my Dad, Terry Griswold, who is a researcher for the USDA and manages the USDA bee collection doing identifications for other researchers all over the world. Carolyn Cromer and the Napa Valley Land Trust have been kind enough to work with me on collection site access.

Overall I have had a wonderful research experience. I feel that being involved in research is important to students education because it gives them an appreciation of the arduous process that others went through to obtain the information they have learned all through their biology education. It also gives them a chance to experience the joy of asking questions and finding answers for themselves. Contributing to the world of science as a student makes that world a little more tangible. Students who are involved in science before they graduate will be better prepared for their careers and further education after graduation.

By Shondene Griswold, Senior Biology major



Shondene Griswold uses her net to catch insects found on and near Chamise (*Adenostoma*) plants. She is particularly interested in specialist pollinators.



Shondene studies a vial of insects collected from Chamise. Her research site is on Howell Mountain, just a few miles from the PUC campus.

HIGHLIGHTING STUDENT RESEARCH

I am Doubting Thomas incarnate. When I first heard about ongoing cancer research at PUC, I was extremely skeptical. In a setting where lab equipment and facilities were scarce, what good could come of all the work? Without state of the art technology and multimillion dollar funding what could be accomplished? My ignorance kept me from setting foot in the lab for an entire two years.

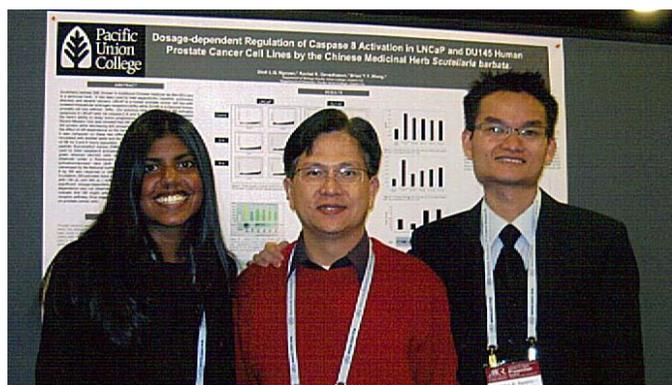
Since the early 1990s, Dr. Wong has been studying the effects of *Scutellaria barbata* and *Oldenlandia diffusa* on cancer prevention. His research has received a great deal of attention, and was recently picked up by scientists at UCSF, who are currently using an extract of SB in phase II clinical trials on breast cancer patients. Over time, my eyes too were slowly opened. I began perusing journals, articles, and papers on cancer biology and herbs with apoptotic properties. I was privileged to join Dr. Wong's team of researchers and began to work in earnest. Suddenly, Analytical Chemistry, Biochemistry, and Biology all came alive as I used techniques from each in research. I began my tutelage by learning how to perform a proper caspase assay in an *in vitro* study. The work was tedious, frustrating, and the first assay was unsuccessful, but I improved with time and eventually figured it out. Research on SB and OD has extended in many directions, from *in vivo* studies on prostate cancer in mice to *in vitro* studies on cancer cell lines to our upcoming pharmacokinetics study on proper dosage of the drugs.

Our research on SB and its signaling pathway was selected for presentation at the AACR's Frontiers on Cancer Prevention Conference this past November! With the unselfish help of Dr. Hemmerlin, who took money out of his own budget, I was on a plane bound for Washington D.C. with our poster in hand. The conference was like nothing I had ever experienced before. Passionate, brilliant scientists presented cutting edge research right before my eyes. Advances in prostate cancer, colon cancer, tumor microenvironment, genetic influences, cell signaling, and HPV vaccines were all hot topics. I could not keep up with the MDs, PhDs, or post-docs. When it came time to present our own research I was petrified. At one point I was left to fend for myself at the poster and was forced to answer the questions of an apoptosis expert all alone. I somehow managed to stumble through the explanations, but resolved that someday, with training and expertise, I would present original work and stand my ground when explaining it.

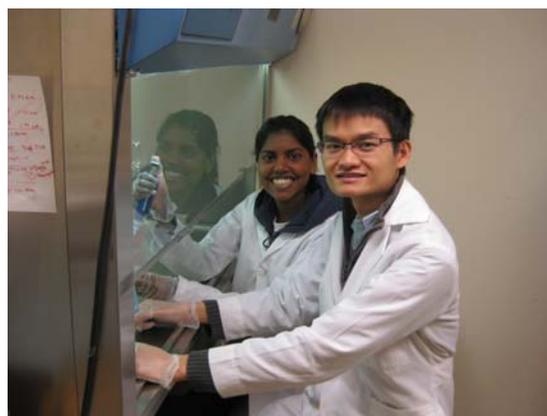
Students in pre-professional programs are often too narrow-minded in their pursuits. There is more to science than just medicine or dentistry. A degree in Chemistry or Biology is not simply a ticket into Loma Linda, nor is it a guarantee of success. Developing the analytical mind of a sharp critical thinker is of greatest importance. Science is a living, chameleon-like entity that evolves with every new experiment and discovery. The quest for knowledge will never end as long as we are willing to press onward. We must simply free our minds in order to search for questions that have not yet been asked.

Last night I walked through the research lab and experienced the quiet satisfaction of knowing that radical changes have swept through the area. A brand new \$10,000 lyophilizer is under the fume hood, and a superb cryoprotectant tank is in the corner. The fluorescent microscope will soon receive a new filter, and the tantalizing possibility of acquiring a microtome lingers in the air. That which I once deemed impossible has been accomplished with even a certain amount of style. The unwavering faith of my mentors has brought this to pass. Research will continue at PUC after I am gone, and will hone the skills of many students just like myself as they continue their never-ending intellectual journey.

By Rachel Devadhason, Senior Biochemistry major



Rachel Devadhason, Dr. Brian Wong, and Tom Nguyen in front of the poster they presented at the AACR Frontiers on Cancer Prevention Conference, November 2008.



Rachel and Tom work on their project under a fume hood in the Joseph G. Fallon Microbiology Lab in Clark Hall.

HIGHLIGHTING STUDENT RESEARCH

During my freshman year, I applied for a summer research internship at various places. My applications were turned down one by one as the summer approached. I was extremely frustrated and wished that PUC had biomedical research opportunities. I wanted to do research to learn interesting things that I typically could not find in textbooks. Moreover, after my first and second quarters of General Biology, I realized that the lab techniques that students learn as undergraduates are very important. I determined to reapply for a research internship the next summer.

During my sophomore year, I was amazed by a research project on Cancer Prevention presented in Seminar. It was unlike any other presentation because it was conducted through the PUC Biology Department. I didn't waste any time deliberating and quickly jumped at the rare opportunity to get involved with cancer research. My professor, Dr. Brian Wong, kindly spent time teaching me some basic research techniques. After learning the fundamentals of cancer biology, cell culture, and animal rearing, Dr. Wong allowed me to work on my own project. My first research abstract was on the activation of Caspases in prostate cancer cells by Chinese medicinal herbs. I was very excited about learning how to do a presentation poster for the first time and was thrilled that the poster was presented at the AACR's Cancer Conference in Pennsylvania in Dec. 2007.



Tom Nguyen and research collaborator Rachel Devadhasan.

I decided to stay at PUC during the summers of my sophomore and junior years. I did not want to apply anywhere else since I already established a firm foundation and started a project here. Despite the scarcity of funds and equipment, I wanted to stay to help the Biology Department to develop a better research program for future students. I published my second abstract and presented another poster at the AACR's Annual Meeting in April 2008. Dr. Wong was very generous and allowed me to be the first author. I was allowed to travel to San Diego to present my poster. It was exciting to meet all the prominent researchers from famous places. Most of them had PhDs, MDs, or MD-PhDs. No one knew that I was an undergraduate student until they asked. Surprisingly, instead of looking down on me, they were very amazed to know that I was involved and that I was the first author for the poster. After attending several presentations at the AACR annual meeting, I was even more interested in cancer research. I was exposed to many new ideas and data that had not even been published in journals or textbooks yet. The new knowledge later helped me to publish a third abstract in which I proposed a plausible mechanism for the work of the Chinese herbs in activating apoptosis in prostate cancer cells. I presented this poster at the AACR's Cancer Prevention Conference in November 2008.

I am currently working on expanding the mechanism of action of the Chinese herbs and revising a paper to submit for publication. I am also trying to form a student research team to continue the research when I am gone. I am very thankful to my professors and generous donors who helped to make research possible at PUC. I recommend that students should get involved in research because it is a great experience. Amateur scientists will learn how to work as a team and will have more interaction with professors. Also, developing questions and hypotheses and conducting experiments to find answers will become second nature. I hope that research thrives at PUC and that when I return as an alumnus someday, the program will be bigger than I ever could have imagined.

By Dinh "Tom" Nguyen, Senior Biology major

ALBION FIELD STATION UPDATE

Many of you already receive regular updates from Biology Professor Emeritus, Dr. Gilbert "Gibby" Muth. For those who do not, this is for you!

Over the past two years, scores of volunteers and thousands of donated dollars have been used to renovate Albion Field Station into a place with all of the modern conveniences that we enjoy. Each of the cabins now has its own indoor bathroom! More efficient space heaters and water heaters have been installed in each cabin and a wireless network is now available in camp. Currently, volunteers are remodeling the old lab building. A 15' x 60' deck is being added on the back of the lab and are completely redoing the inside. This includes double-paned windows and 12' sliding glass doors leading out to the deck.

Aimee Wyrick has developed a baseline monitoring study of Albion River eelgrass (*Zostera marina*). This project will be completed in late June 2009 as a first-step to installing the new dock at Albion Field Station. Several biology students will be involved in this project which requires a detailed underwater survey of eelgrass.

Please visit http://web2.puc.edu/Albion/Albion_2008/ to see pictures of the camp and to learn more.



The biology faculty pose with 2008 biology graduates. Not all graduates are pictured.

MARGARET R. HUSE, M.D., RESEARCH and EDUCATION FUND

In our last Biology Newsletter, we announced with sadness, the passing of Dr. Margaret Huse.

Dr. Huse first taught Human Anatomy during the summer sessions from 1986-1994, then twice each year from 1996-2000. She also taught Dissection of the Human Body on several occasions; this laboratory-only course ultimately evolved into the more complete course Advanced Human Anatomy which is now so much in demand by pre-professional students. Probably close to a thousand students will remember Dr. Huse with deep appreciation for her quality teaching in both classes and labs during her tenure with us.

The Biology Department continues to benefit from Dr. Huse's life as the recipient of a trust titled the Margaret R. Huse, M.D., Research and Education Fund. The money from this trust is designated to fund biology faculty research projects and pay for continuing education opportunities for the biology faculty. This fund has already enabled several faculty members to expand their research activity. This generous donation will continue to be a blessing to our faculty for many years.

If you would like to donate to this fund for biology faculty research and education visit <https://www.puc.edu/alumni/give-online> and select "Other" under fund priority or make a check out to Pacific Union College and send to the PUC Advancement, One Angwin Ave, Angwin, CA 94508. Be sure to indicate that your donation is for the Margaret R. Huse, M.D., Research and Education Fund. We appreciate your help with keeping our faculty active in research and current in their fields of expertise.

Please visit our website:
<http://www.puc.edu/academics/departments/biology>
 to view this newsletter in color and to see more pictures
 of current biology students and faculty.

2008 BIOLOGY GRADUATES

Jeremy Barnes	Reuben Lakshmanan
Danayshiya Brown	Ryan Meller
Cody Carter	Dwight Miller
Drew Davis	Angela (Forgey) Peoples
Segundo Gallo	Niehmer Santiago
Jeanne Gustafson	Minami Sato
Lauren Harris	Jonquile Williams
Hyojae "Chris" Jeon	David Yoon

We are very proud of all our 2008 biology graduates. With about 5000 other students nationwide, nineteen PUC seniors took the Major Field Test (MFT) in biology. Typically, our students perform very well on the this nationally-normed and comprehensive test. This last year, the PUC group averaged an impressive 92nd percentile.

In 2008 we had a first—one of our biology students . scored a perfect score (scale score of 200 – raw score of 150). The previous high score for PUC students was 198.

We can only take partial credit for our student's impressive success as we work with top-notch students to begin with. However, the biology faculty do take satisfaction in knowing that we help prepare able graduates that will be successful in whatever career they pursue.

PUC BIOLOGY CLUB

The Biology Club was revived last school year and it has been a great success.

This year, the club has already sponsored a t-shirt design contest. This year's winner, Peter Han, receives a free club membership and a cash reward. The club has had several activities including a Sabbath hike to Inspiration Point and an evening film and pizza party. The club officers are planning much more this quarter and next.

Club Officers: Lawryn Ask, Lydia Kang, Rachelle Kim, Brian Kim, and Sam Sabri Faculty Sponsor: Aimee Wyrick

DROP US A LINE, GIVE US A CALL!

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