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GREETINGS

We are happy to deliver news about our former and current students who make us proud.

Most of our alumni count their biology classmates and professors as

some of their dearest friends, with friendships lasting decades. We are pleased to report that experiences in the department continue to inspire close friendships.

As we stay connected and keep you up-to-date, we invite our alumni to

share stories of their work and service with us, as we want to celebrate you.

We hope the newsletter reminds you of your fond memories in Clark Hall, "Where Nature and Revelation Unite in Education."

PUC STUDENTS & ALUMS SERVE IN INDONESIA

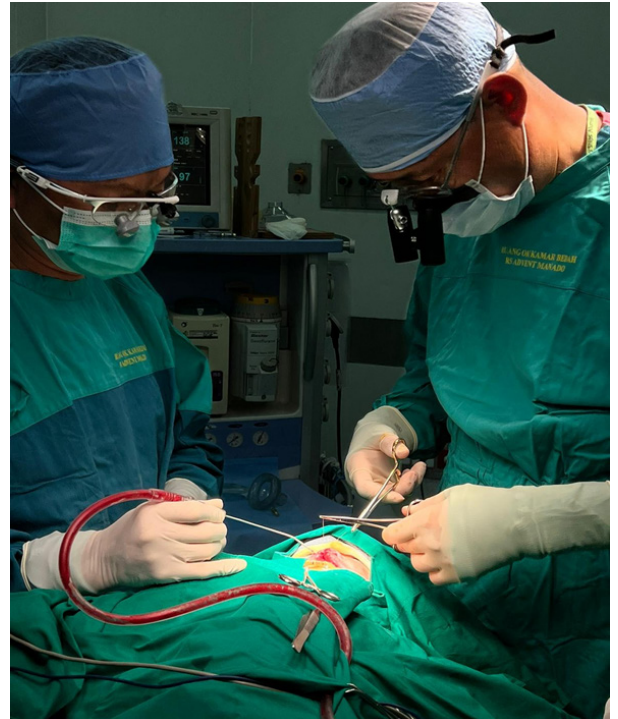
PUC biology faculty, students, graduates, and their families joined an international medical mission trip last summer.

by Backil Sung, MD, PhD

48 volunteers gathered from the USA, South Korea, Malaysia, and Australia. They served the people in Manado, Indonesia, from July 18-22, 2022.

The program was approved by PUC President Ralph Trecartin, Ph.D., and organized by the PUC biology department and a charity organization, All to Heaven (headed by Professor of Biology Backil Sung, MD, Ph.D.), with medical and dental professionals, including PUC graduates. Local SDA church conference in Manado, Indonesia, and East Indonesian 1,000 missionary training center (Director, Pastor Jang Won Cho) combined supported the medical service project. The training center provided food and rooms for all the members to stay.

Manado Adventist Hospital very warmly opened its operation room to do the surgery to repair cleft lip/palates of 15 patients by an internationally renowned



plastic surgeon, Kyung Hoon Chung ('96, MD, DDS), who volunteers cleft lip/palate surgery internationally around five times every year since having the board-certified specialty. Worldwide donors paid for all the surgery, transportation, and accommodation expenses for patients and their families. Five local churches served medical and dental services, which their church conference arranged.

Above: Cleft lip repair surgery on the Indonesian medical mission trip

Below: Patient intake at Indonesian medical mission trip

Right: Nurses at Indonesian medical mission trip



Six physicians (including two PUC graduates, Hyung Woon An ('91, MD) and Norman Pang ('91, MD), saw patients and treated them with

prescribed medicine and removal of masses in the skin. Seven dentists, including four PUC graduates, Suk Young Ahn ('95, DDS), Eddie Chang ('96, DDS), Joseph Kim ('14, DDS), and James Yoo ('94,

DDS) saw dental patients treated with tooth extraction and cleanup and basic restorative treatment. Each day, more than 200 patients were treated by medical and dental professionals.

PUC students and graduate volunteers Breanna Tran (Sophomore), Tristan Tran (Junior), Crystal Le (Sophomore), Steve Min (Senior), and Anne Jasmine Holandez ('20) assisted medical and dental professionals and observed cleft lip surgery. They helped at the pharmacy to distribute prescribed medicine to patients and measured patients' vital signs of pulse, temperature and respirations, and

blood sugar and pressure. They made the clinical services go smoothly by guiding patients to find exam tables, their doctors, the pharmacy, and the pathology lab.



Before and after photo of cleft lip repair on the Indonesian medical mission trip



"I was totally impressed by the dedication, teamwork, and faith in God portrayed by all the doctors, dentists, surgeons, and volunteer

members," said Anne Jasmine Holandez. "This trip made me realize that despite the challenges that life may throw at you, God's purpose will always prevail." Proverbs 19:21 says, "You can make many plans, but the Lord's purpose will prevail."

Volunteer members also fund-raised \$35,000 to support the training center where they stayed during the trip by purchasing a brand-new 4X4 SUV. This vehicle will continue to share the local people with God's love even after the volunteers leave the area.

Below: Overview of Indonesian medical mission trip facilities.



PUC STEM AND LLU HEALTH PROFESSIONS WORKSHOP

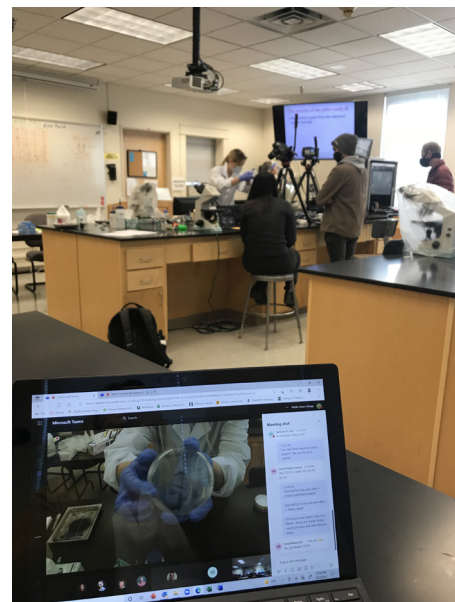
PUC's biology department has collaborated with other science departments to offer a Math and Science Workshop for over 50 years. This event occurred over several days, allowing academy and high school juniors and seniors to participate in activities that would appeal to and increase their interest in joining PUC as a STEM major.

Past activities included:

- Performing a CSI crime-solving activity complete with a lie detection test.
- A darts game with simulated alcohol warped sensory input.
- A computer science code writing.
- Using chemical tests and equipment to determine unknown chemical solutions.

The evening program included explosive chemical reactions and interaction with the creepy crawlers (tarantulas), huggers (boa constrictors), and awe factors (Guinea pigs) maintained in the Biology Department.

If you know or have high school juniors or seniors, save the dates April 10-12. Please email science@puc.edu for questions or more information.



DEPARTMENT TRAVELS TO THAILAND

PUC's biology department is known for providing great opportunities for students to participate in not only mission trips but also field biology and research trips. These experiences allow the students to take academics out of the classroom setting and participate in research, and in many cases, these trips result in a published paper. In the past, students and faculty have gone to Mexico, Fiji, Alaska, Kenya, and Roatan. This summer, it was suggested the department take an exploratory trip to Thailand to assess the country for being a favorable destination for future field research opportunities.

One of the topics that has been quite fruitful in generating published papers for our students is to examine the commensal relationship between sea urchins and fish. Commonly, there are certain juvenile and small adult fish that hang out either in the holes created by rock-boring urchins (*Echinometra lucunter*) or between the spines of long-spined urchins (*Diadema setosum*) as a mechanism for defense against being eaten by larger fish. Therefore, we wanted to explore the country to see not only how likely it would be to conduct research of this nature but also how easy it was to find national parks and other areas to hold outdoor labs for tropical biology.

It was an extraordinary trip! We started by landing in Bangkok, driving down to Krabi, and catching a ferry over to the Phi Phi islands. Dr. Floyd Hayes had researched national parks and points of interest along this route and mapped out how we would use each day to travel, visit a location, and find accommodations. We figured that this itinerary would allow us to scout a fair portion of the isthmus of the country between Burma and Malaysia, giving us an idea of how we would then be able to structure a tropical biology class having a marine research component.

Our first candidate for a class visit to experience tropical biology was the Khao Nang Phanthurat Forest Park, which was a well-maintained, somewhat small national park that was not far from Bangkok. It contained several kilometers of trails that looped within the park with a spur that branched off and climbed to the top of a hill that gave a great panoramic view, including an introduction to the famous rock formations of Thailand. Though it was relatively small, it packed many plants, trees, and tropical vegetation, providing a plethora of specimens to engage in a tropical biology class discussion during a several-hour outdoor lab. What this park lacked was animals – specifically large animals.

The animals that we were most keen on encountering were elephants. Floyd had taken a group of students to Kenya and had been able to see African elephants, but it was now our opportunity to see Indian elephants in the wild. We traveled to Kui Buri National Park in the Kaeng Krachan forest complex, where promotional materials proclaimed we had a ninety-nine percent chance of seeing elephants. We entered the park with high expectations only to realize we had won the one percent lottery. There were plentiful gaur buffalo, and they were impressive. However, they were not elephants. We saw several other animals, birds, and evidence of elephants, but we left knowing that we would have to return on our way back to the airport.

Continuing our trip, we arrived in Krabi, spent the night, and caught the ferry to Koh Phi Phi in the morning. We spent several days traveling around the Phi Phi islands while Floyd, Madeline, and I collected data on the abundant sea urchins and the fish residing in the long spines. When we planned this excursion, my impression was that we were going to explore the possibilities of doing research, not collecting enough data to write a paper. However, as we started observing the marine environment, it became clear that not



only could research be done, but we were also gathering enough data to write a paper when we returned to PUC. We have completed looking through all the photos, counting the urchins, and identifying the fish visible using the urchins for cover.

We traveled back to Bangkok, allowing enough time to return to Kui Buri National Park. Our reward was seeing elephants behind and in front of nearly every tree. The first group of elephants included a male that grew intolerant of the visitors, and the rangers had every vehicle leave with haste. The rangers themselves raced out of the area behind us on several motorcycles. We moved on to several other areas, allowing us to observe small to large groups of elephants- either from the back of the truck or getting out and walking to

look from the top of a rise. The elephants were impressive.

We left Thailand after eating some of the best street food on the planet, gathering enough data to allow Madeline, a junior biology major, to have her name on a published paper, a very negative impression of monkeys, and a strong desire to return.



Above: Kui Buri National Park sign - (99% chance of seeing an elephant in the park).

Below Left: Madeline Eastman, John Duncan, Tania Duncan, Floyd Hayes Thailand research

Below Center: Indian Elephant (Elephas Maximus)

Below Right: Trash monkey - exhibit of bad monkey behavior



THE GREBES OF CLEAR LAKE: FROM PESTICIDE POISONING TO REPRODUCTIVE RECOVERY

The first documented case of biomagnification was in Clear Lake after being sprayed by DDD to kill the Clear Lake Gnat, which became a pest, in 1949, 1954, and 1957. After hundreds of Western Grebe and Clark's Grebe carcasses were found along the shores of the lake, the breeding population of more than a thousand pairs ceased nesting for several years. Subsequent studies revealed a gradually increasing number of nests as the breeding population slowly recovered, with maximum annual counts of 165 nests in 1967, 390 during the early 1990s, and 2,675 in 2000.

From 2010 to 2019, my field assistants, including ten biology and environmental studies students, received more than \$110,000 in funding from the Redbud Audubon Society to study the breeding ecology of the grebes of Clear Lake. Each summer during the study period, we spent many days canoeing 10-15 miles while searching for grebe nests and studying the behavior of the grebes. During four summers, we set up trail cameras to document activities within the colonies

of floating nests, obtaining hundreds of thousands of photos.

The results of our research are published in five peer-reviewed articles so far, with a few more remaining to be written. Three articles focused on aspects of their reproductive behavior, including copulation behavior, nocturnal reproductive behavior, and egg destruction. A fourth article documented the use of their floating nests by 47 species of vertebrates, revealing the grebes' previously unrecognized role as ecosystem engineers.

The most recent article, published as a 36-page article in *Monographs of the Western North American Naturalist*, is titled "Historical and Recent Breeding of the Western Grebe and Clark's Grebe in a Severely Impaired Ecosystem at Clear Lake, California." It summarizes the long history of research on the grebes of Clear Lake and summarizes the data obtained during our 10-year study, when we recorded a mean of 3,123 nests per year, with up to 5,936 nests in 2014. In addition to

the number of nests tallied, we report and analyze data on the locations of nests, types of nests, clutch size, seasonality of nesting, species ratios, predation on eggs and chicks, other causes of nest failure, and reproductive success.

Despite the recovery of the grebes' breeding population, our data reveal that reproductive success is still lower than that of other lakes in western North America due to a variety of natural and anthropogenic factors. Our data provide a historical benchmark for future comparisons and reveal gaps in knowledge requiring further study. In the future, I expect to complete and publish three more manuscripts on hybridization between the two species of grebes, communal egg dumping, and nest attendance by males and females. The grebe publications may be accessed at my ResearchGate account (Google it!).

Nesting grebes on Clear Lake



BIOLOGY ALUMNI SPEAKER SERIES

We expanded our efforts to connect and stay in touch with our alumni. Our biology department community is diverse, and our current students benefit from hearing your stories – the successes and triumphs alongside the challenges and hurdles.

In spring 2021, we kicked off an alumni speaker series that allows our students a glimpse into various paths they might follow. This fall quarter is our fifth installment of this series, and we plan to continue with more presentations each quarter. Our goal is to give students a variety of perspectives from a range of professionals and to connect them with you for possible mentorship. Here's a list of alumni who have been involved so far:

Larry Bhattacharjee, '15	Jason Lohr, '97
Rebecca Chin, '18	Sabrina Mostoufi, '18
Gabriel Cenicerros, '18	Mindy Nelson, '12
Abi Daniliuc, '17	Karen Ong, '06
Duyen Doan, '16	Charles Raya, '11
Jon Eilers, '12	John Stewart, '12
Rob Frey, '18	Dylan Turner, '17
Peter Han, '12	Lacy Wagner, '15
Shannon Henry, '18	Chris Walters, '13
Cody Holthouse, '16	

If you would like to participate in the seminar series, please email biology@puc.edu or complete the Google Form at forms.gle/1S3m9VFT8kZwHrX88



Top: Shannon Henry, '18, founder of the Kaylia Group, talked with students about the interconnection between fashion and science in context of sustainability

Above: Sabrina Mostoufi, '18, with Bryan Ness, used her own academic experience to give tips and pointers about getting into and through graduate school.

DESERT BIOLOGY STUDY TOUR

Five biology students joined me and nursing professor Nicolette Piaubert on a desert biology study tour in southeastern California during January 2-6, 2023. After meeting in Riverside on Monday morning, we drove in a van to Big Morongo Canyon Preserve, where we identified a variety of plants and animals. We spent the rest of the day driving through Joshua Tree National Park, stopping occasionally for short hikes to study the plants. At dusk we drove through Box Canyon Road, where a Bobcat scampered across the road in front of us, and arrived after dark at Salton Sea State Recreation Area, where we set up tents for camping overnight.

The following morning, we identified many birds along the shores of the Salton Sea and then drove to the Cleveland Street Drain at the north end of the Salton Sea, where we identified two species of introduced fish. Afterward, we went to Dos Palmas Preserve, where we enjoyed a hike to a large series of spring-fed ponds. The highlight was seeing several endangered Desert Pupfish. In the afternoon, we visited Sonny Bono National Wildlife Refuge, observing more wildlife. After dark, we headed to Ocotillo Wells, where we set up our tents at a privately owned campground.

On Wednesday morning, we explored patches of desert scrub, including blooming Desert Agaves, while driving to Anza-Borrego Desert

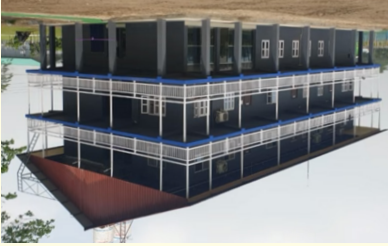
State Park. At the state park, we set up our tents in a campground and spent the rest of the day exploring the nearby ravine and hillsides, identifying many plants and animals. After dark, we spotted a Merriam's Kangaroo Rat and enjoyed watching several brilliantly fluorescing scorpions found with the aid of a fluorescent light.

The next day, we drove to Agua Caliente County Park, where we hiked up a canyon but had to turn around when it began raining. We enjoyed seeing more species of plants and animals, including a lost Tundra Swan, in a sewage pond. When we returned to our camp at Anza-Borrego, we discovered that several of our tents had blown over, so we spent a lot of time stabilizing them and then went on another hike at night to observe fluorescing scorpions.

After packing up on Friday, our last day, we were thrilled to see three Bighorn Sheep, including a magnificent ram, cross the road just 15 feet away from us as we sat in the van on the outskirts of Borrego Springs. We drove to the Salton Sea, viewing the ancient shoreline of Lake Cahuilla, and continued to Palm Springs, where a hike on the dunes produced a couple of large scorpions and a Desert Iguana brumating under a piece of debris. Despite the chilly air and a few brief periods of rain and strong wind, we all enjoyed our adventure in the desert.



Ryan Lee, Benjamin Rangel, Reno Moreno, Nicolette Piaubert, Seulgi Lee, Wai Kiu Lee



SDA missionary training center
in Falakata, India.

Looking for PUC volunteers who can help clinical professionals – pharmacists, clinical pathologists, physicians/surgeons, dentists, and the Bible and do creative work for the people in the mission field. Service location and registration fee will be determined later.

Contact: Backil Sung, MD, PhD
bsung@puc.edu (707) 965-6633

MEDICAL MISSION TRIP TO INDIA:
JULY 10-21, 2024

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Please consider giving to the department of biology to help us continue to educate the next generation of PUC students.

Donate today at PUC.EDU/GIVE



THANK YOU

We are so grateful to receive support from our alumni and contributors. Your contributions keep our program strong and allow us to provide opportunities otherwise unaffordable. Recently, we were gifted \$10K, and the donor

requested the money go to a major course that would immediately benefit current students. After discussion, we decided to purchase a DNA sequencer, which has long been on our bucket list! The sequencer will benefit students

in Genetics, Biotechnology I, and Principles of Conservation Technology. This equipment will also allow students and faculty to pursue novel research.

DEPARTMENT OF BIOLOGY NEWSLETTER



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