After 33 years as dean & 47 years at Cal Poly, Phil Bailey announces his retirement.
FROM THE DEAN

As some of you may know, 2016-17 will be my final year — my 34th as dean and 48th as a faculty member. I’ll be retiring next June. As the academic year gets underway, I’m just as enthusiastic about Cal Poly and the College of Science and Mathematics as I’ve ever been.

It’s been a great 47 years so far, thanks to the exceptional students, faculty and staff I’ve had the privilege to teach and work with. Many of you were kind enough to write in and share reflections of our time together, some of which can be found later in this magazine. These kinds of relationships have made my time at Cal Poly special, and I want everyone to know I really appreciate you and have enjoyed getting to know you.

But I’m not done yet! I’m looking forward to my 48th year on campus. I’m especially excited about the new undergraduate research complex you’ll read about on page 9. It will provide a true home for student researchers right in the heart of campus.

It’s also a big step toward the college developing one of the premier undergraduate research programs in the country. I believe we can do it! In fact, that’s what I’ll be working toward after I retire.

We need everyone’s help, though. Biochemistry alumnus Bill Frost and his wife, Linda, have generously pledged $20 million toward the building’s construction, for which we are extremely grateful. Your contribution — of whatever size — is also important. The college needs to raise another $5 million. This is a great chance to invest in our students and their future.

For all that you do for Cal Poly, for your friendship and support over the years, and for making my time at this special university the best 48 years anyone could ask for — thank you.

PHIL BAILEY, DEAN
College of Science and Mathematics
The world is swimming in big data. The problem is, not many people know what to do with it.

Cal Poly is filling that gap with a new cross-disciplinary minor in data science. Students who graduate with the minor will be among the few who can help companies make sense of big data. The program is a collaboration between the Statistics and Computer Science departments and is tailored to meet the needs of this growing job sector.

“Graduates of the minor will really be among the first generation of formally trained data scientists,” said Andrew Schaffner, a statistics professor who helped to develop the program.

Data science lies at the intersection of computing and statistics, and data scientists turn all forms of data — for example, numbers, text, sound or images — into usable information. Though data is constantly being produced — through internet searches, consumer transactions, bioinformatics and more — it can't tell us anything until it's been processed.

“What’s missing is humans to process this data,” said Alexander Dekhtyar, a computer science professor involved in creating the program. “There aren’t many people out there who have this breadth of skills.”

The minor aims to give computing and statistics majors that broad skill set by enhancing the traditional programs. Statistics majors will add programming and database classes, while computer science majors will study probability and statistical modelling.

“It’s a truly interdisciplinary, cross-college program, which is rare,” Schaffner said. “The upper-level courses will be team-taught, giving students access to expertise in both fields in one class.”

In true Learn by Doing style, students in the minor will work with real-world data throughout the program. During the minor’s capstone experience, students will help actual customers understand large data sets.

Graduates will be able to work at any point in the data processing pipeline: collecting data, converting it into a usable form, visualizing and describing it, and finally interpreting it to help make data-based decisions.

“The demand for graduates with this skill set is only going to grow with the Internet of Things,” Dekhtyar said. “When your car engine, your refrigerator and your house are all producing data, companies across all industries will need data scientists.”

Cal Poly’s first official data science alumni will enter the job market at the end of this school year with two years of classes under their belts. The minor is currently open to statistics, computer science and software engineering majors, with more majors to be added as the program grows. //

Pictured: Statistics professor Andrew Schaffner works with data science students. Photo credit: Tenney Rizzo
HONORED ALUMNA OPENS DOORS TO STUDENT SUCCESS

Nohemy Ornelas (M.A., Education, 2007) discovered her passion for helping students early in her career. This dedication to others, especially underrepresented students, earned Ornelas the College of Science and Mathematics Honored Alumna award for 2016.

Ornelas first made an impact on students’ lives as a financial aid specialist and counseling assistant at Allan Hancock College in Santa Maria, where she now serves as associate superintendent and vice president of student services. After earning her master’s degree at Cal Poly, she worked at Berkeley City College and Cuesta College, including two years as dean of student services, before returning to Allan Hancock in her current position.

For Ornelas, advocating for student success is the most rewarding part of her job. Her role provides many opportunities to do just that by overseeing a number of support services, programs and departments, and managing several state and federal grants.

“I believe college opens doors to infinite possibilities for students. I see my role as widening those doors and creating pathways to success,” Ornelas said.

As a member of Cal Poly’s Counseling and Guidance Program’s advisory board, Ornelas helps the faculty develop a cutting-edge curriculum. Her contributions to the counseling internship program are part of what makes Cal Poly’s degree stand out among others in the field.

She also provides one-on-one mentorship for students and contributes to increasing the diversity of the program’s applicants.

“Nohemy has been a key player in helping us recruit and retain individuals from diverse backgrounds. She’s made a big impact on our ability to attract outstanding Latino and Latina students,” said Steve Kane, the program’s coordinator. //

I BELIEVE COLLEGE OPENS DOORS TO INFINITE POSSIBILITIES FOR STUDENTS.

BIOLOGIST RECEIVES PEW AWARD

Cal Poly biologist Jennifer O’Leary was awarded a prestigious Pew Fellowship in Marine Conservation, one of only five worldwide. O’Leary is using her $150,000 award to expand a program that combines science with policy in the management of marine protected areas (MPAs) in the Western Indian Ocean.

“I am extremely honored to receive the Pew Fellowship in Marine Conservation,” said O’Leary, who is a California Sea Grant extension specialist at Cal Poly’s Center for Coastal Marine Sciences. “The award will allow me to continue my work in East Africa and the Western Indian Ocean helping marine managers use science to assess MPA status and take proactive conservation action.”

O’Leary is co-director of the Science for Active Management Program in East Africa, which helps fishing communities and managers of MPAs apply science to marine conservation efforts. The program has been adopted nationwide in Kenya, is expanding nationally in Tanzania and the Seychelles, and has been used to train MPA managers from eight African nations. With her Pew fellowship, O’Leary will expand the program to other parts of the Western Indian Ocean and evaluate any resulting changes to social and ecological systems. //
Pictured: A laser pointer shoots toward the sky during the Lassen Volcanic National Park’s Dark Sky Festival, which some RECON teams attended. Photo credit: Manzanita Lake Night Sky Viewing by Alison Toggar-Barone, used under Creative Commons License 2.0

**CITIZEN SCIENCE PROJECT BRINGS TELESCOPES TO RURAL COMMUNITIES**

One Cal Poly physics professor is bringing real-world astronomy research to underserved communities in five states. John Keller and his research partner, Marc Buie from the Southwest Research Institute in Boulder, Colo., have engaged 56 communities in a citizen scientist project that stretches 1,200 miles from the Canadian border to Mexico.

Each community received a telescope, camera and training as part of the research project. “The town of Hawthorne, Nev., and the Mineral County School District now have a telescope to share for educational and community use, the first time ever,” said community member Kathy Trujillo.

Hawthorne is just one of the communities in the Research and Education Collaborative Occultation Network (RECON). These teachers, students and amateur astronomers are helping Keller and Buie measure the size of Kuiper Belt Objects (KBOs). These large, frozen bodies that orbit the sun in the outer region of the solar system hold important clues about the origins of the solar system.

Both Buie and Keller see the benefits of RECON stretching far beyond what scientists will learn about KBOs. “These rural cities are highly underserved communities,” Keller said. “This engages a whole network of high school students and citizen scientists in the excitement of scientific discovery.”

The network will conduct six coordinated observation campaigns of KBOs each year through 2019. “It’s so exciting that our students will grow and learn with the RECON project throughout their high school careers,” said Trujillo.

Results from the project have already been published in The Astronomical Journal.

**TEACHERS ARE BETTER TOGETHER**

In July, teachers across California came together for a free day of learning at Cal Poly and 39 other locations throughout the state. The second annual Better Together: California Teachers Summit gathered teachers, teacher candidates, school administrators, and other educators to share best practices in implementing new standards in language arts, math and science.

“**THIS EVENT DRAWS ON THE STRENGTH OF TEACHERS BEING BOTH EXPERTS AND LEARNERS**”

More than 120 educators gathered at Cal Poly. Much of the information was shared by teachers for teachers.

“When teachers come together and learn from each other, everyone benefits,” said Cal Poly education Professor Tanya Flushman, who organized the local gathering. “This event draws on the strength of teachers being both experts and learners.”

Teachers gave TED-style talks and also had small group discussions on topics such as project-based learning and using technology in the classroom.

“No one has more experience with what works in the classroom than teachers. They are the experts on the California Standards,” Flushman said. “The networks teachers will build through this summit will have a significant impact on students statewide.”

Next year’s Better Together Summit is set for July 28, 2017.

**“THIS EVENT DRAWS ON THE STRENGTH OF TEACHERS BEING BOTH EXPERTS AND LEARNERS”**
There’s no one quite like Phil Bailey. It could be the Southern drawl or the big smile, but more likely it’s that he cares. Deeply. About everyone — the custodian who works in the dean’s office, the new faculty member, and especially the student on academic probation or the one who doesn’t have enough to eat.

Bailey coined the college’s motto “It’s all about our students” and has acted on it, both professionally and personally. From developing the “Study 25-35 hours per week” campaign, to championing the Baker Center, to inviting underrepresented students in need of financial assistance to stay with him and his wife, Tina, Bailey has supported student success campuswide with unwavering enthusiasm.

He considers all students “our students,” whether they take one general education class in the college or they major in chemistry. As he often says, “Every Cal Poly student is a College of Science and Mathematics student.”

We reached out to you, our alumni and friends, and asked what you remembered about Dean Bailey, and how he made a difference in your lives. The following selection of responses tells his story better than we ever could.
COSAM has been so fortunate to have such an involved, passionate and caring dean and professor for so many years. Dr. Bailey always had our backs and pushed us to be our best.

WENDY HAMILTON | B.S., BIOLOGICAL SCIENCES, 2002

Dean Bailey is such an amazing supporter of the school and the students – he will be missed. I've been so lucky to know him all these years; from a freshman home economics major changing to chemistry, to doing a study abroad in polymers, to introducing him to the Alpha Phi house, to serving on his advisory council. I'm excited to see him in his new role with the Frost Program, and glad to know he will still be active at the school.

JOAN PINDER | B.S., CHEMISTRY, 1979

Phil is more than a professional role model to me. He taught me that actions are stronger than words. He taught me about integrity, love, family, work ethic, charity, wine, how to make rice, living on the edge, even though sometimes he went beyond the edge. People tell you that you should join their institution. Come to Cal Poly and be part of the family. With Phil and Tina, it was a family in more ways than you can imagine.

VICTOR VILCHIZ | B.S., CHEMISTRY, 1996

He tipped me $20 when I was working at Starbucks. He’s an awesome guy.

KRISTINA JOSLIN | B.S., BUSINESS ADMINISTRATION, 2011
Phil’s best advice to me was to always try my best, seek to learn, and be challenged.

BLANCA LOPEZ  |  B.S., MATHEMATICS, 2011; M.S., MATHEMATICS, 2014

Phil unselfishly supported me both morally and financially without expecting anything in return. He became one of the most important and influential people in my life. He encouraged me to apply to graduate school. He was there for me during the ups and downs. He even proofread my doctoral dissertation.

NHY Y TRAN STESSMAN  |  B.S., BIOCHEMISTRY, 1994

I worked for Dean Phil for a year, and he was truly one of the best bosses I ever had. I found out that he has reached out to so many students on a personal level and helped so many disadvantaged students get through college (and calculus!) over the years that it’s amazing.

TERESA MARIANI HENDRIX  
FORMER COLLEGE COMMUNICATIONS DIRECTOR

My favorite chemistry teacher and a role model! Thank you, Dean Bailey, for making a difference in my life.

JOHN BEATON  |  B.S., BIOCHEMISTRY, 1975; M.S., CHEMISTRY, 1980

During my time at Cal Poly, I always thought of you as approachable, committed, concerned for your students, kind, funny, and just plain awesome! COSAM students were lucky to have the best dean around. I am now a mom to two young daughters, and I enjoy teaching them the science and beauty of the natural world around us. I am forever grateful for the lessons you helped teach us at Cal Poly.

NICOLE GERBRANDT  |  B.S., BIOLOGICAL SCIENCES, 2004

I have never met a power couple like Phil and Tina. They have shaped the way I think. They have shaped the way I react. They have shaped the way I want to be in the future. When I was at Cal Poly, I asked Phil and Tina why it is that they help students in the manner that they do, and they simply said, ‘Because it’s the right thing to do.’

SYLVIA AGUILAR  |  B.S., MECHANICAL ENGINEERING, 2013

Been a pleasure working here, largely because of Phil Bailey.

J. MICHAEL ROBERTSON  
B.S., MATHEMATICS, 1995; LECTURER, MATHEMATICS DEPARTMENT

Cont’d from pg. 06
Phil Bailey arrives on campus as a 26-year-old assistant professor.

In other news...
A stamp costs six cents
The class of 1991 is born
Apollo 11 astronauts Neil Armstrong and Buzz Aldrin walk on the Moon.

Phil Bailey is named dean of the College of Science and Mathematics.

In other news...
A stamp costs eight cents
The class of 1995 is born
The first handheld mobile phone call is made.

Phil Bailey is named associate dean of the College of Science and Mathematics.

In other news...
A stamp costs 20 cents
The class of 2005 is born
Polymerase chain reaction (PCR) is developed by Kary Mullis, allowing scientists to quickly copy segments of DNA.

Phil Bailey serves as Cal Poly’s interim provost and vice president for academic affairs.

In other news...
A stamp costs 25 cents
The class of 2011 is born
The first world wide web server and browser is developed by British computer scientist Sir Tim Berners-Lee.

Faculty Offices East, Bailey’s first building, opens.

In other news...
A stamp costs 29 cents
The class of 2014 is born
British scientists find the new largest perfect number.

The Warren J. Baker Center for Science and Mathematics opens.

In other news...
A stamp costs 46 cents
The class of 2035 is born
Scientists confirm that they found the Higgs boson.

Phil Bailey announces he will retire at the end of June 2017.

View related video online at cosam.calpoly.edu/intersections
Bill Frost (B.S., Biochemistry, 1972) didn’t coin the term “find a need and fill it,” but he has lived by this model all his professional life. In Cal Poly’s College of Science and Mathematics, he saw the need for enhancing student-faculty research and envisioned the development of one of the best undergraduate research programs in the country.

Frost and his wife, Linda, have committed almost $29 million in gifts and pledges to fulfill this vision, including $20 million for undergraduate research facilities in a new interdisciplinary building.

THE VALUE OF AN IDEA

Bill Frost came to Cal Poly in winter quarter 1970 as a transfer student, but not a typical one. He brought with him a potential $30,000 grant provided by a Los Angeles-based company to conduct research on a novel process for wastewater treatment.

“The father of my best friend was the superintendent at a local wastewater treatment plant. He introduced me to the president of the company, who wanted to establish a small research station at the plant,” Frost said. Unfortunately, the city pulled out of their involvement in the project, leaving the company with no place to conduct their research.

“When asked by the company if I had any ideas — and always mindful of where my next meal would come from — I told them I was transferring to Cal Poly, which might be a good fit for the project because of its strong polytechnic reputation,” Frost said. “When I arrived at Cal Poly, I presented the idea to my advisor, Dr. Glenn Wight. With his support, the university approved the project, and the research station became operational.
“While the grant helped support my college education, I also learned two important concepts during my time at Cal Poly. First was the notion that I could sell an idea! Second, I learned how to solve problems, which involved navigating through all the ambiguities created in the process of research, sorting out the data, and piecing it back together like a puzzle. These two concepts have stayed with me ever since, and they are an integral part of my success,” Frost said. “My experiences at Cal Poly gave me the confidence to define and solve problems as well as actually develop and implement solutions.”

“After leaving Cal Poly, I entered industry, and soon thereafter, I formed my own business, where I put these concepts to work and went about ‘finding needs to fill.’”

THE VALUE OF UNDERGRADUATE RESEARCH

Bill and Linda Frost want to give current and future students that same experience of discovery that Bill had. Their transformational gift recognizes the impact that undergraduate research can make. Engaging in real-world research with faculty mentors presents students with questions no one has answered..."
Finding the solution takes curiosity, imagination, critical thinking, innovation and sometimes interdisciplinary approaches and entrepreneurship. This hands-on, Learn by Doing approach encourages both independent thinking and collaboration.

Students take this experience out of the research lab into the professional world while still at Cal Poly. They share their ideas, solutions and results in campus seminars and student research conferences. Many have the opportunity to present at regional, national and international conferences alongside professional scientists and mathematicians. With their faculty mentors, students also co-author peer-reviewed papers that appear in academic journals.

SUPPORTING UNDERGRADUATE RESEARCH

A decade ago, Bill Frost and Dean Phil Bailey began discussing what a transformational gift centered on undergraduate research might look like. “It had to be substantial because Bill always thinks big,” Bailey said.

This time was no exception. Frost saw that, with the right resources, Cal Poly could have one of the best undergraduate science and mathematics research programs in the country. To develop this program, Frost and Bailey started with two areas of need: scholarships and research stipends.

“We want to attract the best students, and that means offering them an incentive to come to Cal Poly,” Frost said. Providing as much as $20,000 per year for four years, the scholarships allow the recipients to focus on their education and pursue undergraduate research.

The Frost Scholars and other science and mathematics students are encouraged to pursue student-faculty research, sometimes as early as their freshman year. Frost and Bailey decided to first concentrate on increasing research opportunities during the summer months.

The Frosts donate $200,000 to student stipends every summer. The college matches those funds twice over. With these resources and additional funds from faculty grants, more than 200 students receive $2,500 research stipends each year.

“Summer is an excellent time for students to do research because they can make it a full-time experience every day. The stipends make this financially possible for them,” said Bailey.

Over the last four years, the Frosts have given $7.4 million in scholarships and stipends, and Bill Frost is already looking toward the future.

“We also hope to establish some stipends for undergraduate research during the year,” he said.

A HOME FOR UNDERGRADUATE RESEARCHERS

The top undergraduate research program that Frost envisions would provide a high level of research activity year-round, but currently, when classes are in session, most of the college’s facilities are used for coursework and labs.

To address this need for space, the Frosts pledged $20 million toward construction of science and mathematics undergraduate research facilities, a pledge that equaled the largest the university had ever received. A new interdisciplinary
Building at the center of campus will include 15,000 square feet of laboratory space containing computational tools for mathematics and statistics, instrumentation for physics, and wet labs for chemistry and molecular biology. The Colleges of Agriculture, Food and Environmental Sciences and Liberal Arts are also designing facilities for this 64,000-square-foot building.

“We’re not just building a building. We’re creating a space where students can learn the most important lessons of their time at Cal Poly — that what they’ll do as scientists or doctors or statisticians is discover and learn. Undergraduate research is about encountering a question whose answer is unknown and figuring out how to solve it,” Frost said.

“We can’t teach students anything more important than that,” Bailey said.

Now is the time to join us in supporting undergraduate research

The college needs another $5 million to construct the science and mathematics facilities where students will become innovators, entrepreneurs and leaders. Your contribution will help build walls and furnish labs, but more importantly, it will give students the confidence to find new and innovative solutions.

Your gift will make a difference, regardless of the size. Final planning for the building will begin in February 2017, and the funds raised at that time will determine the full scope of the research facilities.

“Linda and I hope our donation will inspire others to see the importance and the urgency of this program and give whatever they can. We know we can’t do it alone,” Frost said.

The college’s undergraduate researchers need dedicated space to enhance their Learn by Doing experiences. They need you.

We hope you’ll join the Frosts and those listed below in providing a home for what will be one of the nation’s top undergraduate research programs at a place you can always call home — Cal Poly.

Many alumni, parents, current and retired faculty and staff, and organizations have already pledged their support for the new undergraduate research building. Please consider joining those listed below in building a home for undergraduate science and mathematics researchers at Cal Poly. Gifts of all sizes make a difference. Gifts of $5,000 and above will be recognized on the building’s donor wall.

John P. and Susan L. Andersen
John and Christine Anderson
Kay Antúnez de Mayolo
Philip S. and Christina A. Bailey
Diana B. and John D. Barnhart
Glen R. and Linda D. Barton
James and Neta Bear
John E. and Karen J. Beaton
Merry L. Bern
K. Dirk and Kristen Bondy
California Occidental Consultants
Peter and Joan Carpenter
Arthur L. and Marilyn J. Carpenter
Roseanne Chambers
Lee and Penny Coombs
Lois L. and Walter C. Darbonne
Derek F. Dormedy and Erin E. Stafford Dormedy
Jan M. Downs
Kim, Scott, and Sierra Durham
F. Conrad Engelhardt IV and Jennifer M. Engelhardt
Michael and Francesca Fairbrother
Harry and Arline Fierstine
RoseAnne Fischer
Claudia C. Florsheim
Katherine E. and Joshua D. Freier
William L. and Linda J. Frost
John W. and Alison A. Goers
Ann M. Gross
David and Gina Hafemeister
James Hare and Betsy McCullough
Jake Hare
Margaret Hartman and Robert Zahary
Ken and Jeanne Hoffman
Myron and Susan Hood
Julie Hopper and Mike Israel and Family
Ruth E. Huehn
Clyde S. and Kimi M. Ikeda
Donald and Diane Jackson
Randall and Sally Knight
Paul Koski
Fely (Felipe) Krewell
Kevin and Tomoko Laverty
Philip and Ann Lester
George Lewis and Louise Noël
Jennifer A. Martin
Sherrie L. McClung
Brooke and Andy Mead
Tom and Kim M. Modugno
Barbara J. and Paul F. Murphy
Barbara D. Olson-Arenz
Stacey Kathleen Olson
Charles Pasquini Family
Mike L. and Laura J. Patnode
Gail E. Pollard
Scott H. and Marilee L. Quady
Pierre C. and Terri L. Rademaker
Lisa Rezende

Marie Samples
Seneca Structural Engineering Inc.
Lisa Shinomura and Austin Bock
Nadine and Oscar Siguenza
Jan Simek and Judy Lang
Ken and Jeanne Stone
Carlyon and Greg Tapscott
Timothy G. Tapscott
Howard H. and Michele P. Tsuchiya
Andy and Bobbi Ungerer
Barbara Van Ness
Willem and Margaret Van Wyngaarden
Randall C. and Jamie H. Voss
Richard G. Warner
May T. Yong
Diane M. and Richard A. Webb
Matthew W. Webb
Dan and Toni Weeks
Andrew J. and Jacqueline T. Willrodt
May T. Yong
Thomas A. and Karen C. Zanardi

*Includes gifts as of October 21, 2016.
ROOKIE SEASON: 24 HOURS WITH LOS ANGELES FIRE DEPARTMENT

In 2015, Anh Nguyen (B.S., Kinesiology, 2012; M.S., Kinesiology, 2014) was one of the first two women hired by the Los Angeles Fire Department (LAFD) after a hiring freeze that lasted from 2008 to 2013. In August 2016, she successfully completed her probationary year and received the official firefighter’s shield on her helmet. Join her in a typical 24-hour day as a rookie at Station 58, just south of Beverly Hills and West Hollywood.

5:45 A.M. SHIFT CHANGE
Nguyen arrives on time. The firefighter she’s relieving has been there for 24 hours. She pulls her equipment and tools out of her locker and checks them over. “We typically check the breathing apparatus — that’s one of the most important pieces of equipment,” Nguyen said.

7:30 A.M. LINE-UP
The crew gathers to discuss staffing, any new material or bulletins released by the department, and the plans for the day. Nguyen and the other rookies are called on to give presentations, or “drills,” on topics from rotary saws to department procedures. “A rookie’s biggest duty is just learning the job. You’re constantly studying,” she said.

8 A.M. HOUSEWORK
“The fire house is our second home. We eat there. We sleep there,” Nguyen said. Like any home, there’s cleaning to do. Rookies get more than their share of the housekeeping, but everyone at the station pitches in. Nguyen may clean bathrooms, the apparatus floor, the kitchen, and more.

10 A.M. DRILLS
The crew heads to a house that was slated for demolition but was instead donated to the department. The veteran firefighters describe a situation the crew might encounter — the fire is on the third floor or someone is trapped in the rear of the building. Crew members react as they would during an actual call, hauling ladders from the truck to the house, cutting holes in the roof, unwinding and positioning hoses, getting the feel of hundreds of pounds of water shooting through their hands.

“I LOVE INTERACTING WITH THE COMMUNITY BECAUSE YOU KNOW YOU’RE IMPACTING THEIR LIFE.”

Pictured: Anh Nguyen (right) and a fellow crew member search a building for any spot fires after the knockdown of the original fire. Photo courtesy of: Anh Nguyen
12 P.M. LUNCH
As a rookie, Nguyen also gets her share of the cooking toward the end of the probation year. The assigned cook has already shopped and prepared off-duty, so she puts together chicken salad sandwiches. Everyone sits down to eat together. “We interact like a family,” Nguyen said. “We’re in these dangerous situations together, and our lives depend on each other. There’s a different level of bond and attachment there.”

2 P.M. STUDYING
Veteran crew members partner up with the rookies to get them started on their next study topic. Today, Nguyen is learning more department policies. “For the rookie, it’s constant, constant information,” Nguyen said.

2:15 P.M. EMT CALL
The lesson is barely underway when the station receives a medical call from dispatch. In under a minute, the crew is in the fire engine and on their way to the site of the emergency. In L.A., firefighters are the first responders when someone calls 911.

Arriving at the house, they find an elderly man complaining of chest pain. After making sure it’s not a heart attack, the firefighters settle him into a chair.

“We see a lot of things. When you see someone hurt, one of the hardest things is knowing in the back of your mind that this is someone’s family member,” Nguyen said. “On the brighter side, I love interacting with the community because you know you’re impacting their life. When things work out, to them, that’s the best thing that could have happened.”

The crew transports the caller to the hospital for further tests and care.

5:30 P.M. DINNER
Nguyen has cooked one of her signature dishes: salmon. The guys give her a hard time about everything from the fish being overcooked to her drill presentation, but she knows it’s the good-natured razzing all rookies receive and gives it right back.

7 P.M. WIPE DOWN THE RIG
With spray bottles and towels, the crew cleans the outside of the fire engine. It’s accumulated a few layers of dirt from the drill and the multiple runs they have had throughout the day.

“We take a lot of pride in our rig,” Nguyen said. “We want it to be in good condition for the guys who will relieve us the next day.”

7:30 P.M. DON’T WATCH TV
Veteran crew members watch TV, but the rookies aren’t allowed to. For Nguyen, it’s more time to hit the books.

11 P.M. BED
Nguyen and the rest of the crew each make their way to bed. As everyone settles in, the dormitory sounds like a locker room as jokes fly back and forth. The firefighters sleep well but lightly, knowing a call could come at any time.
Internal waves are slower than surface waves, but they’re big, sometimes as tall as two Empire State Buildings stacked on top of each other.

But they might affect our lives in important ways. Do the phytoplankton that produce half the world’s oxygen depend on these waves to move nutrients from deep in the ocean up to the level where the phytoplankton live? How do internal waves affect ocean acidification and oxygen levels? Do they move wastewater discharges back to shore?

Physics Professor Ryan Walter wanted to find the answers to these questions. He collected a whole lot of data about the density and velocity of water in internal waves when they break near shore.

Then he met math professors Paul Choboter and Joyce Lin and graduate student Caleb Miller, who likes waves and was looking for a thesis project.

Together, they thought they could test out some computer models to see whether they could make a model that matched the data.
When Miller graphed the data, he found that the changes in the density of water and in its velocity along shore were related. So he chose these two variables to plug into the model.

Then he got to work modifying the equation solver to account for the actual data. He made it run calculations based on different times of day or different potential energy. Every time he needed to consider something new, his answer was, “I can write a computer script for that.”

And it worked! Plugging the data into the models turned up some patterns. When the speed of the water changes, the wave narrows or gets broader. The water’s density determines the shape of the wave.

But there were still a whole lot of data points, more than could fit in a model. Being a mathematics student, Miller thought, “Hey, if I can find a formula that describes the pattern of the data, I can plug that into the model instead.”

These are just the first few steps toward answering those questions about the health of the ocean. The underwater adventure continues…

He started with the Dubreil-Jacotin-Long (DJL) equation, which describes internal waves generally. He also found a computer program called the DJL Equation Solver.

$$f(x) \rightarrow \text{Internal waves}$$
WE NEED A GAZELLE TODAY

While studying the smallest of organisms, Beth Schaefer (B.S., Microbiology, 1990) realized that she wanted to work with lions, tigers and perhaps pangolins. She’s now general curator at the L.A. Zoo. Below, she explains how she got there and why she’s so passionate about zoos.

HOW DID YOU GET FROM MICROBIOLOGY TO BEING A ZOOKEEPER?
When I volunteered at the Charles Paddock Zoo in Atascadero, I realized that I wanted to be a zookeeper. When I had the opportunity to talk to people about the animals and see them get intrigued and involved, I knew instantly, “This is it.”

WHAT EXACTLY IS A ZOO CURATOR?
Zookeepers care for animals on a day-to-day basis. Curators decide what species of animals to bring to the zoo, like the curator of a museum.

DO YOU MISS WORKING DIRECTLY WITH ANIMALS?
I think everyone in zoo administration misses the animals, but you see that you can make a bigger difference in their lives if you’re willing to take on a leadership role. Helping the animals has always been my driving goal.

WHAT’S YOUR FAVORITE PART OF THE JOB?
Maybe the best part is when our visitors realize the biodiversity. They see these animals they didn’t even know existed.

HELPING THE ANIMALS HAS ALWAYS BEEN MY DRIVING GOAL.

For example, the L.A. Zoo as a whole consulted on the movie “The Jungle Book.” There’s a character in there called a pangolin that’s also one of the most endangered animals on the planet. The reason it’s in the movie is that an L.A. Zoo curator suggested it. And now the whole world knows about the pangolin.

WHY ARE ZOOS IMPORTANT?
I work with a program that rehabilitates baby gorillas whose parents have been killed by poachers. It’s hugely rewarding to take 20 years of captive animal experience and use that to help animals that might go back into the wild. This is one of the big reasons why zoos are relevant. We learn so much about animals’ behavior and medical care. Studies done in zoos translate into the wild. Look at the California condor. If it weren’t for the L.A. Zoo, there would be no California condors in the wild.

DO YOU HAVE A FAVORITE ANIMAL?
One of my favorite species is orangutans. They’re very smart and flexible in their thinking. One of my favorite individuals was Tempest the raven, who was also very smart. She was always looking for a way to annoy you. She would steal the sunglasses off your head.” One day she stole a $20 bill out of a zookeeper’s pocket and ripped it up.

ANY ADVICE FOR CURRENT STUDENTS?
Follow your passion. Don’t worry about the money. Staying authentic to yourself and what you want to do is really important. Don’t be afraid to get outside your comfort zone. There’s a whole wide world out there. //
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Thanks to a generous donation*, planning for an undergraduate teaching and research building is underway, but we need your help. Your support will give students like Karoline the opportunity to discover the confidence and creativity that leads to success. *See page 9

Doing research has enabled me to embody Cal Poly’s Learn by Doing motto. It’s given me a creative outlet where I can approach a problem and figure out an innovative way to solve it. The lab experience I’ve gained doing research at Cal Poly will put me ahead of the game when I enter graduate school and the workforce.

— KAROLINE ECKHART
CHEMISTRY MAJOR | CO-AUTHOR OF A PUBLICATION IN A RESEARCH JOURNAL

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