

ISSUE 3 | 2019

# DISCOVERY



**CalPolyPomona**  
College of Science

**DISCOVERY MAGAZINE**  
a publication of the College of Science

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**COVER PHOTO:**  
Students from a life science class explore the diversity of life that exists at the Project Blue riparian habitat.

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The College of Science is training the next generation of scientists and science educators. In this endeavor, we are guided by our core values of curiosity, integrity, collaboration, inclusivity, and innovation.

The vision statement of our college is *“Fostering curiosity and a culture of scientific discovery.”*

Within these pages you will find many examples of our mission to *“Educate, mentor, and inspire students through scientific inquiry and hands-on learning.”*

The College of Science community is made up of faculty, staff, students, alumni and donors who support our vision and mission. We invite you to be an active member of our community by supporting or participating in an activity that is meaningful to you.

- Alison Baski, Dean



At Project Blue dedication from left to right: Dean Alison Baski, Carol Virani, Mohammad Virani, President Soraya Coley.

# Inside





they'll collect in the field.

The JPL data is particularly effective at detecting invasive species. Invasive vegetation such as grass tends to grow in cool winter months and to die back in hot summer months, whereas species native to the area are more likely to stay green year round. Mapping conversion areas is valuable in guiding restoration efforts.

Another important aspect of the work is identifying areas that have recovered naturally without human intervention. Examining what factors contributed to nature's success can provide a framework for intervening in the areas that haven't recovered.

The Audubon Society will lead surveys of wildlife distribution, abundance, and avian composition as they relate to existing and restored vegetation. This will allow assessment of the impact of the fires and restoration on wildlife.

The project will include about 200 volunteers and over 50 high school, community college and college students. Questad's core research team is made up of five students and the project will provide opportunities for eight interns as well as students from three Cal Poly Pomona courses, Resto-

ration Ecology, Geospatial Tools for Field Science, and Plants and the Environment.

Questad's research will also look at data taken prior to the fires, allowing the team to accurately assess changes to the habitat and how those changes have affected wildlife. Current information being used to guide restoration efforts is outdated or incomplete, making it difficult for land managers to choose the areas of greatest need or employ the most effective restoration techniques. With the help of Questad's research, land managers will have the tools they need to develop restoration and conservation plans that will have a greater chance of success and allow them to be more accurate in evaluating the effect of their efforts.



## Planning for Restoration and Conservation of the Angeles National Forest

In California we've grown accustomed to hearing about wildfires in the news. In 2017 alone, there were over 9,000 fires that destroyed more than a million acres in the state. The 2017 fires devastated communities and some estimates say the total cost to the state will exceed 100 billion dollars.

In the Angeles National Forest, the Copper, Ranch and Sayre fires destroyed 37,000 acres. Though the fires occurred in 2002, 2007, and 2008, respectively, restoration is still taking place. The Angeles National Forest, like much of the state, has been in drought conditions since 2014, underscoring the urgent need for planning that will safeguard this important natural resource.

Associate Professor Erin Questad aims to do just that. Her two year project, "Planning for Restoration of the Angeles National Forest" was recently funded by the Environment for the Americas whose work is supported by the National Fish and

Wildlife Foundation. Questad's project partners include the Jet Propulsion Laboratory (JPL) and the Los Angeles Audubon Society (LAAS).

One important step in planning for the restoration of forest land is an assessment of the damage and recovery that has occurred. For much of the terrain this can be difficult if not impossible to do in person. Questad's team will use data from JPL's Airborne Visible Infrared Imaging Spectrometer (AVIRIS) which is collected with an ER-2, the civilian version of a U2 spy plane. While the data is readily available to all, her partnership with JPL will provide the computing power needed to make full use of it. Questad stated that "Vegetation-type maps will be prepared using a standard technique, multi-endmember spectral mixture analysis (MESMA) unmixing, which can identify vegetation present at fractional levels." The spectral data Questad's team will use will be verified using transect data

**"With the help of Questad's research, land managers will have the tools they need to develop restoration and conservation plans."**



(Associate Professor Erin Questad conducting research in the field.)

# Better Living Through Green Chemistry

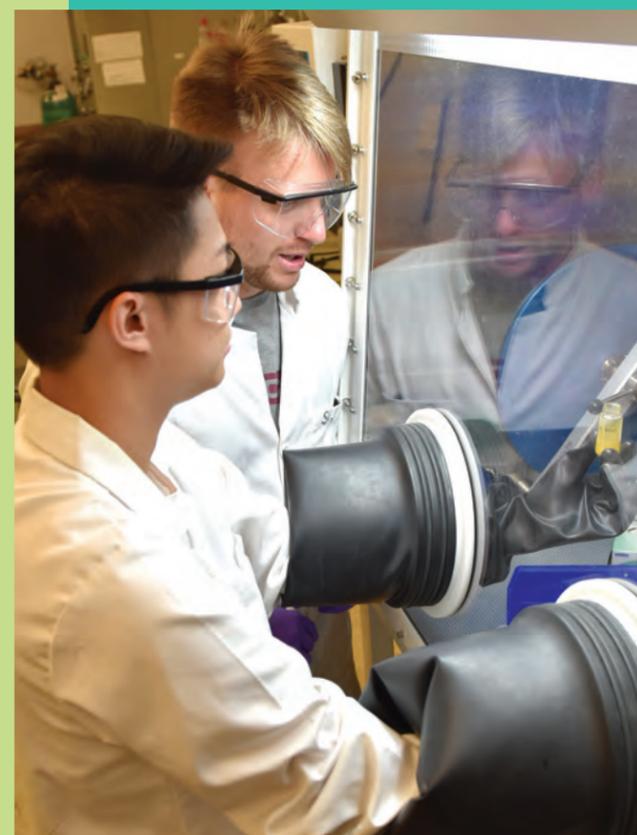
Everyone knows that when they fill up their gas tank they're consuming a fossil fuel that was pumped out of the ground and refined. Refined petroleum is also the source of many products we use every day, products like tires, the asphalt on roads, paint, nylon, and many of the plastics we use. Thousands of items are created from petroleum products, but because crude oil comes from fossils that took millions of years for nature to turn into oil, the supply is finite and non-renewable.

The idea of bio-fuels and producing plant-based products isn't new but a major obstacle has always been that the catalysts required to turn plant-based material into petrochemicals are too expensive to make the process viable on a large scale.

A \$240,000 grant from the National Science Foundation (NSF) is funding research at the College of Science that may provide a low cost alternative to current methods. The work is being led by Assistant Professor Alex John, chemistry and biochemistry department. John and his team of students are developing catalysts for the deoxy-dehydration reaction that's necessary to turn biomaterials into platform chemicals that can serve as the building blocks of many useful chemicals.

There are nine undergrads and two graduate students conducting research alongside John in his lab. Undergrad Christine Navarro said, "The idea of green chemistry really appealed to me. I knew I wanted to do research that makes the world a better place or helps people." Navarro plans to work in cancer research.

"It wasn't until I got this research experience that I became excited about the field because it gave meaning to what I was learning in the classroom," undergrad Timothy Siu said. "Through research I applied the knowledge I gained in class and I'm gaining real-world experience through hands-on learning that is transferrable to industry."



**"The results of the lab's preliminary work showed that the students were capable. It helped us get the grant."**



(Professor Alex John discusses a sample with students Skyleer Gibbon-Stovall & Consuelo Martinez.)

John said, "The results of the lab's preliminary work showed that the students were capable. It helped us get the grant." The grant is titled "Evaluation of Ligand Effects in Molybdenum."

Rhenium is a common metal catalyst for the type of reaction that's needed but it's rarer than molybdenum and 100 times more expensive. John's group is studying the use of ligands in molybdenum catalysis. The ligands bind to the metal and allow scientists more control over the chemical environment while the reaction is taking place. The goal is a better understanding of this process which can increase efficiency and allow production to scale to a level that would make it a viable alternative to petroleum-based products.

The beauty of using biofuels is not only that it's sustainable because scientists can grow more fuel, it also means that the source (plants) will consume the carbon dioxide that burning fuel produces and replace it with oxygen.

Both Siu and Navarro plan to pursue their Ph.D.'s. Navarro said, "I learned a lot from this research with Professor John. I learned to write

academic articles, plan out my lab work, and learned how to present my research."

Siu said, "I will start my Ph.D. program in September at UC Riverside. The research experience I got here was critical to me getting accepted."



# Project Blue Creates a Living Lab

Project Blue, which was dedicated in the fall of 2018, provides a wealth of learning opportunities for students. The vision for the project started in 2011 with Professors Edward Bobich, and Kristine Hartney from the Department of Biological Sciences. The project's goal was to uncover what they dubbed Lower Kellogg Creek and turn it into an outdoor learning environment.

"Students can study the evolution of life in riparian habitats and examine the water that is teeming with life," Bobich said.

Hartney said, "My Life Science class studies the importance of riparian habitats to life forms. But it's not just about biology or science, every single department on campus has a connection to this project. There is conservation and sustainability, water rights, environmental design, and civil engineering involved, and art classes can capture the beauty of the site."

The Ernest Prete Jr. Foundation provided a gift of \$200,000 that brought Project Blue to life. Mohammad Virani, president of the foundation, visited the campus and believed in their vision. "I saw the passion they



Project Blue is located off University Drive, behind the southwest section of Building One.

had for this project and that it could provide a tremendous learning experience for students. Such experiences as these can be life-changing. The foundation also supported BioTrek and the Mesozoic Garden which have shown the value of such outdoor learning environments," Virani said.

"Mr. Prete's vision was that 'The spirit of this foundation honors significant proactive and imaginative activities regarding earth preservation and the exploration of the universe.' Ernest Prete Jr. believed we ought to leave the world a better place. In support of that vision, we continue to partner with Cal Poly Pomona and help develop students who are making a difference in the world."

The project will provide more learning opportunities for the thousands of elementary school students that make field trips to BioTrek every year. "Making science accessible is part of our Science for All initiative," Dean Alison Baski said. "Thanks to Mike Brown, curator of Rain

Bird BioTrek, CPP students from several disciplines have been involved."

Brown, who joined the project in 2014, said, "Students from the colleges of science, agriculture, and environmental design helped clear the area of non-native plants and then carefully sculpted seep points, placed rocks, and planted native plants."

The experience allowed students to learn by doing. Werner Abrego, who majors in urban and regional planning, said, "I really learned a lot by working on this. It was a creative experience because even though Mike provided direction, we were allowed the freedom to experiment and try different things to see what worked best."



Ernest Prete Jr. Foundation President Mohammad Virani (2nd from right) joins President Coley (center, right), Dean Baski (center, left), Professor Bobich (far left) and Michael Brown (far right) for ribbon cutting.



*One mother put it this way, “You haven’t just given my child the ability to kick, to dribble, or to ride a bike, you’ve given my child his self-confidence. You’ve given him the ability to be included, to belong.”*

## Motor Development Clinic Celebrates 40 Year Anniversary

The ability to walk, run, and play sports is something that most of us take for granted. But for children with developmental delays these things do not come naturally. Since 1979 the Motor Development Clinic at Cal Poly Pomona has been helping such children to lead more active and fulfilling lives.

One mother put it this way, “You haven’t just given my child the ability to kick, to dribble, or to ride a bike, you’ve given my child his self-confidence. You’ve given him the ability to be included, to belong.”

The clinic also changes the lives of the CPP students who work with the children as part of their pedagogy course. Alejandro Chavez (‘18, pedagogy) said, “It’s so rewarding for both me and the student. Seeing a student smile when they’re able to throw a ball after weeks of struggling to do it – there’s no better feeling in the world.”

Chavez’s experience at the clinic led him to volunteer two summers there. He’s currently working on his teaching

credential with the adapted physical education (APE) added authorization and is preparing to enroll in a master’s program. His experience at the clinic validated his interest in working with children with disabilities.

“The clinic is a perfect example of learn-by-doing. You can’t get this from a lecture,” Chavez said.

Another student, Elisianna Normann agreed, “We’re so lucky because we’re actually teaching. We get to do it all, the paperwork, the planning, the teaching, and we learn how to deal with challenging behaviors.”

“What I learned through the clinic about motivating students and dealing with behavior has also helped me in dealing with typical elementary school students,” Normann said.

Assistant Professor Beth Foster who is director of the clinic in the kinesiology and health promotion department said, “Our kinesiology students start out apprehensive at first but around their sixth week of teach-

ing you can see the change--they’re more confident.”

The clinic serves about 15 children who are between five and fifteen years of age. When a child comes to the clinic Foster does a motor assessment and CPP students also do an assessment, providing them with an important learning experience.

Foster works with staff to develop an individualized plan for each child. Then, working under Foster’s guidance, CPP students develop lesson plans. They also develop “homework” assignments for the parents to work on with their children.

Students usually work with only two children at a time during the semester. Volunteers help with summer sessions which are more like a sports camp and draw about 50 participants.

There’s a shortage of special education teachers, including adapted physical education teachers, in the country and the College of Education and Integrative Studies received a \$1.1 million federal grant from the U.S. Department of Education to address that need. Foster is involved in the APE part of that grant which provides full scholarships called Special Educators of Excellence in Diverse Settings (SEEDS). Her student,



Alejandro Chavez, is a recipient of the scholarship.

The Motor Development Clinic is funded through a combination of fees and endowments, and additional support would provide more opportunities for learning and allow the clinic to provide more services to the community. In addition to the number one goal of training future educators, Foster has ambitious plans for the clinic.

First, because early intervention can offset developmental delays, she wants to start an early childhood program. Second, she’d like to partner with a local school district to provide services to their students. Lastly, because of the importance of life-long physical activity, and the shortage of services for adults with intellectual disabilities, she’d like to start a Special Olympics team.

“Beth Foster is an exceptional professor and mentor who is always there if you need her. She presents at conferences and is active in the community. She’s the type of teacher I aspire to be,” Chavez said.

“I loved being an adapted PE teacher and taught 175 students at 13 schools. What attracted me to Cal Poly Pomona was the Motor Development Clinic because it allows me to continue working with people with disabilities,” Foster said.

Foster became the MDC director in 2017, succeeding Professor Emerita Perky Vetter, who served for 31 years. The founder of the clinic is Professor Emeritus Varujan “Barney” Anoo-shian, who passed away on December 4, 2018. The Anooshian Scholarship was established in his honor upon his retirement in 1986.



(Cal-Bridge scholars from Cal Poly Pomona (L-R) Chelsea Adelman, Bo Shrewsbury, Sierra Garza, and Evan Nuñez)

# Cal-Bridge is Changing the Face of STEM one Student at a Time

African Americans, Latinos, and Native Americans combined earn between 70 and 80 Ph.D.'s annually in physics and astronomy. That's less than 4% of the national total even though they represent 30% of the U.S. population.

The Cal-Bridge program is having a significant impact on this disparity and thanks to a \$5 million grant from the National Science Foundation (NSF) the program will have an even bigger impact.

Cal-Bridge was started at Cal Poly Pomona in 2014 with the goal of increasing the number of underrepresented minorities (URM) earning Ph.D.'s in physics and astronomy. The principal investigator (PI) and director of the program is Alexander Rudolph, professor in the physics and astronomy department.

"This grant will increase representation nationwide by 50%, all from one program in California," Rudolph said. "CSU students aren't always aware of opportunities for continuing their education. UC schools are the only public institutions in the state that grant Ph.D.'s in physics and astronomy so their participation was key and Cal-Bridge creates a bridge between the CSU and UC systems. The program provides the mentoring and financial resources students need to achieve their dreams of becoming physicists and astronomers."

Initial funding provided support for about 12 students per year, and with the newly acquired \$5 million NSF grant that number will grow to 40 to 50. The program has selected its fifth cohort of 27 scholars from 10 CSU campuses which brings the total number of scholars to 61.

The partnership between 15 CSU, nine UC, and 30 community colleges is what makes this program so powerful. Cal-Bridge scholars benefit from mentors at both the CSU and UC systems, and over 150 physics and astronomy faculty are participating in the program.

Scholars can receive up to \$10,000 per year yet they cite mentorship as being one of the

most valuable aspects of the program.

Evan Nuñez, a Cal-Bridge scholar and Cal Poly Pomona Alumnus ('19, physics) said, "Cal-Bridge is preparing me to succeed, particularly through the mentorship. Having mentors pushed me to want to be in their shoes someday so I can inspire some students who might be going through a rough patch." Nuñez is working on his Ph.D. at Caltech.

"I firmly believe the adage that 'talent is equally distributed, but opportunity is not,'" said Soraya M. Coley, president of Cal Poly Pomona. "Cal-Bridge is an engine of opportunity that is providing transformative educational experiences for students across our state."

A co-PI on the grant and College of Science Dean, Alison Baski said, "Cal-Bridge can become a model for expansion to other STEM degrees and to other states to create similar networks. I think it's a superb model that could be scaled across the nation and have a concrete impact on the number of underrepresented students who are in STEM disciplines."

***"Cal-Bridge is preparing me to succeed, particularly through the mentorship."***



Professor Alexander Rudolph, principal investigator (PI) and Cal-Bridge director.



## Distinguished Teaching Award

Professor Robin Wilson's contributions to student learning both inside and outside of the classroom are remarkable. His methods include engaging students with flipped classroom curriculum. As a participant in the First in the World Grant he is committed to the program's goals of creating a supportive STEM faculty community to drive change in teaching and learning.

Wilson is also involved in the Algebra Project at the local and national level, providing support and training to high school math teachers. His career has been motivated by the idea that "Math literacy can be the key to unlocking the unlimited potential of disenfranchised communities." In 2018 Wilson was honored during black history month by the Network of Minorities in Mathematical Sciences. He is also involved in organizing a visit from Bob Moses, founder of the Algebra Project, during the spring 2020 semester.

**Professor Robin Wilson**  
Mathematics and Statistics

# Alumni Return to Campus

## Professor for a Day

This popular event happens during spring semester. Alumni will have the opportunity to visit a class and share their experience with students during the week of February 17-21, 2020. Register at "Professor for a Day" on the alumni webpage.



## Ralph W. Ames Distinguished Research Award

Professor Amar Raheja has an outstanding record of scholarly work and has published 39 journal articles since 2001 when he joined Cal Poly Pomona. Many of those publications were in collaboration with graduate and undergraduate students. His expertise in teaching includes image processing, computer graphics and computer vision, and he also co-proposed machine learning to enrich our curriculum.

Raheja's interdisciplinary research work reaches across campus and includes an Agricultural Research Initiative (ARI)-funded project for precision agriculture, developing a forecasting model for apparel sales, and an NSF-funded Research Experience for Undergraduates in Unmanned Autonomous Vehicles (UAV's).

In addition, Raheja's record serving as a thesis/project advisor for master's students and his mentoring of students in research projects are examples of his dedication as a teacher-scholar.



**Professor Amar Raheja**  
Computer Science

## Alumni Reunion Weekend

In May 2019, 25- and 50-year alumni who chose to tour Rain Bird BioTrek also got to make an herbal balm and chocolate. Yum!





# NSF MRI Grant Increases High-Performance Computing Capabilities on Campus

We live in a world of big data made possible by advances in computer technology and the internet. The access to more data provides more opportunities for research but also creates more challenges. The primary challenge is the storage and management of large data sets. Speed is also a factor as research projects can take days or weeks to run on personal computers. The solution is high-performance computing (HPC).

High-performance computers are a necessary part of academic research and in 2017 Cal Poly Pomona built its first campus-wide HPC cluster. Funding was provided by lottery funds, the College of Science, and the Division of Information Technology & Institutional Planning (IT & IP). The HPC cluster has a top speed of 150 Teraflops which means it can perform 150 trillion floating-point operations per second. For comparison, Microsoft's Xbox One X boasts six teraflops.



The current storage capacity of the university's HPC is 16 terabytes (TB). A National Science Foundation MRI (major research instrumentation) grant will fund 100 additional TB of storage. Assistant Professor of computer science Hao Ji said, "We now have more tools to collect data so the size of that data is always increasing. This grant gives the campus the ability to work with big data." Ji is the principal investigator (PI) on the grant.

"We'll be conducting research into scalable algorithms for analyzing large data sets, deep learning, and three dimensional biological and medical image analysis," Ji said. Deep learning is a type of machine learning that requires less human guidance because algorithms can assess the accuracy of a predicted outcome. Deep learning is the foundation of Artificial Intelligence (AI).

The HPC will be a valuable resource for many disciplines at Cal Poly Pomona. The College of Business Administration will use it to analyze data extracted from social media. Hui Shi, co-PI on the grant and assistant

professor in computer information systems said, "Using social media data we've found that the total number of Facebook likes, links, and stories are positively associated with real estate sales, whereas the sentiment score of Facebook posts is negatively associated with real estate sales. Social media creates a large amount of data that requires the power of HPC and adequate storage."

"The mass storage system will provide us with a solid base of knowledge and practical skills for developing scalable solutions to data intelligence challenges," Ji said. "It will allow collaboration with other institutions and provide experience for CPP and K-12 students. There is an urgent need for data scientists and intelligence analysts. Cal Poly Pomona will be able to offer courses that tie high performance computing with machine learning and scalable algorithm design."

The IT & IP Division has been an integral part of establishing the HPC on-campus and is working with the PI to purchase the mass storage equipment. IT & IP will also assist in implementing a user plan to advance research on campus.



***"Cal Poly Pomona will be able to offer courses that tie high-performance computing with machine learning and scalable algorithm design."***



Hao Ji, principal investigator (PI) and assistant professor, computer science.

# Professor Helps Students Discover the Beauty of Math



Cal Poly Pomona's Jennifer Switkes was one of three college professors in the country to receive a prestigious award from the Mathematical Association of America (MAA) in January 2019.

Switkes was honored with the Deborah and Franklin Tepper Haimo Award for Distinguished College or University Teaching of Mathematics at the largest mathematics meeting in the world, a joint meeting of the American Mathematical Society and the MAA in Baltimore.

Switkes was quick to point out that many math students and former students from Cal Poly Pomona were also at the Baltimore meeting to present posters and talks. Her desire to put students first is part of who she is and why she was honored.

She's humble while describing aspects of her teaching methods. "I feel like many of my colleagues do the same things I do," Switkes said. One of the things she was recognized for is providing project based assignments that cause students to stretch their limits, develop new skills, and grow.

"With the group projects you read an article then 'discover' what you can do with it. In math one question leads to another, then another and so on," said Esteban Escobar, a McNair and Kellogg Honors Scholar. "Professor Switkes is a great mentor, always there if you need her."

Since 2001 Switkes has been teaching and mentoring students at CPP. In 2013 she took a sabbatical and taught at the University of Makerere in Kampala, Uganda. She's stayed in touch with many of those students. "Some have become teachers, or went back to their villages to start schools, and others have become entrepreneurs," she said.

Switkes is passionate about serving the underserved and has also been active in the Prison Education Project which was started by political science Professor Renford Reese. She's taught math to prisoners in Norco California and Uganda and says the book, "Radical Equations: Civil Rights from Mississippi to the Algebra Project" by Robert Moses, has inspired her. The book emphasizes the importance of math literacy for social mobility.

A common charge leveled against some mathematics instruction is that it isn't used for practical purposes in the real world. Switkes and her students prove that assertion to be dead wrong.

Escobar, whose research she's mentoring, is using mathematical modeling to develop cancer treatment regimens to maximize treatment while minimizing side effects from chemotherapy. The research uses data from the work of faculty members Lisette De Pillis and Weiqing Gu of Harvey Mudd, and Ami Radunskaya of Pomona College, who modeled tumor response to chemotherapy and immunotherapy.

"Our goal is to decrease the suffering of cancer patients," Escobar said. "Using math to model something in the real world reveals the sheer beauty of mathematics."

Other students in Switkes' classes have applied mathematical modeling to such things as traffic flow problems, predicting serial killer behavior, and solving ecological challenges.

In addition to the teaching award from MAA, Switkes received an Outstanding Alumna award from Harvey Mudd College (HMC). HMC recognizes "alumna who have made significant contributions to humanity and society in the areas of community service, global contribution, and science and technology." She completed her combined bachelor's degree in math and physics there in 1994 and was honored at their alumni weekend celebration on May 4, 2019.

**"Using math to model something in the real world reveals the sheer beauty of math."**

## A PASSION for Student Success

Cal Poly Pomona has received a \$1.5 million grant from the National Science Foundation (NSF) for Hispanic-Serving Institutions to increase retention and graduation for students in Science, Technology, Engineering and Mathematics (STEM).

The grant will fund a project called PASSION. The acronym comes from the title of the project – Polytechnic for All: STEM Success via an Inclusive Institution. “The five-year project is an amazing opportunity for collaboration between the College of Science, the College of Engineering, the College of Letters, Arts, and Social Sciences, and the Faculty Center.” Associate Professor of CEMaST and biological sciences and Principal Investigator (PI) Paul Beardsley said.



Paul Beardsley, biological sciences & CEMaST, is PI on the grant. Co-PI Viviane Seyranian (upper right), assistant professor of psychology, will lead a series of research based interventions.

The project is important because the combined six-year graduation rate for engineering and science students at CPP is 74 percent but for underrepresented minorities it's 55 percent. Hispanics make up 16 percent of the overall workforce in the U.S. but only six percent in STEM fields.

PASSION will address the graduation gap through short-term interventions, faculty development, peer-led supplemental instruction, and new pedagogical approaches in critical early courses. The investigators will analyze the results of their work and add to the body of research on STEM education.



# Grant Highlights

## SPIRES Will Take Students to new Heights

The College of Science has acquired a new \$1 million grant from the National Science Foundation (NSF) to promote the success of low socio-economic scholars in the sciences. The project is called “SPIRES” which stands for Scholars Program in Research, Education and Science. Steve Alas ('94, biology) who is director of Science Educational Enhancement Services (SEES) and professor in the biological sciences department is the principal investigator. The co-PI's are Daisy Sang from the Department of Computer Science, Laurie Riggs from CEMaST, and Wei-Jen Lin, Department of Biological Sciences.

Alas said, “SPIRES has three strategies to support student success. To engage and retain targeted students, the program will award 125 scholarships over a five year period. The program will integrate sector-specific career skills in the training of scholars so they are ready to exceed workplace expectations. In addition to that, workplace psychology workshops will teach women and underrepresented minorities how to navigate less hospitable work environments.”

Geological sciences student and SEES Scholar Manuel Vejar said, “The greatest challenge for me has been access - access to financial resources, access to career planning, access to research opportunities.” Vejar is a 2019 graduate and has been accepted to a Ph.D. program at Notre Dame where he'll study environmental actinide chemistry.



Steve Alas, principal investigator (PI) and professor in the biological sciences department.

## NSF Career Award

Assistant Professor Chantal Stieber from the Department of Chemistry and Biochemistry was recently awarded a highly competitive \$475,000 CAREER Award by the National Science Foundation (NSF) to integrate research and education.

Stieber's research at Cal Poly Pomona focuses on using metals for conversion of air pollutants into value-added products, and engages undergraduates and master's students in hands-on research. This award addresses societal needs for sustainable chemistry and creates classroom research experiences to better prepare students for STEM careers upon graduation. These efforts broaden research opportunities for all students and enable the recruitment of a diverse STEM workforce.



Chantal Stieber (left) and her research group.



Science Education Enhancement Services (SEES) and CSU-LSAMP awardees pose with Provost Alva (far left), Dean Baski, (far right) and SEES Director Steve Alas.



## Prete Fellow Learns by Teaching Conservation and Sustainability

Environmental biology major Alexandra Dorough said, “The Prete Fellowship is an invaluable experience that gave me the ultimate opportunity to learn by doing. I was able to work side-by-side with a professional educator where I learned how to develop science curriculum and engage 5th and 6th graders on the topics I’m passionate about such as environmental conservation and sustainability.”

This is Dorough’s second year as a Prete Fellow. Her duties at Kellogg Polytechnic Elementary include mentoring other fellows in the program. She said, “Mentoring the other fellows has been an incredibly rich experience for me. I have been able to support a group of my peers while learning how to tailor my strategies to each individual’s needs and personality. Being a mentor has required me to improve upon my time management and leadership skills, which are valuable skills in all walks of life.”

The Center for Excellence in Mathematics and Science Teaching (CEMaST) manages the Prete Fellowship program which places Cal Poly Pomona students with the Pomona Unified School District where they co-teach science courses. The courses integrate the Next Generation Science Standards (NGSS) and appropriate California Common Core State Standards (CCST) in the K-8 curriculum. The program started as a collaboration between CEMaST Research Director

Nicole Wickler and Kellogg Polytechnic Elementary School Principal Rabia Minhas. Because of its success the program was expanded to include Armstrong Elementary School this year.

“The kids look up to us college students. We’re still young enough to be cool in their eyes,” Dorough said. Progress is sometimes incremental but even small steps can make a profound difference. She said, “I have one student who was quiet and didn’t like school. He’s made progress and has started taking notes, something he never did before. He’s a shy individual who didn’t want to draw attention to himself but recently he volunteered to do an activity. It may not sound like much but it’s a big deal.”

“I will soon start teaching about earth systems which encompasses how the geosphere, hydrosphere, atmosphere, and biosphere interact to shape our earth,” Dorough said.

Dorough teaches in Ms. Garcia’s class. “I really like how she challenges the students with inquiry based instruction. Because of her major she has a solid background in science and I’ve actually learned more about science while working with her,” Garcia said.

The Prete Fellowships are funded by the Ernest Prete Jr. Foundation which currently provides funding for 15 Fellows at each elementary school. Each CPP student provides up to 10 hours a week of support to the teachers which at Kellogg includes using an existing garden at the school to integrate urban gardening lessons into the curriculum. Students learn about gardening, nutrition, and how certain crops complement each other and affect the soil.

Dorough said, “The results were incredibly meaningful as I observed these children understand complicated scientific concepts as a result of my teaching. The financial stability that I gained through being a Prete Fellow decreased my overall stress and anxiety which allowed me to increase my productivity in all realms of my life. I am very grateful for the donor support which provided a pathway to share my passions with these children. I hope that future students can encounter the fulfillment that stems from this experience.”

The College of Science relies on donor support to help fund important programs like this that provide valuable learning experiences for college students while giving K-8 students in-depth exposure to science.

For information on supporting programs like this or other programs of interest please contact Development Director Melissa Martinez at [melissam@cpp.edu](mailto:melissam@cpp.edu) or (909) 869-4160.

**“The Prete Fellowship is an invaluable experience that gave me the ultimate opportunity to learn by doing.”**



# Geophysics Helps us Understand our World and Beyond

Geophysics is one of the focus areas students may choose to study in the Department of Geological Sciences. By definition, geophysics encompasses the earth's physical processes, which include hydrology or the study of water, as well as atmospheric science. The discipline also applies to the study of planetary bodies such as the moon or Mars.

Jascha Polet is a professor in the geological sciences department. Her specialty is seismology and she's involved in a collaborative project that includes four graduate and four undergraduate students, as well as representatives from Caltech, the Jet Propulsion Laboratory (JPL), Harvard University, University of Utah, and Louisiana State University. In May, a group of 5 teams placed 200 seismometers, provided by Caltech, in the Chino Basin.

"Acquiring data on the Chino, San Gabriel, and San Bernardino Basins will allow us to better predict the propagation of seismic waves. The ground motion predictions from the Great California ShakeOut are based on a detailed structural model for the L.A. basin but not these other basins," Polet said. "The other three basins actually act like a funnel, channeling energy toward the L.A. basin." That amplification could result in ground motion lasting as long as two minutes.

Polet said, "The research being done in the basins doesn't require waiting for an earthquake. The seismometers can measure ambient motion created from human and atmospheric activity.



Geological sciences students place seismometers.

The purpose is to get an idea of how the ground will move during an earthquake. Two master's theses from CPP students have already been completed on this and two more are currently underway."

Because of Cal Poly Pomona's participation in the project, the College of Science will have exclusive access to the seismic data for 1 1/2 years. After that it will be made available to all.

Having an idea how an area will move during a quake can help builders build safer buildings.

There is also a resonance frequency for an earthquake as well as for buildings.

When the natural resonance of a building is the same as the resonance frequency of an earthquake, the result is that the motion is compounded.

"In the L.A. basin we're looking at a primary resonance period of 6 to 10 seconds. This resonance period is comparable to that of the tallest high rise buildings in downtown L.A.," Polet said.

The Department of Geological Sciences has many tools to study the earth. A gravimeter which costs over \$100,000 was donated by a private firm. It measures differences in gravity that are so slight it can build an accurate picture of the material below the surface. The department also has ground penetrating radar (GPR), a magnetometer which measures the Earth's magnetic field, and its most recent addition is ground-based LiDAR equipment.



LiDAR stands for light detection and ranging. Seventy percent of the cost of the \$100,000 piece of equipment came from lottery funds and the remainder was funded by the college. The LiDAR uses lasers for imaging and allows geophysicists to create 3D models of terrain.

There are many practical uses of LiDAR imaging. Polet will use it to compare images over time to study landslides and to monitor fault creeping. The college can also use it to analyze road cuts in hillsides to determine points of weakness and help design road cuts that aren't susceptible to sliding.

Graduates of the geological sciences program find jobs in their



Professor Jascha Polet (center) poses with President's Discovery Fellows.

field because there's a demand for their skills. Polet said, "The geotechnical industry needs workers who can take geophysical measurements and image the subsurface. Builders need to understand building sites in order to design safe structures. Our graduates also find work in the environmental industry where an understanding of soil and water is important."

The geosciences encompass everything related to the earth so there's a wide range of fields in which our graduates can find work. Geoscientists work in the energy industry in the areas of wind, solar and geothermal where an understanding of atmosphere and terrain is critical. They also work in the petroleum and natural gas industries where knowledge of subterranean structures can aid in the discovery and extraction of those resources.

Geoscientists' value isn't limited to the study of the earth; they're also involved in space exploration as it relates to planetary bodies. Moon and Mars quakes need to be understood before safe bases can be built there. An earthquake causing a crack in a building here on earth can mean risk and costly repairs, but on the moon or another planet, a compromised structure would be catastrophic.

# Mary Mogge's Journey from Professor to Donor

Professor Emerita Mary Mogge understands the challenges of college students. She was a first generation college student from a working-class family. Her mother only had two years of high school but encouraged Mary to go to college. "I went to college, in part, because no one told me I couldn't," Mogge confided. Her best friend in high school had parents who didn't believe it was a good investment to educate women.

Mogge was always interested in the sciences and decided to major in chemistry but also had an interest in math. Her first chemistry course included some physics curriculum which she liked and by sophomore year she made up her mind to major in physics. At Carleton College, Mogge was one of only three women in the physics program. The physics cohort immediately before and after hers had none. Mogge said, "It was alright because we gave each other moral support and the faculty were supportive as well."

"Now a lot of students are burdened with student loans, mortgaging their future, or must work full-time while going to school."

ment, moral support, and financial support in the form of scholarships.

After completing her Ph.D. at Florida State University, Mogge taught for a year at Colorado State University. Eventually she moved to Southern California and took an adjunct teaching position at Cal State Long Beach. Mogge said, "I was a freeway flyer, adjunct teaching at three community colleges and three universities, driving back and forth between them. One of them was Cal Poly Pomona."

Her adjunct teaching led to a permanent position at Cal Poly Pomona and she was Physics Department Chair from 2001 to 2007. Mogge served on the

Mogge was destined to become a supportive faculty member herself. She's provided generations of students at Cal Poly Pomona with educational opportunities, encourage-



national board of the American Association of Physics Teachers and is still active in the organization. She's been a coach and academic director of the U.S. Physics Team, made up of high school students, that competes in the International Physics Olympiad and has led them to several victories. In that position she's been a role model for high school students, particularly women, who have a passion for physics.

"I like the diversity at Cal Poly Pomona," Mogge said. "I especially want to support women, underrepresented minorities, and DREAMers."

Mogge's journey from professor to donor gained momentum when she taught a first year experience class in physics. She was one of the people who helped develop the course which is aimed at helping students stay in college. The class opened her eyes to what the students were going through and how student life had changed since she was in college. She said, "I was on scholarship and work-study, and with help from my parents was able to make it. Now a lot of students are burdened with student loans, mortgaging their future, or must work full-time while going to school. One student I remember had a full class load, worked full-time, and on top of all that drove 500 miles every weekend to work another job."

This awareness inspired Mogge to start supporting the physics department's scholarships. As time progressed and she was able to do more she made an endowed gift to ensure that physics scholarships would continue. In addition to her generous support of scholarships she has recently named the College of Science in her estate.



## Students Make a Difference on Giving Day

Giving Day is our annual university-wide online fundraising campaign. The College of Science raised nearly \$18,000 from a total of 48 gifts.

Giving Day 2020 will take place in April.

*We're looking for Giving Day Ambassadors who are willing to reach out to their networks via email, text messages and social media.*

*We're also looking for matching gifts to kick off the event. Please contact Melissa Martinez. (contact information below)*

Chemistry major Elizabeth Garcia got the most gifts for the college.



Environmental biology major Joaquina Hernandez got the most clicks for the college.



## You can Make a Difference by supporting the College of Science

Choose an area that's of special interest to you or support one of these initiatives:

### Discovery Through Research

This initiative funds research opportunities for undergraduate students. These experiences are proven to have an enormous impact on students' growth and career success.



### Science for All

This initiative promotes the sciences and prepares a diverse STEM workforce by inspiring K-12 students to pursue studies in science, and by preparing the next generation of science teachers.



### Scholarships

Scholarships alleviate the financial burden of students and allow them to focus on their studies.



## DISTINGUISHED ALUMNA MARIA ALVAREZ

Engineering General Manager, Shared Engineering Services  
Microsoft-Artificial Intelligence and Research Division



**"Computer Science has been foundational to what I do today. Cal Poly Pomona prepared me for the challenges and transformation of this industry."**

Maria Alvarez ('95, master's in computer science) credits her mother's foresight as the greatest influence on her career — a path that has taken her from her native Venezuela to one of the most successful technology companies in the world. Since 2011, Alvarez has been general manager of Shared Engineering Services in the Artificial Intelligence and Research Division at Microsoft in Bellevue, Washington.

She is responsible for a 200-person team that provides engineering tools and services for security, privacy, accessibility, compliance, design, user research and content. Previously, she held technical positions with Symantec, HP, CoCreate Software, and Yahoo!, and served as chief technology officer of Panda Security in Spain.

More than 30 years ago, Alvarez's mother encouraged her to study computer science. She followed that advice, eventually attending Cal Poly Pomona with the help of scholarships. She received a master's degree in computer science in 1995 after earning her bachelor's degree in information technology from Universidad Tecnológica del Centro in Venezuela. In 2016 she attended Stanford University's Executive Leadership Development program.

"I'm in the technology industry because of my undergraduate and graduate degrees," she says. "Computer science has been foundational to what I do today. Cal Poly Pomona prepared me for the challenges and the transformation in this industry."

Alvarez encourages women and minorities to enter the technology field and has created scholarships at Cal Poly Pomona and Woodbury University in Burbank to help students of color and with financial need to pursue technical or computer science majors.

"I was a recipient of a scholarship through the Organization of American States, so being able to provide scholarships to benefit others is a privilege," she said.

Alvarez also devotes her time to mentoring women in the tech industry and is involved in joint projects between Cal Poly Pomona and Microsoft to train students and provide internships and employment. She sits on the board of trustees at Woodbury and is a technical advisor and board member at Grabbr.

Alvarez and her husband, Alejandro Rangel, live in Pasadena. They are parents to three children, Maria Alejandra, Elida Maria and Alejandro Jose.

**Please visit: [give.cpp.edu/science](http://give.cpp.edu/science)**

**Gifts can be made in all forms, including cash, securities, equipment, or through a planned gift.**

**For more information please contact:**

**Melissa J. Martinez, CFRE**  
Director of Development  
College of Science  
(909) 869-4160  
[melissam@cpp.edu](mailto:melissam@cpp.edu)

College of Science  
2019 Commencement



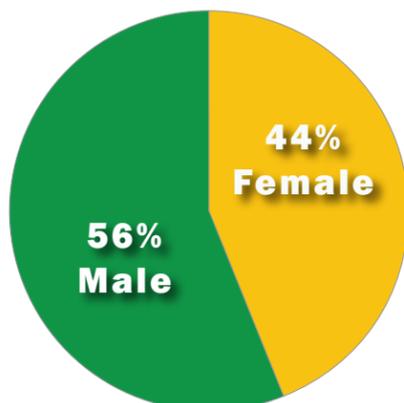
916 graduates  
832 bachelors  
84 masters  
7,000 attended

## College of Science Facts 2018-2019

First Generation College Student



Hispanic/Latino



**ENROLLMENT BY DEPARTMENT**

Biological Sciences	1,409
Computer Science	931
Kinesiology and Health Promotion	636
Mathematics and Statistics	554
Chemistry and Biochemistry	409
Physics and Astronomy	224
Geological Sciences	123
<b>Total</b>	<b>4,286</b>

## 2019

### September

12 - Hilda L. Solis Scholarship Dinner & Reception

26 - Fall Career Fair, Career Fair Breakfast  
(Visit the Career Center webpage for more details)

### October

5 & 6 - Pumpkin Festival

18 - Cal Poly Pomona Night at Honda Center (Duck's Game)

25 & 26 - Dining with Broncos

### November

1 & 2 - Dining with Broncos

22 - Holiday Mixer at Bronco Bookstore



## 2020

### February

TBD - STEAM Fair at Fairplex

17 - 21 - Professor for a Day Luncheon is Thursday, Feb. 20

### April

TBD - Giving Day

24 - Research Symposium (Tentative date)

### May

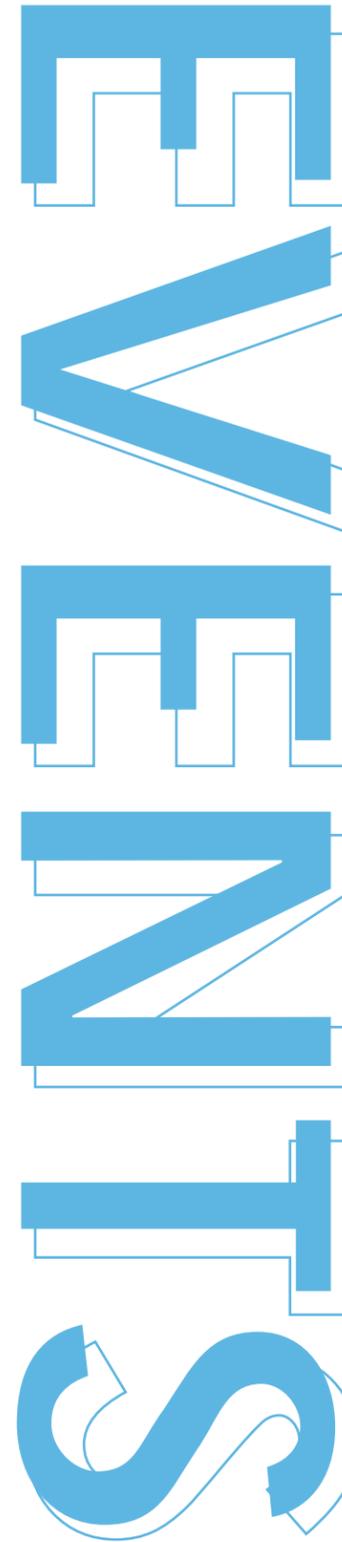
2 & 3 - Alumni Reunion Weekend

3 - Tasting & Auction



The annual College of Science Research Symposium is where students showcase the amazing research they've conducted under the guidance of CPP faculty.

Alumni and friends of the college are welcome and encouraged to attend. If interested, please let us know so we can assist with parking & directions. Lunch is provided.



For alumni event times and details visit [cpp.edu/alumni/events](http://cpp.edu/alumni/events)

## College of Science



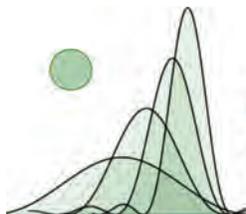
BIOLOGICAL  
SCIENCES



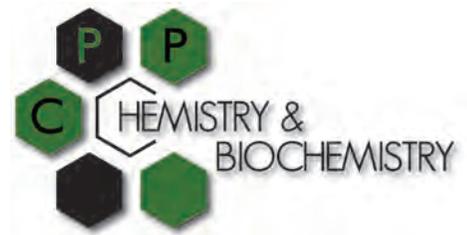
COMPUTER  
SCIENCE



KINESIOLOGY &  
HEALTH PROMOTION



MATHEMATICS  
& STATISTICS



PHYSICS &  
ASTRONOMY



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