

# Transmission

News from the College of Natural Sciences & Mathematics



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## A FORMULA FOR FULFILLMENT: CELEBRATING 25 YEARS OF PROJECT MISS

Boredom led Pamela Pilz to stop paying attention during high school math classes. The confusion and frustration that followed caused her to give up on a subject she initially loved. Fortunately, Mathematics Intensive Summer Session (MISS) got her back on track, and today she is a high school mathematics teacher and part-time instructor at Santa Ana College.



“I was always strong in math,” says Pilz. “I immigrated to the United States when I was 7 years old. The language barrier made other academic subjects daunting, but math I could do. When I got to algebra II, I was bored during the review at the beginning of the course and stopped paying attention. At some point, I looked up at the board and saw something unfamiliar. I couldn’t make sense of it and I didn’t know I could ask the teacher for help, so I dropped the class.”

Enter Project MISS.

In 1990, during her junior year of high school, Pilz heard from a fellow student that if she signed

up for a summer math program, she’d receive a free graphing calculator.

“It was something I could have never afforded on my own,” she explains. “So I went to my counselor and signed up. Project MISS was different from a regular classroom. It felt like a community of girls. We worked in groups to solve problems, we made posters of our solutions, and we presented to our peers. Dr. (David) Pagni taught us how to program on that graphing calculator. I didn’t know anyone who had a graphing calculator, let alone anyone who knew how to enter and use a program.”



*David Pagni founded Project MISS 25 years ago to help high school girls succeed in college preparatory mathematics. During the intensive summer program, girls work in teams and with tutors to solve problems and present those solutions to the class.*

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### **AN ENCOURAGING EDUCATIONAL ENVIRONMENT**

Pagni, professor of mathematics and director of Project MISS, says the concept for the month-long program to help high school girls succeed in college preparatory mathematics at the algebra II level and above stemmed from conversations with Ina Katz, the director of the Cal State Fullerton tutoring center.

“Ina noticed many female students struggling with math who got good grades in all other subjects,” says Pagni.

“We conjectured that this phenomenon may start in high school. Since mathematics is a so-called ‘gateway’ course, that could be a contributing factor in keeping students from college. So we began to look at ways to support girls aspiring to become first-generation college students.”

This realization inspired the basic model for the quarter-century-old program: to recruit students succeeding in most other courses but struggling in mathematics, especially girls from ethnic and economic backgrounds typically underrepresented in college and science, technology, engineering, and math (STEM) fields.

The intensive mathematics program improves academic prowess, self-esteem, and personal power in mathematics among the young female participants. Its long-range goal is to encourage more female students to take – and succeed in – calculus, thus paving the way for them to pursue STEM majors.

At the beginning of the program, students are grouped into teams of four based on pre-test scores and high school experience. Participants aren’t assigned homework. They work as a team during program hours to present solutions to the class. Tutors work with students to strengthen areas of weakness uncovered in the pre-test,

clear up any misconceptions, and build their understanding of new material. Each class of 32 students works with two instructors, two tutors, and sometimes a volunteer tutor.

“We began following up on students’ high school math course grades to be sure we were actually preparing them for success,” notes Pagni, whose work with Project MISS has been recognized with a Presidential Award for Excellence in Science, Mathematics, and Engineering Mentoring. “We also wanted to make sure the girls were able to follow their dreams of going to college. We’ve discovered that almost all go on to college and about one-third come to CSU Fullerton.”

The difference in participants’ pre- and post-test scores show growth in their mathematics skills. In 2014, the average student’s second-year algebra readiness increased by 63 percent and math analysis readiness increased by 105 percent.

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*“At NSM, I believe we are modeling a brand new kind of university; a student research university...what distinguishes Cal State Fullerton is the way our faculty collaboratively engage undergraduate students in their scholarship.”*

## MESSAGE FROM THE DEAN

**Students at the College of Natural Sciences and Mathematics (NSM) continually engage in cutting-edge scientific research. From curating million-year-old fossils at the Cooper Center to working among international teams unearthing the mechanisms and potential cures for antibiotic resistance, the dedication of these young scientists and the faculty mentors who support them, is immeasurable.**

At NSM, I believe we are modeling a brand new kind of university: a student research university. While our faculty is just as engaged as scientists at traditional research universities, what distinguishes Cal State Fullerton is the way our faculty collaboratively engage undergraduate students in their scholarship. Our alumni understand and appreciate the important role this broader, deeper method of learning has played in their own success.

Our faculty truly understand the value of engaging students. From the remarkable 25-year old Project MISS program, an intensive summer session designed to help young women succeed in mathematics, to supplemental instruction during those first, critical years of a STEM major's college education, to one-of-a-kind research opportunities right here in Orange County or abroad, our students graduate with the deep understanding and career engagement they need to work at the highest level of science or mathematics, anywhere in the world.

In this issue, you will read about our quality faculty and students, who consistently make us proud. You'll learn about the grants and honors bestowed upon them in recognition of their work. And you'll discover the story of an extraordinary alumnus who, for decades, has dedicated the time and resources we need to further our mission of excellence.

You are part of this success story. As you connect with NSM by reading this newsletter and reflecting on your time here, I encourage you to get more involved with this dynamic campus. Reach out to your Alumni Association. Come back to campus and participate in alumni events. Tell us how you or other alumni are changing the world in a special way. We want to hear from you and value your support as we move toward an exciting future. •

**David Bowman**

*Interim Dean, College of Natural Sciences and Mathematics*

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# CURATING A COUNTY'S CHRONICLES

Millions of years ago, what is now Orange County was mostly under water. At some point in its past, its land was even located hundreds of miles away – originating near present-day Sonora, Mexico, before starting to slide up the San Andreas Fault system due to plate tectonics about 25 million years ago. More than 10,000 years ago, the earliest human residents settled here – adding to its complicated, fascinating history.



The Cooper Center, a research partnership between California State University, Fullerton, and the County of Orange, through OC Parks, documents that history – curating fossils and artifacts, providing research opportunities for students and scientists, and educating the public about the amazing relics just beneath their feet.

“These fossils and artifacts belong to the people of Orange County; we just manage them,” says Jere Lipps, director of the Cooper Center. “The county has a mission to curate and protect these items and to make them available for exhibits and outreach. Because CSUF manages the collection, students and faculty can access them for research.”

In 1970, the state of California passed the California Environmental Quality Act (CEQA), in response to the National Environmental Policy Act (NEPA). CEQA requires state and local agencies to identify the significant environmental effects of their actions and to avoid or mitigate those effects when feasible. That means that any archaeological and paleontological resources unearthed during construction within the county must be properly collected and preserved.

“As stewards of Orange County’s resources and history, the county goes to great lengths to ensure that distinctive aspects of the county are protected,” says Griselda Castillo, manager of historic parks for Orange County. “To accomplish this mission, OC Parks

strives not only to care for and preserve these archaeological and paleontological resources, but also to share them through public outreach.”

OC Parks oversees the maintenance and upkeep of buildings and equipment at the Cooper Center and coordinates with the University the development of public exhibits and displays within the county’s parks to share emerging discoveries from the Center.

“We also partner with them to hold several free public events every year – such as Prehistoric OC at Ralph B. Clark Regional Park – that celebrate the fields of archaeology and paleontology,” adds Castillo.

# TraNSMission

The Prehistoric OC festival, which takes place on October 10, 2015, allows the Center to share Orange County's rich natural history, prehistoric animals and plants, and Native American culture with the community through archaeological and paleontological demonstrations and exhibits, educational crafts, and hands-on activities.

The Cooper Center currently manages at least six million artifacts and fossils stored in two large warehouses. In 1999, Orange County contracted with CSUF to develop a curation program. CSUF professors John Cooper, geological sciences, and Phyllisa Eisentraut, anthropology, were assigned as the principal investigators and spent the next four years developing the program. The contract ended in 2003, but Cooper continued as a volunteer and an advocate for preservation of the collection until his death in 2007. The Cooper Center is named in his honor.

"As Orange County's largest college, Cal State Fullerton plays an important role in this endeavor," explains David Bowman, interim dean of NSM. "The nature of the collection spans so many disciplines that tell us about the evolution of this county and of life on earth: paleontology, archaeology, biology, chemistry and geology. It's an unparalleled collection and a fantastic opportunity for our students to engage in vital research in their own backyard."

## EXPLORING EARLIER ERAS

The Cooper Center Laboratory and Curation Facility opened in July 2011 and was fully staffed by early 2012. Over the last few years, Center staff, researchers, and volunteers have curated at least 200,000 artifacts and 12,000 fossil specimens.

"This project will continue for many generations, especially since we find new fossils and artifacts wherever

there is a construction project in the county," explains Lipps. "There are 3.3 million people in the county and this tremendous amount of material. Orange County ultimately deserves a natural history museum, but that requires a lot of money. It's probably far off in the future."

In the meantime, the Cooper Center offers its collections for research by CSUF faculty, students, and visiting scientists; displays curated items at exhibits in the CSUF library, small park museums, and other public buildings; and presents them during public festivals, lecture series, and school visits.

"The Cooper Center partnership greatly benefits both organizations and the citizens of Orange County," says Castillo. "The county benefits from University staff expertise for the curation of its extensive collection. University students benefit from direct access to the collection and, through OC Parks, the University has additional venues in which to share its discoveries with the public and the greater scientific community. Scientists from around the globe visit and request information about the discoveries within our collection."

*Meredith Rivin, associate curator of paleontology at the Cooper Center, works on the skeleton of "Willy," a newly discovered species of toothed baleen whale found in Orange County.*



*"These fossils and artifacts belong to the people of Orange County; we just manage them."*

Jere Lipps, director of the Cooper Center



# TRAVEL BACK IN TIME TO PREHISTORIC OC

Want to learn more about the creatures that walked (and swam) Orange County millions of years before you did? Curious about what the county's earliest residents ate, how they lived, and what they did for fun?

Join us on **Saturday, Oct. 10, from 10 a.m. to 3 p.m.** for the **Cooper Center's Prehistoric OC** festival at Ralph B. Clark Regional Park in Buena Park. The event will celebrate International Archaeology Day and National Fossil Day with guided tours through the Clark Paleontology Museum, where visitors can view Orange County's extensive fossil collection and see real paleontologists and archeologists in action at its working lab.

Enjoy exhibits and demonstrations that will amaze archaeology- and paleontology-aficionados of any age. Throughout the park, you'll find a Junior Scientist Camp featuring educational crafts and hands-on activities; volcano demonstrations; Native American storytelling; and lectures by leading experts on archaeology, paleontology, and geology. You can even take a guided hike through the fossil beds of Clark Park.

The Prehistoric OC festival is a celebration of Orange County's rich natural history, made possible by the Cooper Center's research partnership between California State University, Fullerton and the County of Orange (through OC Parks).

For more information, visit [prehistoricoc.org](http://prehistoricoc.org) or [facebook.com/PrehistoricOC](https://www.facebook.com/PrehistoricOC), or call 714.647.2100.



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The Cooper Center boasts among its treasures the fossilized remains of plants and animals dating as far back as 180 million years.

"We have complete fossils of many marine mammals: six different kinds of walruses, a few different fur seals, and even complete whales – up to 45 feet long – some of which are considered toothed baleen whales. These show the evolutionary transition from ancient toothed whales to the baleen whales we see today," says Lipps. "We have fish, all kinds of shellfish, and we even have a few incomplete dinosaurs – mostly hadrosaurs we think lived along the stream beds."

Many of the Center's archeological artifacts come from Paleo-Indians who inhabited the land more than 10,000 years ago. Most of these surviving objects are hard items – cooking tools, hunting and fishing points, shells and bones from the food they ate – which have been preserved over time.

"These were some of the earliest humans in North America," explains Lipps.

Faculty advisors from CSUF help Cooper Center staff choose fossils and artifacts that will be useful in student research. The Center employs

*"We have complete fossils of many marine mammals: six different kinds of walruses, a few different fur seals, and even complete whales – up to 45 feet long – some of which are considered toothed baleen whales."*

six students, paid through a National Science Foundation grant, who curate the Center's collections. Several other students are paid to prepare fossils and artifacts. Approximately 40 volunteers from the community and interns from local high schools, community colleges, and CSUF also work with the Center's paleontology and archeology collections.

"It is a truly unique and groundbreaking partnership between a public university and a public entity, leveraging both resources to greatly benefit the people of this county," says Bowman. "There's not another model out there like this. We're not a museum, but in a sense we bring the museum to the people. That's a powerful difference because we're making history and science available where people live." •

## PROVIDING INTERNATIONAL INSPIRATION FOR YOUNG INNOVATORS

In the summer of 2011, Christina Adams was gearing up for her junior year as a biochemistry major at the College of Natural Sciences & Mathematics with her mind set on graduate school. When her research mentor, Chandra Srinivasan, recommended her for a summer

research program in Buenos Aires, Argentina, Adams thought it would be a great addition to her CV. During the two-and-a-half months that followed, she realized it was much more than that.

Through the Minority Health and Health Disparities International Research Training (MHIRT) program, Adams – now a doctoral student at the University of California, San Francisco – spent her summer in a South American lab, identifying horizontal gene transfer elements responsible for disseminating multidrug-resistance in bacteria.

“I was performing PCRs (polymerase chain reactions) to determine whether specific genetic elements were present in the clinical isolates we received from the hospital,” Adams explains. “I learned a lot from my labmates there – not least, how to communicate scientifically while overcoming a bit of a language barrier.”

Adams says her Spanish was a bit rusty going into the experience, so she had to learn fast to understand discussions and task assignments.

“I learned not to be shy in asking for help. I also learned how to recognize how cultural differences shape scientists’ thoughts,” she notes. “When I returned to the United States, I knew how to efficiently optimize PCRs, which I now apply to my research in graduate school.”

Adams not only discovered the importance of international relationships and networking, she also learned a bit about a work-life balance.

“I realized my labmates were able to live full lives without sacrificing productivity at work,” she says. “So, while I was there, I did everything I could to experience as much as Buenos Aires had to offer while contributing to some cool

science. The opportunity for undergraduates to travel, meet new people, learn from these people, and engage in an exciting research project makes this program amazing and one of a kind.”

### ENCOURAGING CLINICAL AND CULTURAL COLLABORATION

MHIRT scholars like Adams are identified by a selection committee of faculty from multiple CSU campuses and spend 10 weeks conducting research in the lab of a foreign research advisor. Students become more aware of minority and international health problems, as well as novel approaches to resolving them. The program emphasizes the importance of international research collaboration to address health disparities worldwide.

Health disparities are gaps in the quality of health and healthcare that mirror differences in socioeconomic status, racial and ethnic background, and education level. These disparities may stem from reduced accessibility of healthcare, increased risk of disease from occupational exposure, and increased risk of disease from underlying genetic, ethnic, or familial factors.

“Students love these collaborations, and many opportunities open up because of them,” says Marcelo Tolmasky, professor in the Department of Biological Science

and director of the college’s MHIRT program. “Just this past summer, one of our participants was accepted to a Ph.D. program at the University of Oxford. That student will be able to train with colleagues abroad and bring that knowledge back. The program has also brought international students and researchers here to the college.”

*“I learned a lot from my lab mates there – not least, how to communicate scientifically while overcoming a bit of a language barrier.”*

Christina Adams (B ’13)

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The National Institute on Minority Health and Health Disparities created MHIRT in 2006. This initiative allows U.S. colleges and universities to offer short-term international research training opportunities to undergraduate and graduate students from health disparity backgrounds.

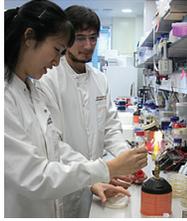
The college's MHIRT program seeks to increase the number of students from health disparities populations or underrepresented minority groups, pursuing advanced degrees in scientific, biomedical, and clinical research fields.

"It's critical to understand how other cultures view and treat the same problem, and nothing beats going there and immersing yourself in that culture," explains Tolmasky. "Global health is very important. If a strain of disease pops up in one place, it's eventually going to show up everywhere else."

International research experience allows students to both learn the methods and ideas of foreign researchers and contribute their own points of view, based on what they have learned in the United States.

"When it comes to global health, we need researchers trained in and paying attention to all aspects of the discipline," he says. "This program emphasizes how important it is to look at health issues in a more holistic way." Tolmasky explains that there are many approaches to consider. One team of clinical researchers may be studying the symptom progression and potential causes of a disease, while another team is focused on new therapeutic approaches or methods of eradication. Still others are concerned with the distribution, expense, and compliance challenges associated with a drug or treatment.

*"It's easy to focus on one set of experiments or one project in the lab. We have to remember that researchers around the globe are studying other important aspects of science."*



*Students in the Minority Health and Health Disparities International Research Training (MHIRT) program spend 10 weeks conducting important public health research in the lab of a foreign advisor.*

"We want to spark a conversation between students and professional researchers trained in all of these areas, a rich exchange of ideas that takes into account cultural sensitivities and prejudices, issues of access – aspects that they may not otherwise consider," he says.

#### **GAINING POWERFUL PERSPECTIVES ON PUBLIC HEALTH**

David Lin, a doctoral student at the University of Michigan, says his 2013 MHIRT experience enhanced his passion for science and helped him better understand its global impacts.

"Working in a lab can sometimes feel like a bubble," says Lin, who conducted research at the University of Oxford before completing his master's degree at CSUF. "It's easy to focus on one set of experiments or one project in the lab. We have to remember that researchers around the globe are studying other important aspects of science."

He learned about the program from Tolmasky, his research mentor, and eagerly went abroad to study the role of bacterial proteins in the spread of antibiotic resistance genes.

"Antibiotic resistance is a pressing issue with no clear solution. More than 23,000 deaths in the United States are directly attributable to failed antibiotic treatments as a result of antibiotic resistance," Lin explains.

A class of proteins called recombinases is able to mobilize genetic elements, including antibiotic resistance genes, allowing for an exchange between organisms. Researchers must address the spread of these resistance genes between different pathogenic organisms, he says.



"I studied how these recombinases function in *Acinetobacter baumannii*, a species of bacteria with an extremely high mortality rate as a result of antibiotic resistance," Lin says. "I learned to perform various techniques in molecular biology, such as protein purification and mobility shift assays. And, most importantly, I learned how to think. A lot of science is thinking about what experiments will support a hypothesis and, through discussions with both (international mentor) David Sherratt and Tolmasky, I learned to think like a scientist."

Lin says he would recommend the MHIRT program to anyone interested in biomedical research as an incredible opportunity to learn more about science and culture and see the world.

"We can really highlight the success of this program when we look at what happens with these students' lives after their research experience," adds Tolmasky. "They have a tremendous rate of success. A lot of students want to go back and repeat the experience, and some of them find other funding or save money so they can spend a few more weeks in a certain place. The program has a very positive influence." ●

## MODELING MODERN STEM SCHOLARSHIP

Students who successfully complete first-year required mathematics courses persist in science, technology, engineering, and math (STEM) majors at approximately double the rate of students who did not complete these courses during their first year, according to the National Center for Education Statistics.

Cal State Fullerton’s supplemental instruction (SI) program gives STEM students the tools they need to excel in their first two years. Consistently, participants earn higher grade point averages, and exhibit 20 to 25 percent better course pass rates compared to their nonparticipant peers.

“The higher pass rate gives SI students a much better chance of retaining their majors and completing their degrees,” says Marty Bonsangue, professor of mathematics and one of the coordinators of CSUF’s SI program.

Cal State Fullerton’s SI program is based on a model developed by the University of Missouri-Kansas

City (UMKC) in the 1970s. CSUF faculty and program leaders undergo regular training in all aspects of the SI model, using materials from UMKC.

While traditional support programs wait until a student is struggling and then offer remedial instruction, SI seeks to eliminate the need for “catch up” by offering proactive support. Many STEM fields include difficult gateway and bottleneck courses. Historically, many students have received D’s or F’s (or have withdrawn from the course before they earned a painful grade). Now, all students enrolled in

*“Consistently, participants earn higher grade point averages including a 20 to 25 percent greater course pass rates compared to non-participant peers.”*

these classes have access to the SI program – they get the support they need while they’re still ahead instead of after they’ve fallen behind.

“SI focuses on student retention and facilitating learning. We identify difficult courses, assign an SI leader, and regularly schedule peer-facilitated SI group discussion and study sessions,” says Mark Filowitz, associate dean of the College of Natural Sciences & Mathematics (NSM.) “The College of NSM also provides dedicated space and facilities to accommodate SI sessions so that students have a stable and consistent environment.”

Filowitz explains that SI leaders head each SI session. These leaders are exceptional students who have already mastered the course material. They are trained to facilitate group discussions. Under their direction, students meet to improve their understanding of course material, review and discuss important concepts, develop study strategies, and prepare for exams.

Since the goal of SI is to create independent learners, these student leaders provide a critical link between the classes and the SI session.

### NSM’S SUPPLEMENTAL INSTRUCTION PROGRAMS IN 50 CLASSES

more than  
**40**  
SI leaders

UP TO  
**1,000**  
STUDENTS

On average,  
SI participants score  
**0.3 to 0.7**  
grade points higher  
than nonparticipants

more than a  
**dozen** key gateway courses  
are now linked to  
SI programs

**20–25%**  
higher pass rate

MORE THAN **220** SI-LINKED COURSES SERVE  
**9,000+** STUDENTS ACROSS CAMPUS

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*“The higher pass rate gives SI students a much better chance of retaining their majors and completing their degrees.”*

Marty Bonsangue, professor of mathematics, SI program co-coordinator

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“SI offers at least two things that are hard to find elsewhere,” adds Bonsangue. “For one thing, by working with their peers rather than authority figures, students are less likely to be embarrassed if they don’t know how to do a problem. And the sessions can be tailored to meet individual needs. The facilitator and students work together to bring everyone in the group up to the level that is required for success in a college level mathematics or science course.”

*“For one thing, by working with their peers rather than authority figures, students are less likely to be embarrassed if they don’t know how to do a problem. And the sessions can be tailored to meet individual needs.”*

“On average, SI participants score 0.3 to 0.7 grade points higher than nonparticipants and have a 20 to 25 percent higher pass rate than nonparticipants,” he says.

The defining characteristic of the model is the targeting of high-risk courses rather than high-risk students. This removes any stigma associated with participating.

“While we have adjusted the program, as needed, to work within the CSUF structure, we have tried to incorporate all of the essential elements, including open access, strong leadership, and university support that are effective in the original UMKC program,” says Bonsangue.

The CSUF SI model works thanks to coordination between the academic departments and colleges as well as the Offices of Student Services and Academic Affairs. In addition to Bonsangue and Filowitz, key players in initiating the SI program at CSUF include instructors Todd Cadwallader Olsker, Philip Janowicz, Kathy Lewis, Trista O’Connell, and Sean Walker; Director of Student Academic Services Rochelle Woods; and NSM deans (past and present) Steven Murray, Robert Koch, and David Bowman.

In NSM, more than a dozen key gateway courses are now linked to SI programs says Bonsangue. Since most of these are multiple-section courses, SI programs are currently offered in about 50 classes in the college, involving more than 40 SI leaders and about 1,000 undergraduate students. With support from CSU and the Office of the Chancellor, SI is now incorporated across campus, with more than 220 SI-linked courses serving some 9,000 students from diverse backgrounds.

The Office of the Chancellor now seeks to open a Center of Excellence for SI at CSUF to help develop and support other SI programs throughout the California State University system. •

### EVIDENCE OF EXCELLENCE

The college offers SI for nearly every gateway course in mathematics, chemistry, biology, physics, and geology. These courses, such as calculus I and II, are required for STEM majors but can be difficult for many students. “Failure to pass a gateway course, such as calculus, can have a profound psychological impact on how the student sees himself or herself as ‘belonging’ to a STEM field,” explains Bonsangue. “This underscores the importance of programs such as SI, which help optimize students’ success in a course rather than weed them out.”

And there are practical consequences as well. Repeating these early classes can throw off a student’s entire course of study, potentially delaying graduation and making it much more difficult to complete the STEM major within six years.

Bonsangue says the program draws a mix of students across all academic levels, and results have shown that SI can be especially effective for students from minority or underprivileged backgrounds.



**PARTICIPANTS EARN  
HIGHER  
GRADE POINT AVERAGES**

**20 TO 25%**

BETTER COURSE PASS RATES  
compared to nonparticipant peers

## PHILANTHROPY PERPETUATES PROMISE

**Dan Black often tells the recipients of his scholarships, “This is just a loan. You have to pay it back.”**

He doesn’t mean that they owe him anything, of course. Black (P ’67) wants to emphasize how important it is that successful graduates give back to the college that gave them their start. He explains to students that without alumni contributions, the College of Natural Sciences & Mathematics (NSM) and the university as a whole can’t sustain extraordinary programs or welcome talented students who require financial support.

“When I think of the success I’ve had in my career, I realize I owe much of it to the college,” says Black, a physics graduate who reconnected with NSM in 1998 after founding three multi-million-dollar companies. “I can remember one of my professors staying up all night to help me build a laser I was working on. How many professors do that? I’ll always be grateful for those faculty who always took an interest in how I was doing and how they could help. They were my primary motivation to give back.”

In 1998, he established the Dan Black Scholarship, which provides \$25,000 annually for scholarships to physics majors. Then in 2000, he launched the Dan Black Program in Physics and Business with a \$25,000 annual donation. The program is designed to teach business concepts and entrepreneurial skills to physics majors who dream of starting a business or managing a science- or technology-related company.

“I was thrust into the business world and had to learn through trial and error,” says Black, of his first job working in sales and marketing for EG&G, a firm that manufactured physics equipment. “My physics degree gave me the

deep scientific background I needed – especially when I founded my first company, Trace Analysis Laboratory. But on the business side, I always wished I would’ve been better prepared.”

In 2006, the university renamed its science laboratory center Dan Black Hall in recognition of more than \$4 million in gifts and pledges to NSM from Dan and his wife. The Blacks have also gifted in excess of \$100,000 to the Mihaylo College of Business and Economics capital campaign as well as contributed thousands of dollars to Cal State Fullerton’s performing arts campaign.

Most recently, Black gave \$100,000 toward the purchase of a portable planetarium and related equipment that will be used to promote astronomy education and encourage NSM and CSUF students as they pursue careers in the sciences.

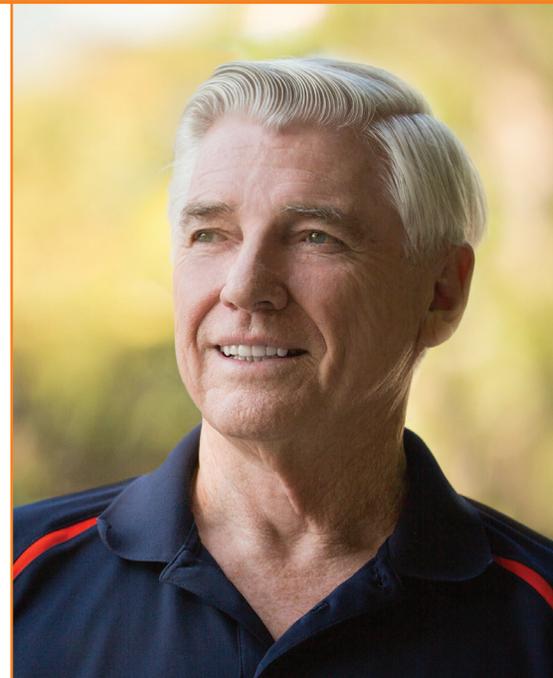
### SCHOLARLY SUPPORT AND SUGGESTIONS

Before attending the college, Black served four years in the U.S. Air Force. After graduating from NSM, working in sales, and founding Trace Analysis Laboratory, he launched MineraLab (later renamed Advanced Medical Nutrition, Inc.), which he sold in 1998. Dan then co-founded ProThera, a nutritional supplement company. He recently retired from this company.

Black has served on the Cal State Fullerton Philanthropic Foundation Board for more than a decade. In 2007, he was awarded an honorary doctorate in recognition of his entrepreneurial spirit and contributions to business, his community, and the university.

“It’s a great feeling to see someone who earned a degree in physics now working as a patent attorney; to see that – partially because of what you’ve done – someone has gone on to do incredible things,” explains Black. “That’s what these professors do every day, and now I’m fortunate enough to repay them.”

In addition to monetary support, Black frequently returns to the college to speak with recipients



*Physics alumnus Dan Black has pledged more than \$4 million in gifts to NSM and launched the Dan Black Program in Physics and Business, which teaches entrepreneurial skills to physics majors.*

of his scholarship and students enrolled in the Physics and Business Program. For those interested in starting their own businesses, he offers “Dan’s Pearls of Wisdom.”

“I tell them to realize their limitations, and hire their deficiencies,” notes Black. “When I started out, I realized I didn’t have a good accounting background, so I hired someone with a master’s in finance and let him do what he was good at. I didn’t get in his way.”

Black also advises budding entrepreneurs to share their success with their employees, realize they won’t be on top forever, let their gut guide them, and never quit.

“None of this advice is earth-shaking, but if they abide by it, they’ll be surprised how far they can go,” he says. ●

# INTRODUCING NEW FACULTY

We've welcomed 11 new faculty members over the last year.

**JOE CARLIN** (Geological Sciences), who joined CSUF in fall 2014, earned a doctorate in oceanography, with an emphasis in coastal geological oceanography, and a bachelor's degree in ocean and coastal resources at the Texas A&M University at Galveston. He also earned a B.A. in communications at the Corpus Christi campus. Before joining CSUF, he conducted postdoctoral research in the Department of Marine Sciences at Texas A&M and participated in the National Science Foundation/University-National Oceanographic Laboratory System chief scientist training program.

**JOSHUA DER** (Biological Science) joined CSUF in spring 2015. He earned his doctoral degree from Utah State University, his master's degree from Southern Illinois University Carbondale, and his bachelor's degree from Humboldt State University. He also served as a research associate and project manager for the Amborella Genome Sequencing Project at the Pennsylvania State University.

**AMANDA EVANS** (Chemistry & Biochemistry) joined CSUF in fall 2014 after working as a research fellow and visiting professor in astrobiology at The Nice Sophia Antipolis University in France and as a research associate in energy materials and flow chemistry at the University of Padova in Italy. After earning her doctorate in synthetic organic chemistry from King's College at the University of Cambridge, she continued her research into polymers and DNA nanochemistry as a postdoctoral fellow. She also served as a teaching fellow and director of studies for chemistry at Cambridge's Murray Edwards College and received a Fulbright Fellowship to study chemistry in Munich.

**LEIGH HARGREAVES** (Physics) has been teaching at CSUF for three years. A native of Adelaide, Australia, he studied physics at Flinders University, where he earned his bachelor's degree and doctorate, followed by postdoctoral work at the University of Adelaide. In 2011, he arrived at CSUF as visiting professor and lecturer and also worked in the lab of Muradha Khakoo, professor of physics.

**VALBONE MEMETI** (Geological Sciences) began teaching at CSUF in fall 2014. She earned her doctorate in earth sciences from the University of Southern California and her master's and bachelor's degrees from the Darmstadt University of Technology in Germany, where she grew up. She received a Marie Curie Fellowship from the European Union to conduct postdoctoral research at Durham University in England.

**THOMAS MURPHY** (Mathematics) joined CSUF in fall 2014 and earned his doctorate, along with his master's and bachelor's degrees, from the National University of Ireland, University College, Cork. Murphy was previously a Britton Fellow at McMaster University in Canada and was awarded a postdoctoral fellowship at the Université libre de Bruxelles. He has given lectures at universities across the world as an invited speaker.

**ALEXANDRA ORCHARD** (Chemistry and Biochemistry) joined CSUF in fall 2014. After earning her doctorate in medicinal chemistry from State University of New York, Buffalo, she worked as a postdoctoral fellow at Emory University, conducting research focusing on discovering new drugs to target such viruses as HIV and hepatitis C. She also holds a bachelor's degree in biochemistry from State University of New York, Fredonia.

**MISTY PAIG-TRAN** (Biological Science) has taught at CSUF since fall 2013 as a postdoctoral fellow and lecturer. She earned a doctorate in biology from the University of Washington, where

she taught at Friday Harbor Laboratory. She conducted postdoctoral research at Arizona State University, investigating the material properties and evolution of cartilage in deep-sea fishes. She also holds a bachelor's degree in marine biology from California State University, Long Beach.

**REZA RAMEZAN** (Mathematics) joined CSUF in fall 2014. He earned his Ph.D. from the Department of Statistics and Actuarial Science at the University of Waterloo in Canada. He earned his master's degree from Allameh Tabatabaiee University in Tehran, Iran, and his bachelor's degree from Isfahan University of Technology in Iran. He previously served as a lecturer in statistics at the University of Waterloo.

**MATTHEW RATHBUN** (Mathematics) joined CSUF in fall 2014. He earned his Ph.D. in mathematics in 2010 from the University of California, Davis, and recently served as a teaching fellow at Imperial College London, after spending two years as a research associate there. He also spent one year as a research training grant postdoctoral instructor at Michigan State University. His teaching experience includes algebra classes at Sacramento City College and more advanced axiomatic geometry, higher geometry, and abstract algebra courses at Michigan State University.

**MARÍA SOLEDAD RAMÍREZ** (Biological Science) joined CSUF in fall 2014 as an assistant professor. She earned her Ph.D. and master's degree at the University of Buenos Aires in Argentina. Her research areas include molecular mechanisms of antibiotic resistance and their dissemination, evolution, and the impact in the morbidity and mortality of bacterial infections. She teaches General Microbiology and Advances in Microbiology. While living and working in Argentina, she served as a foreign mentor for the Minority Health and Health Disparities International Research Training Program (MHIRT).

CONTINUED FROM PAGE 2 ›

After they complete the program, some students return as tutors. Others, who pursue CSUF math degrees, become instructors, and still others become speakers and professional role models in industry or academic STEM professions.

## REAL-WORLD ROLE MODELS

Project MISS relies on the support of corporate sponsors, including Fluor, Edison International, and Walmart.

“This summer will be our 15th year of supporting Project MISS,” says DeeDee Rosenthal, community relations manager for the Southern California offices of Fluor, a global engineering and construction company. “Supporting quality education, with an emphasis on STEM, is one of Fluor’s giving priorities, and Project MISS really gives girls the support and confidence in their math skills that they need to be successful. Math is so important, no matter what career they choose, and a regular classroom can’t always offer the time or resources these young women require.”

In addition to supporting the program financially – with more than \$75,000 so far – Fluor sends female engineers each year to speak with the young women about their careers, the varied disciplines open to those with strong math skills, and the importance of higher education.

“It’s rewarding for the engineers. The women who go with us are always so happy to encourage – and hopefully inspire – the girls,” adds Rosenthal. “The responsibility to support these young women extends beyond their homes and classrooms to corporations and community organizations as well. We need to ensure that these strong young women have what they need to become the successful leaders of tomorrow.”

As an energy company, Edison International also focuses its educational funding on preparing students to excel in STEM areas and promotes the inclusion of underrepresented students in these academic fields.



The company provides funding for scholarships and program support and, each year, identifies a female Edison executive to speak to the Project MISS class. This speaker shares personal stories about her educational pursuits and career path, encouraging the girls to continue their education and become leaders in their chosen fields.

“Corporate support – in the form of both female role model speakers and funding – has allowed the program to continue over the years,” notes Pagni.

## PROVING THEIR POTENTIAL

When the program began, no one knew how long it would last.

“The last 25 years seem to have vanished for the program, but that is true for many things,” says Pagni. “In that time, MISS has demonstrated what a university should be doing in terms of offering programs that support students who desire to go to college.”

It certainly worked for Pilz.

“I think the program allowed me to open up in the classroom,” she explains. “I was always the quiet kid who slipped through the cracks. I was not a behavior problem and my parents did not communicate with the teachers, so I went unnoticed. In this program, I was with a group

of girls all day, got to know them, and became a part of a community of learners. It was the first time I ever spoke up and contributed in class.”

She also looked up to Pagni, impressed that a professor would dedicate so much time and energy to helping high school students.

“He believed in our ability to understand and apply the math,” says Pilz. “Up to that point, I had never felt valued as a student. I always felt I just passed through my classes without having to demonstrate content knowledge.”

After her time in Project MISS, Pilz graduated from high school and successfully completed all of the calculus level classes and higher that she took at community college and the University of California, Los Angeles. She began teaching – both at the high school and college level. Currently she teaches Common Core math, geometry, and Advanced Placement statistics.

Each day, she reflects upon lessons she learned 25 years ago.

“It is important for students to experience success early on and throughout the course,” explains Pilz. “I use the pacing of the class to keep students engaged. I hope that they leave my class believing that they can do math and are excited to learn and understand the next course.” ●

# FACULTY RESEARCH

## NSM CHEMIST MAKES STRIDES WITH FUEL CELLS

Assistant chemistry Professor **John Haan** and his team have made exciting advances in alternative energy research with a focus on fuel cell technology.

“In 2012, we developed a direct formate fuel cell, which converts aqueous formate directly into energy,” explains Haan. “The use of formate as fuel is a new concept, but it is very promising compared with other fuels because formate is nonflammable, noncorrosive, and nontoxic. We have worked extensively to optimize this fuel cell in order to make it practical. Our most recent publication on the direct formate fuel cell demonstrates its operation with an inexpensive catalyst and at ambient conditions.”

In the last six months, Haan’s team created the first formate fuel cell on a paper microfluidic platform, in collaboration with Frank Gomez at California State University, Los Angeles. This type of microfluidic fuel cell has potential applications in point-of-care diagnostic devices and other electrochemical sensors.

“We are also carrying out a project funded by the Petroleum Research Fund to study how adding transition metals to palladium may make a more efficient and inexpensive catalyst for the oxidation of fuels, particularly formate,” he says. “This project is a collaboration with Su Ha and Louis Scudiero at Washington State University.”

Haan’s team recently demonstrated that a variety of renewable fuels (formate and various alcohols) could be used in the same fuel cell to create a flexible-fuel fuel cell.

“Not only would this fuel cell allow various fuels, but the fuels would not have to be pure. If they were ‘contaminated’ with other fuels during production, it would not be detrimental,” he explains.

# FACULTY AWARDS

## ASSISTANT PROFESSORS RECEIVE GRANT FOR CHEMICAL SCIENCES LECTURE SERIES

**Amanda Evans** and **Alexandra Orchard**, both new assistant professors of chemistry and biochemistry, received a 2014 Jean Dreyfus Boissevain Lectureship for Undergraduate Institutions grant award, offered by the Camille and Henry Dreyfus Foundation, to support a lecture series and undergraduate research in the chemical sciences. Cal State Fullerton is one of five institutions nationwide selected for the \$18,500 Camille and Henry Dreyfus Foundation grant.

## GROUNDWATER EXPERT RECEIVES GRANT FROM NATIONAL GROUNDWATER ASSOCIATION

**Richard Laton**, associate professor of geological sciences, has received more than \$2 million in research grants from the National Ground Water Association for projects related to water quality, use, and management. He is currently developing a geological and hydrogeological conceptual model of the Malibu Valley Groundwater Basin.

## CAL STATE FULLERTON RECEIVES MORE THAN \$600,000 FOR BIOSCIENCE SCHOLARSHIP PROGRAM

The Scholarships to Enhance Excellence in the Chemical and Biological Research-based Workforce program, developed by science faculty members **Barbara L. Gonzalez**, **Chandra Srinivasan**, **Marcelo E. Tolmasky**, and **Sean E. Walker**, has been awarded a \$617,139, five-year grant from the National Science Foundation. Over the next five years, the funding will provide scholarships to 80 students interested in joining the biological and chemical workforce.

## NATIONAL SCIENCE FOUNDATION GRANT WILL PREPARE MATH STUDENTS FOR GRAD SCHOOL

Cal State Fullerton has been awarded a \$600,146 grant supporting math faculty members **Angel Pineda** and **Scott Annin** and their four-year Graduate Readiness and Access in Mathematics Program. Six undergraduates will be selected each year to receive a \$5,000-per-year stipend for two academic years as well as mentoring, research experience, graduate school exam preparation, and invitations to conferences.

## PROFESSORS WIN AWARD FROM UNIVERSITY OF CALIFORNIA OFFICE OF THE PRESIDENT

**David Pagni** and **Margaret Kidd**, both professors of mathematics, have received a \$23,000 award from the University of California Office of the President for their participation in the California Mathematics Project at CSU Fullerton. The project is a collaborative, statewide network of classroom teachers and university scholars dedicated to providing students with a rich, rigorous, and coherent mathematics curriculum.



# RECO

## STUDENT SPOTLIGHT

### BIOCHEMISTRY STUDENT RECEIVES TOP UNDERGRADUATE RESEARCH AWARD

Biochemistry major **Ashley Chui** received the top undergraduate research award at CSU's Biotechnology Symposium this January for her work with neurodegenerative diseases. Now a senior, Chui began working with her mentor, Michael D. Bridges, assistant professor of chemistry and biochemistry, in 2012 as part of the Research Careers Preparatory Program.

### PHYSICS STUDENT SPENDS SUMMER RESEARCHING IN ITALY

Last summer, physics major **Adrian Avila-Alvarez** worked on the Virgo gravitational-wave detector in Cascina, Italy, as part of the University of Florida's International Research Experience for Undergraduates program. His work focused on assessing the coupling of electromagnetic noise into the signals recorded by the Virgo.

### MATHEMATICS MAJOR EARNS ACTUARIAL SCHOLARSHIP

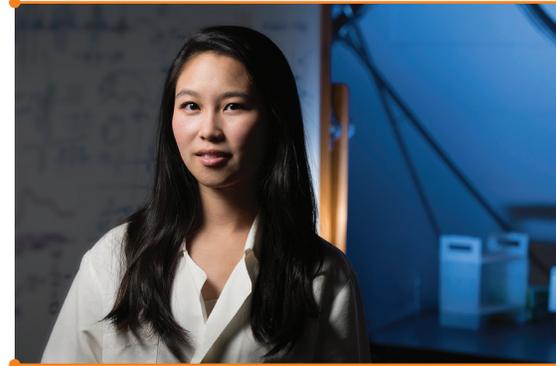
Last fall, **Rudolph Saenz**, a senior majoring in mathematics – probability and statistics – was among 42 students nationwide awarded the Actuarial Diversity Scholarship from the Actuarial Foundation. This scholarship recognizes African-American, Hispanic, Native North American, and Pacific Islander students for their academic achievements in pursuing a degree that may lead to an actuarial career.

### BIOLOGY GRADUATE STUDENT'S SPIDER STUDY WINS AWARD

**Elizabeth Herrera**, a graduate student majoring in biology, won second place for her research presentation on embryonic spider development at this summer's national meeting of the American Arachnological Society in Ohio. Herrera is creating a universal system for determining the stage of a developing spider.

### GEOLOGY GRADUATE STUDENT CONDUCTS DINOSAUR EXPEDITIONS

Geology teacher and graduate student **Peter Kloess** spends his summers conducting dinosaur expeditions in the Four Corners region of the United States for the Natural History Museum of Los Angeles County and the Raymond M. Alf Museum of Paleontology in Claremont. In New Mexico, Kloess has uncovered teeth of tyrannosaurids (a family that includes *Tyrannosaurus rex*), and in Utah, he's found hadrosaur (duck-billed dinosaur) fossils.



*Ashley Chui, biochemistry major*



*Peter Kloess, geology teacher and graduate student*



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## UPCOMING EVENTS

### Physics Fair

Physics Department  
Saturday, April 18, 2015  
12:00 p.m. – 5:00 p.m.  
6th floor of McCarthy Hall, Cal State Fullerton  
*For more information, please contact: [physicsclub.csuf@gmail.com](mailto:physicsclub.csuf@gmail.com)*

### “Research Day 2015” – Department of Geological Sciences

For Geology and Earth Science Students  
Friday, April 24, 2015  
3:00 p.m. – 6:00 p.m.  
Cal State Fullerton  
*For more information, please contact Richard Laton at [wlaton@fullerton.edu](mailto:wlaton@fullerton.edu)*

### Project MISS 25th Anniversary Celebration

Friday, July 31, 2015  
Fullerton Marriott at California State University  
*For more information, please contact: Monica Garza at [mogarza@fullerton.edu](mailto:mogarza@fullerton.edu)*

### Prehistoric OC – The Cooper Center

Saturday, October 10, 2015  
Ralph B. Clark Regional Park  
*For more information, please visit: [www.prehistoricoc.org](http://www.prehistoricoc.org)*