INTERSECTIONS

CAL POLY COLLEGE OF SCIENCE AND MATHEMATICS | 2020-21

creating
COMMUNITY

HEALTHY · **INCLUSIVE**
EQUITABLE · GLOBAL

INTERSECTIONS

Cal Poly College of Science and Mathematics | *2020-21*

pg 12

healthy ***communities***

inclusive & equitable ***communities***

Cover photo by: *Joe Johnston*

global ***community***

pg 18

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letter from the dean

Science and mathematics are inherently communal activities. The great power of these human endeavors is our accumulation of knowledge and truth over time, which comes from building on one another's progress to move society forward and improve our quality of life. Every Nobel Prize or Fields Medal winner has built on other people's contributions.

We encourage our students not only to do well in the world but to do good with the knowledge and skills they gain at Cal Poly. Whether advancing our fundamental knowledge about Earth or the universe or applying that knowledge, this process of discovery and innovation, in its noblest form, serves the common good.

Our understanding of the common good must be grounded in inclusion and equity. This means making our own disciplines of science and mathematics accessible and welcoming to all people, regardless of gender, racial, socioeconomic or other backgrounds. It also means ensuring that the projects we choose benefit people in greatest need and that the knowledge we produce is available to all.

I am proud of the contributions our students and alumni are making to their communities at all levels — locally, to the state of California and the nation, and even globally. They are making effective use of their ability to discover and innovate using the skills and mindset they learned right here on campus. They are learning by doing good.

And I'm grateful for your contributions to our Cal Poly community, which extends far beyond San Luis Obispo. From offering financial support, to giving guest presentations in classes, to hiring Cal Poly graduates, to bringing a Learn by Doing approach to your daily life, you continue to create and grow this community of lifelong learners, intrepid innovators and caring individuals.

The challenges presented to us at this moment in history are substantial, but when we approach, consider and solve them together, we can and do change the world for the better. //

I'M GRATEFUL FOR YOUR CONTRIBUTIONS TO OUR CAL POLY COMMUNITY, WHICH EXTENDS FAR BEYOND SAN LUIS OBISPO.

DEAN WENDT, DEAN
College of Science and Mathematics

An Innovative Response

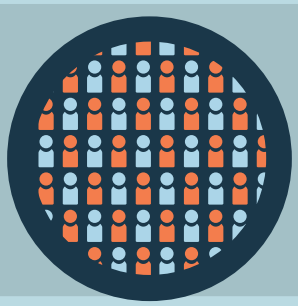
Inside Cal Poly's Saliva-Based COVID Testing Program

Design by : Connor Mariott

Led by the College of Science and Mathematics, faculty, staff and students from across campus created a new lab to run in-house, saliva-based and wastewater COVID-19 surveillance tests. The lab helped the university keep the Cal Poly community safe by more effectively catching infections before they spread — all while providing students a valuable Learn by Doing experience.

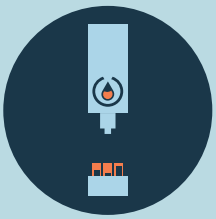
The Team

From students to faculty to technical, health, facilities and maintenance staff, the Cal Poly community came together to make the lab work.

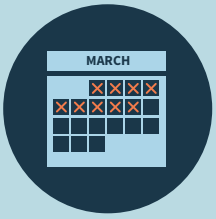


25 STUDENTS
FROM
3 COLLEGES

FACULTY AND STAFF LEADERSHIP & SUPPORT
FROM DEPARTMENTS ALL ACROSS CAMPUS



8 OPENTRONS ROBOTS
TO MOVE LIQUID SAMPLES

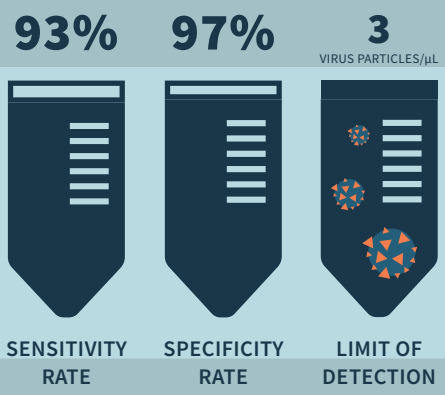


3 MONTHS
FROM GREEN LIGHT TO FIRST TESTS

> *"It's cool to actually apply what you did in a lab class to real life."*
>
> **VINAY GOPAN,**
> **Microbiology Student**

Saliva Testing

Thanks to a quick turnaround time and high accuracy, the university could test all students coming to campus twice a week.

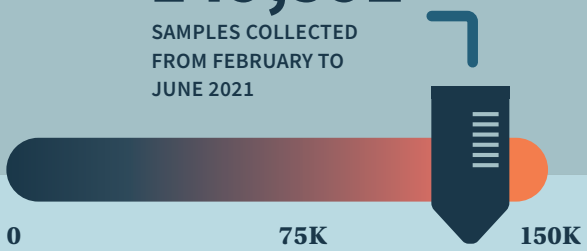


Defining Terms

Sensitivity rate is in regard to accurately determining if someone is positive for COVID-19, while specificity rate is in regard to accurately determining if someone does not have COVID-19. Limit of detection is the lowest amount of pathogen that can be differentiated in a clinical sample.

4,000
TESTS IN 8 HOURS

149,592
SAMPLES COLLECTED FROM FEBRUARY TO JUNE 2021

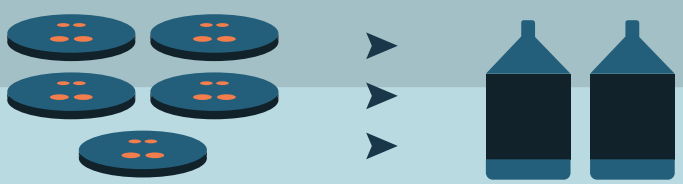


"I'm really proud of our protocol — it is unique ... We are able to do it much more efficiently and much faster than other institutions."

JEAN DAVIDSON
Biology Professor

Wastewater Testing

Wastewater testing monitored for potential outbreaks before they spread and allowed for more targeted saliva testing if necessary.



CAL POLY PULLED UP TO

10 GALLONS

OF WASTEWATER OUT OF FIVE MANHOLES TWICE A WEEK.

UP TO

55 MILLION

VIRUSES PER LITER WERE DETECTED

FILLING THE GAPS

STUDENTS HELP COMMUNITY MEMBERS OWN THEIR HEALTH

Keeping an entire population healthy isn't easy. Through the Mi Gente, Nuestra Salud program — which translates to My People, Our Health — students discover firsthand who the public is and what efforts are sometimes necessary to connect communities to healthcare.

Part of Cal Poly's Center for Health Research, Mi Gente, Nuestra Salud aims to give marginalized community members in Santa Maria and Guadalupe the resources and knowledge needed to take ownership of their health.

The first step in this approach is asking people what they need. Student volunteers got a real-world lesson in the art and science of survey creation and administration. In previous public health surveys from sources such as the federal census and the city of Santa Maria, data wasn't collected for certain community groups for multiple reasons. Perhaps people spoke only Mixteco, rather than Spanish or English, or never had the opportunity to become literate, or maybe they were undocumented and feared that their responses might put them in danger.

Students and their faculty mentors developed a survey to fill in the gaps in the existing data sets.

"Before the project started, the students looked into what we know about the health status of the Santa Maria community," said Marilyn Tseng, an epidemiologist and professor in the Kinesiology and Public Health Department. "We were trying to capture those voices that aren't captured in typical surveys." Tseng co-leads the project with kinesiology and public health Professor Suzanne Phelan and Cuesta College professor Mario Espinoza-Kulick.

In order to capture these voices, researchers needed to make new questions, take the survey to the places where underrepresented community members were and administer the survey in a way that made it easy for people to complete it.

> "THIS RESEARCH METHOD CENTERS AND RESPECTS THE PEOPLE WITH WHOM YOU'RE DOING RESEARCH. IT'S LISTENING TO THE PARTICIPANTS FOR WHAT *THEY* THINK IS IMPORTANT."
>
> — MARILYN TSENG

After creating the survey, students discovered what it takes to reach out to a marginalized population. They translated the survey into Spanish and took paper copies to people waiting in their cars to pick up food at the Allan Hancock College distribution site. Sometimes they read the surveys to community members. When they saw that the survey was too long for people to finish, they changed the questions based on community feedback.

"This research method centers and respects the people with whom you're doing research," Tseng said. "It's listening to the participants for what *they* think is important."

The student-collected data will be used to identify the community's major health needs and influence how to address them. As they move forward together, students, faculty, staff and community members will become partners in public health. //

Pictured: *The Mi Gente, Nuestra Salud team prepares to work with community members.* ***Image courtesy of:*** *Mi Gente, Nuestra Salud.*

PRACTICING A PASSION FOR EQUITABLE HEALTHCARE

BY IRMA TORRES, PUBLIC HEALTH '21

Mi Gente, Nuestra Salud in conjunction with the Mobile Health Unit and HLTH 281 Health Ambassadors were my most valuable Learn by Doing experiences at Cal Poly. As a public health major with a culture and society in health concentration, I got to try out my future career plans by going directly into a community to promote and advocate for health equity among underrepresented and vulnerable people.

The direct English translation of Mi Gente, Nuestra Salud (MGNS) is "My People, Our Health." The name encompasses our goal of creating a people's movement for health ownership among the residents and community members of Santa Maria and Guadalupe.

As a female-identifying person of color (Chicanx) who grew up in an agricultural town with a mostly Hispanic population, I could identify with the people I worked with. My background helped me give a voice to an often-silenced population. These projects also aligned with my greatest passion, which is to decrease health inequity in marginalized communities.

So many studies show the health disparities between people of color and their white counterparts, but the data stops there. I'm proud of my work in MGNS because we designed the project to empower community members to play a role in their own wellbeing and let them show us where resources need to be allocated. We are attempting to do something about these disparities, not just show that they exist. It is rare for healthcare research to come from a bottom-up approach.

MGNS allowed me to see a situation from various angles — from a healthcare provider, through a community lens and from the person in need of care. Similarly, as a health ambassador on the Mobile Health Unit, I was able to directly see how free primary healthcare and preventative services positively impacted the womxn who visited the unit.

I also gained a greater understanding of the importance and impact of a person's social identities and saw how the intersection of these identities affects people's lives. For example, being female-identifying and Hispanic leads to different experiences than being male-identifying and Hispanic.

> "MY BACKGROUND HELPED ME GIVE A VOICE TO AN OFTEN-SILENCED POPULATION." — IRMA TORRES

Now I work as a health educator at BREATHE Southern California and the Emphysema Foundation of America. My Cal Poly experience is helping me a great deal because I'm comfortable doing community outreach in English and Spanish. Working with MGNS and the Mobile Health Unit also taught me to look at the larger picture, not only to focus on health outcomes but also on the possible influencing factors and behaviors that led up to or reinforce those outcomes.

I look forward to helping more organizations adopt a community-centered approach to achieving health equity for marginalized communities. //

Pictured: (left) *Irma Torres, second from right, and the staff of the Mobile Health Unit.* ***(right)*** *Torres, second from right, and the Mi Gente, Nuestra Salud research team ready for a day of collecting survey responses.* ***Photos courtesy of:*** *Irma Torres.*

proud to be an indigenous educator

FUTURE TEACHER MANUELA CRUZ WANTS EVERY CHILD TO REALIZE THEIR FULL POTENTIAL.

GROWING UP IN SANTA MARIA, MANUELA CRUZ (LIBERAL STUDIES, '21) DREAMED OF ATTENDING CAL POLY. THOUGH HER PATH WAS LITTERED WITH OBSTACLES, HER QUIET DETERMINATION KEPT HER MOVING FORWARD UNTIL ONE LIFE-CHANGING DAY IN AN ELEMENTARY SCHOOL CLASSROOM POINTED HER FIRMLY IN THE RIGHT DIRECTION.

Cruz, who spent her first eight years near Oaxaca, Mexico, remembers her early childhood fondly: "I was happy playing with my cousins and my friends. We would leave the house, be out all day and come back when it was dark. I was really free. When I look back and think about my parents, though, it was not as good."

After Cruz survived what doctors predicted would be a deadly bout of meningitis, her parents decided to move the family to the U.S. to better care for their children. From a carefree life, Cruz landed in a place where she didn't know anyone and had to stay inside all day because both parents worked.

During her own schooling, Cruz never could have predicted that one day she'd find great joy in walking into a classroom.

"School was the hardest part" about life in the U.S., she said. "I started falling behind. Everything was two to three times harder because I didn't know the language. I didn't have friends till fourth or fifth grade. I felt invisible."

With that background, discovering she had a passion for teaching was a complete surprise.

When the Deferred Action for Childhood Arrivals policy (DACA) was put in place, Cruz enrolled in a nursing program at Allan Hancock College. Waiting in place in 2012, she took an education course that included classroom observation.

> THE CHILDREN WERE DELIGHTED. THEY HAD WHAT CRUZ HAD NEVER HAD — A TEACHER WHO LOOKED AND SPOKE LIKE THEM.

continued

Pictured: ***(left)*** *Manuela Cruz in the Dream Center at Cal Poly, where she met other students who shared her experience.* ***Photo by:*** *Joe Johnston.* ***(above)*** *Cruz, center, and members of the Educators of Color Club distribute backpacks full of school supplies for farmworkers' children.* ***Photo courtesy of:*** *Manuela Cruz.*

While sitting with a group of students, Cruz tried to connect with the shyest one, asking him a direct question. One of the other students informed her that the boy didn't speak English or Spanish, only Mixteco, an indigenous language.

"That's OK," she said, "I speak Mixteco."

The children were delighted. They had what Cruz had never had — a teacher who looked and spoke like them.

"I loved how they were so happy and they were so proud of telling other students that they spoke Mixteco," Cruz said. "It was a completely different experience than what I had, and I thought, if I can give them a different view of their home language, something I've never had, I'd love to do that. Growing up I never thought I could be anybody. I never thought I could have a good job or a career. I never saw anyone that had a good job that was indigenous like I was, that spoke Mixteco like I did. Representation is so important. This is what I needed, this is what students need, and I felt like I could be this, I could do this."

Though her passion for teaching never wavered, Cruz struggled to form an identity as a teacher while an undergraduate at Cal Poly, a predominantly white university. Once again, her classmates and role models didn't look like her and didn't share or understand her background or experiences.

She found a sense of belonging and community at the campus Dream Center, a space dedicated to providing services and support to undocumented students.

"I started going into the Dream Center and started seeing more students of color and seeing this isn't just my experience," Cruz said. "I felt like that was my community, this was my place.

"The staff advocates were Kat Savallos, the coordinator, and Catherine Trujillo. I felt like no matter what, they would be there and help support students. It was my first experience of being in a community that was always there for each other. It was the only place that would understand truly what I was going through."

During her senior year, Cruz helped to co-found and served as vice president of the Educators of Color Club. The club has a dual mission. Club members come together to support one another so future education students don't experience the same identity struggles Cruz and other club founders did.

They also see building up the community as part of their role as educators. Many of them are the children of farmworkers and intimately understand the challenges and difficulties families in that industry face. The club's outreach projects have supported the children of farmworkers through a holiday toy and book drive and the donation of backpacks full of school supplies.

Club co-advisor and education Professor Tina Cheuk finds Cruz's dedication inspiring.

"What most impressed me about Manuela's educational journey is that in spite of all of these personal adversities, she found inner strength and a commitment to persist and continue her education both to better the life of her multigenerational family and to work for students who share her similar lived experiences and identities in the Santa Maria community," Cheuk said.

> "GOING TO CAL POLY, I FOUND WHO I AM, WHERE I AM, WHERE I BELONG. I'M AN INDIGENOUS WOMAN. THAT'S WHO I AM. I BELONG HERE." — MANUELA CRUZ

Despite her struggles, Cruz is proud to be a Cal Poly graduate.

"Going to Cal Poly, I found who I am, where I am, where I belong. I'm an indigenous woman. That's who I am. I belong here."

Cruz is pursuing her multiple subject teaching credential and master's degree in curriculum and instruction through Cal Poly's School of Education. When she completes her program, she plans to teach fifth or sixth grade in Santa Maria.

"I would love to see more indigenous students go into education, to change that view that I don't belong in any of the spaces," Cruz said. "The indigenous community in Santa Maria has so much potential, but as a community we're not doing enough to support them. So I hope from Cal Poly that we do more and we come together to help our community because if we don't help them no one's going to." //

Pictured: (left, top to bottom) *Manuela Cruz (**second from right**) at home with **(from left)** her brother Ricardo holding her sister Janet, brothers Eduardo and Rigoberto and cousin Daniel; the Cruz family at Lopez Lake; Cruz with her parents and brothers at her high school graduation.* ***Photos courtesy of:*** *Manuela Cruz.* ***(above, top to bottom)*** *Cruz in front of Roberto and Dr. Francisco Jimenez Elementary where she is doing her clinical practice as a teacher candidate,* ***photo by:*** *Joe Johnston, and in her Cal Poly graduation gown,* ***photo by:*** *Jamie Soja.*

welcome to the water

WHO DECIDES TO ATTEND CAL POLY? WHO CHOOSES TO BECOME A MARINE SCIENTIST? THE COLLEGE OF SCIENCE AND MATHEMATICS IS EMBARKING ON A VISIONARY EXPERIMENT TO CHANGE THE ANSWERS TO THOSE QUESTIONS.

Through a partnership with the Santa Rosa Creek Foundation, the college aims to attract future marine scientists from historically underrepresented groups starting in middle school and support them and their love of science through the beginning of their professional or graduate school career.

"We can see the difference a diverse workforce has in addressing disparities in healthcare, for example," said Dean Wendt, dean of the college. "We need that breadth of perspective to solve the challenges of marine conservation at this crucial time in our planet's history. That means we need to get kids interested in science and mathematics early."

STEP 1: A LOVE OF SCIENCE

Learn by Doing experiences increase curiosity and kindle passion for a subject. Many middle school students don't get to do hands-on science. Partnering with Lindsay Unified School District in Tulare County, California, the marine sciences program will develop a model for bringing the ocean to students in the Central Valley and vice versa.

The college will fund travel expenses for seventh- through ninth-graders from this underserved area to explore physical and life sciences with Cal Poly student mentors who are trying out teaching in the Learn by Doing Lab course. While on the Central Coast, students will also experience the ocean — some of them

for the first time — through guided tide pool observations at Montaña de Oro State Park, visiting the Central Coast Aquarium in Avila Beach or attending the Cal Poly Pier Open House.

Cal Poly students in the Communicating Ocean Sciences course will bring touch tanks with marine invertebrates and other activities to Lindsay schools for those who are unable to travel.

"These hands-on learning opportunities can be transformative and impact learners' education and future career choices," said Nikki Adams, biology professor and outreach coordinator for the partnership.

STEP 2: I COULD BE A SCIENTIST

As students in Lindsay Unified enter high school, a number of programs will give them the skills and confidence to see themselves as scientists.

Cal Poly students will tutor high school students in mathematics, an important skill for all science majors. Lindsay students will also be invited to join the Math Academy, a summer camp that lets students discover mathematics by solving puzzles.

For juniors whose academic accomplishments meet Cal Poly's admissions requirements, a summer marine science camp will provide an immersive experience. Students will stay on campus and interact with marine ecosystems and organisms through real-world research with faculty mentors.

"Science is so critical to understanding our life, our planet and our world," said Tom Rooney, Lindsay schools superintendent. "The more exposure we can offer our learners, the more they'll become interested in the sciences. They'll begin to discover their role and the influence they can have in that area."

> "SCIENCE IS SO CRITICAL TO UNDERSTANDING OUR LIFE, OUR PLANET AND OUR WORLD"
>
> — TOM ROONEY, LINDSAY USD SUPERINTENDENT

STEP 3: MAKING CAL POLY POSSIBLE

As Marine Science Scholars, students with high financial need will be eligible for scholarships that cover 100% of tuition and fees. In addition, admissions officers will offer workshops and help with applications for first-generation students.

"The scholarships are an essential component," Rooney said. "Tulare is one of the most economically impoverished counties in the country. In Lindsay, 100% of our learners qualify for free and reduced lunch. When our learners come to realize that the university is investing in their future, that's a strong motivator for them to perform to the highest levels of academic and personal excellence."

STEP 4: LEARN BY DOING

Once these young scientists join the Cal Poly community, they will engage in a lab-based curriculum and paid research opportunities. Working side-by-side with faculty mentors, they will discover new scientific knowledge that can make an impact in marine conservation and adaptation to climate change.

continued

"THESE HANDS-ON LEARNING OPPORTUNITIES CAN BE TRANSFORMATIVE AND IMPACT LEARNERS' EDUCATION AND FUTURE CAREER CHOICES."

– NIKKI ADAMS, BIOLOGY PROFESSOR AND OUTREACH COORDINATOR

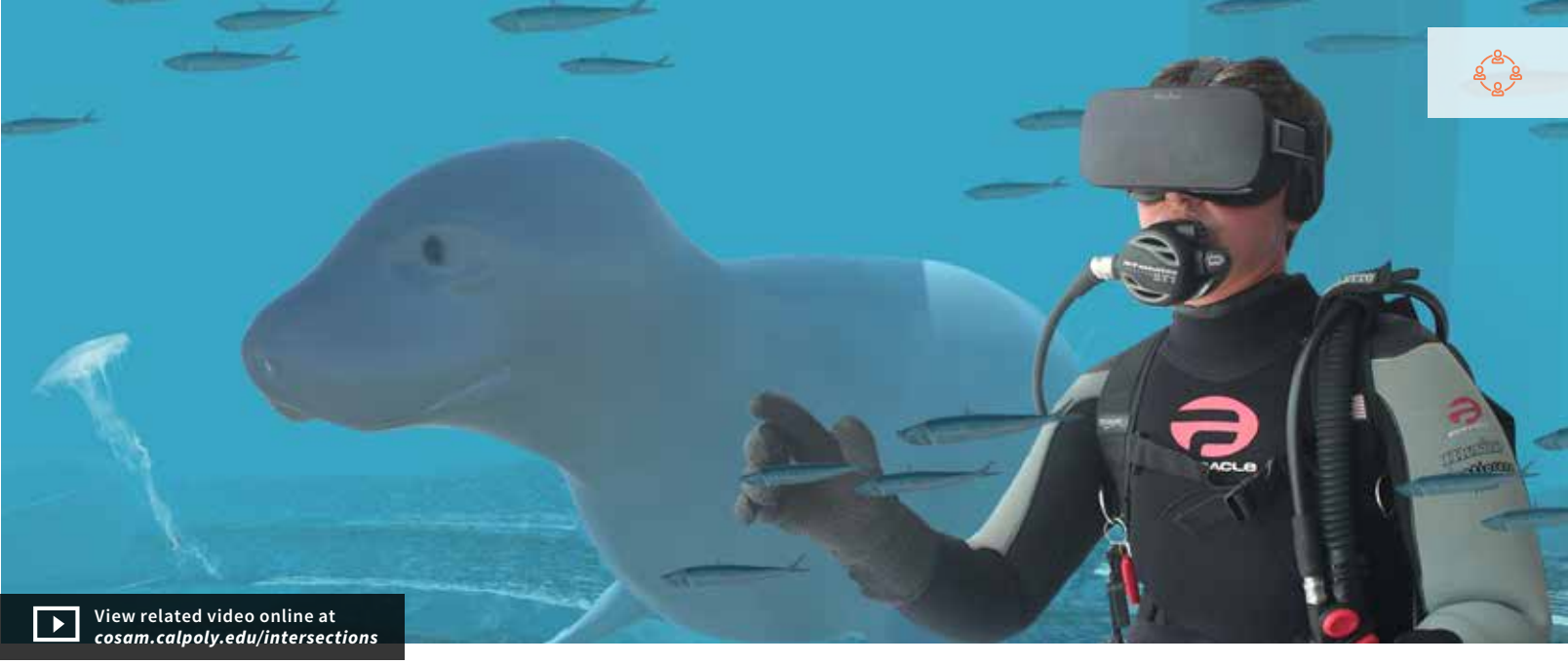
The College of Science and Mathematics is partnering with departments across campus that offer guidance and an increased sense of belonging to students from underrepresented backgrounds. This sense of welcome and inclusion is key to student success and helps students stick with their academic program through inevitable challenges.

STEP 5: PREPARING FOR THE FUTURE

The program will create a bridge to various professions. Students who pursue a graduate degree at Cal Poly will be eligible for fellowships that provide full funding. Through existing relationships with industry and governmental agencies, the college will develop paid internships that will lead to future employment in fields such as marine conservation or aquaculture.

"We're going to support these future scientists and policymakers from before they apply until after they graduate," said Wendt. "This program is going to provide incredible opportunities for these students. Their presence here will strengthen Cal Poly, and their future work will improve the health of our oceans." //

Pictured: *The Cal Poly Pier* ***(page 12 and right)*** *and research vessel* ***(above)*** *open up Learn by Doing experiences such as student-faculty research and course-related field work. Through this new partnership, students from Lindsay Unified School District would have access to these opportunities in middle and high school.* ***Photos by:*** *Brittany App* ***(top)*** *and Joe Johnston.* ***(previous page)*** *Elementary school students get a taste of hands-on science in the Learn by Doing Lab.*



View related video online at *cosam.calpoly.edu/intersections*

UNDER THE SEA

HOW DO YOU TAKE AN ENTIRE MIDDLE SCHOOL SCIENCE CLASS SCUBA DIVING? VIRTUALLY, OF COURSE.

Biology student Meg Beymer spent the summer creating a lesson plan that uses virtual reality (VR) to teach marine science. Her work was funded through a partnership with the Santa Rosa Creek Foundation and the STEM Teacher and Researcher Program.

Dive Beneath the Surface, as the educational VR experience is called, helps elementary and middle school students fall in love with marine science even if they've never seen the ocean.

"I love talking to young students and getting them excited about the ocean," said Beymer, who introduced children to marine invertebrates during the course Communicating Ocean Sciences. "My favorite part is when I get to see their eyes light up when they touch the animals. My hope is to spread some of that same awe with this DiVR 360 lesson plan."

Beymer worked with fellow students and Frost Research Fellows Maddie Verburg and Landon Keller to record 360-degree video underwater in multiple marine habitats. They then worked with Laguna Middle School science teacher Lesley Salter to develop a lesson plan aligned with the Next Generation Science Standards for sixth- through eighth-graders.

In the lesson plan, students discover that organisms depend on their environment to survive and reproduce by virtually exploring different marine ecosystems. They hypothesize about which habitat will have the most anemones, sea stars and sea urchins, and then test their hypothesis using VR. By counting and graphing the numbers of organisms, students draw their own conclusions about how habitat affects populations. They also practice communicating their results to their fellow students who studied a different VR environment.

"The middle school students are really learning the process of science, not just memorizing terms," said Crow White, a marine sciences professor and co-leader, with electrical engineering Professor Lynne Slivovsky, of Dive Beneath the Surface. "Plus they get to experience the ocean and appreciate its beauty and complexity."

> "THIS PROJECT MADE ME REALIZE I AM MEANT TO BE AN EDUCATOR."
>
> — MEG BEYMER

White stressed that the interdisciplinary nature of the project gave Cal Poly students hands-on experience in a variety of fields. To bring their knowledge of marine biology to life in the classroom, the research team had to get certified in scientific diving, learn underwater videography and video editing, and find out how middle school students learn.

"We were exploring new technology and software that no one we knew was familiar with, not even our professors," Beymer said. "We needed to do our own research and reach out to people living on the other side of the world to figure out our problems."

Her teammates' and her resourcefulness will benefit young scientists through the VR lessons and through what Beymer learned about herself during this experiment.

"Hopefully, we will inspire some future marine scientists," she said. "This project made me realize I am meant to be an educator, and I look forward to creating Learn by Doing projects like this one for my future students." //

EQUAL ACCESS TO THE COSMOS

Cal Poly physics professor Louise Edwards teamed up with her former colleague, Meg Urry, of Yale University, to teach young astronomers that addressing inequities in their field is as fundamental as particle physics. Together they created the Granville Academy, a weeklong series of diversity, equity and inclusion workshops for Cal Poly and Yale students, held first at Yale and last summer online. Here are some basic elements for focusing on inclusion in astronomy.

1

2

3

4

30

10,110

5

1 **KNOWLEDGEABLE AND EXPERIENCED INSTRUCTORS:** Edwards, an astrophysicist, organized the academy and led multiple workshops. Thanks to the virtual format, Cal Poly statistics instructor Immanuel Williams joined her with a keynote titled "You Betta NOT Give Up…: Words of Wisdom on Your Journey Towards Your Ph.D." Urry and Yale graduate student Malena Rice also led workshops. 2 **CURIOUS AND DEDICATED STUDENTS:** Ten Cal Poly students joined their counterparts from Yale to discuss implicit bias, stereotype threat, microaggressions, sexual harassment and what they could do to counteract these issues. They left with an increased sense of confidence in their ability to pursue physics. 3 **AN INSPIRATIONAL FIGURE:** Evelyn Boyd Granville was the second African-American woman to earn a doctorate in mathematics. Granville created computer software to analyze satellite orbits for NASA space programs and later taught computer programming at CSU Los Angeles. 4 **THE NUMBERS ON UNDERREPRESENTATION**: In physics, less than 20% of doctoral degrees are awarded to women each year. In 2016, there were 30 Black women faculty members total in physics and astronomy departments in the U.S. By comparison, there are about 10,100 full-time faculty members in physics departments alone. 5 **INFORMATION ON HOW TO FOSTER INCLUSIVITY**: The reasons for fewer women in physics have been found not to be family or ability but lower expectations and uneven academic and professional evaluation. "This means we can explicitly work to remove these unconscious biases," Edwards said. "For example, I can ask students to use a non-gendered student number on exams instead of their name."

View related video online at
cosam.calpoly.edu/intersections

CLIMATE LEADERSHIP CAN BE LEARNED

Mathematics professor Erin Pearse is heading up the Initiative for Climate Leadership and Resilience, a new interdisciplinary group focused on implementing solutions to climate change. Below he explains the initiative and why it's important.

WHAT IS THE INITIATIVE FOR CLIMATE LEADERSHIP AND RESILIENCE?

We're a group of faculty who are working to build an organization that's addressing climate change and sustainability issues on the academic side of campus. The campus is doing a great job of decarbonizing its own facilities operations, but in terms of educating students to become the next generation of climate leaders, there's more that needs to be done.

WHO'S INVOLVED IN THE INITIATIVE?

Most people think that in order to do something substantive, you need to be an environmental science major or something similar, maybe an electrical engineer. But it turns out that the types of jobs that need to be done and the skill sets for them are much broader. Right now, we actually have all the technology we need to solve the climate crisis. What's missing is the human part of that solution — the ability and willingness to implement those solutions.

And that means educating people, building consensus, getting political reforms passed and then doing the ins and outs of daily work to develop plans and make infrastructure changes. This requires people who are in communications and education and English, people who are in political science and marketing and graphic design and music, people from all over campus, including disciplines you wouldn't necessarily think of.

WHY IS IT IMPORTANT TO DO THIS WORK AT CAL POLY?

Climate change is the biggest problem humanity has ever faced, and it will be the defining challenge for the next generation. Any university that doesn't educate students in this area will be left behind. Cal Poly is in a great position to lead in this area because of our Learn by Doing approach, our comprehensive polytechnic nature and our location.

San Luis Obispo is a climate leader. We're ahead of the curve in many respects, and Cal Poly students and faculty can support the work the city is doing with targeted research projects. It also helps people with their climate anxiety, to see that there's actually a lot of work being done and they can contribute.

There are a lot of ways to get involved, regardless of your background or training. Look at what you're good at, what needs doing and what brings you joy. I guarantee you there is a common point of intersection for those three things that lies in climate work. //

> "RIGHT NOW, WE ACTUALLY HAVE ALL THE TECHNOLOGY WE NEED TO SOLVE THE CLIMATE CRISIS. WHAT'S MISSING IS THE HUMAN PART OF THAT SOLUTION."
>
> — ERIN PEARSE

PUTTING THEIR EDUCATION TO USE

LEARN BY DOING IS CENTRAL TO MAKING A CONTRIBUTION IN RURAL AFRICA

Drive 320 kilometers south of the Ethiopian capital Addis Ababa and you'll reach the mountain town of Soddo, home to the Wolaittan people, piles of excellent coffee and Cal Poly alumni David (Biological Sciences, Modern Languages and Literatures, '07) and Krichele (Kinesiology, '07) Jeffcoach and their family.

Two years ago, while living in Fresno, the Jeffcoaches began to think deeply about the gift of education they'd been given. At the time, David was a faculty member at the local UC San Francisco campus and Krichele was a practicing physician assistant. After some reflection and soul searching, they decided they needed to use what they'd learned to do something bigger than themselves.

Study and travel abroad while at Cal Poly played a large role in shaping the Jeffcoaches' outlook. Krichele changed her career trajectory from physical therapist to physician assistant after seeing the high need for basic care in rural Indonesia. David credits his time studying in Germany for expanding his view and allowing him to recognize how big the world is.

Partially because of this background, the Jeffcoaches volunteered with Pan-African Academy of Christian Surgeons, which focuses on training African surgeons who are committed to serving in Africa. David trains local surgeons, and Krichele works at Soddo Christian Hospital, where the training takes place.

Every day in Soddo provides a reason to be grateful for their Learn by Doing education.

"Have you ever done surgery with Google open?" David said. "It's good to have a Learn by Doing background when every day I'm encountering challenges that I just don't know. Today I did many complex urology cases I wouldn't have to do in the U.S. Cal Poly prepares you to not be intimidated by obstacles. You learn how to learn."

This can-do approach also serves them well in their daily life.

"It's more difficult to find someone who can build you a table in southern rural Ethiopia than figuring out how to do it yourself," Krichele added. "So there are lots of things in our everyday life that we've figured out ourselves. I left Cal Poly feeling like if someone else can do it, I can too. You just have to figure it out."

Their time in Ethiopia has helped the Jeffcoaches and their children become global citizens by seeing up close how people in other countries live.

EVERY DAY IN SODDO PROVIDES A REASON TO BE GRATEFUL FOR THEIR LEARN BY DOING EDUCATION.

Krichele describes their average Tuesday driving to Addis Ababa, passing mud huts and dodging donkey carts. In the midst of this, "People are people are people," David says. "There are grandmothers here. There are single moms trying to raise kids. There are disabled people. The challenges are the same."

The resources, however, are not "in the same stratosphere," as David describes it. An hour and a half outside of town is a clinic that serves the poorest residents of the area, many of whom are starving. When funding allows, staff from the hospital travel to the clinic and bring back patients who need a higher level of care.

Krichele once brought an infant who was near death from the clinic to the hospital. The valve between the infant's stomach and intestine was blocked, making it impossible for him to eat. After a successful operation and a week in the hospital, he went home eating and healthy.

"Bus fare from the clinic into town is a dollar and a half, and they're so poor they can't make it to our hospital. You get to see the difference between the opportunity to live or not, and $1.50 is the barrier," Krichele said.

Stories like this are the reason David is so enthusiastic about his work with young surgeons. Ethiopia had 248 general surgeons in 2016, according to a study commissioned by the World Health Organization. That's approximately one surgeon for every 418,000 people, compared to approximately one surgeon for every 6,000 people in the U.S. in 2020.

"I have 10 men and women who are going to be the crazy awesome ones doing great things for their country," David said. "I was training a student on a complex case the other day. There's only one surgeon in the whole country who does this kind of case. I did six or seven with this student. Now there are two."

> "IF PEOPLE THOUGHT SERIOUSLY ABOUT HOW COULD I RELIEVE SUFFERING IN WHATEVER SPHERE IT IS, THAT WOULD BE A RADICAL CHANGE." — DAVID JEFFCOACH

For the Jeffcoaches, their time in Africa stems from a need to use their Cal Poly education to contribute to the global community.

"If people thought seriously about how could I relieve suffering in whatever sphere it is, that would be a radical change," David said.

Krichele agreed. "I've got one life to live. When I get to the end, I don't want to regret that we didn't love people in the out-of-the-box way we were called to do it." //

Pictured: (left) *The Jeffcoach family in their backyard in Soddo, Ethiopia.* ***(above, left to right)*** *David Jeffcoach instructs Ethiopian physicians in surgical procedures in the intensive care unit in Soddo Christian Hospital; David and Krichele Jeffcoach pre-surgery; a traditional home in the region around Soddo.* ***Photos courtesy of:*** *the Jeffcoach family.*

Giri Gopalan (L), Max Barshay (R)

RESEARCH CORNER:

PREDICTING GLACIAL MELT IN ICELAND

One of the most important questions about climate change now is how best to adapt. Statistics Professor Giri Gopalan and Frost Research Fellow Max Barshay are helping to answer that question by modeling how glaciers are losing mass.

"It is expected that a major source of sea-level rise in years to come will be from the melting of glaciers, including large ice sheets of Antarctica and Greenland, as well as mountain glaciers, such as those in Iceland," Gopalan said.

> "WHAT WAS SURPRISING TO ME WAS THAT THE MORE I STRUGGLED, THE MORE I LEARNED." – MAX BARSHAY

Predicting the rate of loss will help countries understand how much sea level rise to expect and when to expect it.

Glaciologists have been measuring the 350-square-mile Langjökull glacier in Iceland since 1997. Using measurements taken from 1997-2015, Bayesian statistics and the statistical programming language R, the Cal Poly research team is modeling the rate at which different parts of the glacier are losing mass.

For Barshay, the research project was a jump into the unknown. When he started, he knew very little about Bayesian statistics, which is helpful in making scientific predictions, and had no experience using modern Bayesian statistical software packages, like Stan.

"There were many times this summer when I felt stuck learning new and advanced concepts that I was not exposed to in my undergraduate studies," said Barshay. "It took a lot of independent work to not only learn the new ideas but to determine which new ideas I had to learn. What was surprising to me was that the more I struggled, the more I learned."

Gopalan was impressed with the depth and breadth of Barshay's independent research.

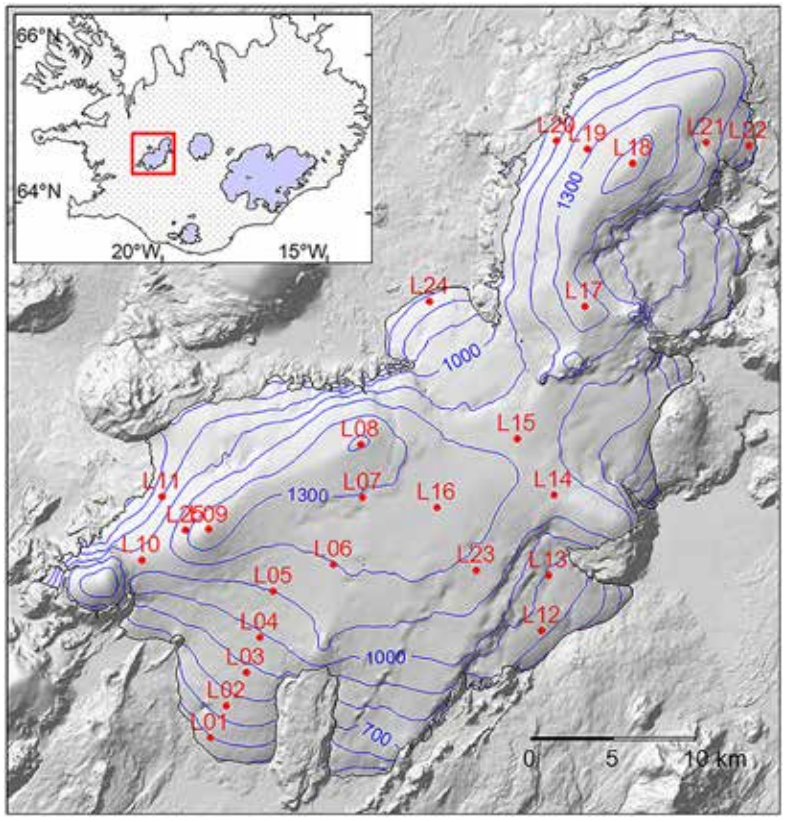
"It was completely Learn by Doing for Max," Gopalan said. "He learned by actually implementing a complex statistical model in the R language using a software package called Stan, using real data collected by researchers at the University of Iceland. This required him to learn Bayesian statistics mostly on his own, which he picked up on quickly."

The results of the modeling effort show that the glacier is generally losing mass along its boundary at lower elevations and some of the higher elevations are gaining mass from accumulating snow. Some projections suggest that Langjökull will disappear in about 150 years or so.

Barshay's work could help scientists better model the process of glacial melting, which has implications for understanding sea-level rise around the globe.

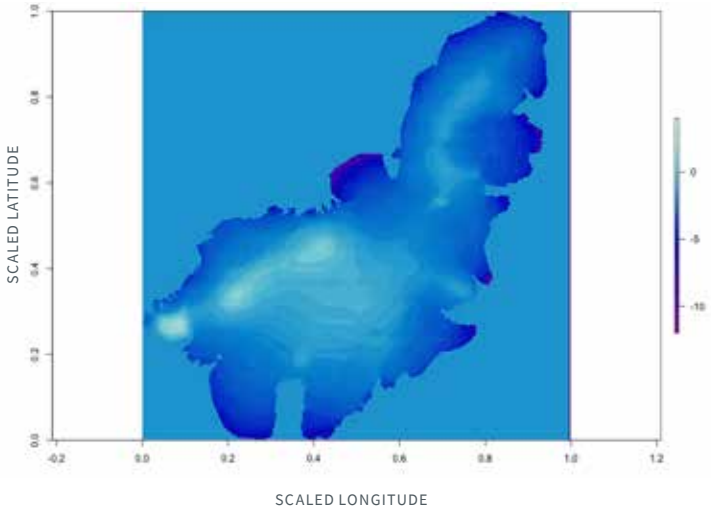
"I was able to use real-world data that was collected by a team at the University of Iceland and perform analysis on it that will hopefully be beneficial to those researchers," he said. //

GLACIOLOGISTS HAVE BEEN MEASURING THE 350-SQUARE-MILE LANGJÖKULL GLACIER IN ICELAND SINCE 1997. USING MEASUREMENTS TAKEN FROM 1997-2015, BAYESIAN STATISTICS AND THE STATISTICAL PROGRAMMING LANGUAGE R, THE CAL POLY RESEARCH TEAM IS MODELING THE RATE AT WHICH DIFFERENT PARTS OF THE GLACIER ARE LOSING MASS.

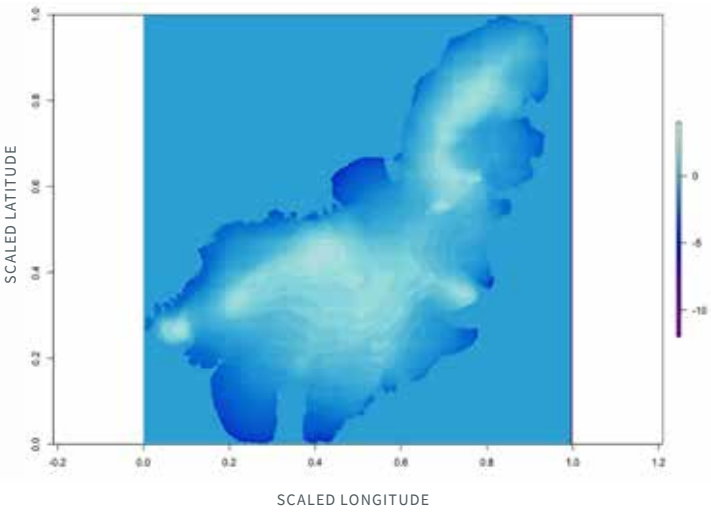


This topographical map shows the elevation of the LANGJÖKULL glacier. The numbered points are the locations where glaciologists took ice samples to measure the glacier's mass twice a year from 1997-2015. The inset shows the location of the LANGJÖKULL glacier in Iceland. The map was originally published in the journal Frontiers in Earth Science in the article Bayesian Inference of Ice Softness and Basal Sliding Parameters at Langjökull.

R-INLA NET MASS BALANCE PREDICTIONS FOR 1997



R-INLA NET MASS BALANCE PREDICTIONS FOR 2015



These graphs are created based on statistical models of the glacier's changing mass. Statisticians use existing data to test their predictive models. When the models produce predictions that match measurements taken in the past, that's a good indication that the models may accurately predict future changes. The color sliding scale in these graphs represents surface mass balance, and the changes between the graphs demonstrate that the glacier lost mass from 1997 to 2015.

THERE'S A LOT OF LIFE IN THIS CORPSE FLOWER

THOUSANDS OF COMMUNITY MEMBERS VISITED MUSTY, CAL POLY'S FIRST EVER CORPSE FLOWER BLOOM, IN THE SUMMER OF 2020. BUT WHAT HAPPENED TO THE PLANT AFTER ITS TWO DAYS OF FAME? *READ ON.*

Photos by: *Joe Johnston and Tony Turretto*

View related video online at ***cosam.calpoly.edu/intersections***

Musty is an Amorphophallus titanum, a plant that produces the world's largest unbranched inflorescence, or cluster of flowers. That rare bloom was just the beginning of Musty's influence in the botanical world.

Cal Poly botanists pollinated Musty while it was blooming with pollen from Kansas State University.

The pollination was successful, and about a year later, the fruit ripened and was sent to universities and botanic gardens across the country that were interested in growing their own corpse flower.

When botanists dug up Musty's storage tuber, or corm, it was intact and had a new bud sprouting. The bud will likely produce a leaf, and Musty may flower again once it has gained energy from its annual leafing.

In August 2021, Musty got some company. Another corpse flower, dubbed Bertha, sent up a bloom about a foot taller than Musty's was.

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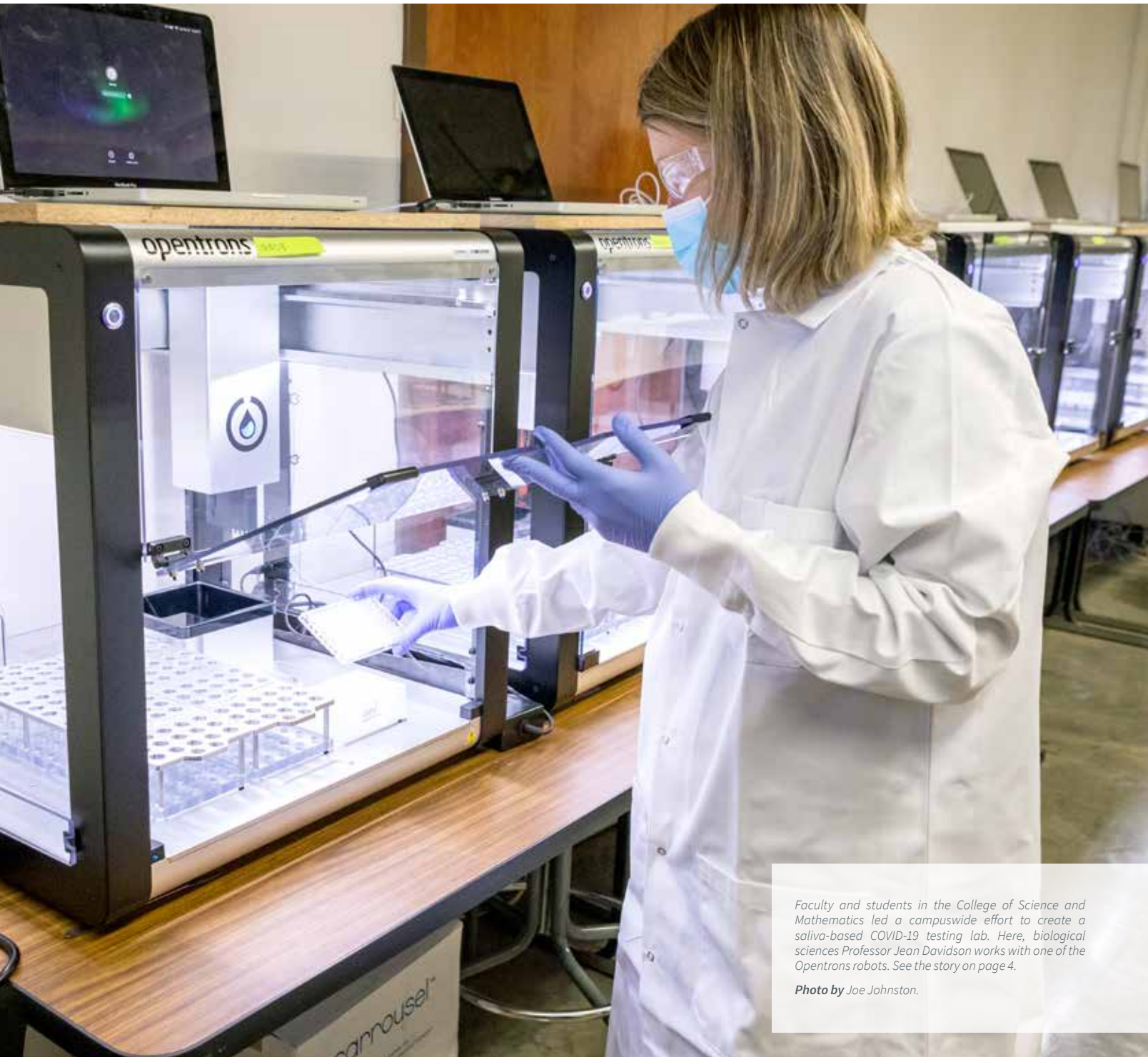

Faculty and students in the College of Science and Mathematics led a campuswide effort to create a saliva-based COVID-19 testing lab. Here, biological sciences Professor Jean Davidson works with one of the Opentrons robots. *See the story on page 4.*

***Photo by** Joe Johnston.*