CPP ENGINEERING

MAGAZINE 2021

THE BRONCO GRIT 4

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If WALL-E Took Up Boxing

Matthew Vasquez is a full-time electromechanical engineering technology student, and a part-time robot builder.

Or maybe it is the other way around.

For years, he and his family have competed in *BattleBots®*, an internationally televised competition that airs on the Discovery Channel. Top-tier teams from around the world fight against each other with their 250 pound robots ready for combat. These one-on-one metal melees often end in shrapnel, something on fire, or sometimes both. Vasquez's robot, Whiplash, came in second place out of 60 competitors in 2020. With the next competition being held in August 2021, Vasquez shows us how he is getting ready.

Robo Rumble

"With evenly matched robots, it comes down to who's the better driver. The nerves were worse in the beginning, but as the years go on, the nerves start to go away. As you get more competitive, you learn to just take care of the task at hand."

"The meta right now is vertical spinners. The best counter is to get underneath them and flip them upside down."

Whiplash does both. Vasquez shows the lifting apparatus of his bot. The green vertical spinner is attached to the lifter.

It all happens in Vasquez's garage—research and development, testing and manufacturing.

"I've been around my dad forever building robots. At this point, I plan to keep doing it as long as it [*BattleBots®*] exists."

THE BRONCO GRIT

A pandemic delivered one uppercut after another.

These engineering students took it on the jaw, and persisted.

BY CHRISTOPHER PARK

Building Unmanned Vehicles in Their Garages

At a certain point, an engineering project at scale is as much of a problem to solve as the actual project itself.

Wrangling hundreds of engineers across several disciplines to move toward a common goal is a game of continuous communication and adaptation. Teams become dependent on each other, and complexity grows exponentially. Any alumni who have been a part of huge projects and have reached the end of this paragraph are nodding in emphatic agreement.

This is the kind of complexity more than 100 Cal Poly Pomona students across engineering, computer science and other majors took on in the last year-and-a-half to get their project to the finish line. A pandemic did little to stop them.

> "The experience I gained from this project is priceless."
>
> —YAHIA HAGGAG ('21, AEROSPACE ENGINEERING), CHIEF ENGINEER FOR THE NGCP UAV TEAM

Maria Toro (left), aerospace engineering student, and **Lizette Chavez** (right), mechanical engineering student. The duo leads the 2021-22 Northrop Grumman Collaboration Project after serving as chief systems engineers in their previous year of work on the project.

Challenge accepted

The Northrop Grumman Collaboration Project (NGCP) is a student-led program for the research and development of unmanned systems. Each year since 2011, Northrop Grumman Corporation commissions a project, and roughly 200 students across Cal Poly Pomona and Cal Poly San Luis Obispo work together to serve the needs of their client. For years, the focus has been on developing autonomous unmanned vehicles for complex search and rescue missions and the 2020-21 project was no different.

This year, however, Northrop Grumman asked for more than ever before: design and manufacture a fixed flying wing unmanned aerial vehicle (UAV)—imagine a plane shaped like a boomerang—which had to carry a smaller unmanned ground vehicle (UGV) for autonomous rescue operations. The practical application: Picture a lost hiker in the dead of night. With no human input, the UAV carrying a UGV flies over pitch-black wilds in search of the hiker's radio signal. Once the hiker is found, the UGV is deployed, the hiker boards the vehicle and is transported to an autonomous helicopter that ferries him to safety.

In the past, students were provided with the vehicles to program and augment to meet the project's goals. This year, they were required to create one at scale—the lost hiker is scaled down to six inches in height—but a tall order, nonetheless.

One heck of a year to do that

Despite the pandemic shutting down in-person work and access to a necessary collection of hardware and tools on campus, the project's goals stayed the same.

"Simple problems that would take hours to solve took days," says Jeffrey Hymas ('21, computer engineering), project manager. Normally, a drive train issue in a vehicle could be solved in a matter of hours by a mechanical engineering colleague sharing the same lab space. Social distancing meant that Hymas had to take the vehicle to the colleague's home, drop it off to be worked on, and then arrange a time to pick it up.

Yahia Haggag ('21, aerospace engineering), chief engineer for the UAV team, had to use fiberglass, a durable composite material, to manufacture the UAV. This is a simple task with a team of three to mix, layer, and shape the composite material, but becomes a headache as a one-person job. So, he called forth his roommates to get the job done.

And then there is Lizette Chavez and Maria Toro, the chief systems engineers for the project. Every vehicle has its own systems, or logic, and their systems must understand all the other systems in other vehicles. In short, Chavez and Toro had to make sure the vehicles understood and talked to one another, and they had to do it while learning new systems engineering software.

"A few moments in the beginning, we had the new software but couldn't present with it," says Toro. "We figured out how to use it as a team and from working with it for hours."

In the end, the team had functional vehicles with some kinks left in the design. The systems Chavez and Toro helped assemble were validated in simulation. Everything worked in theory but was inconsistent in practice. Considering the circumstances, it was a win for the team.

Advised by a quartet of faculty advisors—Scott Boskovich, Ph.D., Zekeriya Aliyazicioglu, Ph.D., and Subodh Bhandari, Ph.D. from CPP Engineering, and Daisy Tang, Ph.D. from the College of Science—students broke off into integrated product teams (IPTs), an industry-standard approach where multidisciplinary groups work on delivering what they are responsible for in the larger project. IPTs were led by the program management teams. From the top of the organization chart to the bottom, the teams consisted of all undergraduate students.

"The learning you get from working on a real project is invaluable," says Boskovich, faculty advisor and electromechanical engineering technology associate professor. "It gives students a taste of what it looks like to work with an engineering client."

Passing the torch

Like most student teams in the college, project leads move on and other team members take over. In this instance, Hymas completed his role as the project manager and was hired to work for Northrop Grumman. He will be on the flip side of the next NGCP as it ramps up again in the 2021 fall semester. Taking his place will be Chavez and Toro.

"This is something Maria and I are really looking forward to," says Chavez. "Jeff did so well and Tristan before that. A lot to impress and live up to. For Maria and myself, this is really exciting and probably the most rewarding thing I can think of in the past three years we've put into this project."

Haggag also departed from the team and takes with him the experience that will land him his first engineering job.

"I got what the project promised—an experience as close as possible to industry experience," says Haggag. "Many projects teach the technical steps and how to manufacture something, but not the culture and common industry practices of the job. The experience I gained from this project is priceless."

It's a Three-Peat

The clock is ticking. General contractor and building firm UNICO is hard at work to win over their potential client, the city of San Francisco.

City officials want to build a fire station on a port. It must be two stories, have all the amenities of a typical fire station, and it must be done in 22 months within a budget of $33.5 million. With less than 10 hours before deadline, officials send an addendum. They would like to consider an option for the station to be built on a floating foundation. UNICO's at an impasse—they have worked on their proposal with a fixed foundation. Committing to a floating foundation would require a vast rework to their proposal. UNICO's employees are split—start over or continue with the work that has already been done?

Reasoned, impassioned debate monopolizes the team's focus. Capitulating, the team appeals to project executive Arminda Diaz. Make an executive decision, they ask. Diaz weighs in—she decides to move forward with what they have worked on thus far, with supplemental analysis of the feasibility of a floating foundation.

It was the right decision. UNICO won the contract, and the student team went on to win first place in the competition for the third year in a row...

... Pulling back the curtain

UNICO is not a real construction firm and the client's request is just as make-believe. This was the scenario put forth in a student competition, the 2021 ASC Design-Build Competition. It is the largest of its kind, and tasks student teams with winning over fictional clients as fictional construction, design and architecture firms. Typically, crafting a proposal for a client is a long process, but the competition crunches it down to a 16-hour challenge. Conceptual design; cost analysis; construction scheduling; mechanical, electrical, and plumbing; and sustainability analysis—all this and more must be done within less than a day.

Challenging to be sure, and only exacerbated by this year's virtual format. But for Ayman Jaber, civil engineering student and lead architect, it is "**E**asy **M**oney, **B**aby." The team called their architecture firm E.M.B Architects.

> "I started from zero and learned the process of construction. The only thing you need is passion."
>
> —SEPEHR RAMSHINI, CONSTRUCTION ENGINEERING STUDENT AND THE TEAM'S PRECONSTRUCTION MANAGER

< The winning student team. Front row, left to right: Sepehr Ramshini, Arminda Diaz, Mayra Peredo. Back row, left to right: Ryan Tran, Ayman Jaber, Jeri Robles, Arutyun Akopyan, Tyson Sint.

They've done this before

This is not the first or second time a CPP Engineering team has won this competition. It is their third win a row—the last time this happened in the competition's history was over 15 years ago.

"I feel so happy. The amount of work we put into this is so much outside of school and work," says Arminda Diaz ('21, construction engineering management), team captain and project executive for the team's construction firm UNICO. "So when you get the news that you won first place, it's paid off."

For Diaz, she has been a part of all three winning teams and has received internships and job offers through the competition. In fact, all of her teammates have internships.

For the 2021 competition, the team ran away with the win. Judges, who work in the construction industry, were baffled by how the team was able to assemble their proposal in a mere 16 hours. Bafflement turned into a soft interrogation, where judges asked technical and difficult questions to make sure the proposal was not smoke and mirrors. The harder the questions, the better the chances your presentation was very good, Diaz notes.

Real-world in a microcosm

From client request to project proposal, this is a true learn by doing experience. Every part of the competition calls forth real-world skills in construction management.

"Basically, it's a simulation of what happens in the real world. When an owner wants to build a building, it'll ask companies to create a design and another to build it for them," says Assistant Professor Jeyoung Woo from the civil engineering department and faculty advisor for the team.

"I started from zero and learned the process of construction," says Sepehr Ramshini, construction engineering student and the team's preconstruction manager. "The only thing you need is passion."

What's next

The team is always recruiting. The winning teams are always a combination of rookies and veterans. Veterans lead the rookies, the rookies become veterans, and the veterans graduate. The cycle has proven to be sustainable.

"Even new students get familiar with topics and industry, and they become so confident in their area and career path," says Woo. "They're more engaged and motivated in the classroom and want to share and help others to succeed."

For Diaz, she is graduating and pondering her job offers. While she is leaving the team, she takes with her lifelong friends.

"My teammates are my best friends. I go to them for whatever—career or personal life advice that I need," she says.

Diaz leaves a final farewell: "Thanks for putting up with the crazy schedule for the past year, and sorry I forgot to feed you guys lunch sometimes."

Change For Today, Not Tomorrow

It is 2020 and Zareen Ahmed closes her virtual thermal fluids class. She opens a new window on her browser to watch the protests that roil the nation.

What does it mean to be an engineer when the nation contracts in pain?

"Class time is instructional time, right?" says Ahmed ('21, mechanical engineering). "No one's going to take the time out of their engineering coursework to actually talk about systemic racism, and even if we did something where students went into their classes and took a session, we would be taking a professor back one session."

And so, she and her team of Engineering Student Ambassadors (ESAs)—a carefully selected group of undergraduate students who represent the college both on and off campus—launched their three-part virtual lecture series over the spring 2021 semester. They invited speakers—experienced alumni who dealt with systemic racism, and faculty experts in microaggressions and student engagement. Students came to listen and participate in the discussion. None of the presentations were recorded to encourage free discourse.

Her team's initiative was one of four. Three other ESA groups took on their own projects—one group held an outreach event for high school students, another held a social mixer for current students, and the final group built a web page that centralizes inclusive resources on campus. All of it was virtual and all of them asked a fundamental question: What can we do today to make the college more inclusive?

Ahmed and her team organized each lecture from top to bottom—the initial contact with the speaker, assembling marketing materials, and moderating the sessions—while concluding another challenging, virtual, and remote semester. It mattered too much to excuse themselves of this work even when they had a valid reason to put it aside for someone else.

Ahmed wants change, and hopes these virtual lectures move that stubborn needle. She wants to be the change too. First interested in policy, Ahmed grew cold to the idea of the time it takes between announcing policy and executing it. She wants to be the change now.

"Policy can take forever, but the execution of that policy is possible through engineering," says Ahmed. "If you want to help a community through policy that fixes their infrastructure, a civil engineer has to do that."

So, Ahmed joins the class of 2021 with an eye toward work that brings tangible change.

"I want to work somewhere that does good for the community." ■

> **"I want to work somewhere that does good for the community."**
>
> —ZAREEN AHMED ('21, MECHANICAL ENGINEERING)

FROM HARDSHIP, TENACITY

BY CHRISTOPHER PARK

A Vietnam refugee and now an advocate for the students who need it most, Lily Gossage, Ph.D., is the right woman for the job.

April 29, 1975

Exodus in Saigon. A frenzy of people everywhere looking for a way out of the city. Sons and daughters held tightly by their mothers and fathers. The People's Army of Vietnam announced their impending arrival. The Vietnam War is ending. The city is being overthrown.

Five-year-old Lily Gossage is pulled along by her pregnant mother. Behind them are Gossage's two sisters. Her mother worked for a U.S. government pacification program that was designed to gain support from rural communities controlled by insurgent communist forces. They might kill her if she stays. Either the family will become refugees or perish under the new regime. It is time to go.

They reach the port. Flames in the ocean fueled by diesel leaking from boats. U.S. navy men hurrying native families, and government and military workers onto barges and boats to leave Saigon forever.

The family gets on a barge, and they drift out to sea for six nights and seven days. Gossage and her sisters subsist on sips of water and powdered milk they lick from their mother's palm. Then finally, the U.S.S. Midway finds them. Navy men drop ship mast netting down to the refugees. A woman begins the climb. She slips and falls a long way back down to the barge. Dead soon after.

"Looking back, I actually don't know how I felt. I don't know if it was a sadness," says Gossage. "These are past memories, but I feel a bit of sadness when I visit the ocean, I don't feel happy."

For nearly four months, the family hopped from one camp to another—first Subic Bay in the Philippines, then Guam for one month and then Marine Base Camp Pendleton for another two. Then finally, Long Beach, a coastal city in Southern California. They would build a new life here.

> **"Life can be tough, but I like to help students harness the power of positive self-talk by visualizing past experiences, and exchanging yesterday's pain, anger, and hurt for productive work, here and now."**

"Just learn English. Learn it well."

America was different. Pavement and asphalt across flat stretches of single-unit homes with manicured lawns. Every neighbor a Caucasian and the Vietnam War fresh in their minds.

"Never speak Vietnamese in public," said her mother. "Just learn English. Learn it well."

10 new words every day. 10 new English words her mother strained to pronounce into a tape recorder for her daughters to listen to on their way to school.

"Those who can't assimilate won't know how to decode cross-culturally. I was decoding and code-switching before I knew what it took to learn the language," says Gossage. "Not just the language, but how certain grammatical nuances are used to emphasize something, offer a compelling argument, and have a meaningful conversation. It was very important to belong. Mastering English was a cultural tool that I needed to survive, to help my family become American. But at home, mother insisted that we speak, live, and celebrate Vietnamese. It was her desire that we keep our homeland in our heart."

For college, Gossage went to Cal State Long Beach. Her mother worked on campus and kept close tabs on her daughter by befriending Gossage's professors and administrators. They became Gossage's aunts and uncles. Her father left years ago, but the family grew. Black and White aunts and uncles, none of them related by blood, but family nonetheless.

In the service of others

The Peace Corps visited the campus, and Gossage looked at the pamphlet handed to her. A small, malnourished boy with a distended belly. The image stayed with her.

A few years later, Gossage graduated with a bachelor's in medical microbiology with a minor in chemistry and worked in a laboratory. She worked alone in sterile rooms. Walls without windows, and equipment encased in plastic shells. Words hardly spoken, and some days, no words at all. She thought about the small boy.

"I think it takes a very special person to do this. It's a wonderful type of work, contributing to the scientific community, but I think I was mismatched for lab work."

She put the last eight years of sacrifice behind her—the sacrifices of her mother, who worked three jobs, and her sisters and herself who all worked full-time to help pay the mortgage. All this for a degree she will never use again. She joined the Peace Corps.

"It was a heart-to-heart talk with my mom. She said, 'you're not going to make any money.' She didn't agree with it, but we didn't have a dispute. She raised me to make my own choices, so I left."

The Peace Corps stationed Gossage in a small village in Eritrea, a country in Northeast Africa. Surrounded by highlands and mossy mountains, running water and electricity did not exist there.

Drawing water with a donkey and kindling the fire before dawn. Teaching math, science and English to eighth grade students in the little village from sunrise to sunset. Evening meetings with the principal under a kerosene lamp. A very satisfying year-and-a-half.

Upon return, her aunts and uncles at Cal State Long Beach greet her with good news about an open position for the founding director of recruitment and retention in the College of Engineering. She applied, took the position, and did a very good job for 15 years.

"The Peace Corps was like my training ground. Cal State Long Beach was like my stomping grounds."

Now, she directs our Maximizing Engineering Potential (MEP) program. It is much like her previous job but with more focus on recruiting, retaining and graduating engineering students who are underrepresented minorities, low-income, and first-generation—much like her in so many ways.

Personal tenacity, finding strength

"The underlying theme of MEP is personal tenacity. It's not something you can teach. You encourage students to embrace their fears with open arms. Once those fears are tackled, they're no longer distractions. This starts with creating community. Community is at the core of MEP. There's nothing more powerful than a community energized by personal tenacity. If students feel they belong here, they can weather every storm. We enforce attendance and participation, we value merit and effort. So, there's a little bit of carrot, but there's also a bit of stick, and I think this student success approach comes from my own upbringing.

You know, we all have stories, and mine is not unique. There are a lot of people who had these experiences. I've leveraged mine into the service of others. I like to think that my calling is to draw out the best in everyone. Life can be tough, but I like to help students harness the power of positive self-talk by visualizing past experiences, and exchanging yesterday's pain, anger, hurt for productive work, here and now. We can all move toward intergenerational healing, externalize our pain into positive energy, and transform our lives."

TOP PHOTO: Lily Gossage (bottom-right) with her two sisters and her mother in Long Beach, Calif.

BOTTOM PHOTO: Gossage, 25, in the Peace Corps. She served in Eritrea, a small country in East Africa.

GAMING IN HIGHER ED

BY CHRISTOPHER PARK

STUDENTS ACROSS THE NATION SPENT HUNDREDS OF HOURS IN A VIDEO GAME BUILDING THEIR UNIVERSITY AT SCALE. WHY?

In front of you is a burlap sack the size of half a sedan. Inside it is over a quarter-million LEGO pieces—enough to build a small town for a community of LEGO-sized citizens. In the sack is a task scrawled on paper: "Build this, at scale. Don't forget the interiors."

Flipping it over reveals the building in question—the marquee building of your university. With no further instructions, you dump the plastic contents on the floor.

How long will this take? 100? 200 hours?

What about your unprecedented, all-virtual semester?

Irrelevant. You are filled with determination.

This is the approximate headspace students are in when making this commitment in Minecraft, an immensely popular video game where players are given the freedom to build whatever they want cube by cube. Over the last year-and-a-half, college students built their universities in the video game, undaunted by the time required.

What is going on here, and what can we learn from it?

What is going on

Since COVID-19 robbed students of a full college experience in 2020, they built their universities in Minecraft. Since March 2020, Minecraft college campuses have sprung up—UCLA, Stanford, and Brown University to name a few.

These are herculean efforts with the guiding principles of accuracy and thoroughness. A single building can require over 250,000 cubes. Now add every building in a university—that is millions of hand-placed cubes.

Further, these projects are done with few resources. Students crawl the internet to search for floor plans and reference photos of their university. Once the idea forms and a plan takes shape, teams start their work on Minecraft maps—flat planes that stretch onto infinity.

Why it is happening

Three things: love for video games, structure, and accountability.

Students do not need a reason to play video games—the hobby runs deep in their lives. Gaming is predominately enjoyed by young people, but older generations, like Generation X, are not far behind as they grew up with video games as well. Gender demographics also show that while males are the majority of gamers, females make up a significant share. Zoom out further—approximately 244 million people in the U.S. play video games according to market research company NPD.

"They're already doing this [creating in Minecraft] in the gaming space. They're posting on Discord [a popular messaging app] at 2 a.m." says Lily Gossage, Ph.D., director of CPP Engineering's Maximizing Engineering Potential (MEP) program.

MEP launched semester-long Minecraft competitions in the fall semester of 2019. The idea was put forth by her avid Minecraft-playing sons. She floated the idea to the fall 2019 MEP cohort, and the response was an emphatic yes. Since then, student teams are tasked with recreating a Cal Poly Pomona building in Minecraft each semester.

Each team is restricted to three members and teams are required to provide weekly progress reports via screenshots of their in-development construction. Without these requirements, students fall behind, eventually abandoning their project, says Gossage. With the structure and accountability, the results speak for themselves.

What to take away from it

It builds communities. Students were separated from their peers for over a year. First-time freshmen will not take their first in-person classes until the second-half of 2021. Gaming brings them together.

"If they aren't doing well in classes, they have an outlet," says Gossage. "I've seen a couple of students who are typically withdrawn, but in-game they're a totally different personality. It's a way for them to meet other people."

Students who took part in these competitions echoed a similar sentiment of social connection.

"We found that playing videos games and going on Minecraft gave us a reason to all jump on the phone and talk for a few hours every night. It helps us maintain some of that social normality," says Stanley Rohrbacher, aerospace engineering student.

It can engage and sharpen skills

A 2018 study titled "Influence of online computer games on the academic achievement of nontraditional undergraduate students" suggests that video games may be an effective engagement tool for students who are older, have more responsibilities (i.e. work, family) or are returning to education after a pause. Another study suggests that gamers were better at a number of cognitive skills than non-gamers.

However, literature is sparse. "This is a phenomenon that academia hasn't had much of an interest in," says Gossage, much to her chagrin. "There is a whole area of brain learning, spatial motor skills, hand-eye coordination and critical thinking."

ABOVE: A recreation of a food court at Cal Poly Pomona. Both exteriors and interiors were painstakingly recreated by student teams.

CENTER: Cal Poly Pomona's 165,000 square foot recreational and intramural complex built in Minecraft.

A FIRE IN HIS EYES

Andre Bullock is tenacious. He had to be.

BY CHRISTOPHER PARK

Little Andre Bullock entered the world on a Friday in the autumn of 1960, and his parents wanted nothing to do with him.

Bullock's father swore he was not the father and left before he was born. Bullock's mother was young and uncertain but knew that he came too early in her life. She tried to be a mother anyway, but Bullock's great grandparents took him in permanently by age seven.

Something was not right about Bullock. He was Black, but his skin was powder white. When a family member waved his finger left to right, right to left, little Bullock did not track it. He could see, but barely—Bullock was born with albinism, a condition that sapped his skin of pigment and degraded his sight where anything beyond a few feet was an abstraction. His vision was further impaired by nystagmus, which made his eyes involuntarily wander and dart. He had no other choice. He learned to live with it.

Bullock loved electronics. He built his first flashlight by seven and built an antenna for his old radio to listen to his favorite station.

By nine, he was stripping down old radios to inspect every component.

By his teens, he repaired televisions and was paid in joy and amusement. (The money he earned was also nice.) By his 20s, he built decoders and circuits. Bullock had to get close to the electronics. He had no other choice. He loved what he saw—learning to read the schematics, understanding the components and radio theory. It lit a fire in him. Bullock ('84, engineering technology) knew this much early on: *I am an engineer.*

"I didn't come to school not knowing what I'd major in," he says. "I still remember my first day, March 30, 1981, because of how excited I was to know that I was on my way to becoming an engineer."

He breezed through his first quarter just like he did in his two years of junior college before that, where he earned an associate degree in computer technology. Bullock relied on teaching himself—he could not see what a professor wrote on the board. He read his textbooks closely, his nose on every page.

Once he started his core engineering classes, the textbook mattered less and what the professor wrote on the board mattered more. Bullock could infer some of it by the movements he could perceive: The professor has drawn a triangle, a symbol for an operational amplifier. His stroke on the chalkboard starts from the upper left and ends on the lower left. Those are inverting and noninverting terminals. He picked up little else.

"I wasn't getting any of what the professor was teaching. I fell on my face, to be blunt. In the 1980s, our society really didn't have a way of looking at people like me with 'we're trying to bring you along.' You showed up to either pass or fail. I wasn't inclined to ask for help, having done so much on my own."

Bullock went from dean's list to academic probation in two quarters. In his summer quarter while taking notes, he wrote in despair: "There seems no way to overcome the situation of present."

He reminds himself: *I am an engineer.*

He got a monocular, a small handheld telescope, to see the board and looked through it with one eye to take notes. It was always difficult, but what could be done? He had no other choice. Bullock salvaged his GPA back to a 2.8. By 1984, he earned his diploma. *I am an engineer.*

During job interviews, Bullock would be shown drawings by employers of what they were working on. Bullock bluffed with an interested glance—he could not see any of it. Northrop Grumman hired him, but the jig was up. "It was soon figured out that I couldn't see worth a damn."

Northrop did not mind, but one of their clients did. They were concerned about Bullock's inability to drive. At the client's test launch, Bullock was asked to leave and was sent back on a plane. With his tail between his legs, he was let go in the first round of layoffs. Among the wave of college hires Bullock was a part of, he was the only one let go. He was given two weeks to find a new job while human resources tried to find a new position for him in the company. Neither panned out.

The woman in human resources said to him, "I'm probably not supposed to tell you this, but they're concerned about your eyes."

What about my eyes? I am an engineer.

Bullock learned to drive. He had no other choice. He got biotic lenses, a miniature telescope mounted on top of glasses, and completed a driving program. He bought a modest sedan. He spent thousands out of pocket while making no income. Still, no one hired him, and he had exhausted his savings. By his sixth month of unemployment, he thought of quitting engineering and applied for a job selling insurance.

No. I am an engineer.

During this impasse, Bullock called L'Garde, an aerospace company in Tustin, Calif. He reached Andy Becht, their electronics lead. If Bullock were willing to drive to Tustin for an interview, Becht would meet with him. So, he put on his biotic lenses, recalled what he learned in the driving program, got into his modest sedan, and drove.

"I didn't even know where Tustin was until I got off the phone with Andy."

That was the hard part. The rest was easy. Becht asked Bullock if he liked paperwork or electronics. Bullock spoke from the heart—learning to read schematics, understanding components, and radio theory—he went on and on. Becht saw the fire in his eyes. Bullock worked at L'Garde for 10 years. Now he is a principal systems engineer at Raytheon.

A young Andre Bullock sitting very close to the television because of his visual impairment.

"I'm disinclined to give up and I'm not terribly interested in those who can't find within themselves the love for what they want and aren't willing to keep pushing for it.

I don't mean to be unkind when I say that."

Bullock understands tenacity better than most, and he wants to help students in the same way he would have wanted the help when he was one. That is why he started two $10,000 scholarships at Cal Poly Pomona. One of the two is for students who are registered with the university's Disability Resource Center.

"I want to make it easier for someone else to take their place in the world like I have. At the risk of sounding a bit immodest, I want a bright person like me to show up and take my place."

Andre Bullock never had a choice. It is in his heart to give, in the same way that he is an engineer.

Andre Bullock with his great grandparents.

> **"I want to make it easier for someone else to take their place in the world like I have. At the risk of sounding a bit immodest, I want a bright person like me to show up and take my place."**

THE ONLINE PROBLEM, AND SOLUTION

BY CHRISTOPHER PARK

Jordan has logged onto his computer, just in time for his fluid mechanics midterm. Confronted with the first question, he opens Chegg on a web browser and a Discord chat channel where classroom friends are already working to collectively solve the question. **What will it take for Jordan to consider taking a more legitimate path?**

Illustration by Maddie Lebiedzinski

"Let's Chegg it."

The pandemic started the largest social experiment in remote and virtual learning. Second to translating in-class, hands-on curriculum onto a virtual format was maintaining the integrity of a student's final grade. In many cases, with no mechanism to enforce students to play by the rules come test time, they can make their own.

From K-12 to college, teachers and faculty feel there is not a means to completely stop it. No matter the intervention or imposition—writing new exams every semester or locking a student's computer from accessing a web browser—there is a non-zero chance of students working around every roadblock to cheat their way to a better grade.

The conditions of a virtual and remote learning environment puts an incentive on learning to circumvent a system rather than learning the material being taught. Chegg, the uberpopular service that offers step-by-step answers to questions posted by subscribers, saw its revenue spike 54 percent and share values rise 345 percent once the pandemic forced virtual and remote instruction.

Cheating, or short-circuiting an education in exchange for a grade is obviously not new. Online-only classes existed before the pandemic. The difference is the scale and the continued proliferation of online learning after the pandemic subsides.

What to do, then?

Nolan Tsuchiya, Ph.D., associate professor for the mechanical engineering department.

Shokoufeh Mirzaei, Ph.D., associate professor for the industrial and manufacturing department.

> "If all you're trying to do is band aid all these problems [to minimize cheating], that to me is more like prescribing drugs for a symptom."
>
> —NOLAN TSUCHIYA, PH.D., MECHANICAL ENGINEERING ASSOCIATE PROFESSOR

Get them motivated

"What I found ultimately, in medical terms, is do you treat the symptoms or the cause?" says Nolan Tsuchiya, Ph.D., associate professor for the mechanical engineering department.

"If all you're trying to do is band aid all these problems [to minimize cheating], that to me is more like prescribing drugs for a symptom. Instead, if I can engage students more and make them care for the content more to have a general interest in the material, they will be wanting to put in the work and put in more effort."

Motivation and engagement is Tsuchiya's prescription. The research suggests this to be the case. A study in Germany found that a student's ability to positively self-assess their knowledge and learning ability was the great motivational predictor of a student's grade. Another study in 2019 found that online students had lower motivation compared to students learning face-to-face but more importantly, performing well in the class was a far more important motivator than whether the class was online.

In short, it is important students believe in themselves, and that their belief translates into a good grade. In theory, the two elements in tandem create a cycle of motivation for students to do their best.

Shokoufeh Mirzaei, Ph.D., associate professor for the industrial and manufacturing department, adds to the prescription by emphasizing process more than results.

"I'm not concerned whether they're getting a good grade since you don't know how much of the work students did on their own," she says. "I'm concerned about whether they put in the effort they need to understand the follow-up classes."

The primary variable

Above all, faculty have some of the greatest influence in driving motivation. Tsuchiya puts his theory into practice using a combination of pre-recorded lectures prior to meeting online in Zoom. These live meetings act as open-ended discussions for students to ask questions and check in with each other. The former has Tsuchiya free-handing notes on a tablet, showing his thinking to his students in real-time. The latter lets Tsuchiya understand the attitudes and needs of the classroom, adjusting the timing of midterms and quizzes if needed.

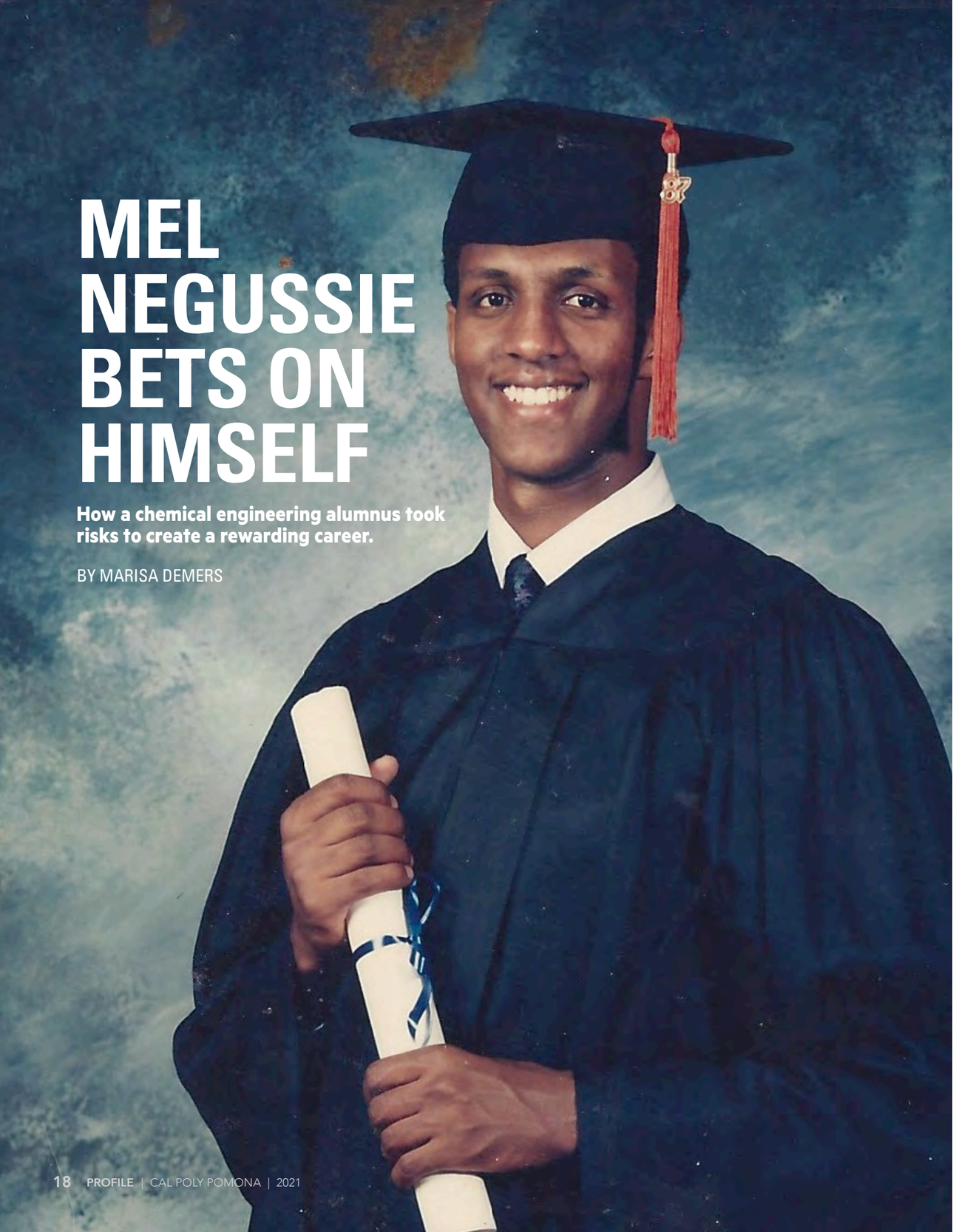
"Trying to learn online is the most I've struggled with in terms of motivation," says Sarah Ragle, one of Tsuchiya's students. "It comes down to the professor's attitude and really caring."

Laura Niedringhaus, another one of Tsuchiya's students, echoes that sentiment.

"If I see the effort of a professor trying their best in an online environment, then it makes me more participatory," she says.

Both Ragle and Niedringhaus have observed that relative to their other online classes, Tsuchiya's classes tend to have more student cameras on—about 5 to 6. That does not sound remarkable until you know the relative comparison is zero in their other classes.

No doubt regulations and restrictions have their place in curbing bad actors from cheating their way to a grade, which online learning makes easier. But rather than depending on these tools, it is the fundamental task of being an engaging teacher that gets students through this type of learning environment.



MEL NEGUSSIE BETS ON HIMSELF

How a chemical engineering alumnus took risks to create a rewarding career.

BY MARISA DEMERS

"Cal Poly Pomona showed me that I wasn't limited to the normal career trajectory of an engineer. I'm grateful that I learned that lesson early in life."

Mel Melaku Negussie's ('87, chemical engineering) career defies definition. Since he earned his first paycheck at 15-years-old, Negussie's work has spanned industries and professional titles. The self-made executive attributes his success to embracing risk, not running away from it.

"Risk is not doing something wild. It is finding something that you want to do and knowing when to cut your losses," says Negussie, who was inducted into the CPP Engineering Hall of Fame in 2015. "I've never been afraid to take a risk and fail because I know I can pick myself up, work hard, and do anything I have to do to succeed."

Engage him in conversation and Negussie will freely share risks that led to failures. He will mention the time he walked away from a law firm job to join Africa.com. In early 2000, the startup was heralded as Yahoo for Africa but six months later Negussie was unemployed. The company became another casualty of the dot com bust.

"There was an entrepreneurial spirit [at Africa.com] that I really enjoyed," he says. "After the company went belly up, I had the choice to go back to the law firm, but I thought to myself, 'I want to give this another try.'"

The company's failure, it turned out, gave him clarity. He craved an entrepreneurial career, not a corporate one. In the years that followed, he joined fledgling companies and eventually launched his own. Today, he lives in Washington, D.C., and is the chief executive officer of NT Group LLC, a firm he founded that provides real estate development, information technology, and business consulting services. He is also a venture capitalist who has invested in a renewable energy startup and a data center in Africa.

Negussie is also helping a group of Ethiopian healthcare workers build a new hospital in Addis Ababa. As the chief operating officer and general counsel for Ethio-American Doctors Group, he oversees legal issues related to financing and serves as project manager for the building's construction. When the hospital opens in 2024, it will be the first facility in Ethiopia to follow international standards of care, Negussie says.

Fleeing communist rule

Born in Ethiopia, Negussie enjoyed a comfortable middle-class life in Addis Ababa, a hub of politics, commerce, and education. His father, a pilot, and mother, a secretary, provided Negussie, his two brothers and sister with a Catholic school education and vacations to the Red Sea and Lake Awasa, a lush region known for the hippopotamuses and crocodiles that live in it.

Yet, Cold War tensions were rising in Ethiopia. A coup d'état in 1974 turned Ethiopia into a communist country, and Negussie's parents began to fear for their family's future. They witnessed the military junta conscript children into military service and push conformity over free thoughts. Although the entire Negussie family could not escape their homeland, the father secured an exit for his two oldest children through his military connections. Negussie and Yohannes ('87, mechanical engineering) were sent to live with family friends in Madison, Wis. At the time, Negussie was only 13 years old.

"Our life was a dichotomy," Negussie says. "We were having this new and exciting experience in America. But, at the same time, we missed our family. It was a difficult time, frankly."

Negussie and Yohannes moved to Southern California less than two years later to live with their aunt and three cousins. As soon as Negussie completed high school, the brothers were on their own. They rented an apartment, bought a car, and supported themselves by working at a fast food chain and a grocery store. They remained close to their parents and siblings during this time, but the brothers never asked for money. They knew the communist government would never allow it.

By the time college applications were due, Negussie only considered Cal Poly Pomona. Tuition was affordable and his STEM-focused family had a deep connection with the university: Yohannes was already studying mechanical engineering and cousins Nebabie ('82, electrical engineering) and Proton ('86, electrical engineering) Kebebew and uncle Berhanu Kebede (84, mechanical engineering) were all graduates from the college.

Dreaming bigger

Negussie's college years were an endless loop of working, studying and making ends meet. Some days being able to get his old car onto the freeway to Pomona required a leap of faith. Still, he never gave up. Faculty would help by directing him to scholarships and hiring him for on-campus jobs.

Looking back, he credits Cal Poly Pomona for encouraging him to look beyond his day-to-day life to dream bigger.

Professor Emerita Cordelia Ontiveros, Ph.D. ('78, chemical engineering), for example, represented possibilities that Negussie had not yet imagined.

"She was open, very encouraging, and not much older than the students she was teaching," Negussie says. "It was very inspiring to see her in the classroom."

Success and time have not tempered Negussie's risk tolerance. In a post-COVID-19 world, he plans to invest in more African companies. He also predicts a resurgence in modular, prefabricated homes and plans to pivot his real estate development business in that direction.

Negussie continues to stay in touch with Ontiveros and Cal Poly Pomona. At her invitation, Negussie serves on the board for Women in Science and Engineering (WiSE), a program that seeks to recruit and retain female engineers at the university. He is also a member of CPP Engineering's Dean's Leadership Board, which helps the college define its strategies and goals. He is proud that the university continues to educate first- and second-generation immigrants and offers advice to them and other engineering majors when he can.

"I only considered one school and it was an incredible experience," Negussie says. "Cal Poly Pomona showed me that I wasn't limited to the normal career trajectory of an engineer. I'm grateful that I learned that lesson early in life."

MOHAMED EL-HADEDY ALY

EXCELLENCE: UNENCRYPTED

BY MICHAEL WALTON

In today's data-drenched world, so many of our communications are digitally encrypted for security. But there is nothing cryptic about electrical and computer engineering assistant professor Mohamed El-Hadedy Aly, Ph.D. and his passion for safeguarding digital communication. Aly is an internationally recognized cybersecurity expert dedicated to helping the world take a quantum leap forward—and to keeping students on the leading edge.

A man of science

Aly was born in Egypt where he received both his undergraduate and master's degrees. He worked for several years as a scientist at an Egyptian nuclear reactor in the areas of control and security.

He earned his doctorate in Norway and worked on digital security for a nuclear power plant. After that, he joined Atmel's Norway division to design and test chips as a senior design engineer. Years later, he moved to the United States to work as a scientist for the University of Virginia and University of Illinois at Urbana-Champaign in network security reconfigurable computing.

He came to California and Cal Poly Pomona in 2018 for the opportunity to upload his deep knowledge into the minds of eager students. He also yearned to realize his vision: to help make our college a seedbed of innovation, and our students its beneficiaries.

"The U.S. has always been a top-ranked R&D force involved in so many leading-edge discoveries," Aly says. "So, we have to continue that legacy and stay ahead of the curve. The best way to do that is to keep cranking the wheels of curiosity in students' minds."

Making a quantum leap

Guided by that vision, Aly set his students on a mission to address a looming threat facing the entire world: security vulnerabilities posed by the rise of quantum computers.

Because quantum computing is so much faster than its conventional counterpart, it can "crack" encrypted communications easily. Currently, we are in a so-called Post-Quantum Era, where the science is only in limited use. Thus, the threat to digital communications at large is limited. Yet once the technology attains widespread adoption all that changes. We then risk compromising things that depend on current encryption measures: nuclear power plants; banking; satellite communications; medical devices, and much more. That threat could literally paralyze certain realms of our society.

Aly has an extensive research record in cryptography, with over 20 published papers and confernce presentations on the subject. Further, federal organizations like the U.S. Air Force, Department of Energy and the U.S. Navy have all awarded Aly fellowships to study post-quantum computing. In short, Aly is an expert absorbed by the field.

Students rise to the challenge

Bringing his vast understanding of the quantum computing threat to the classroom, Aly set students to work on coming up with a solution. But not just any solution. Instead, one that would use minimal resources so it can be implemented quickly.

"[Professor] Aly was very helpful in guiding us toward a real-world application," says student Ian Lieu ('21, electrical engineering; computer engineering) about the award-winning efforts of his team.

Aly split his class into two groups. The first team was tasked with solving the cryptography part of the puzzle. After intense research inspired by Aly they arrived at a hash-based signature algorithm, the kind widely used in cryptocurrency today.

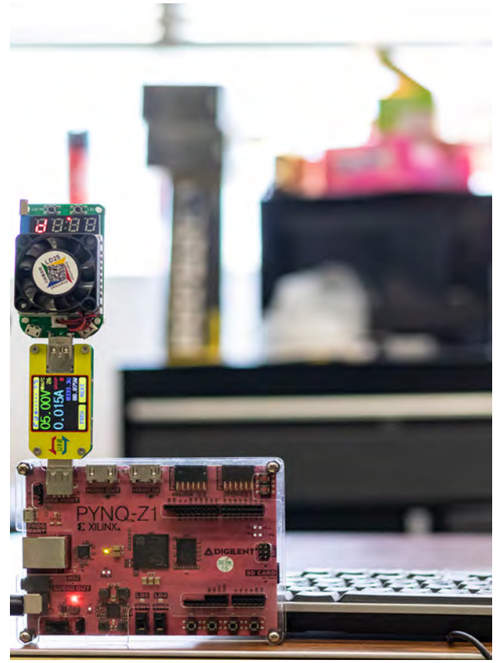
The second team was challenged to apply that algorithm to a technology familiar to anyone using a smartphone, wireless speaker, keyboard or mouse: Bluetooth. Easier said than done. First, Bluetooth has weak security. Second, much of the technology on Bluetooth devices is proprietary, leaving few resources to accommodate a universal solution. Nevertheless, the team came up with a novel idea: move the hash-based cryptography algorithms to a partition, thereby enhancing security without sacrificing performance or resources for other tasks.

The solution was so inventive that the team won two major competitions. They took home honors at the 2021 CPP Student Research, Scholarship & Creative Activities (RSCA) conference, and then went on to win the system-wide California State University Student Research Competition later that year.

Notwithstanding the tremendous talent and efforts of the students, this engineering breakthrough owed much to Aly's teaching philosophy—one emphasizing not just course material but a different way of thinking.

"I teach my students to become like philosophers in a way that they will be successful no matter if they're in an exposition or deposition."

> **"The U.S. has always been a top-ranked R&D force. So, we have to continue that legacy and stay ahead of the curve. The best way to do that is to keep cranking the wheels of curiosity in students' minds."**
>
> —MOHAMED EL-HADEDY ALY, PH.D., ELECTRICAL AND COMPUTER ENGINEERING ASSISTANT PROFESSOR



The winning device that ran the team's hash-based cryptography algorithm for a Bluetooth device, a type of device notorious for its weak security. In short, the team created a solution that improves Bluetooth security without sacrificing its performance.

POMONA'S **OUTSTANDING FACULTY**

BY ALICIA HANSELL

AWARDS

Wen Cheng, Ph.D.

Professor
Civil Engineering

Outstanding Teaching Award—American Society of Engineering Education (ASEE), Pacific Southwest Section

Wen Cheng, Ph.D. regularly disseminates information on the scholarship of teaching and adds to the literature pertaining to teaching methodologies through publications, presentations, and other media. His work has helped uplift CPP Engineering and support continuous improvements in the classroom. His research focuses on highway safety, statistical modeling, machine learning, and higher education pedagogy and evaluation. He is an author of a textbook on highway safety and has served as a principal investigator (PI) or Co-PI on research or teaching-related projects, with a total funding of $2.8 million. A portion of the funding is dedicated to laboratory upgrades.

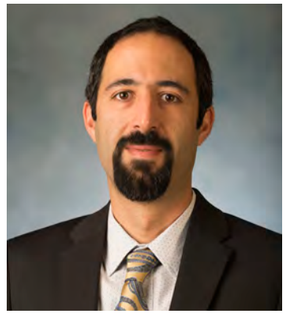
Seema Shah-Fairbank, Ph.D.

Professor
Civil Engineering

Outstanding Faculty Advisor —American Society of Civil Engineers (ASCE)

Excellence in Service Award—Provost's Award

Seema Shah-Fairbank, Ph.D. currently serves as a faculty fellow for program reviews and teaches water resource engineering courses to both undergraduate and graduate students. She is the Los Angeles Section President for the American Society of Civil Engineers and has also served as the faculty advisor for the Cal Poly Pomona student section. Previously, Shah-Fairbank served as the inaugural faculty director for assessment and program review. During that time, she led the collection of assessment evidence for the core competencies and the general education student learning outcomes, helped to increase faculty engagement with assessment, and contributed to the improvement of the program review process.



Ali Sharbat, Ph.D.

Associate Professor
Civil Engineering

Outstanding Advisor Award —Cal Poly Pomona

Ali Sharbat, Ph.D. is chair of the Student Affairs committee for the Department of Civil Engineering. In this role, he works closely with students for career and academic advising. Sharbat is a first-generation college graduate, and he gives special attention to first-generation and underrepresented groups. During semester conversion, he worked closely with the CPP Engineering Advising Center to revitalize group advising in civil engineering. Sharbat is also faculty advisor for Chi Epsilon and Tau Beta Pi. His research is focused on water engineering and involves students in these projects and regularly sponsors students to attend American Water Works Association national conferences.

JOURNAL EDITORSHIPS AND RESEARCH

Faculty Named Academy Fellow for the National Academy of Inventors

Vilupanur Ravi, Ph.D. professor and chair of the Department of Chemical Engineering, was recognized by the National Academy of Inventors (NAI) as a fellow for his pioneering research which has resulted in the creation of new materials and devices, and unique ways to test the corrosion resistance of materials. Election to NAI fellow is the highest professional distinction accorded soley to academic inventors. At Cal Poly Pomona, Ravi works with students on projects to make advancements in solar thermal energy conversion, materials in fuel cells, corrosion resistance, advanced alloys for medical implants, and more. Ravi holds 15 U.S. patents, several international patents, and several U.S. and international patent applications. Recently, he was awarded a grant for the investigation of novel nickel-based alloys, and Ravi will serve as the PI.

Grants Drive Research and Support Student Success

Wen Cheng, Ph.D. will serve as the PI to study statewide traffic safety with support from the U.S. Department of Transportation and the National Highway Traffic Safety Administration. He will also analyze statewide collision data with support from the State of California's Office of Traffic Safety and the U.S. Department of Transportation.

The Governor's Office will fund research for enhancing student success via active adaptive learning and guided inquiry, with **Mingheng Li, Ph.D.** and **Alan Fuchs, Ph.D.** serving as Co-PIs. They will work to redesign a set of introductory engineering classes by addressing students' understanding of engineering concepts, capacity for self-regulation, and their engineering identity.

USDA Grant Funds Engineering and Agriculture Collaboration

The USDA wants an efficient process for making wool, and they have awarded civil engineering and agriculture faculty a four-year grant to figure it out. **Simeng Li, Ph.D.**, civil engineering assistant professor, with **Helen Trejo, Ph.D.**, from the agriculture college, will serve as Co-PIs as they seek to develop a low-cost solution to processing raw wool, which could help farmers, the fiber industry and sustainable fashion. Undergraduate civil engineering students will experiment with a low-cost water treatment approach to wool washing.

Faculty Organizes Quantum Engineering Workshop

Farbod Khoshnoud, Ph.D. organized an international workshop in quantum engineering. The virtual workshop invited professors and researchers from Caltech, USC, MIT, Oxford, and more. Speakers and presenters spoke on pushing engineering boundaries beyond existing techniques via quantum engineering.

Cal Poly Pomona Faculty Editors for Journals

Several CPP Engineering faculty join the editorial committee of the special quantum engineering issue of the Journal of Mechatronic Systems and Control. Faculty members include **Farbod Khoshnoud, Ph.D.** electromechanical engineering technology professor; **Massoud Moussavi, Ph.D.** electromechanical engineering technology chair; **Behnam Bahr, Ph.D.** mechanical engineering professor; and **Mohamed El-Hadedy Aly, Ph.D.** electrical engineering assistant professor.

Thomas Ketseoglou Ph.D., electrical engineering professor, serves as an editor of the journal IEEE Transactions on Green Communications and Networking. After successfully completing an initial one-year period, he was selected to serve for a tenure of another three years. Ketseoglou will primarily be responsible for reviewing papers in green wireless communication and networking.

Vilupanur Ravi, Ph.D. serves as a guest editor for the Dec. 2021 issue of *JOM*, a journal published by The Minerals, Metals & Materials Society. He is responsible for the topic "Corrosion and Protection of Materials at High Temperatures".

IN BRIEF

BY ALICIA HANSELL AND CHRISTOPHER PARK

$2.4 MILLION LIQUID ROCKET ENCLOSURE FUELS ROCKET R&D

A 2,100 square-foot enclosure will open in fall 2021 for the sole purpose of building and launching liquid rockets.

A $2.4 million federal award from the Air Force Research Laboratory primarily funds the enclosure's construction and the purchase of a vast and necessary collection of hardware to shape and weld metal materials. Hand tools, like saws and drills; a mill lathe, tube bender and much more will give students hands-on experience to build their liquid rockets.

An assembly room will enable students to assemble parts in-progress, leave them and continue progress on another day. Prior to this enclosure, this basic convenience was impossible—teams borrowed the college's structures lab to assemble parts, disassemble them and then had to put them away to make room for classes taught in the lab. Tedious inefficiencies like these are now in the past.

"It is going to be a great increase to our capability to perform well," says Frank Chandler, Ph.D., director of the Liquid Rocket Lab (LRL) and aerospace engineering associate professor. "We are so looking forward to this new addition to the campus."

This will be the first time LRL will have a dedicated space to call their own. Funds are also being used for the purchase of an autoclave, a device used to create some of the strongest materials on Earth, like carbon fiber. This industry-standard device will be accessible to any engineering students interested in using it for their own projects.

LRL has in its sights making Cal Poly Pomona the first university to send a liquid rocket 45,000 feet into the air within the next few years. Longer term, their aim is to soar past the Kármán line, 62 miles above sea level, and considered to be the boundary between Earth's atmosphere and outer space. In other words, the vision is to exceed 45,000 feet by a factor of over seven.

"I think LRL has definitely played the biggest role in determining what I wish to pursue as a career," says Kyle Lopez, an LRL team lead and aerospace engineering student. Lopez has dreams to work at SpaceX as a propulsion or development test engineer. "I still feel the same passion and determination I had since I joined four years ago. There is not a lot of things that I can say the same for."

WE TO WISE—SUPPORT PROGRAM FOR FEMALE STUDENTS GROWS

Annual welcome lunches like the above will be available to female students from the engineering, science and agriculture colleges.

The Women in Engineering (CPP WE) program is now the Women in Science and Engineering (CPP WiSE) program. The program now serves students in the science, engineering, and agriculture colleges. CPP WiSE creates a welcoming environment for students to thrive, and connects members with alumnae via speaker and networking events. Plus, CPP WiSE members help inspire the next generation of women in STEM via K-12 outreach events. Since the program's founding in 2012, CPP WE students consistently enjoyed higher graduation rates than their non-CPP WE counterparts.

"I'm excited to see our program grow and to offer our services to other populations in the colleges of agriculture and science," says Kristina Rigden, Ed.D., director of Outreach Programs and CPP WiSE.

A WORD FROM AHMED

"The College of Engineering's focus on applied research and practical problem solving forms a critical foundation for the success of all businesses, as they did in my own endeavors."

Ahmed Adel Al-Khatib ('83, electrical engineering), the college's 2021 Distinguished Alumni. Al-Khatib is chairman and CEO of AGILINE Software, LLC and is responsible for corporate development, building strategic partnerships and broadening business relationships. He was inducted into the CPP Engineering Hall of Fame in 2014.

CPP ENGINEERING A TOP SCHOOL FOR HISPANICS

Hispanic Outlook on Education magazine ranks the college No. 5 in the nation for graduating Hispanic students with a bachelor's in engineering. Our student body is comprised of 40 percent Hispanics, the majority population in the college. CPP Engineering also ranks high in education quality, social mobility and diversity. Check out page 26 to see how we rank nationally.

TAKING THE "H" FROM H20

A chemical and materials engineering student duo Rogine Gomez and Alessandro Pereyra won second place in American Society for Microbiology (ASM) International's 2020 Undergraduate Design Competition. Advised by Vilupanur Ravi, Ph.D., chemical and materials engineering department chair, the team achieved this distinction in a competition space dominated by teams from major research universities. The team's project focused on materials innovations related to the process of splitting water to produce hydrogen, a critical element for energy applications.

"Our win is a win for our research group, for the Department of Chemical and Materials Engineering, and of course, for Cal Poly Pomona. We are more than happy to represent our school to the world," says Gomez.

DEAN'S LEADERSHIP BOARD LAUNCHES STUDENT SUCCESS INITIATIVES

CPP Engineering's Dean's Leadership Board (DLB)—an advisory board of high-level executives with an alumni majority—brought their expertise and knowledge in three student success initiatives during the spring 2021 semester:

Bronco Mentoring Network: The Cal Poly Pomona Bronco Mentoring Network was expanded and enhanced through board member participation to help students and alumni connect and build networking relationships. To find out more about the program and how to become an alumni mentor, contact cppmentorship@cpp.edu. "Industry leaders who take time to mentor can provide students with information that may help them make better career choices, ensuring a successful and gratifying future," says Larry Gates ('87, civil engineering), president of DRC Engineering, Inc.

An Inside Look at Industry: DLB members held a series of virtual tours and presentations for the companies they work in or lead. During these events, students had the opportunity to talk with industry leaders and learned about project sites, entry-level job opportunities, and the importance of diversity and inclusion for companies.

Stuff They Don't Tell You in School Series: DLB-hosted seminars taught students the fundamentals of earning their first job. The four-part series covered creating a quality resume, preparing for the interview, following up, and negotiating salary. "Through this series, we hope to connect more industry representatives to engineering students and better prepare them for the interviewing process," says Clark Rucker ('83, engineering technology), chair of the DLB and director of Phantom Works Quality at The Boeing Company.

THIS ALUMNUS WAS A LITERAL ROCK STAR

James Williamson ('82, electrical engineering), playing for The Stooges in 2010.

***Insider* featured James Williamson ('82, electrical engineering) in their feature "10 rock stars with impressive college degrees."** A list that includes rock legends like Queen's Brian May, Williamson was a member of Iggy Pop's Rock and Roll Hall of Fame band, The Stooges. Iggy and James co-wrote the band's seminal work, Raw Power.

"I gave up being a Stooge to study calculus," says Williamson. He would go on to work at Advanced Micro Devices, then Sony, then retire and finally reunite with the band for a few more years. In 2014, Williamson was inducted into CPP Engineering's Hall of Fame, joining an inaugural class of 22 engineering alumni.

LUIS HELPS GET US TO MARS

Luis Dominguez ('09, mechanical engineering; pictured) served as deputy electrical integration and test lead for NASA's Perseverance—the latest Mars rover, which landed on the planet on Feb. 18, 2020. Dominguez played a major role in testing and installing the rover's electrical and software components. Perseverance will seek signs of ancient life and collect rock and soil samples for possible return to Earth.

"The most difficult thing about it is the troubleshooting aspect of the job, but it is also the most fun," he says. "I enjoy when I have to go into troubleshoot mode and figure out what's not working and why."

DEAN'S MESSAGE

In Conclusion

Every year, we make claims of how we are one of the best engineering programs in the nation. This is true, but where does excellence come from?

Our people. The students who excel, the faculty who teach, the staff who support, and the alumni who work and come back to the college to pay it forward. Without our people, CPP Engineering ceases being an institution that graduates students who are ready to work day one.

This year, we focused on telling the stories of our people. Our cover story highlighted the grit our students had to excel when a pandemic dictated so much of what we could and could not do. Our profile stories showed the tenacity of our alumni and staff. Every person in our magazine embodies the values that drive the college forward.

I hope you enjoyed this year's issue, and if you would like to share your thoughts, please send them to engineering@cpp.edu. Until next year, be well.

Alison Baski

Alison Baski, Ph.D.
Interim Dean
CPP Engineering

CPP Engineering by the Numbers

Enrolled Students^

6,161 Undergraduate Students

- **649** Aerospace Engineering
- **477** Chemical and Materials Engineering
- **1,471** Civil Engineering
- **1,203** Electrical and Computer Engineering
- **524** Electromechanical Engineering Technology
- **518** Industrial and Manufacturing Engineering
- **1,319** Mechanical Engineering

359 Graduate Students

^ Enrollment data from fall 2020; degrees awarded data from the 2019-20 academic year

Diversity & Social Mobility

- **42%** Underrepresented Minority Students
- **52%** First Generation Students
- **41%** Low Income Students

HIGHEST SAT AND GPA AVERAGES IN THE UNIVERSITY

- **3.79** Average Admit GPA
- **1,269** Average Admit SAT

Degrees Awarded **1,157**

- **74** Master's Degrees
- **1,083** Bachelor's Degrees

U.S. News & World Report 2021 National Rankings*

5th Nationally
Best public undergraduate engineering program

- **2nd Nationally** — Best industrial/manufacturing engineering program
- **3rd Nationally** — Best aerospace engineering program
- **4th Nationally** — Best computer engineering program
- **6th Nationally** — Best civil engineering program
- **8th Nationally** — Best electrical engineering program
- **8th Nationally** — Best mechanical engineering program

*Among programs where doctorate is not offered

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CalPolyPomona

College of Engineering

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ELECTRONIC SERVICE REQUESTED

Different Commencement, Same Creativity

This year's ceremony was different. The classes of 2020 and 2021 celebrated via a drive-in commencement, but one thing remained the same—the creativity Bronco Engineers put into their mortarboards. Here are just a few from this year.