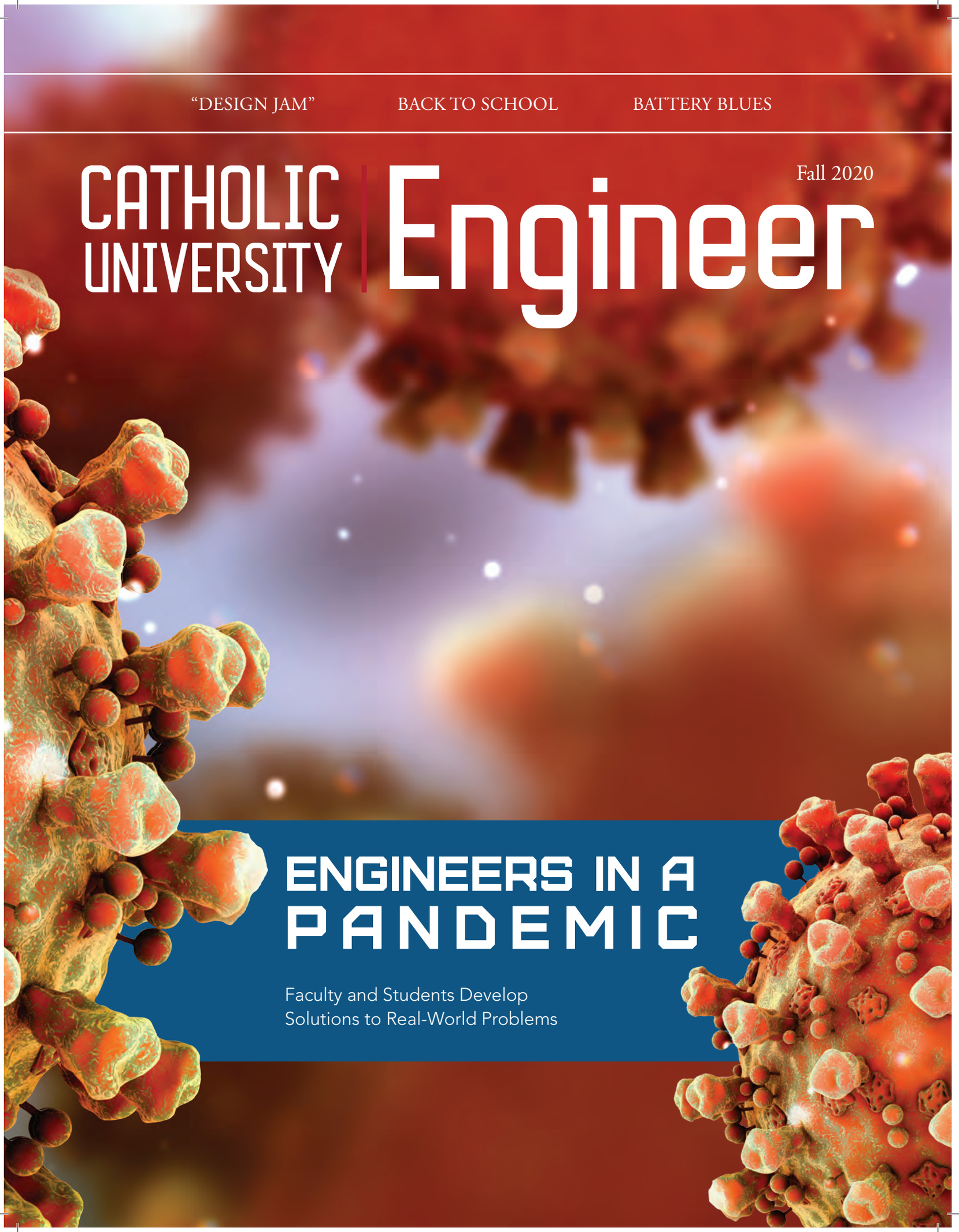
"DESIGN JAM" BACK TO SCHOOL BATTERY BLUES

CATHOLIC UNIVERSITY | Engineer

Fall 2020



ENGINEERS IN A PANDEMIC

Faculty and Students Develop Solutions to Real-World Problems

CATHOLIC UNIVERSITY | Engineer

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Dean´s Welcome

No one will ever forget the year 2020. The COVID-19 pandemic has claimed more than a million lives, caused tens of millions of illnesses, and disrupted the global economy in unprecedented ways. For those of us in academia, it has forced a radical rethinking of how we educate students at a time when gathering people together in large groups can contribute to the spread of the virus. Colleges and universities across the country and around the globe have raced to adapt, and thousands of creative minds have turned their attention to developing the best techniques for remote and online teaching — not to mention the challenges of mixed in-person and remote classes, and of contingency plans for student and instructor absences.

This year, our students, faculty, and staff have inspired me with their adaptability and resourcefulness. In some cases, they’ve applied their ingenuity to projects related to the pandemic itself, while in others they’ve found creative ways to keep forging ahead with plans and projects conceived before the pandemic arrived. Throughout this edition of Catholic University Engineer, you’ll find stories of their successes. Our students, alumni, and faculty have always had a focus on using engineering skills to contribute to our society — even before the novel coronavirus brought attention to the need for innovative solutions to global problems. A rigorous technical education within a context of concern for our fellow human beings has never been more urgently needed.

As the pandemic disrupts and reshapes higher education, I’m focused on the importance of the human factor. People learn from other people — from teachers and mentors and colleagues and classmates. The technologies that enable us to have classes with students and professors in far-flung locations don’t take away our need for personal interaction, but they do enable us to build connections and community in ways that weren’t previously possible. Since the invention of the written word, people have found ways to share knowledge with others remote in time and space, but we’ve always been the most inspired by learning and working together. I’m convinced that the connections that students make with their professors and classmates, and the communities we build together in pursuit of learning, are what is vital about a university, and what will endure in spite of the challenges we collectively face.

In these uncertain times, I’ve never been more certain of the importance of the education that students in our School of Engineering receive, and never been more proud to be a part of this community.

John Judge
Dean, School of Engineering

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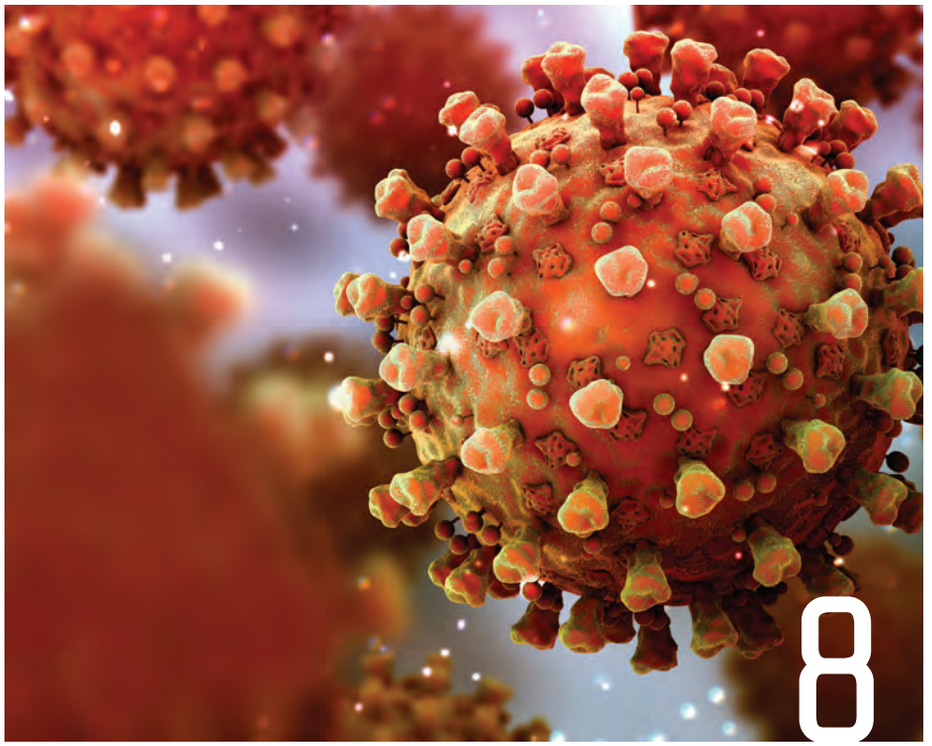


Engineers in a Pandemic

"Design Jam" Tackles the Problem of Food Insecurity

Back to School

Battery Blues

//SCHOOL NEWS

Developing Change-Making Engineers

Many young people study engineering because they want to make a positive impact on the world. In January 2020, three CatholicU faculty members attended a workshop at the University of San Diego (USD) on developing change-making engineers.

Jason Davison, assistant professor of civil and environmental engineering, Otto Wilson, associate professor of biomedical engineering, and John Judge, dean and associate professor of mechanical engineering, joined faculty and deans from schools around the country for the two-day event, which was funded through a National Science Foundation grant.

At the workshop, faculty from a number of universities presented on topics such as adding social context to individual projects and assignments; developing courses aimed at broadening students' perspectives; and structuring a curriculum to incorporate ideas of social responsibility, justice, and sustainability throughout an engineering student's education.

Juan Lucena, professor of engineering, design, and society and co-director of humanitarian engineering at the Colorado School of Mines, described some of the challenges of getting engineering faculty to think beyond their technical expertise. "No real problem is purely technical," Lucena emphasized. "Problems are always defined and constrained by human factors, economics, culture, and so on."

"Engineers need to provide solutions for society that are sustainable, economically positive, ethical, and engage within a larger system" explained Camille George, associate professor of mechanical engineering at the University of St. Thomas in St. Paul, Minn., where she is also an associate dean.

As the world of the 21st century becomes more connected, the soft skills that engineers will need include empathy and cultural agility. Ming Huang, Susan Lord, and Rick Olson, USD faculty members in (respectively) mechanical engineering, integrated engineering, and industrial and systems engineering, gave descriptions of several modules that they have incorporated into core engineering courses at a variety of levels.

For example, a module used in a sophomore-level electric circuits course dealt with conflict minerals, raising student awareness of the fact

Courtesy of the University of San Diego

An aerial view of the USD campus.

that much of the tantalum used in capacitors in cell phones is mined in Rwanda and the Democratic Republic of Congo, countries known for issues with conflict minerals. Major electronics manufacturers such as Apple, Samsung, and IBM have explicit "conflict mineral strategies" that attempt (often imperfectly) to insure that their supply chains are not contributing funding to wars and human rights abuses.

The workshop concluded with a brainstorming session on what universities can do to strengthen their students' preparedness to address social problems while using their engineering skills. Deans from several universities met in a parallel session to plan future activities on this topic, and to discuss how to best share and disseminate results and to support faculty members who incorporate social issues into their research and teaching.

Shipbuilding inside shipyard.

Engineering School Partners with Newport News Shipbuilding

TECHNICAL GRADUATE PROGRAM BEGINS THIS ACADEMIC YEAR

The School of Engineering has created a new graduate program for employees of Huntington Ingalls Industries' Newport News Shipbuilding division. The school will administer two Master of Science degrees in Computer Science — with concentrations in either software development or cybersecurity, each specifically for industrial control systems — to a cohort of 17 employees selected by the company. The new graduate program began in the spring 2020 semester.

Newport News Shipbuilding is a privately owned company that is solely responsible for the design, building, and refueling of U.S. Navy aircraft carriers, and one of two providers of U.S. Navy submarines. With approximately $4 billion in revenues and more than 20,000 employees, the company is the largest industrial employer in Virginia and the largest shipbuilding company in the United States.

"The School of Engineering has a long history of providing quality graduate education for employees of the Department of Defense, the federal agencies, and defense contractors," said retired Vice Admiral Mel Williams Jr., associate dean of professional programs. "We are pleased to be able to continue these efforts with Newport News Shipbuilding."

Students will complete 10 courses (30 credit hours total) by taking up to four courses per year over three years. Eight of the courses in each program are offered through the Electrical Engineering and Computer Science department, and two are through the Master of Science in Engineering Management program. The courses will generally be offered in a hybrid of in-person and online classes. Summer sessions will primarily be administered face-to-face in Newport News.

Research Day Moves Online

The COVID-19 pandemic did not deter Catholic University from holding its annual Research Day festival. This year, the event moved online, with more than 130 research projects — many from the School of Engineering — highlighted in virtual presentations.

The event was held on Tuesday, April 21. There were no classes during the day so that the entire University community could participate.

Event co-chairs Xiaolong Luo, associate professor of mechanical engineering, and Anita Shagnea, clinical instructor of mathematics, commended students, faculty, and staff for their passion for research and their dedication to sharing scholarly work.

"We heard from faculty and students that they were excited and ready to participate," said Luo. "COVID-19 didn't stop them from working on their research, and they wanted to share it! It became just a problem-solving challenge."

Holding the event online broadened its audience beyond the campus, to include the general public as well as presenters' families, friends, and professional colleagues. More than 3,000 visitors came to the website to participate in the event, and 212 of them posted follow-up questions or comments.

"The hallmarks of this research are its innovation, novelty, and global nature," Luo said, "and it's appropriate that this year University Research Day itself comes in a form that is unprecedented, innovative, and, for the first time, available anywhere in the world."

The research topics and presentation approaches ranged far and wide. Eye blink detection software to facilitate communication for paralyzed patients; how mood affects memory; combating increasing resistance to antibiotics; techniques to improve math skills for first-grade students; designing a sustainable school building in Arlington; using big data to help farmers in Ghana; meeting the spiritual needs of Generation Z — these are just a tiny sample of the research subjects CatholicU students and faculty are exploring.

"Research Day is a bright spot each spring, and this year it seemed to shine even brighter," said University President John Garvey. "In the midst of the coronavirus crisis that has kept us all sheltered in place, our faculty and students demonstrated an unparalleled commitment to our identity as a Catholic research university."

Students described their research in oral and poster presentations evaluated by faculty judges. Groups from the School of Engineering won the awards for best undergraduate presentation in both categories.

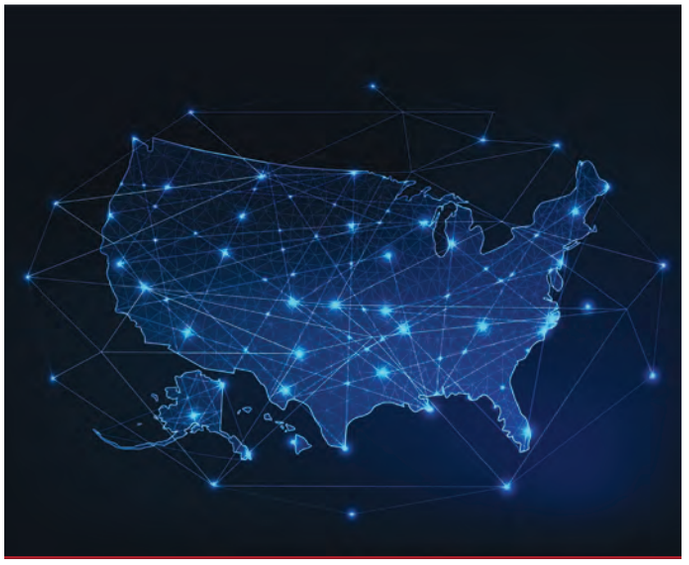
Mechanical engineering students Ann Vogel, Mariangelica Bermudez Gonzalez, Christopher Cupo, and Ashley Sieber presented their work on a breakaway prosthetic device designed for improved safety of users. Supervised by faculty advisor Greg Behrmann, they designed a lower-limb prosthetic for a military veteran who uses it to go mountain biking.

In their oral presentation, the students explained how traditional socket prosthetics can irritate the skin and don't provide as much range of motion as osseointegrated models, which are inserted directly into the bone. But when too much stress is applied to prosthetics of the latter type, bone injury can result. The model created by the students detaches more safely in emergency situations.

A group from the Department of Electrical Engineering and Computer Science, consisting of Caroline Shagnea, Katherine McCusker, Christopher Smith, and Mina Grace Larraquel, created a poster presentation describing a method for rapid detection of concussions using eye tracking and image processing.

Under the supervision of Chris Danek, the students created a prototype device that uses a camera to track the eye movements of someone with a potential concussion. Baseline measurements showing normal eye movement for a particular subject are compared with post-collision videos and an algorithm then correlates the smoothness, jag, or jitteriness in the eye with the likelihood of a concussion. This will have applications in a variety of scenarios, such as allowing athletes to be evaluated on the field before being sent back into play.

The keynote address for Research Day by Psychology Professor David Jobes, and other parts of the program, were posted on the website (**research-day.catholic.edu**), with links providing access to the videos, posters, and other digital content.



Engineering Contributions to Research Day 2020

BEST UNDERGRADUATE ORAL PRESENTATION

Breakaway Device for an Osseointegrated Prosthetic, by **Ann Vogel, Mariangelica Bermudez Gonzalez, Christopher Cupo, and Ashley Sieber**, Mechanical Engineering
Advisor: **Greg Behrmann**

BEST UNDERGRADUATE POSTER PRESENTATION

Device for Automatic Detection of Concussions Using Eye Tracking and Image Processing, by **Caroline Shagnea, Katherine McCusker, Christopher Smith, and Mina Grace Larraquel**, Electrical Engineering and Computer Science
Advisor: **Chris Danek**

FINALIST, GRADUATE ORAL PRESENTATION

Combating the Persistence and Increasing Antibiotic Resistance in Biofilms with a High Throughput Calcium Alginate Hydrogel Assay, by **Le Hoang Phu Pham**, Mechanical Engineering
Collaborators: **Hao Wang, Sangwon Lee, Yi Wang, Kenneth S. Phillips, Food and Drug Administration**
Advisor: **Xiaolong Luo**

FINALISTS, PH.D. POSTER PRESENTATION

Research Sharing Access Control Based on Hyperledger Composer Blockchain, by **Afnan Alniamy**, Computer Science
Advisor: **Bradley Taylor**

Determining the Role of Mechanical Stress in Breast Cancer Cells Invasion, by **Hanadi Alqosiri**, Biomedical Engineering
Advisor: **Christopher Raub**

FINALIST, UNDERGRADUATE POSTER PRESENTATION

Anisotropic Magnetoresistive Sensor to Monitor Post-Surgical Contractility of Pediatric Hearts, by **Daniel Ennis, Sabrina Scott, and Yousef Sindi**, Biomedical Engineering
Advisors: **Christopher Raub and Otto Wilson**

ORAL PRESENTATION, FACULTY & STAFF

Biofabrication: building a better (living) bridge to understand human health and disease, by **Christopher Raub**, Biomedical Engineering
Collaborators: **Xiaolong Luo, Bidhan Bandyopadhyay**

ORAL PRESENTATION, GRADUATE STUDENTS

Modeling sound propagation over rough sea for the detection of vessels, by **Andrea Vecchiotti,** Mechanical Engineering
Advisor: **Diego Turo**

Ozone Holes: Atmospheric Chemistry and Magnetic Field, by **Laurie Wei**, Mechanical Engineering
Collaborator: **Ibraheem Alelmi**
Advisor: **Sen Nieh**

ORAL PRESENTATION, UNDERGRADUATE STUDENTS

The Path to the Patent Office, by **Brian Aberle**, Mechanical Engineering
Advisor: **Gregory Behrmann**

Cybersecurity Risk Assessment Tool for Social Media Profiles, by **Sara Cho, Julia Ma, and Taner Tuncer**, Electrical Engineering and Computer Science
Advisor: **Lin-Ching Chang and Hang Liu**

Website Security, by **Juhyeong Kang, Ben Higgins, Sarah Beretich, and Jack Ropelewski**, Electrical Engineering and Computer Science
Advisor: **Bradley Taylor**

CUWaze: Campus Navigation using Graph Theory, by **Achuna Ofonedu**, Electrical Engineering and Computer Science
Advisor: **Bradley Taylor**

POSTER PRESENTATIONS, FACULTY & PH.D. STUDENTS

Blood Glucose Monitor Usability Testing and Solutions for End User, by **Razan Bahabri**, Biomedical Engineering
Collaborators: **Mada Alghamdi and Hanan Abusadah**
Advisors: **Kristen Miller and Robin Littlejohn**

Oral-mucosa-chip Provides High Sensitivity in Evaluating the Impacts of Dental Monomers, by **Khanh Ly**, Biomedical Engineering
Collaborators: **Seyed Rooholghodos, Christopher Rahimi, Benjamin Rahimi, Christopher B. Raub; Diane R. Bienek and Gili Kaufman, American Dental Association Foundation**
Advisor: **Xiaolong Luo**

POSTER PRESENTATIONS, MASTER'S STUDENTS

Construction and Mechanism of High-Density Nucleic Acid Storage Device, by **Alana Torres Vidal**, Electrical Engineering and Computer Science
Advisor: **Hieu Bui**

Machine Learning to Detect Infant's Arm Movement, by **Duc Tran**, Electrical Engineering and Computer Science
Collaborators: **Tan Tran, HsinHung Kuo, and Jing Wang**
Advisors: **Lin-Ching Chang and Peter S. Lum**

POSTER PRESENTATIONS, UNDERGRADUATE STUDENTS

Foldable Housing, by **Mansour Aburamyah**, Civil Engineering
Collaborators: **Saud Alenezi and Saad Alhai**
Advisor: **Carrie Maslen**

Help Most Blind, by **Husam Alkifigee**, Electrical Engineering and Computer Science
Advisor: **Chris Danek**

Autonomous Driving Robot, by **Mai Bui, Loc Tran, Hoang Cao, and Han Nguyen**, Electrical Engineering and Computer Science
Advisors: **Lin-Ching Chang and Matthew Jacobs**

Autonomous Oceanographic Scuttling Buoy, by **Ben Higgins, Cid Porter, William Pyne, Conner Guthrie, and Gavin Hurlbut**, Mechanical Engineering
Advisor: **Jandro Abot**

Effects of phone using on thumb, by **Van Lam, Khue Phan, Fahad Alhuthaifi, and Khaled Almutairi**, Biomedical Engineering
Advisor: **Peter Lum**

Wind mapping using drone technology, by **Joseph LaPointe, Claire Sullivan, Lauren Coene, and Brian Aberle**, Mechanical Engineering and Electrical Engineering
Advisor: **Gregory Behrmann**

Eye Blink Detection Computer Project, by **Luke Lepak, Tim Figueroa, Tariq Almazyad, and Sparsh Goyal**, Electrical Engineering and Computer Science
Advisors: **Chaofan Sun and George Nehmetallah**

Golf Assistive Device for Hand Transplants, by **Kaelin Martin, Caroline O'Connor, and Ayda Raja**, Biomedical Engineering
Advisor: **Peter Lum**

Automated CPR machine for pediatrics, by **Alexander Mulyk, Reem Danish, Shouq Aldossari, and Malak Alharbi**, Biomedical Engineering
Advisor: **Christopher Raub**

Stormwater Management in Takoma Park, by **John Russell, Ross Dean, Ahmed Althagafi, and Sarah Gattan**, Civil Engineering
Advisor: **Jason Davison**

Development of a Strain Gauge with Carbon Nanotube Yarns, by **Brennan Woo and Leo Nardo**, Mechanical Engineering
Advisor: **Jandro Abot**

'I WANTED TO BE LIKE HER'

NARROWING THE GENDER GAP IN COMPUTER SCIENCE

Computer, mathematical, and technology occupations are projected to be among the rapidly growing professional fields in the next decade. Despite this demand, women currently make up just 24% of the STEM (Science, Technology, Engineering, and Mathematics) workforce, according to the U.S. Bureau of Labor.

Winds of change can be felt in the School of Engineering, which has raised student interest in STEM careers and is helping to close the gender gap. Currently, 35% of undergraduate computer science students are women, nearly twice the national average (18%). The school's master's and doctoral programs host, on average, 36% women.

"I saw a female student in computer science. It just all clicked that I wanted to be just like her when she talked about her Research Day projects and microprocessing classes," said Mina Larraquel of her engagement with CatholicU as a prospective student. She recently graduated with a computer science major and a minor in theology.

A 2018 study by Microsoft found that when girls and young women have exposure to STEM and female role models in the field, they are more likely to feel empowered to engage in STEM activities.

"Our world as a whole is in need of more scientists and engineers. We need to find ways to encourage girls and young women to major in STEM," said Lin-Ching Chang, a professor of electrical engineering and computer science.

Sophomore Teresa Martinez is interested in pursuing opportunities in STEM because of the challenge of problem-solving and the wide variety of career options.

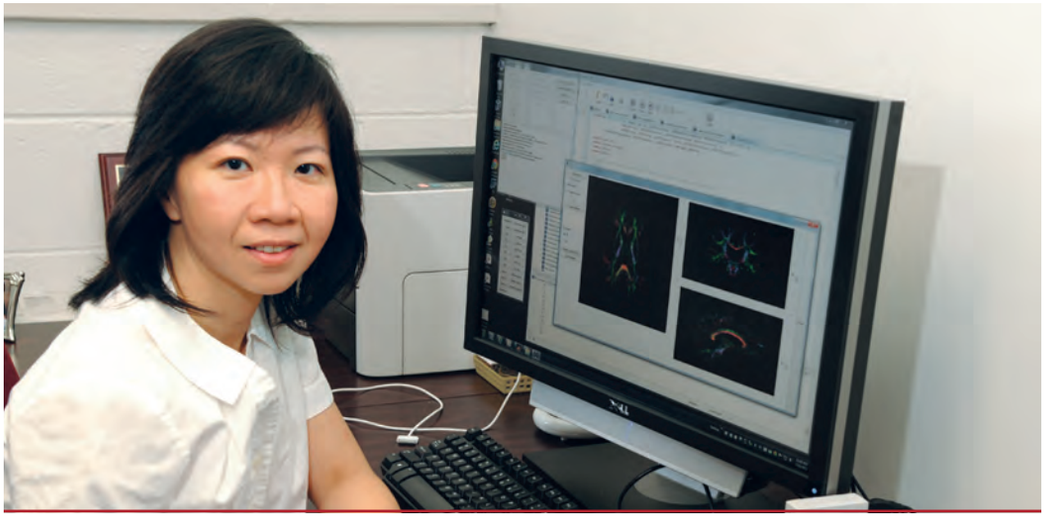
"Computer science is something I had never done before," Martinez said. "I like tackling problems head on and being able to solve them. The most satisfying part when you create a program is when it actually runs and works the way it is supposed to."

Additional studies have shown that girls who participate in STEM clubs and activities outside of school are more likely to pursue STEM subjects later in their education, which is why the School of Engineering organizes summer camps and competitions to expose local high school students to the field. CatholicU students also have created a number of groups and organizations to support each other in their programs.

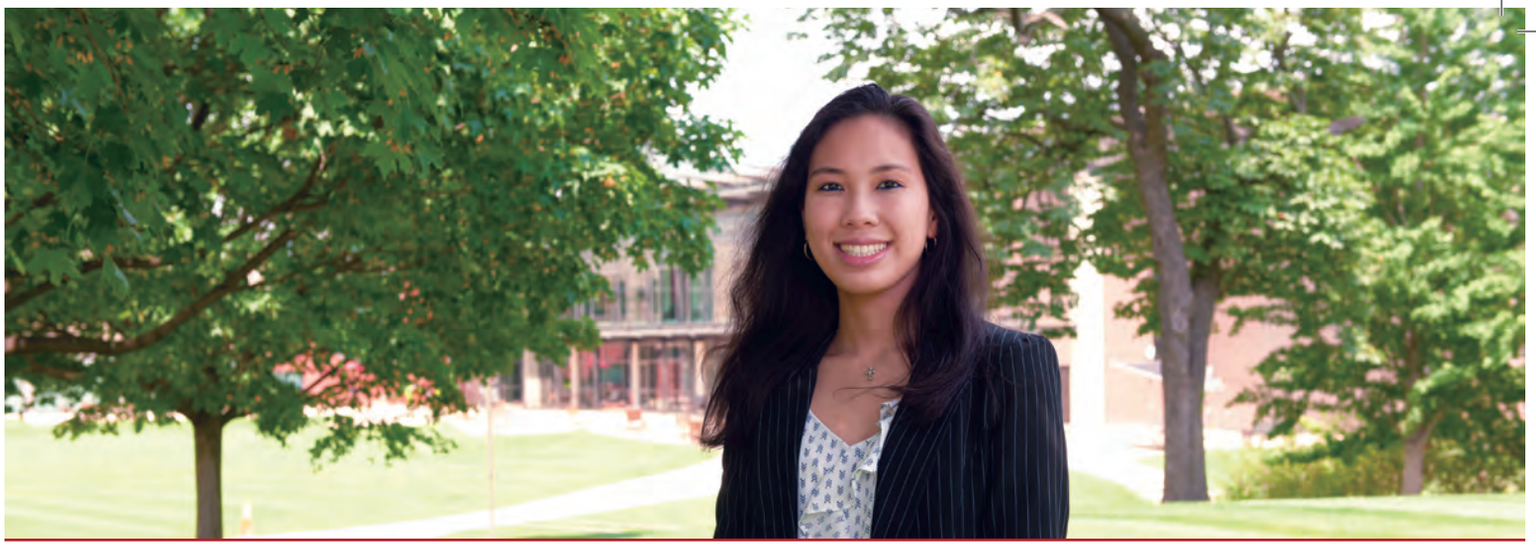
> "Our world as a whole is in need of more scientists and engineers. We need to find ways to encourage girls and young women to major in STEM."

Larraquel founded Upsilon Pi Epsilon, the University's first computer science honor society, in 2019. She also helped to revive the University chapter of the Association of Computing Machinery (ACM), an international society for computing, in 2017.

"I wanted to have an organization where everyone can interact with different grades, share experiences, and form life-lasting bonds that can help support us through this major," said Larraquel.



Lin-Ching Chang



Mina Larraquel

ORGANIZATIONAL TALENT

STUDENT FOUNDS CHAPTER OF COMPUTER SCIENCE HONOR SOCIETY

Mina Larraquel, B.S. 2020, founded the University's chapter of the national computer science honor society Upsilon Pi Epsilon during her senior year. Rising senior Andrew Larsen, also a computer science major, will be the chapter's next president. We asked Larraquel to reflect on her reasons for taking the initiative.

What does an honor society mean to you?

My definition of an honor society is that it recognizes individuals for excellence in their academic and professional achievements. I wanted to establish an honor society that celebrated students not only academically, but professionally, too. I knew Upsilon Pi Epsilon would be the perfect fit.

What made you decide to found this chapter?

My senior year was super challenging, and yet very rewarding at the same time. Deadlines were piling up high and my weekly schedule book was crying out to me that I was very busy, yet I knew something was still missing from our Department of Computer Science and Electrical Engineering. Our department is filled with dedicated faculty and class sizes get bigger every year; you would think we had it all. But it was an honor society that would be the answer to help us thrive in the future.

I was fortunate to be with a class that became my second family and the inspiration for the Upsilon Pi Epsilon's Catholic University of America Chapter. My classmates within the department are not just people I went to class with every day, but people I admire and respect the most. We have watched each other grow into amazing individuals with different backgrounds and experiences.

How did your classmates inspire you?

My classmates and I have achieved so much during our four years, and I knew I wanted to properly celebrate those achievements. What sets our chapter apart from others is that we look at one's professional achievements as well as academics. We want to celebrate everything that makes an individual different from the rest.

In 2017, you helped to revive the University chapter of the Association of Computing Machinery (ACM). What was your goal in doing so?

I wanted to have an organization where everyone can interact, share experiences, and form bonds that can help support us through this major and beyond. Our entire executive board of ACM is female, which really shines a light on how the major is becoming more diverse.

Women Bridging the Gap

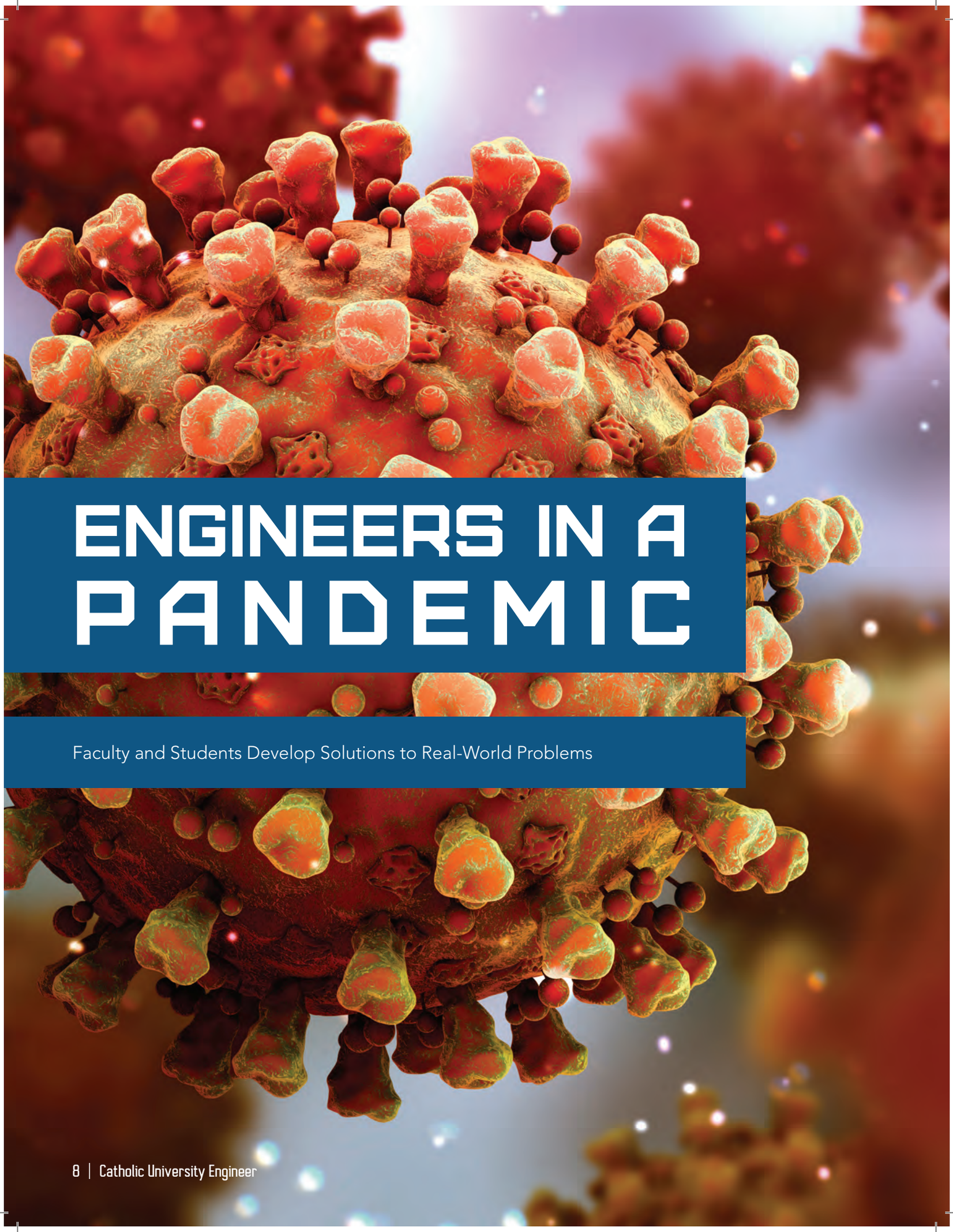
"The professors in our department really want the best from each of us, regardless of gender or academic standing. That being said, I also have female professors that are positive role models. The computer science department is very welcoming." — **Sara Cho**, computer science major with a minor in psychology

"It can be intimidating to pursue a degree in STEM, but our University encourages self-driven and collaborative education, which allows every student to succeed." — **Sarah Beretich**, computer science major with a minor in Italian studies

"We need more women in STEM, not only for a future that benefits women equally as men, but to find better solutions to global challenges. Therefore, although you may face many obstacles and failures, keep up the good work and remember what inspired you to become a woman in STEM." — **Laura Micheli**, assistant professor in civil and environmental engineering

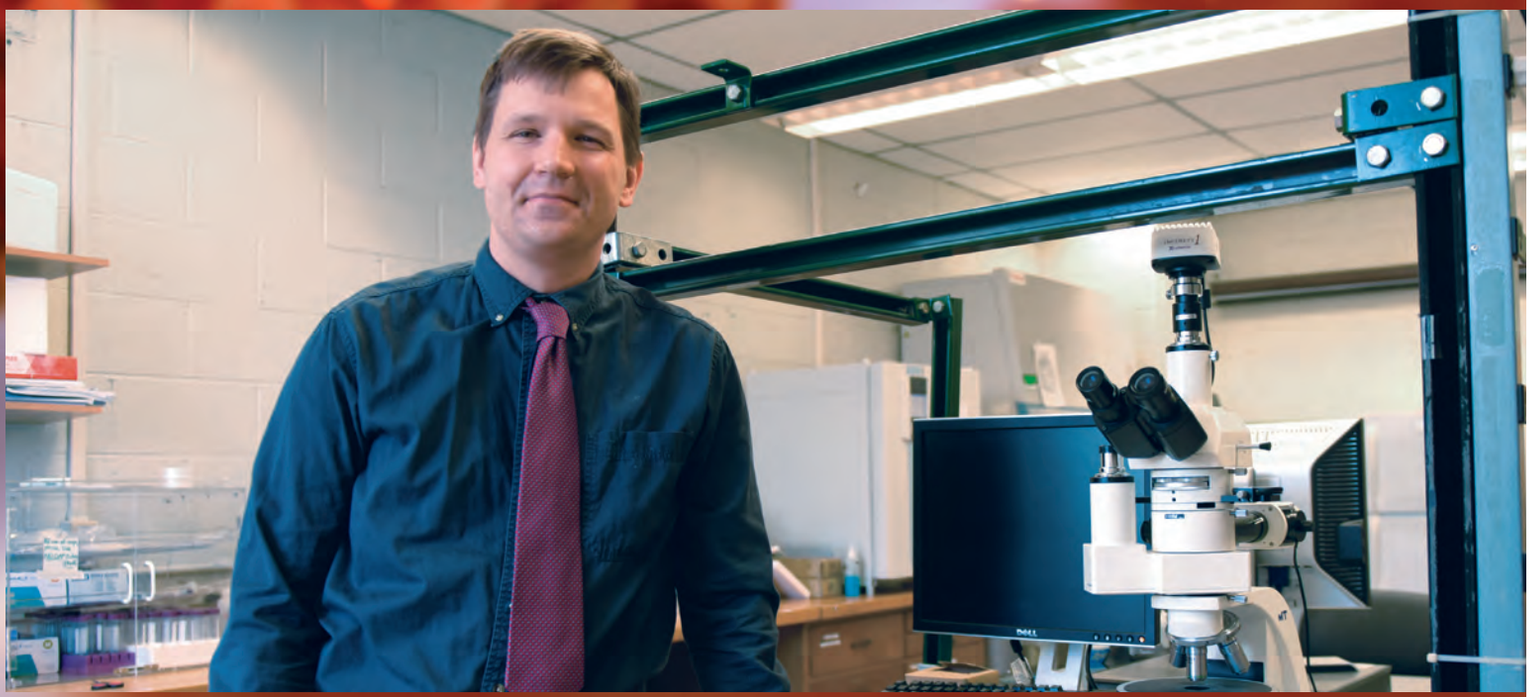
"I'm able to pursue a computer science degree while also remaining in the School of Engineering. A lot of the schools I was looking at had the computer science department either in the math or liberal arts departments. I was looking for a program that would give me both hardware and software experience in order to make me a more well-rounded student in the field." — **Katherine McCusker**, computer science major with a minor in studio art

"The computer science program has small class sizes, and the ratio of men to women in the program is small. Most people in STEM fields want to research. At Catholic, there are research opportunities available for everyone." — **Hayley Buba**, computer science major



ENGINEERS IN A PANDEMIC

Faculty and Students Develop Solutions to Real-World Problems



Chris Raub

Faced with a global pandemic of staggering dimensions, professors in the School of Engineering asked themselves: What can we learn from this? After students were sent home and classes moved online at spring break, many professors adjusted their course syllabi to incorporate the pandemic in lessons and assignments.

Binh Tran, an associate professor of biomedical engineering, teaches an engineering mathematics course on differential equations. As part of that course, he shows students how computer modeling can be used to predict and track the spread of diseases across specific populations. In the past, Tran has assigned students to create models predicting the progress of Ebola or measles. The obvious choice this year was to have them track the spread of COVID-19.

"We always try to model what's going on in the real world," said Tran. "This allows students to understand, as they watch the news and see the various models presented, where these data sets and estimates are coming from."

Studying the infectious disease models helped sophomore Anthony Grieco understand how complex the COVID-19 outbreak really is.

"I was able to see how different real-world phenomena are accounted for within the model," Grieco said. "It also demonstrated how many more factors there are in real life, like mortality rates, susceptible populations, and geographical hotspots. Researchers need to find ways to adjust their models to include these types of factors in order to best inform governments and the general public."

Using the programming tool MATLAB, the students created models that enabled them to see how various factors, such as social distancing, affect the spread of the virus.

"Dr. Tran showed how we can use models to better inform and help society," said sophomore Erin Novak.

The coronavirus was also incorporated in the senior design course taught by Jason Davison, assistant professor of civil and environmental engineering.

Normally, students in Davison's two-semester course spend the year working in groups to complete one design project. Faced with the knowledge that all classes would be moving online and physical interactions between students would be limited, Davison asked his students to wrap up their previously planned projects at the beginning of April. For the rest of the semester, he assigned them to conceive and design projects finding solutions to problems caused by the outbreak.

"What I wanted them to do is try and solve a problem in their community or their life using their engineering mindset," Davison said. "Whether it's turning a basketball court into a classroom or finding a solution to the supply chain problems, I wanted their solutions to be engineering-focused, using math or modeling, and coming up with some kind of design."

Design projects proposed by the students included a social-distancing mobile app, an educational website for children, voice-activated elevator buttons to cut down on surface contact, temporary hospital structures, no-contact food delivery systems, and redesigned grocery stores that would encourage social distancing.

"In civil engineering, we are always designing things for humans and we need to keep that in mind," Davison said. "Even though the COVID-19 virus is a biological thing, the main thing we were looking at in class is the relationship between the built and physical environment, and how humans interact within those two realms. I hope that students realize engineering is about building relationships and working together to help others."

In a course on bioinstrumentation, Chris Raub, assistant professor of biomedical engineering, asked his students what he called a "sort of pie-in-the-sky question": How would you test 300 million people for a virus in the space of two weeks?

"A very basic thing that you'd want to know as a clinician is whether a person is positive or negative for a coronavirus," Raub said. "But the thing about testing is that it's always changing, so you could test negative one week and feel sick next week and come back and test positive, or you may test negative again."

There are two main things you can do to get a true snapshot of what's happening in the country, Raub explained.

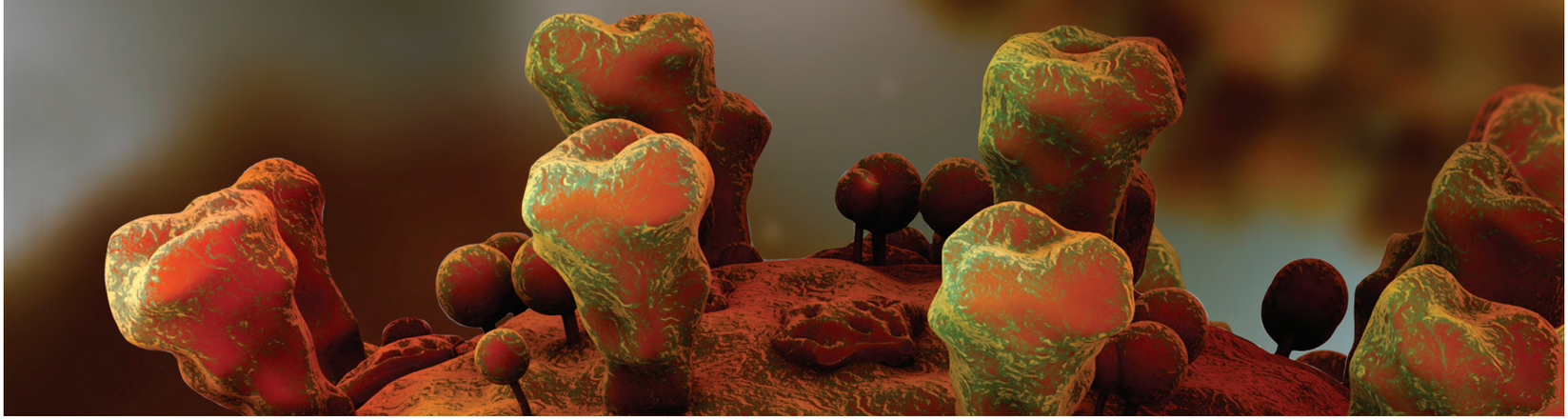
"You can try an extremely rapid and widely disseminated test, that could test huge numbers of people in a short amount of time, or you could do expensive, probably laborious antibody testing with statistical methods to build up snapshots of what's happening in a city or region and eventually in a country."

A good test for a virus should be highly sensitive and highly specific, Raub said.

"In many cases, it would need to be rapid, and it might need to be point-of-care. These are buzzwords in the bioinstrumentation jargon, but what they mean is a test that can be given to anyone anywhere, interpreted easily, and provide information that's accurate and delivered to healthcare professionals where they need it."

Sadly, the perfect test does not exist; in fact, almost all tests fall away from the ideal. Still, there are criteria that biomedical engineers must think of when they're designing a new test.

"My students had to think of their own potential solutions based on what we had discussed in class," Raub said. "At first, the tests for



Grace Boras

'ENGINEERS ARE PROBLEM-SOLVERS'

Students Adapted to the Pandemic's New Reality

Moving from the classroom to virtual learning at home in the midst of the spring semester gave students a pragmatic lesson in adapting to circumstance. Courtesy of the pandemic, it was a more sophisticated version of the lessons many of us learn growing up: No use crying over spilled milk. You just have to go with the flow.

That's the sort of timeworn wisdom reflected by seniors Bryan Minarczyk, B.C.E. 2020, and Grace Boras, B.M.E. 2020, who described their experience as guests at the School of Engineering Board of Visitors meeting in May. Both say they adapted well to learning virtually from home, though new difficulties were thrown in their path.

"Everybody was vying for the flat surfaces around the house," Minarczyk said. "My parents were working from home, so Mom was upstairs, Dad was in the laundry room, and I got sent to the kitchen and was told I had to set up and then clean up my workspace every day so that we could eat dinner at the dinner table."

"I had a brother and a sister at home," Boras

the coronavirus were taking days. The CDC put out a test guideline that turned out not to work so well, and they had to fix it. That's very common in developing a new test for some virus that no one had heard of a couple of months ago. It was impressive to see the viral genome, which was sequenced and posted online very early on by a group in Hong Kong. Immediately, researchers could start to design tests based on that genomic sequence, to try to detect the virus in a throat swab, for example, or saliva, or using a blood-based test. Students learned a lot about the current diagnostic tests and thought about what could be done to improve on those."

Another area in which biomedical engineers play a role is in the creation of personal protective equipment (PPE), including N95 masks and other items used by healthcare professionals. Engineers may be able to prevent the sort of shortages of PPE that we saw with COVID-19.

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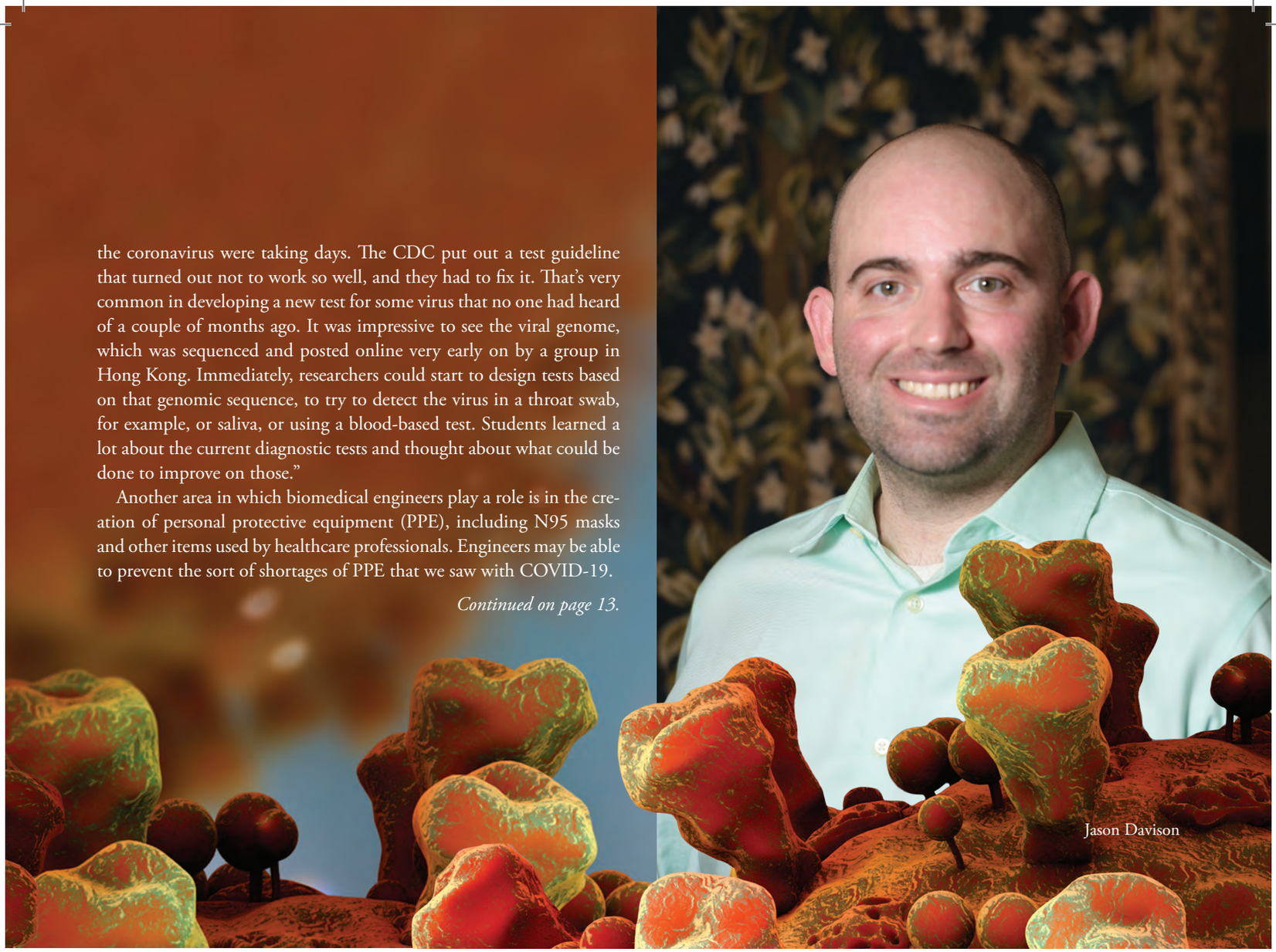


Jason Davison

said, "and you didn't want to be doing work at the same time in the same area."

Both students say they preferred virtual classes they could "attend" on their own schedules to those taught synchronously in real time.

"The first week was a little bit rocky," Boras said, "just trying to be sure I was seeing everything that the teachers were posting and that I was doing all my lessons and assignments."

"That took a little getting used to," Minarczyk said. "In classes that posted prerecorded lectures, you have to be a little more diligent to make sure you stay on top of everything. If you're disciplined and stay on schedule as much as possible, you don't end up with four hours of lectures to listen to."

When it came to classes taught synchronously, with everyone present in real time albeit online, there wasn't a great difference from being in the classroom — at least once the initial strangeness wore off.

"Everybody was a little shy in the beginning," Mincarczyk said. "You may not have any hesitation to speak in class, but now that you're on video, it's a new environment and it took a little getting used to."

Though she likes in-person learning better, Boras said, she appreciated the willingness of the School of Engineering's administrators and faculty to absorb feedback about how to make online learning work better.

Both students were quick to praise their teachers for the way they adapted to the new circumstances and for being available online for "office hours."

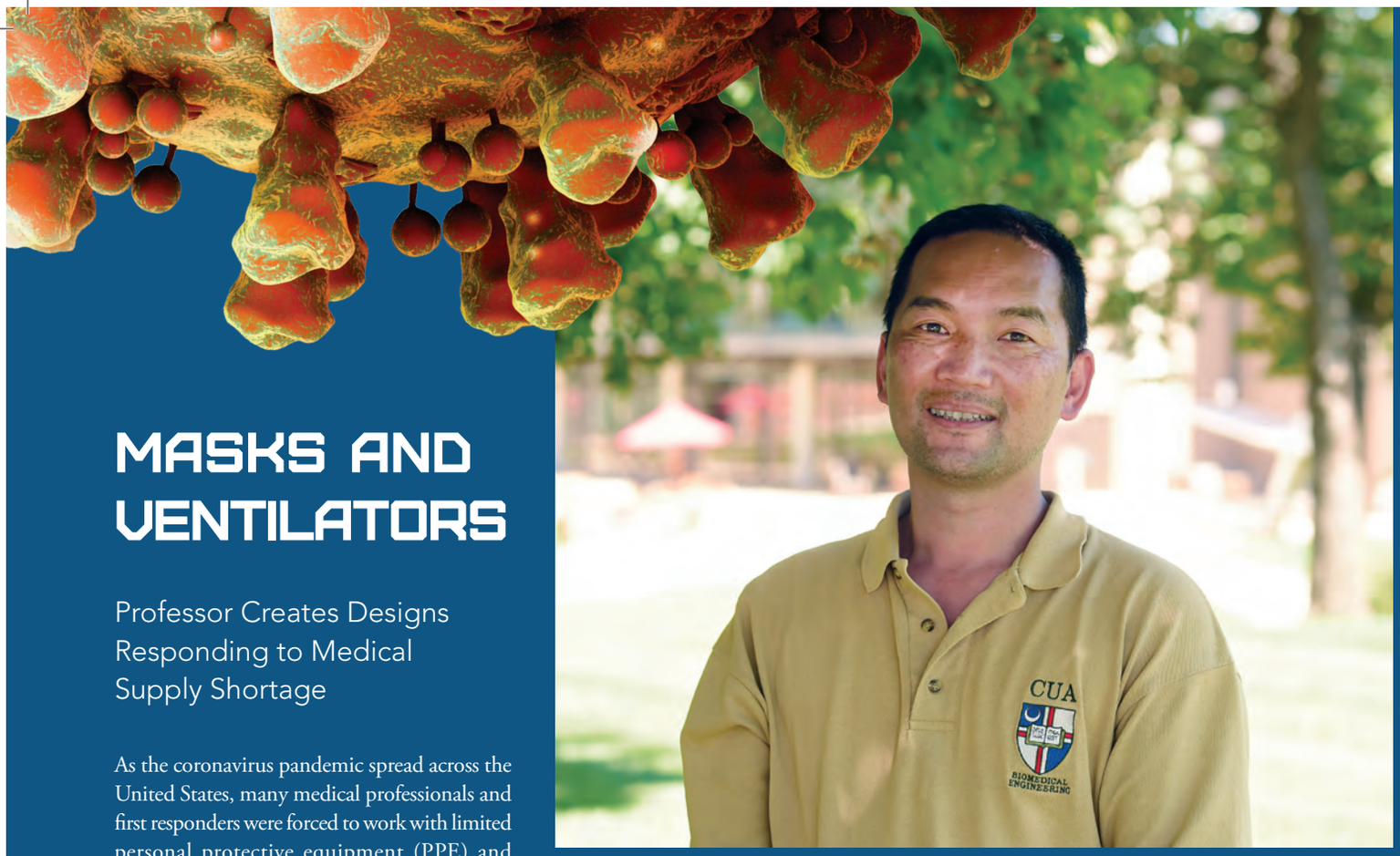
"Engineers are supposed to be problem-solvers," Minarczyk said. "It was a great test of all our skills in adapting to a new situation. Normal life had to be reinvented because of all the shocks the pandemic sent our way."

Their biggest disappointment about the spring semester was in missing the traditional Commencement ceremony.

"It was a little bit of a blow to not have Commencement," Minarczyk said. "It took on a different vibe. I received my degree while sitting on my couch. But I still have the memories of four years at Catholic, the great friendships, and the great education."

"I was happy that they had a virtual graduation ceremony," Boras said. "They did a good job with it. It was also nice being with friends I would have been separated from in a normal Commencement ceremony. I'm hoping to be able to walk in the spring, but I think people in the University administration did the best they could given the situation."

"My parents were probably more crushed than I was," Minarczyk admitted. "They really wanted to see me in my cap and gown."



Binh Tran

MASKS AND VENTILATORS

Professor Creates Designs Responding to Medical Supply Shortage

As the coronavirus pandemic spread across the United States, many medical professionals and first responders were forced to work with limited personal protective equipment (PPE) and other medical devices. Biomedical Engineering Professor Binh Tran knows from experience how dangerous that lack of equipment can be.

He is a former emergency room medic for the Navy Reserve, and he also worked as a design engineer at leading ventilator maker Puritan-Bennett.

"On the frontlines, physicians, nurses, and caregivers are at risk," Tran said. "And with new evidence that COVID-19 is airborne, we're realizing how dangerous it could be for them to have their eyes or other areas of their skin exposed."

With this problem in mind, Tran has been working alongside his friends and family members to design innovative medical solutions that could be affordably and easily replicated on a larger scale. When it came to PPE, Tran worked with his ninth-grade son, Joseph, to conceive a creative solution for the lack of available surgical masks.

"My first thought was that maybe we were approaching this problem the wrong way and that instead of creating masks, we should focus on creating filters," Tran said. "With the needs already so high, maybe if we could reuse the same masks and just replace the filters, we wouldn't need to use as many materials."

The final design devised by Tran and his son is a retrofitted snorkel mask. Using a 3-D printer, Tran adjusts the mask's breathing tube to hold individual filters, which can be replaced easily. Tran has also researched various materials to be used for the filters, including vacuum cleaner bags or double-layer cotton.

"Instead of making a whole mask, we're cutting a square piece of the filter and attaching that to the end of a breathing tube," Tran said. "It's much easier to do and does not require sewing. The disposable filters can be replaced like changing a band-aid. And because the mask isolates the breathing area, it doesn't fog up the entire mask."

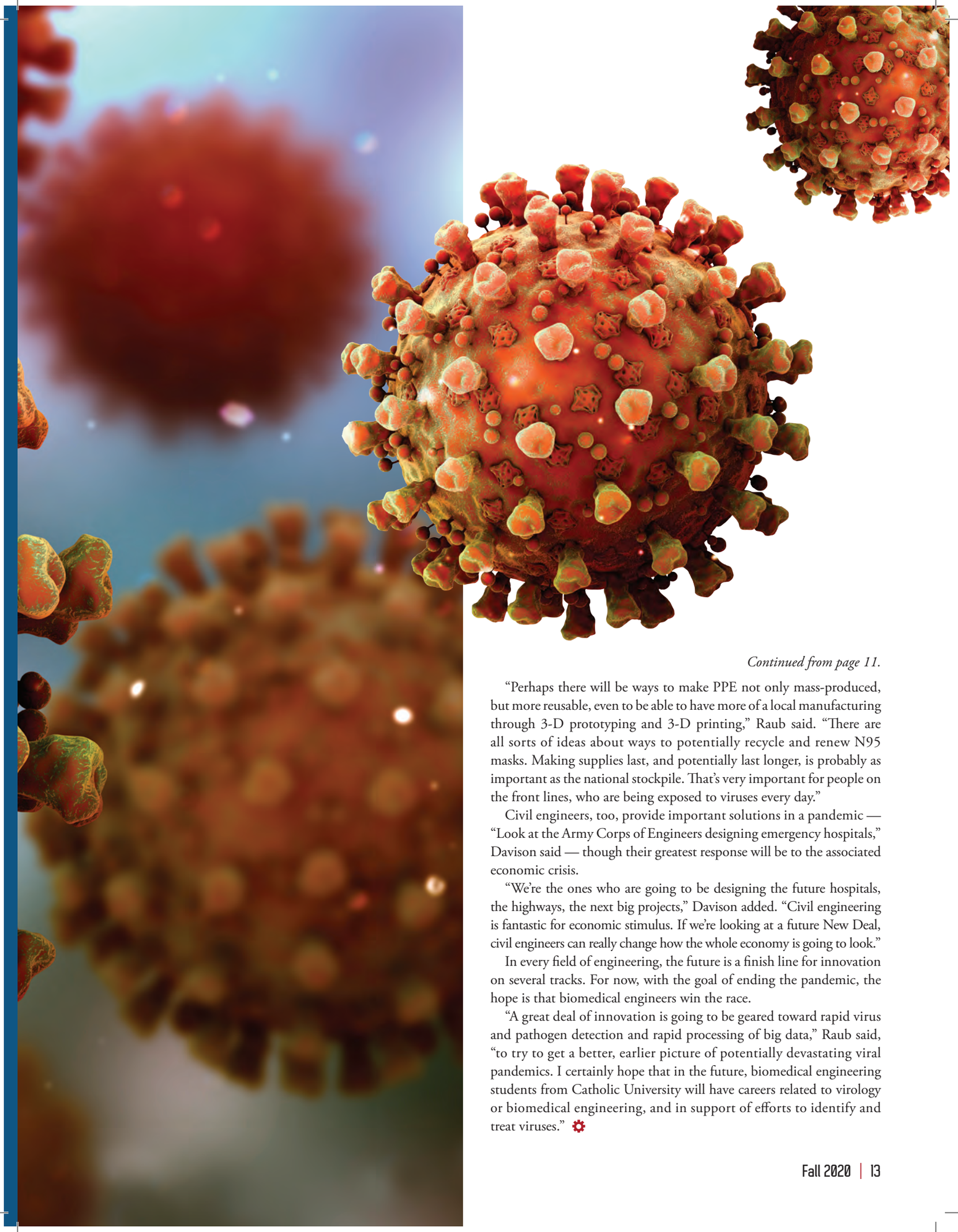
Tran put the instructions for how to build the breathing attachments and filters online and made them available at no cost, so that other people with 3-D printers could help manufacture the masks and donate them to area hospitals. He received feedback that communication was muffled with the closed face design. And there was another problem: in a hospital environment, masks need to be approved by the National Institute for Occupational Safety and Health (NIOSH) before they can be used.

Tran is working on a redesign for a more general-use mask that will not require NIOSH approval. He has also developed a ventilator prototype, inspired by portable bag valve masks, or Ambu-bags, used by first responders. Ambu-bags are portable and affordable but they require individuals to use their hands to squeeze the bags repeatedly, simulating airflow. With the help of his brother Ty Tran, managing partner at Applied Data Systems, Inc., and Stan Wong, a former colleague at Puritan-Bennett, Tran came up with a low-cost design that would automate pumping the bags.

"The idea is basically a motor made with supplies you could normally buy for around $20. We would put an enclosure around the bag, a motor, and the pumping mechanism, and I'm hoping we could put it all together for around $250-350," Tran said. "This could be an alternative to a high-cost ventilator that could supplement the breathing for someone with respiratory distress. Normally, a hospital-grade ventilator costs around $50,000."

At the time of this writing, the anticipated urgency for more ventilators has not materialized. But Tran is undaunted. For him, the idea to work on these projects was an automatic one, inspired by his years of engineering and medical training.

"This is what engineers do, especially biomedical engineers," Tran said. "We're not nurses on the front lines, but we are trying to solve human problems. At that next level, we can certainly work to offer our support."



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"Perhaps there will be ways to make PPE not only mass-produced, but more reusable, even to be able to have more of a local manufacturing through 3-D prototyping and 3-D printing," Raub said. "There are all sorts of ideas about ways to potentially recycle and renew N95 masks. Making supplies last, and potentially last longer, is probably as important as the national stockpile. That's very important for people on the front lines, who are being exposed to viruses every day."

Civil engineers, too, provide important solutions in a pandemic — "Look at the Army Corps of Engineers designing emergency hospitals," Davison said — though their greatest response will be to the associated economic crisis.

"We're the ones who are going to be designing the future hospitals, the highways, the next big projects," Davison added. "Civil engineering is fantastic for economic stimulus. If we're looking at a future New Deal, civil engineers can really change how the whole economy is going to look."

In every field of engineering, the future is a finish line for innovation on several tracks. For now, with the goal of ending the pandemic, the hope is that biomedical engineers win the race.

"A great deal of innovation is going to be geared toward rapid virus and pathogen detection and rapid processing of big data," Raub said, "to try to get a better, earlier picture of potentially devastating viral pandemics. I certainly hope that in the future, biomedical engineering students from Catholic University will have careers related to virology or biomedical engineering, and in support of efforts to identify and treat viruses."

"DESIGN JAM" TACKLES THE PROBLEM OF FOOD INSECURITY

Chris Danek

How do you solve a problem as complex and far-reaching as food insecurity in the Washington, D.C., area? According to entrepreneur Chris Danek, B.M.E. 1989, the answer can only be found by involving as many perspectives as possible.

That was the goal of a student-led and volunteer-driven 'design jam' on Nov. 16, 2019, hosted by the University's Center for Service through Innovation, co-founded by Danek with Associate Dean of Engineering and fellow alumnus Greg Behrmann, Ph.D. 2009. The event brought together students, alumni, business leaders, and community members.

Working in teams in what Danek called an "uncompetition," participants brainstormed innovative ideas for providing affordable and healthy food options for those who are currently hungry.

"We wanted this to have a little bit of the feel of a jam session," said Danek. "This is not a competition or a hackathon, but we have the same goal of coming up with ideas so that we can move forward and begin to make some positive changes in our community."

Jack Bobo, a world expert on food policy and CEO of Food Futurity, gave a keynote presentation explaining some of the major issues affecting the food industry that have resulted in an estimated 800 million people going to bed hungry each night. He also referenced the Rockefeller Foundation Food System Vision Challenge, issued to organizations around the world, to improve the international food system by the time the global population reaches an estimated 9 billion people in 2050.

"We need 60 to 100% more food by 2050,

and we'll have less land and fewer resources," Bobo said. "The next 30 years will be more important than any 30 years in the history of agriculture."

Additional speakers for the day included Alex Cohen, CEO of TwentyTables, an organization that seeks to create consistent access to affordable food, and Amanda Stephenson, founder of Fresh Food Factory Market in D.C.'s Ward 8.

"This is a great way for different minds to come together," Stephenson said. "You have people from different walks of life, different places, cultures, and experiences, but everyone can add value around a common mission."

Following the presentations, jam participants — including the advocates from the local community — split into small groups to frame design challenges that need to be solved. They decided to focus on two key challenges: "How might we help consumers in the D.C. area understand the meaning and benefits of food security and create positive trends?" and "How might we create positive trends for D.C. residents in access to affordable food and healthy choices, when a grocery store is so far from home?"

At the end of the day, the Center for Service through Innovation and the School of Engineering awarded $2,500 in prize money to two local organizations working to make food more accessible: DMV Black Restaurant Week, to support their "Storytelling through Food" initiative, and Fresh Food Factory & Market, to help engage students in service through a community gardening mentor-and-protégé program.

"The point of today is to raise awareness of these issues and also to find a community-centered goal," said senior computer science major Julia Ma, student director for the event. "Food impacts all of us. It's the way that we all come together and reach out and learn about other cultures, so it's important to hear lots of different perspectives on this issue. As a student, I don't really have a lot of access to food distribution policy, so it's good to hear what other people are doing who have that perspective."

Danek said the event provided an introduction to the idea of human-centered design, a design process that can be transformational for those involved because it requires empathy and deep listening to the stories of others.

"We think of all the stakeholders who are involved or touched by the problems and the solutions we're providing," Danek said. "These are things that can change you as a person. I look at human-centered design as a set of methods that are lifelong skills that can help you in any facet of your life, whether it's professional or personal."

BACK TO SCHOOL

Alumnus Teaches Course on Engineering Business Fundamentals

Joe Logue, B.E.E. 1987, has kept busy since retiring as executive vice president at Booz Allen Hamilton, where he led the firm's defense, intelligence, and international business. In the 2019-2020 academic year, he returned to the University to teach a course on business fundamentals for the School of Engineering.

Dean John Judge invited him to create the course after Logue, a member of the school's board of visitors, told him, "You're graduating really good engineers, but it would be great if they knew more about the real world."

With the help of a little research, Logue created a syllabus divided roughly into thirds, the first covering corporate finance — income statements, balance sheets, cash flow, how to raise money in venture capital. The students reviewed financial statements from companies such as Apple and Boeing.

The course's second third covers commercial consulting topics such as strategic planning, aspiration, mission, and vision — how they are developed, and how they are communicated effectively in writing. The final third covers engineering operations and project management.

"The idea of the course is to give students a competitive advantage in understanding how a senior executive looks at things," Logue said. "When you come out of school as an engineer, you're going to be asked to do a portion of a thing, and the idea of this course is to put in perspective how an executive's going to be looking at it. After taking this course, students should be in a better position to execute what they're doing because they have a feel for the bigger picture."

Previously, Logue was instrumental in establishing Catholic University's data analytics program in the School of Engineering. He knew from experience that there is a growing shortage of data scientists.

When it came to teaching the new course on business fundamentals, Logue approached the work with a mixture of humility and trepidation.

"It was frightening," he said with a laugh. "As a senior partner with Booz Allen, I ran a five-and-a-half-billion-dollar-a-year business, with 16,000 people around the world, and I was more nervous about teaching my first class than I was standing in front of boards of directors or heads of countries, because I had never done it before and I wanted to do it well. But as soon as I got to know the students, I realized they were just like I was back in 1983 and it became immediately comfortable. I ended up having a great time."

Several guest speakers, among them the CEOs and CFOs of multibillion-dollar companies as well as presidents of start-up corporations in the D.C. area, helped Logue get his message across to the students. Each semester, seven or eight senior executives volunteered to share their expertise.

"When I first started doing this, I thought it was going to be hard to get people to come in," Logue said, "but I actually had people calling me up to volunteer. I didn't have to twist any arms at all. I think most senior executives really want to give back. And giving back is not always about writing a check. It can be about looking 25 students in the eye and saying, 'I know what your textbook says, but this is how it actually works.' Lots of senior execs get the opportunity to write checks, but not a lot of them get the chance to make a personal difference in a student's life."

While Logue donated his work on the course pro bono, he didn't expect his guests to speak for the entire 75 minutes of class time — but each of them did exactly that. He ended up having to pack more content into the sessions he taught, but it was worth it to see how the students benefited, he said.

The active involvement of so many guest speakers helped Logue accomplish one of his goals for the course, which was getting students used to being in an environment with senior executives, and helping them gain a sense of how executives think. Another goal for the course, he said, was building student confidence in who they are and what they know.

Comments from several students who took the course indicate that Logue has succeeded in his aims.

"The ENGR 370 course was one of my favorite classes," said Victoria Roscoe, now starting her third year in the joint Civil Engineering/Architecture program. "It has added a competitive edge to the skill set I am building."

"This class made me realize that there is so much more I can do with my engineering degree," said Nolan Behringer, B.M.E. 2020. "It inspired me to want to further my education and pursue an M.B.A."

"It was a privilege to meet, talk to, and learn from the many successful engineers, entrepreneurs, and businessmen and women who joined us in class," said Patrick Fischer, a senior Mechanical Engineering major.

"I highly recommend this course to anyone who wants to learn more about what they can do with their engineering degree and gain a greater understanding of running a business," said Kayla Gumina, B.E.E. 2020.

Textbooks typically, almost necessarily, simplify the complications of real life. Logue and his guest speakers worked to give students a sense of how work is accomplished in the world beyond the page — even something so seemingly simple as creating a mission statement.

"When you read a textbook, the creation of a mission statement is pretty straightforward," Logue said. "It's anything but straightforward. You have to understand all the shareholders, all the stakeholders, all the people who have a say in it. You have to know who's going to like this, who's not going to like that, and how to bring them along so that you can actually get an entire organization to coalesce around the mission statement. That's the art, usually not described in a textbook, and that's the kind of thing you learn from experience."

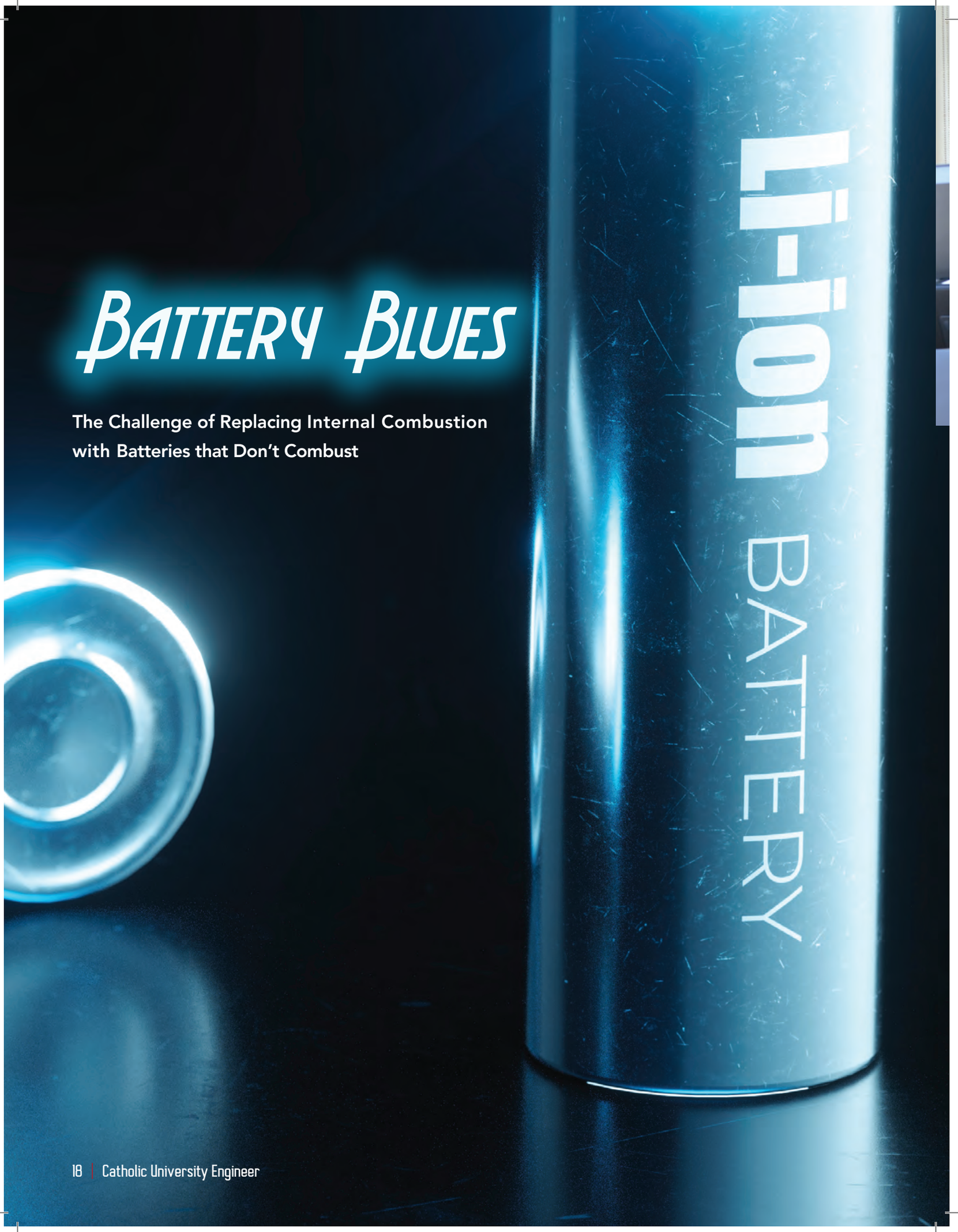
Logue found his year of teaching so rewarding that he is offering the course again this year.

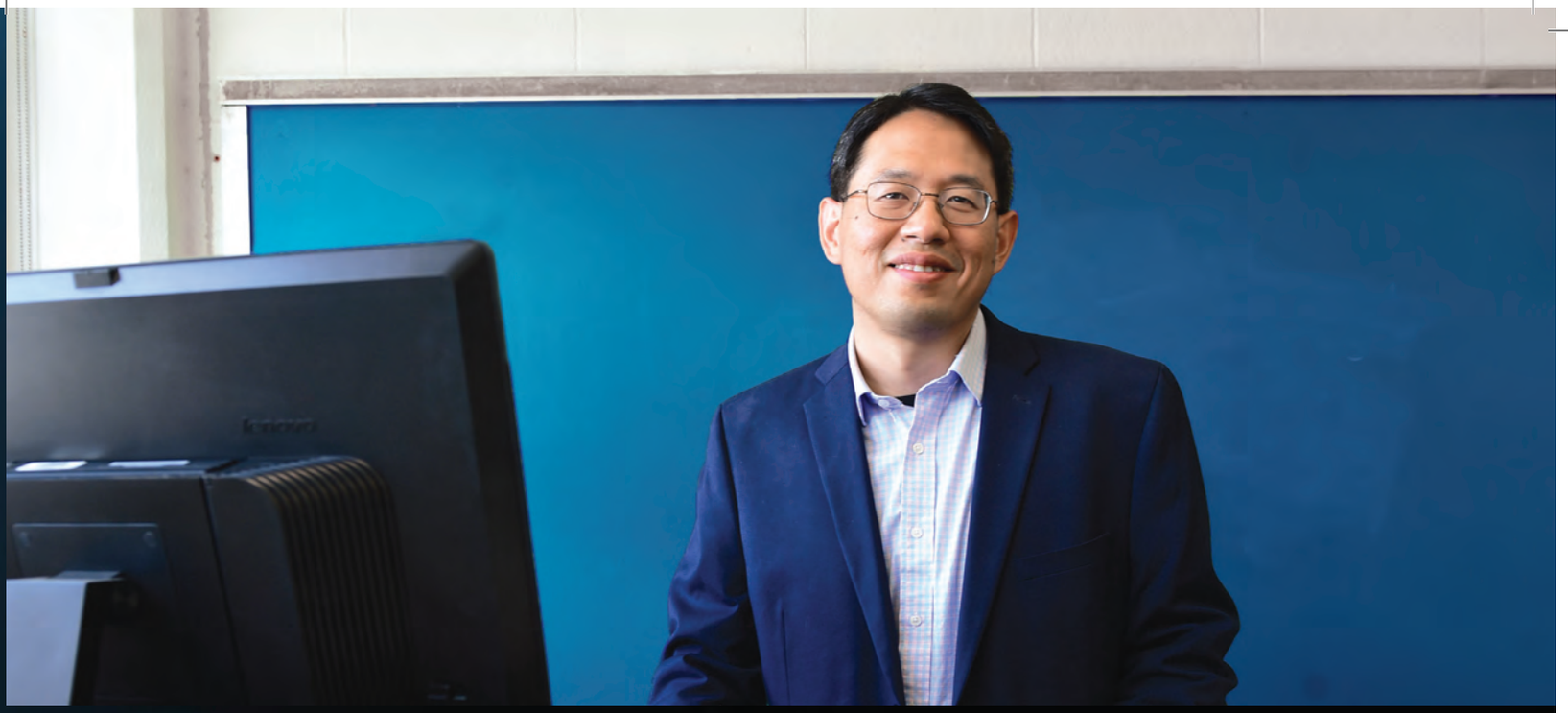
"I'm having a ball," he said.

Left to right: Lauren Coene and Claire Sullivan

Battery Blues

The Challenge of Replacing Internal Combustion with Batteries that Don't Combust





Chuan-Fu Lin

"Power storage and conversion remains a huge missing piece of the responding-to-climate change puzzle. And it will stay missing, says Assistant Professor of Mechanical Engineering Chuan-Fu Lin, the longer we're focused on fixing the system by making incremental improvements instead of finding the solution.

The electric battery as we know it today was invented in 1800 in Italy by Alessandro Volta, and yet as recently as 2019 the National Highway Traffic Safety Administration (NHTSA) announced that it was probing recurring problems of battery fires involving some Tesla vehicles.

How is it possible after more than two centuries that most people still get around primarily via internal combustion, simply because science cannot seem to master making batteries that don't sometimes spontaneously combust?

"In our competitive economy, making a better battery — from the research end through manufacturing and application — does not work the same way as a Manhattan Project or Apollo Program," says Lin. "Cost dominates. Unfortunately, however, we've been just clever enough to produce a system that works, fairly reliably, at scale, and for reasonable cost. So most of the billions being invested in battery technology today are trying to squeeze the margin level of energy out of the existing materials and technology and keep the system running, rather than improving the basic science."

In the 29 years since Sony Corp. first commercialized the basic carbon anode model of a lithium ion battery, cost has been reduced, but there's been relatively little gain — it has approximately tripled — in energy density or how much power you can get into and out of an acceptable size and weight, Lin says. In the same timespan, transistor density has improved by an order of 10,000 times or more, supporting Moore's Law that the speed and capability of our computers double every two years.

While chip designers and manufacturers astound us with how many integrated circuits they can force onto a tiny bit of silica, the physics of the current graphite-based lithium ion battery are being pushed close to their limits, according to Lin, who directs the Materials Innovation Laboratory for Energy and Advanced Manufacturing. One of the lab's primary research directions is investigating novel or newly synthesized materials for their potential use in high-capacity, high-performance batteries of the future — including for electric vehicles.

Currently, thin film processes (including an exotic technique known as Atomic Layer Deposition or ALD) and nanotechnologies appear to be promising areas for exploration and exploitation, says Lin. His research already has drawn the support of the National Science Foundation and Department of Energy, as well as the interest of several major battery manufacturers.

"Research has already demonstrated that lithium-ion batteries that use nano silicon — derived from sand — rather than traditional carbon or graphite on the anode [negative electrode] side are 10 times more effective," Lin says. Although, he adds, surmounting the scientific hurdles standing in the way of progress on better batteries for the future may actually be less of an obstacle than another, non-engineering challenge — market forces.

According to Lin, commercial investment for the future in energy storage R&D is "almost universally" spotlighting solid state. In most cases, this means replacing the flammable liquid electrolytes with solid electrolytes, and replacing carbon anodes with lithium metal anodes. Solid-state technology could potentially pave the way toward safe, noncombustible batteries for electric vehicles, but at the current stage, lower energy density and the much higher cost impede its major application in the market. Such a change may fundamentally resolve the issue, but in the short term, it may not serve expedience for shareholders, create convenience for customers, or open up new revenue streams for burgeoning electric vehicle manufacturers, says Lin.

He notes that it took mankind just six decades to go from a first, tentative flight on a windswept beach in North Carolina to landing on the moon. And already, half a century has passed since that historic event.

"We really need to look beyond just the next step to the next giant leap," Lin says. "Whether a breakthrough single process inserted into conventional battery design or an entirely new designing paradigm, we are seeking materials, processes, and structures that can provide the critical answers needed to meet the wide spectrum of demands posed by next-generation energy storage."

//EYE ON FACULTY

NEW FACULTY FELLOWSHIP TO HONOR MEISTER

Robert Meister was a member of the University community for over seven decades. After serving in the Pacific during World War II, "Bob" Meister enrolled as an undergraduate student in 1946. He earned his bachelor's degree in electrical engineering in 1949, then a master's degree and doctorate in physics, all from The Catholic University of America.

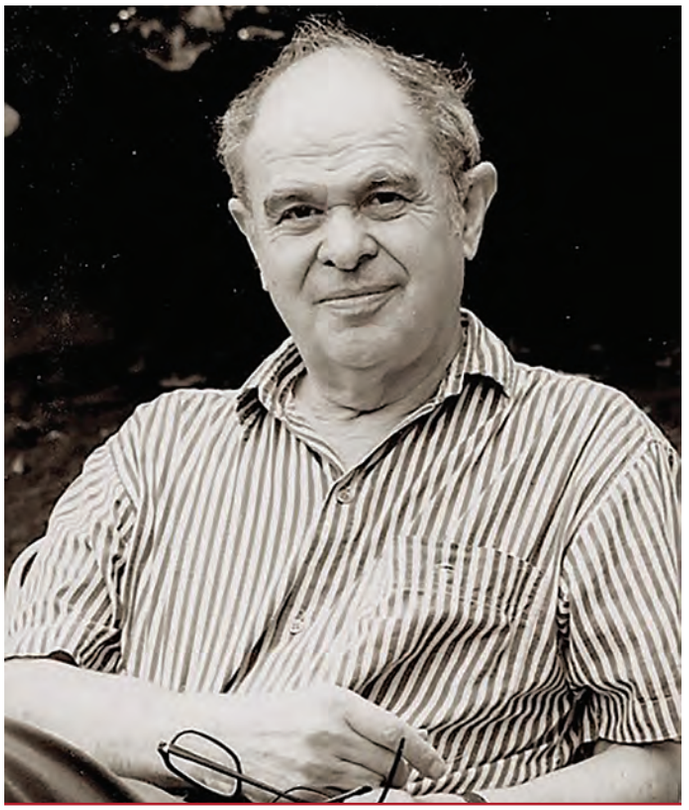
Meister joined the Electrical Engineering Department's full-time faculty in 1958, and served as chair of the department from 1971 to 1997. Beloved by colleagues and students, he was a fixture of the faculty for half a century. Under his leadership, the department hired both its current chair, Nader Namazi, and Dean Emeritus Charles Nguyen, who succeeded Meister as department chair before going on to lead the school as dean for 16 years.

Upon his retirement from full-time service in 2006, Meister was made professor emeritus, and continued making contributions to the school well into his retirement. He was nearly 94 years old when he passed away in January 2019, and is survived by three children, seven grandchildren, and three great-grandchildren. One of his sons, Mark, and his daughter-in-law Carla, are also alumni of the School of Engineering, where they met as classmates. Respected by all who knew him, Meister left countless students and colleagues indebted to his mentorship.

To honor his memory, the School of Engineering has announced the Professor Robert Meister Distinguished Faculty Fellowship. A generous gift from the Meister family has established an endowment that will support the fellowship, and former students of Professor Meister have contributed to the fund to recognize his impact on their lives.

The fellowship will be the highest honor the school bestows on a faculty member, recognizing and rewarding him or her for outstanding performance and dedication, and supporting continued excellence in research and teaching. The inaugural recipient of the fellowship will be announced this fall, and each Meister Fellow will hold the title for a three-year term.

The Electrical Engineering and Computer Science Department has named its chair's office the Professor Robert Meister Office of the Chair. A biographical plaque has been installed at the entrance; a second plaque inside the office bears the following inscription: The Catholic University of America dedicates this office to the memory of Dr. Robert Meister in gratitude for a lifetime of service as a teacher, scholar, mentor, colleague, and friend.



Robert Meister

Pangborn Hall

May 2020 School of Engineering Awards

STUDENT AWARD RECIPIENTS

Dean Charles Cuong Nguyen Leadership Award..... **Virginia Grace Boras**

The Anthony J. Scullen Award ..... **Bryan Matthew Minarczyk**

The Benjamin T. Rome Award..... **Julia Emily Ma**

Dean's Service Award..... **Ann Margaret Vogel**

The H.B. Atabek Award ..... **Michael Francis Taylor**

Biomedical Engineering Society Award..... **Caroline O'Connor**

American Society of Civil Engineers National Capital Section Award ..... **Bryan Matthew Minarczyk**

Dennis McCahill Award for Service in Civil Engineering ..... **Kaitlin Marie Shanahan**

Timothy Kao Award for Excellence in Civil Engineering..... **Bryan Matthew Minarczyk**

The George McDuffie Award for Excellence in Electrical Engineering ..... **John Edward Eisenbacher**

The John N. Welch Award for Excellence in Computer Science..... **Julia Emily Ma**

The C.C. Chang Award for Excellence in Mechanical Engineering..... **John Ropelewski**

American Society of Mechanical Engineers Award..... **Mary Catherine Cain**

Ruth Hicks Award for Service in Mechanical Engineering..... **Ann Margaret Vogel**

FACULTY AND STAFF AWARD RECIPIENTS

Charles H. Kaman Award for Research Excellence..... **George Nehmetallah** and **Christopher Raub**

Charles H. Kaman Award for Teaching Excellence ..... **Chanseok Jeong**

Dean's Faculty Service Award..... **Lin-Ching Chang**

Engineering Staff Excellence Award..... **Afshin Nabili**

Engineering Part-Time Instructor Award..... **Chris Danek**

Burns Junior Faculty Fellowship..... **Jason Davison** and **Laura Micheli**

GRAND CHALLENGE SCHOLARS

Bryan Minarczyk

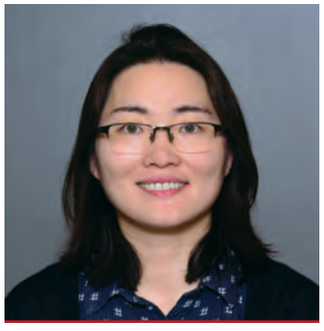
Julia Ma

New Faculty and Staff

Andrew Browne, M.S.B.A. 2013, has been appointed as the senior director of development in the School of Engineering. He started in the University's Advancement division as the director of major gifts for the School of Architecture and Planning in late 2016. In his three years with the school, he successfully launched its Board of Visitors, met with more than 400 alumni, and helped define the school's campaign priorities. He also helped the school grow its average philanthropic revenue from $100,000 per year to more than $750,000 per year. Prior to joining Advancement at Catholic University, he was the development director for a local nonprofit, The Youth Leadership Foundation. Browne earned his master's degree from the Busch School of Business in 2013. He earned his bachelor's degree in sociology while minoring in German and political science at the University of Central Oklahoma. He currently resides with his wife and 4 small children in Maryland.

Kendra Freeman joined the School of Engineering in spring 2020 as its operations coordinator, assisting the dean with the administration of the school. She holds a B.A. in Communications from Howard University and a Master of Science in Leadership degree from Grand Canyon University. Freeman is no stranger to working in a university setting, having spent 10 years as the assistant to the director of academic affairs in the School of Allied Health Sciences at Howard University. In this role, she was responsible for scheduling, managing student workers, payroll, budgeting, and other duties. She helps to make sure every organization she is with runs with dignity, understanding, and firmness, and aims to ensure that all involved always know that she is here to make their lives easier.

Matthew Jacobs, Ph.D. 2017, joined the faculty in fall 2019 as a visiting assistant professor in the Electrical Engineering and Computer Science Department, and is now a clinical assistant professor. During his graduate studies, Jacobs collaborated with NASA Goddard Space Flight Center scientists in researching processing of solar imagery of coronal mass ejections. For his Ph.D. study, he shifted focus to medical image processing by collaborating with the Advanced Cardiovascular Imaging Laboratory of the National Heart Lung and Blood Institute (NHLBI) at the National Institutes of Health (NIH). Subsequently, Jacobs held postdoctoral positions at the NIH and NHLBI's Advanced Cardiovascular Imaging Laboratory and at Catholic University. His research interests center on scientific image processing, both medical and astronomical; pattern recognition; and machine learning.



Minhee Jun joins the faculty in the Electrical Engineering and Computer Science Department as an assistant professor. She completed her Ph.D. at Carnegie Mellon University (CMU) in 2016. Her research concerned the development of an efficient algorithm that finds an optimal configuration in time for a reconfigurable RF front-end, a multi-standards future wireless communication platform. In 2017, she joined the CMU CyLab Biometrics Center as a postdoctoral researcher working on experimental projects involving heart rate detection and face spoofing detection, using the Moiré effect caused by the display resolution of a spoofing electrical device. She designed a benchmarking system of a face detection algorithm for an artificial intelligence and security system at HawXeye Inc. At Bossa Nova Robotics, she worked on various projects. She has published papers in leading wireless communication journals and conference publications.

Linda Kueter joined Catholic University in 2019 as the advancement coordinator for the School of Engineering and the School of Architecture and Planning. She works to strengthen the School of Engineering's overall development efforts and to move it toward the goal for Light the Way: The Campaign for Catholic University. Linda has a B.A. in public relations from Boston College and has worked in school settings for many years. Her capital campaign experience has been focused on educational institutions in both the Boston area and in Washington, D.C. Most recently she worked at Little Flower School in Bethesda, Md., in a role assisting with admissions, finance, and policy. She remains involved there and draws on that experience while serving on several parish and archdiocesan committees. Although a New Englander at heart, Linda now lives in Bethesda with her husband and two college-age daughters.

Chaofan Sun joined the Department of Electrical Engineering and Computer Science in the fall 2019 as a visiting assistant professor. He received a B.E. in physics engineering from Tsinghai University (Beijing, China), an M.S. in Computer Science from Southern University in Baton Rouge (La.), and a Ph.D. in Computer Science from University of Houston (Texas). Previously, he worked as a data scientist in many industries on major projects involving retail customer profiling, financial data modeling, aviation industry data analysis, insurance/medical data analysis, and petroleum industry data modeling. He also trained professionals to incorporate data science, machine learning, artificial intelligence, big data, and programming languages into their work. Currently, he is teaching in the Data Analytics Program, with classes on machine learning and applications and data analyses. His research interests include big data analysis, machine learning, deep learning, and natural language processing.

Rick Thompson, M.S. 2009, Ph.D. 2012, first came to the School of Engineering as a graduate student. He has served as a graduate research assistant and teaching assistant, a teaching fellow, and in 2012 he joined the Department of Civil and Environmental Engineering and the Engineering Management Program as an adjunct faculty member. In 2020, he was appointed a visiting assistant professor. Thompson holds degrees in multiple disciplines. He has a 35-year career as a senior executive in the architecture, engineering, and construction industries, where his responsibilities have included domestic and international risk management, quality management, and executive leadership for multiple billion-dollar projects. More recently, he was charged with corporate responsibility for performance improvement and integration management. He has led architectural teams and complex engineering programs for the U.S. Navy's Electromagnetic Aircraft Launch System (EMALS) and for airport terminal replacements at JFK International and Louis Armstrong New Orleans International airports. Thompson has been responsible for more than $5 billion of constructed building and infrastructure projects.

Joseph Vignola, associate professor of mechanical engineering, has been appointed chair of the Mechanical Engineering Department. Vignola joined the faculty in 2006 after 15 years at the U.S. Naval Research Laboratory. His expertise is in structural dynamics and acoustics, MEMS, and nanotechnology. He has studied nondestructive testing of large-scale systems such as aircraft and submarine structures as well as frescos at the U.S. Capitol and published a number of papers focused on damping mechanisms in micro-systems.

//ALUMNI

Peter Schramm

A STARTUP CONNECTS PEOPLE WITH MENTORS

ALUMNUS CREATES SOFTWARE TO HELP PEOPLE DREAM BIG

Peter Schramm's first game with the Cardinals basketball team was a preseason game in South Bend, Ind., against Division I Notre Dame. "I was so nervous," he recalls. "Even though it was just an exhibition game, we were playing one of the best teams in the country. We lost by 26 points, but what I remember is the importance of teamwork and how being surrounded by a supportive group can build your confidence."

Schramm, B.M.E. 2014, M.S. 2015, spent three years on the basketball team as well as the track team. His teammates remain friends and he is still connected to his engineering classmates and professors, as well. Mentors have been important to him and now he serves as a mentor, in both professional and personal capacities, for current students.

He started his career at Lockheed Martin, working in the areas of proposals and renewable energy, among others, and led a project to build and install the largest solar carport in Florida. "We did this as a group. We are stronger as part of a team; when we support each other; when we have a network," says Schramm.

Moving on from Lockheed, he worked at a smaller defense contractor where he led a team of 100 engineers and scientists to build robots for the army. He sums up the job as "keeping the good guys safe from far away."

In March 2018, Schramm had an idea inspired by his passion for connecting people. It's not what you know, the saying goes, but who you know — and this is how his startup got its ignition spark.

"I was sitting in the courtyard at my apartment in Dupont Circle," he remembers, "and I reflected on all of the people who have been mentors and provided guidance to me —people like Dean John Judge, Dr. Jandro Abot, and so many other engineering faculty, alumni, and friends. And I thought about the joy I experience serving as a mentor for Catholic University students. Being a connector is my true calling."

The company he started is called Lattus, which Schramm says is the "scariest, hardest, most rewarding thing I've ever done." Naturally, he called upon his network as he launched a website and put together a proof of concept and sought feedback.

Schramm describes Lattus as "a software platform that helps people reach their max potential by learning from one another through sharing insights, perspectives, and experiences — mentoring made easy. And it all starts by signing in and scheduling a conversation in your area of interest."

Why the name? "Our logo is based on a lattice structure that can be found in a garden that enables plants to grow to new heights. Lattus is a platform that helps people grow. It supports personal development." The change in spelling is a subtle nod to the importance of "us" — people working together.

Schramm is still growing and developing his company (**lattus.com**), and already has positive outcomes to report: "We have facilitated more than 700 conversations on 35 unique topics, which resulted in nearly 40 dream jobs being accepted at all career levels."

The University's Busch School of Business is using the platform, Schramm says, and many students from the engineering school have participated in pilot programs. The business continues to grow and he now works on it full time.

His long-term goals for the company go far beyond these early results. He wants to see millions of people using the platform before 2030, and firmly believes it can change their lives for the better.

"I hope to see Lattus become a verb in the way that we reference Google and Uber," he says. "Your dreams are a mentor away."

Frederick R. ('Fred') Favo

Alumnus and longtime Trustee Frederick R. 'Fred' Favo, B.Arch.E. 1955, died on June 8, 2020, at age 87.

Favo built a successful career as owner of Oakmont Realty Company and president of Valley Properties, Inc., in Oakmont, Pa. He was elected a trustee of the University in 1987 and continued to serve on the board until 2011,when he became an emeritus member.

Upon his graduation from CatholicU, Favo was presented with the Harris Cup — the highest athletic honor the University bestows on graduating male seniors — in recognition of his "outstanding service to the University as a scholar, athlete, and gentleman." He was a multisport athlete for the Cardinals, running cross country for three years and wrestling and running track for four. He was elected to the University's Athletics Hall of Fame in 1982.

In addition to his service on the Board of Trustees, Favo's contributions to his alma mater include his work as a member of the Alumni Association's board of governors. He also established seven endowed scholarships at CatholicU, including the Maureen Daley Favo Scholarship Fund honoring his first wife of 38 years. With his late wife, Anne (d. 2016), Favo remained a generous benefactor of the University, helping support Cardinal Athletics and Pope Francis' 2015 visit to campus, among many other projects and initiatives.

He received the University's Distinguished Service Award in 1998, the Edward J. Pryzbyla Award in 2004, and the Thomas J. Shahan Award for Service in 2006.

"Fred Favo represented the highest ideals of the University he loved," said President John Garvey, praising him as "a man committed to his family, his community, and the students of today and future generations through his philanthropic support for Catholic. His legacy will always be a valued part of our history."

Coach George P. George in a warm-up chat with Fred Favo during wrestling season, 1955

Eisenhower Memorial (detail)

HE LIKES IKE

CIVIL ENGINEERING ALUMNUS INSTRUMENTAL TO D.C.'S NEWEST MONUMENT

During his days as an assisting project manager on the construction site of the Dwight D. Eisenhower Memorial, Thomas Wong, B.C.E. 2017, M.S. 2017, became a student of the nation's 34th president. He memorized excerpts from some of "Ike's" speeches, carved in stone throughout the four-acre urban park designed by renowned architect Frank Gehry and situated close to the National Mall.

"My favorite is the homecoming speech upon his return to Abilene, Kansas, in 1945," says Wong. "It begins, 'Because no man is really a man who has lost out of himself all of the boy, I want to speak first of the dreams of a barefoot boy.' Eisenhower was twice resoundingly elected to the presidency after service as a five-star general and Supreme Commander of the Allied Expeditionary Force in Europe during World War II. This speech speaks to his humility, which only makes him more of a great American icon."

When he reflects on his role with the federal government's General Services Administration, Wong shows his own bit of humility. "I was this new wide-eyed project manager seeking to learn, grow, and serve as best I could," says Wong. "It was not lost on me that I was getting this once-in-a-lifetime career opportunity so soon after earning my civil engineering degrees."

The field of civil engineering first piqued Wong's interest while he was in high school. "I knew construction was a tried-and-true industry. And I liked the idea of working on physical, tangible things," he says. His

Thomas Wong

interest deepened while attending the School of Engineering's "Engineering New Frontiers" summer program for high school students.

Wong was able to accomplish the rare feat of completing his bachelor's and master's degrees in civil engineering in less than five years, in addition to completing minors in theology and sustainability. He had a memorable internship at the Basilica of the National Shrine of the Immaculate Conception that allowed him to work on another historic project, the completion of the Trinity Dome. He also worked on campus as a Residence Life office manager and served with the Knights of Columbus.

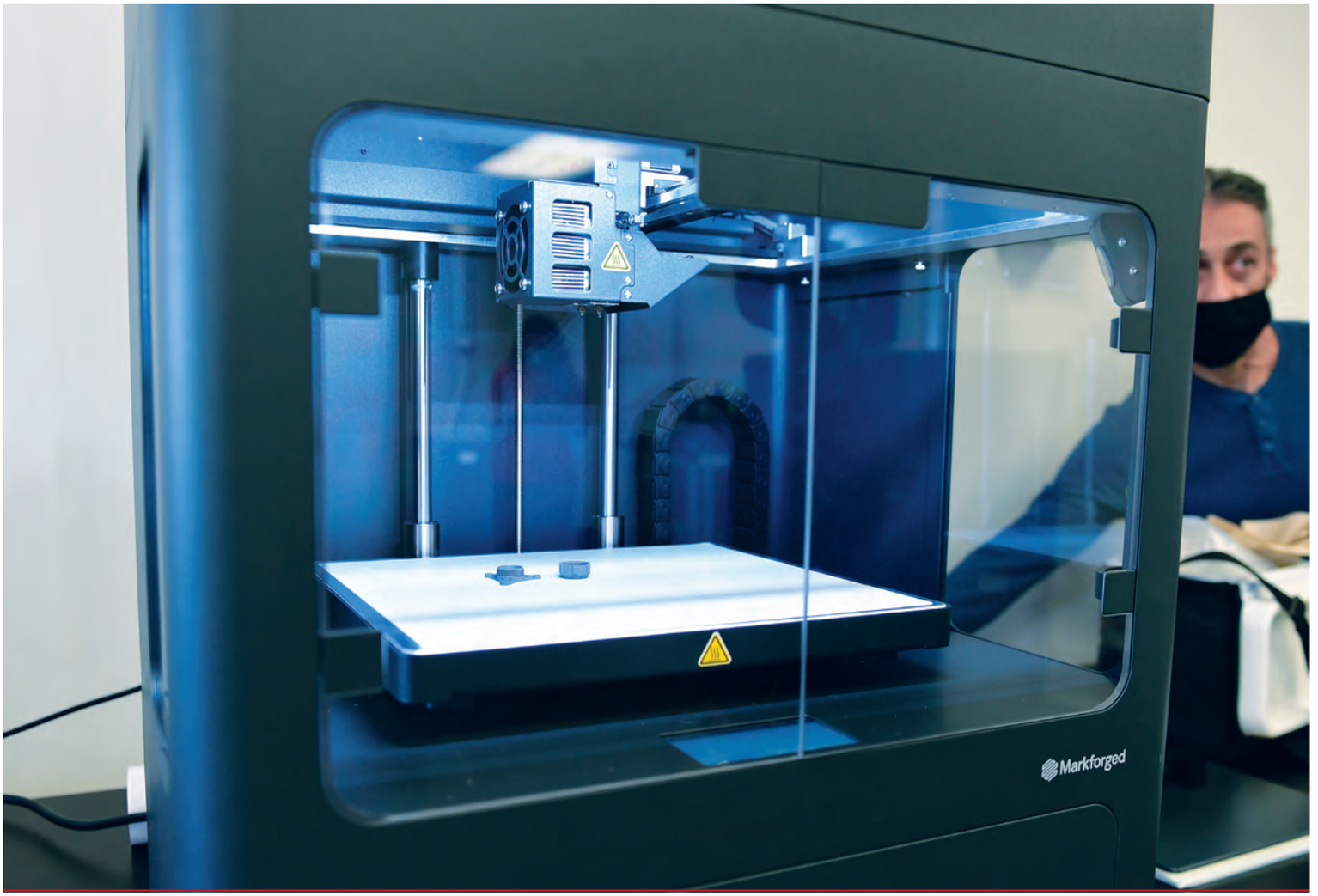
Wong counts Professor Gunnar Lucko, director of the construction engineering and management program, among his favorite faculty members. "Dr. Lucko is always taking his students on engaging site visits that demonstrate the real-world application of what we are studying in the classroom. In appreciation, I invited him and his students to visit the memorial construction site in October 2019."

As he considered career opportunities, Wong says, working for the federal government was not top of mind. He completed an application after talking to a representative at an on-campus career fair. Following a summer interview, he received a job offer during his last undergraduate semester in January 2017.

On Sept. 17, Wong was an invited guest at the formal dedication of the Dwight D. Eisenhower Memorial, located on Independence Avenue just behind the National Air and Space Museum. Under the glow of the memorial's nighttime illumination, the rain did not dampen a joyous evening that featured musical performances by the "President's Own" U.S. Marine Band and various veterans' groups, as well as a flyover by the 177th Fighter Wing of the New Jersey Air National Guard.

Days later, Wong visited the now-seventh presidential memorial in the nation's capital — this time as a tourist with his family. He watched as visitors enjoyed the trees, benches, statues, inscriptions, stone columns, and a 60-foot-tall, 450-foot-wide woven stainless steel tapestry depicting the Normandy coast at peacetime. He thought about "how this shy kid from New Jersey could help continue a long-established legacy of freedom and liberty that makes America great."

//OUR STUDENTS



Sergio Picozzi works with the new Metal X 3-D Printer

THE FUTURE IS HERE

STUDENTS GAIN 3-D PRINTING EXPERIENCE

It's not often that a class project involves printing a prosthetic finger using a photopolymerization printer, but that was recently the case in the School of Engineering's Additive Manufacturing course. The course is part of a certificate program for graduate students.

As part of that program, established in 2019, students are trained in all aspects of 3-D printing, and prepared to provide expertise to industry and government leaders regarding the applicability, potential risks, and opportunities of using 3-D printed parts.

Iriana Garcia Guerra, a master's student in materials science and engineering, enrolled in the program because she is interested in learning as much as she can about the new field.

"I realize how important this new field of additive manufacturing and 3-D printing will be in the future," she said. "People think 3-D printing is as simple as pushing a button, but there's a lot of science behind it."

The School of Engineering recently purchased a 'Metal X' 3-D printer for metals and established an alliance with the company Markforged in support of education and training associated with additive manufacturing.

"Companies like General Electric and General Motors are already working with metal 3-D printers," Garcia Guerra said, "and we are one of the few universities in the country to offer a program to learn about that."

Associate Dean Mel Williams Jr., M.S.E. '84, said he was proud that the school is providing graduate education and research in additive manufacturing and 3-D printing as part of the Materials Science and Engineering Program.

"We are excited and pleased by the interest in 3-D printing," Williams said.

Grace Pooley earned her bachelor's degree in environmental chemistry and is currently pursuing a master's degree in materials science and engineering with an environmental focus. She originally thought 3-D printing was "too gimmicky," she said, but began to see its potential when she learned of its uses for rapid prototyping and quick engineering solutions.

"It's not just for engineers, but for anyone who wants to see their vision become a reality," Pooley said. "When you talk about traditional manufacturing with wood or metals, you have to go through a lot more processing. Additive manufacturing really lets you be imaginative, and you can create intensely intricate geometries and structures."

Pooley plans to pursue her doctorate in environmental engineering. She believes her education in 3-D printing will serve her well, allowing her to prototype design elements for her doctoral project, which will involve strategic installations of nets to collect garbage from the Anacostia River.

"If a piece of the hardware for the net breaks, I will be able to get the dimensions for the piece and have it designed and printed within four hours, with less cost," she said. "That's just one way having this knowledge base will be really helpful."

Classroom experience in additive manufacturing has been so inspiring to Garcia Guerra that she hopes to pursue the field professionally.

"There are so many fields that will be interested in these skills, whether in biomedical engineering, mechanical engineering, or even the arts," Garcia Guerra said. "After enrolling in this program, I'm more than inspired to pursue this. I think 3-D printing is the future, and it's something we need to explore right now."

Dean John Judge and Afshin Nabili, director of laboratories and technology resources, prepare dedication plaques for the new Admiral Williams Additive Manufacturing Laboratory

Mel Williams Jr.

3-D Metal Printer Installed

In a space named in his honor, Associate Dean for Professional Programs Mel Williams Jr., M.S.E. 1984, was among those celebrating the installation of the school's new Markforged Metal X 3-D printer on Aug. 27.

The state-of-the-art system — the first of its kind at a university in the D.C. region — is capable of printing high-precision parts from various metals, achieving shapes that are impossible to produce with traditional machine-shop tools.

The "christening" was held in the Admiral Williams Laboratory on the third floor of Pangborn Hall. Williams retired as a vice admiral from the U.S. Navy in 2010; the lab was dedicated in his honor on Veterans Day 2019. As director of the Materials Science and Engineering program, he oversees the new Additive Manufacturing certificate program.

Dean John Judge joined Williams for the event, which was also attended by students, faculty, and staff (several in person, some via Zoom). Sergio Picozzi, assistant professor of mechanical engineering and associate director of the Materials Science and Engineering program, gave a description of the system and its capabilities. Glenn May, field application engineer for DesignPoint, performed the final steps of the installation and trained faculty and staff on its operation.

3-D-printed prosthetic hands

School of Engineering Hosts its First Maker Tech & Art Event

The School of Engineering hosted a free Maker Technology and Art fair on Sept. 14, 2019. The event, held in the Pryzbyla Center Great Room, showcased various projects and gave students, faculty, and community members an opportunity to interact with D.C. technology and art makers.

"It is a celebration of invention and creativity," said Sergio Picozzi, clinical assistant professor of mechanical engineering, and organizer of the event. "In the material sciences and engineering program, we would like to place an emphasis on advanced manufacturing technologies, like 3-D printing."

Exhibitors included companies like Markforged, one of the leading manufacturers of 3-D printing systems. The company demonstrated printing an item made of Kevlar, a bullet-resistant material manufactured and trademarked by DuPont.

ABC Imaging displayed other items produced in a 3-D printing process. Kevin Armentrout, an account sales executive at ABC, said that the company is planning to install more 3-D printers in engineering and architecture schools.

"3-D printing is the future," Armentrout said. "It's a great tool to have when studying engineering or architecture — to be able to have tangible concepts and pitch them to others."

In addition to tech and engineering companies, the event highlighted artists who use technology to produce art, as well as alumni who used their CatholicU education to shape their business models.

Architecture alumna Marta Ali, B.S.Arch. 2005, showed how Catholic University gave her the tools to start her own business selling custom laser-engraved designs for interior finishes.

"I want to turn everyday places into extraordinary experiences using technology," Ali said, "and CatholicU really helped me learn a lot about time management to be able to do that."

She displayed a mock-up design of what she said could be an interior wall in a restaurant made out of laser-engraved wood and gold spray paint.

Daniel Ennis, Christian Obuchowski, Claire Sturek, and Khue Phan in Minneapolis

A Biomedical "Shark Tank"

STUDENTS LEARN HOW DEVICES ARE DEVELOPED AND BROUGHT TO MARKET

Four biomedical engineering students traveled to the headquarters of Medtronic, Inc., in Minneapolis, Minn., in the summer of 2019 to take part in the prestigious Coulter College biomedical engineering design workshop.

The students spent many hours per day immersed in biodesign and interacting with mentors—clinicians, investors, entrepreneurs, and engineers. Daniel Ennis, Khue Phan, Christian Obuchowski, and Claire Sturek, all seniors in biomedical engineering for the 2019-2020 academic year, participated in the workshop. Professor Chris Raub served as the team's faculty mentor.

The team was tasked with exploring the topic of structural heart defects in pediatric patients. After spending June and July researching fundamentals of heart defect pathophysiology, current treatments, and identifying major deficiencies in current care, the students focused on a way to reduce mortality of infants on extracorporeal membrane oxygenation (ECMO) — a life-saving treatment for individuals whose hearts cannot keep up with the oxygen demands of their bodies.

In ECMO, blood is routed outside the body by an external pump and flushed with oxygen before returning to the body. Blood clots are a severe and often fatal risk. The student team from Catholic University came up with a way to eliminate the risk of blood clotting by rapid dilution and re-concentration of blood along with transient treatment with anti-clotting agents.

The team presented its final design before a panel of experts in a Shark Tank-style venture capital pitch, and was offered daily feedback leading up to the final pitch.

Besides the design workshop and competition, the students were also treated to tours of the research and development facilities at Medtronic. They participated in the unique career development program over the first four days of August.

"This was a rare opportunity for undergraduates to get a window into the biodesign process as it actually happens in the biomedical device industry," Raub said. "The process was eye-opening and motivating — getting a device approved and into the market where it helps patients is a multiyear process engaging thousands of hard-working and driven professionals."

ENGINEERING STUDENT HELPS VETERAN GOLF AGAIN

Biomedical engineering graduate Ayda Rajab, Class of 2020, was highlighted on the website of a charitable nonprofit that fosters innovations to improve the quality of life for injured people who have done national service. The organization, Quality of Life+ (QL+), acknowledged Rajab for her work with a team to create golfing assists for people with hand transplants.

QL+ pairs veterans, active-duty military personnel, first responders, law enforcement officers, and intelligence officers who have life-altering injuries with college students who help them overcome specific challenges.

Rajab and her team were tasked to design an assistive device to help Army veteran Eric Lund play golf, even without the functionality of his arms. The device was required to be comfortable, have a custom fit, be detachable, and reduce wobble. Rajab worked on the project with two other students for her senior design project.

The team's goal was to address the issue of having a lack of control for handling a golf club for patients who do not have functionality in their arms and/or hands. To address that need, a novel prototype was created that allows golfers to gain more control while playing, without feeling like they are using a device.

"It allowed me to think creatively and innovatively," Rajab said. "The most rewarding part of this experience is the fact that the device we worked on is going to directly benefit someone."

Like many students, Rajab changed her educational plans midstream. She wanted to be a doctor, but then Professor Peter Lum, whom she considers a mentor, suggested she try biomedical engineering. She "ended up loving it," she told QL+. "I chose my major because I want to make a difference in people's lives."

Ayda Rajab and Kaelin Martin test the fit of their protoype with Eric Lund

Catholic University students Kaelin Martin, Caroline O'Connor, and Ayda Rajab worked with Army veteran Eric Lund

Engineering Students Reflect on Virtual Internships

Fourteen Catholic University students participated in a virtual internship program this summer with the Biomedical Engineering Alliance of Cleveland — a partnership between Case Western Reserve University and the Cleveland Clinic.

As part of the 10-week program — which drew 500 participants from more than 50 universities around the world — the students participated in virtual seminars, "fireside chats" with biomedical engineering faculty, and a remote research-and-design project to promote Personal Protective Equipment (PPE) compliance at universities.

Junior Marshall Mendoza said he was excited to participate in the internship as a way to learn more about specializations in the biomedical engineering field. He also enjoyed being able to hear from engineers and students from around the country. For his design project — a mobile system for cleaning face masks — he was paired with students from California, Pennsylvania, and Florida.

"This really opened my worldview of what biomedical engineering looks like," Mendoza said. "When you're in one place, you can be stuck with the mindset of that city. We had professors coming from different areas, so there could be a lot more diversity in the way people view things."

As part of her project, sophomore Shaila Biswas worked with a team to design a DIY mask upgrade kit that could allow users to make masks more comfortable to wear with the help of a cooling gel insert. She said she enjoyed the internship because of the seminars offering advice and personal stories about graduate schools and career paths.

"I learned a lot about people in the field, their research, and how they got there," Biswas said. "One of my favorite talks was from a biomedical engineer who shared how to get into medical school — the qualities you need and what they are looking for."

Professor Peter Lum, chair of the Department of Biomedical Engineering, said he was grateful to Cleveland Clinic and Case Western Reserve University for offering a virtual opportunity that benefited so many students.

"A virtual internship of this kind must have been a massive effort," Lum said. "I hope they can offer this opportunity again in the future."

Marshall Mendoza designed the "De-Colonizer 7000" to clean face masks using UV light

Biswas said she was grateful to participate at a time when so many other engineering internship opportunities were cancelled because of the coronavirus pandemic.

"I'm just so happy and lucky," she said. "I hope that Catholic University will continue to find those opportunities for students."

Grad Student's Paper Wins Award

Jane Lam, a graduate student in biomedical engineering, receiving an award from the D.C. Council of Engineering and Architectural Societies in February for her paper, "Quantitative scoring of epithelial and mesenchymal qualities of cancer cells using machine learning and quantitative phase imaging."

Our Students

Congratulations Class of 2020!

Doctoral Degrees

Talal R Alharbi
Dissertation: Detection and Mitigation Against SYN Flooding Attack Using Network Functions Virtualization

Ahamed Dubian Aljuhani
Dissertation: Mitigation of Application Layer DDoS Flood Attack Against Web Servers

Mohammad Ahmad M. Almadani
Dissertation: Prediction of Catchment-Scale Efficiency of Green Infrastructure in an Urban Watershed Using a Process-based Modeling Approach

Vy Cong Bich Bui
Dissertation: Machine Learning for Anatomical Structures Segmentation of Contrast Enhanced Cardiac Computed Tomography Images

Quoc Tan Huynh
Dissertation: Developing Wearable Sensor System for Elderly Independent Living Assessment

Dung N. Huynh
Dissertation: Development of Optical Indices of Articular Cartilage Damage and Microstructure Using Polarized Reflectance

Tri Le
Dissertation: Novel Application Combining Partial Dentrification and Anammox for Simultaneous Removal of Ammonium and Nitrate

David Anthony Lechner
Dissertation: Hybrid Time/Frequency Based Algorithms for Acoustic Localization

Tri Tran Nguyen
Dissertation: Learning Control of Closed-Kinematic Chain Robot Manipulators

Tuan Minh Nguyen
Dissertation: Intelligent Control of a Closed-Kinematic Chain Robot Manipulator

John Anthony Grochol Sterling
Dissertation: Novel Construction Techniques for Arrays of Dynamic Vibration Absorbers: Modeling and Experimentation

Billy Clayton Vermillion II
Dissertation: Effective Rehabilitation of Hand Function by the Biomimetic Assistance Reflecting Impairment of Individual Stroke Survivors

Master of Science, Biomedical Engineering

Sara Esaa Alqasire
Hadeel Matog Alqasiri
Aljohara Alsaadoon
Nadiah Mohammed Alyamni
Heba Abdullah Badawood
Renad Blaisi
Rachel Elizabeth Crespo
Hattan Salem Farah
Olivia Rose Giangiordano
Hunter F. Haddad
Dung N. Huynh
Loan Khanh Ly
Joseph Michael Mastro
Saba Paul Owens
Sadie Anne Marie Sabina
Claude Noel Yamgueu Zanetsie

Master of Science, Civil Engineering

Majed Helal Alanazi
Shahd Aldamkhi
Bandar Miqad Alharthi
Erfan Alikhani
Yousef Aljahdali
Ali Mohammed A Aljubairy
Shane Llenos Alolod
Mohammad N. Alotaibi
Hoda Hafizi
Mabambe Bakagma Kpamnona
Daphrane Kristiane Tresvalles Lingan
Desmond A Ndambi
Alyanna Chiara Española Ting

Master of Science, Computer Science

Norah Ahmed Albibi
Abdullah Shahwan M Almalki
Rasha Matar Alzahrani
Tahani Ali M. Baabdullah
Veli Kocak

Master of Science, Electrical Engineering

Abdullah Dashti
Michael D. Morgan
Lauren Scolese
Chinh V Tran

Master of Science, Engineering Management

Khalid Hussain Alassaf
Osama Farhan Al Balawi
Ahmed Fareed Alghamdi
Bandar Miqad Alharthi
Omar Mohammed A. Alhumeidi
Aljawharah Aljobair
Abdulaziz M Al-kuwari
Fahad Ali S Almahmoud
Faris Mohammed Almazyad
Basheer Khalid Almutairi
Mohammed Mansour Saleh Alnajrani
Saleh Fahad D Alotaibi
Nasser Hassan Alqahtani
Naif Al-Quthami
Abdulaziz Abdullah Alsalloum
Abdullah Mohammed Altowairqi
Abdulaziz Saleh Alzamil
Nicholas Michael Andreyko
Curtis Lennox Celestine
Nnaemeka K. Egede
Wesal Esbaq
Ahmed Esmat Ahmed Fauzi
Peter Tyson Reed
Melissa I. Sanders
Dennis L Waldron III
Megan Wandrisco

Master of Science, Materials Science and Engineering

Iriana Garcia Guerra
Ian Francis Guay
Grace Marie Pooley
Owen Douglas Scholl

Master of Science, Mechanical Engineering

Aseel Abdullah Aboairan
Sam Teddy Bugeja
Andrew James Cunningham
Matthew Kostecka
Luke Robert Palguta
Seyed Ali Rooholghodos
Amelia O'Riska Vignola
Jesse Perez Williams

Bachelor of Biomedical Engineering

Ahmad Albargi
Shouq Aldosari
Mohannad Hamad Alfraihi
Mada Mohammed Alghamdi
Malak Jalal Alharbi
Khaled Almutairi
Sarah Abdulwahed Almutairi
Noof Binfaisl
Mario A. Echevarria
Daniel Patrick Ennis
Hattan Salem Farah
Jessica UyenDai Le
Kaelin Gillian A. Martin
Alexander Montgomery Mulyk
Christian E. Obuchowski
Caroline Claire O'Connor
Ayda Rajab
Alejandro Ros
Sabrina Juliette Scott
Ammar Adnan Sheikhomer
Abdulrahman Abdulkhaliq Sindi
Yousef Sindi
Claire Liliane Sturek
Michael Francis Taylor
Claude Noel Yamgueu Zanetsie

Bachelor of Civil Engineering

Abdulrahman Alassaf
Bandar Miqad Alharthi
Abdulaziz Saleh Alzamil
Katherine Marie Callahan
Grant J. Czerwinski
Patrick W. Daisy
Ross Michael Dean
Nicole DiFabio
Sebastian Ferretti
Kassandra Madison Grumski
Daphrane Kristiane Tresvalles Lingan
Allison K. Marino
Liam John McCrann
Bryan Matthew Minarczyk
Timothy Connor Murphy
Andrew Joseph Murren Jr.
Cosmo Augustus Pirozzi
Joseph Richthammer
Kaitlin Marie Shanahan
Alyanna Chiara Española Ting
James Owen Tweedy

Dual Degree, Bachelor of Civil Engineering and Bachelor of Science in Architecture

Frank A. Alexander, III
Diego Eduardo Cuadros
Silvia Xitlaly Elias
Wesal Esbaq
Lucas Ambrose Parker
William Sieger Pinhak

Bachelor of Science in Computer Science

Tariq Almazyad
Alexander D Braziel
Nikolas James Calias
Sara Cho
Jarred James Cutlip
Tim Figueroa
Sparsh Goyal
Jeffrey T Guile
Ariana Johnson
Mina Grace Larraquel
Luke Gregory Lepak
Julia Emily Ma
Katherine McCusker
Lan Khoa Nguyen
Tien Pham
Caroline Rose Shagnea
Christopher J. Smith
Loc Phuoc Tran

Bachelor of Electrical Engineering

Waleed Moteb Alanazi
Tariq Mubarak Alghamdi
Alhanouf Saleh Aljasser
Husam Alkifigee
Saud Majed Alsaleh
Bada Alsolimani
Daniel Del Pino
John Edward Eisenbacher
Kayla Elizabeth Gumina
George Wakefield Isaacs Jr.
Joseph LaPointe
Thomas Daniel Melgaard
Hung Nguyen
Charles McLeod Simon
Callum J. Walton

Bachelor of Mechanical Engineering

Brian Joseph Aberle
Saad Aghaa
Mohammad Saleh Almaghlouth
Yasser Mushaal Almutairi
Fahad Zaki Alsowayigh
Zyad Mohammed Alyamni
Salem Batays
Nolan Michael Behringer
Mariangelica Bermudez Gonzalez
Virginia Grace Boras
Mary Catherine Cain
Alexander J Caporale
Lauren Margaret Coene
Sean Coughlan
Christopher J. Crafa
Christopher James Cupo
Maria Zofia Galle
Conner McLean Guthrie
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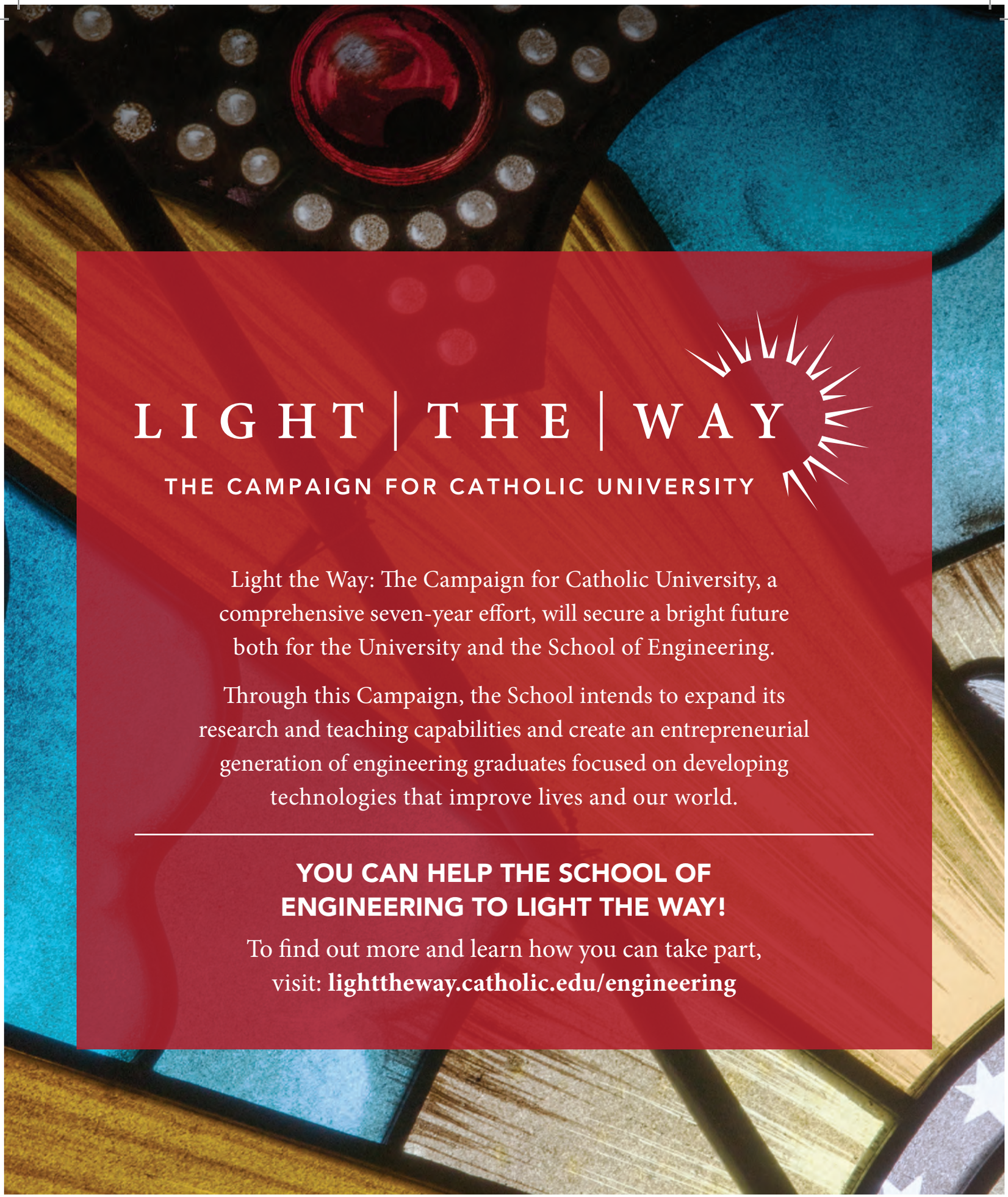
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A Scholarship Helps a Helper

When Christine Motz, a junior from Brick, N.J., was in seventh grade, a biomedical engineer came to speak at her school, sparking Motz's interest in a medical career.

She decided to become a doctor. She wanted to help others and had always been fascinated by the human brain and its role in maladies like Parkinson's Disease and Alzheimer's. Eventually, however, she recognized something about the nature of her own brain, and came to feel that biomedical engineering would be a more comfortable fit.

"I tend to think logically," Motz said. "I think like a computer — very methodically. That can work in a doctor, but I think it's more suited for engineering."

The speaker who lectured to her seventh-grade class described the Wounded Warrior Project and its work designing prosthetics for returning war veterans who have lost a limb. Prosthetics is just one area of possible specialization in biomedical engineering, a field Motz sees as excitingly broad.

"I'm still exploring the different fields of the major," she said. "There's prosthetics, medical imaging, optics, neural engineering, tissue engineering, biomaterials, biomechanics — there's a wide range. I've just got to find my area of focus and go from there."

During the summer of 2020, Motz had a virtual internship with Cleveland Clinic. She worked on designing facemasks that could be more easily used by members of the deaf community and others with hearing impairments. After graduating, she hopes to join the workforce in a biomedical engineering firm. Grad school may be in her future, but not before gaining some real-world experience.

Motz fell in love with Catholic University when she visited campus as a prospective student and took a tour. She is especially grateful to be a recipient of the Mariann and Andrew Youniss Endowed Scholarship for the School of Engineering. Andy Youniss, B.S. 1983, is the president and CEO of Rocket Software, a company he cofounded in 1990. He and his wife, Mariann, have been active philanthropists for some time. The scholarship they made possible is supporting Motz throughout her time at the University.

"It's really helping me out," she said. "I'm very grateful."

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