LISTEN TO THE EARTH

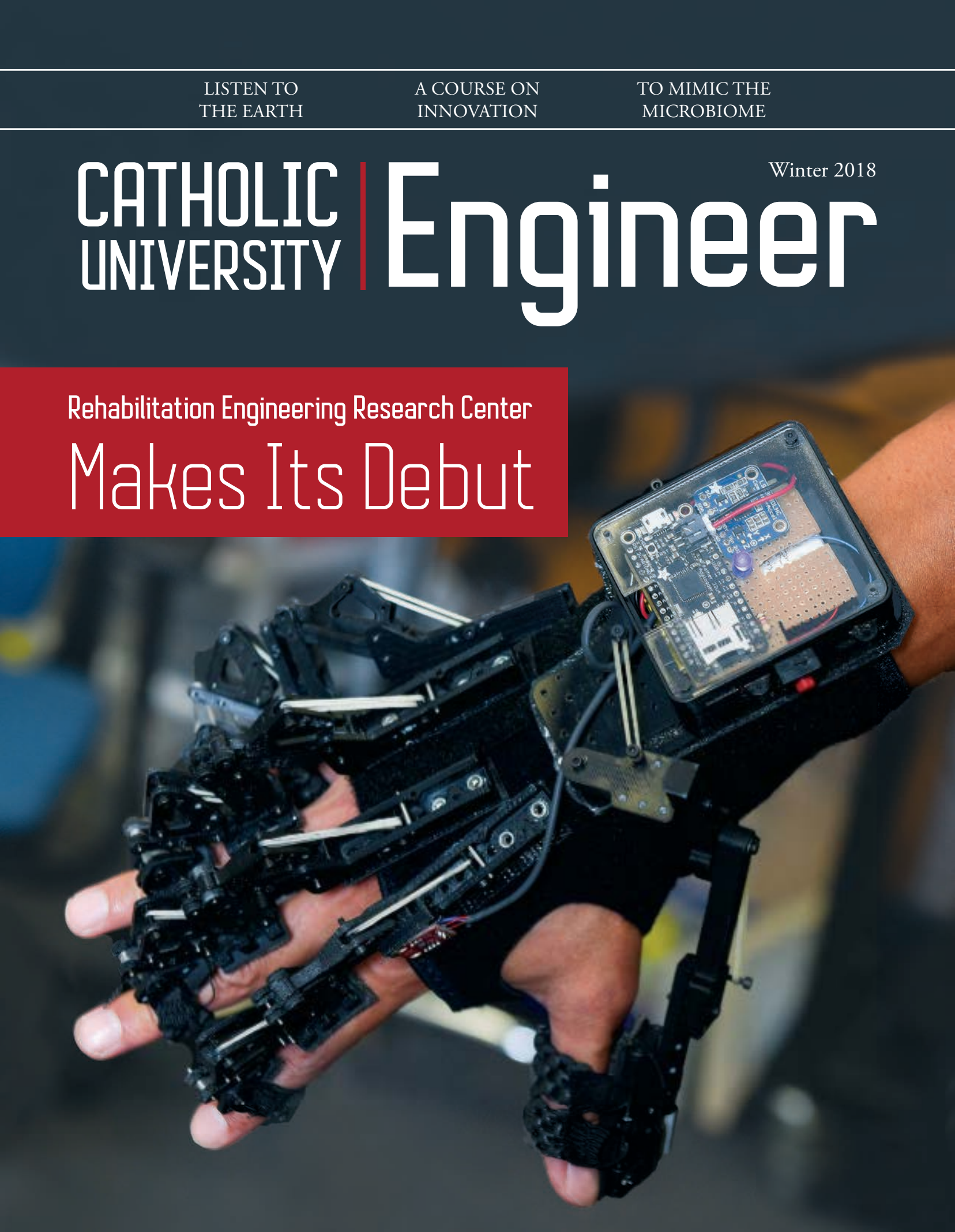
A COURSE ON INNOVATION

TO MIMIC THE MICROBIOME

Winter 2018

CATHOLIC UNIVERSITY Engineer

Rehabilitation Engineering Research Center Makes Its Debut



CATHOLIC UNIVERSITY | Engineer

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Dean's Welcome

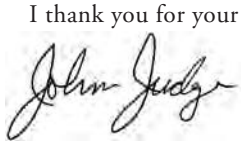
What a year it's been! This edition of *Catholic University Engineer* will give you an idea of the many exciting new things happening in the School of Engineering. We're launching new degree and certificate programs in areas like Data Analytics, Cybersecurity, Power Electronics, and Environmental Engineering, and working to expand our partnerships with local industries and government agencies. We've hosted major events in the past year, including a symposium on climate change and a "hackathon against homelessness," and brought a variety of outstanding guest speakers to campus to share their wisdom with our students. We've sent students and faculty around the world, to study abroad and collaborate on research, to volunteer with organizations like Engineering World Health, and to compete in events like the first Vatican Hackathon in Rome, where our team took second place in the Interfaith Dialog division. Our faculty and students continue to carry out outstanding research, and are supported by several new major grants.

If you've been on campus recently, you know we're enduring a bit of disruption, as the road in front of Pangborn Hall has been torn up since January 2018 for installation of a new utility loop. The system will carry hot and chilled water throughout campus, making heating and cooling buildings substantially more efficient and less expensive. And a new pedestrian walkway will make entering our campus from the Metro more welcoming (see page 11). These are just a couple of the many steps being taken to move Catholic University into the future.

As our new programs show, we're positioning ourselves to educate students to meet the challenges of the 21st century. Engineering faculty continue to devote themselves to research and to mentoring doctoral students while engaging with all our students in small classes and providing outstanding education with a personal touch. Our focus on research and innovation in service to humanity makes the School of Engineering a vital component of the University as it carries out its mission to serve the Church, nation, and world.

Throughout the following pages, you'll find articles highlighting the accomplishments of our students, faculty, and alumni. I continue to be impressed and gratified by the energy and enthusiasm of the members of the School of Engineering community – it's wonderful watching our students grow into exceptional engineers, and I'm enjoying getting to know our alumni and hear their stories of how Catholic University shaped their path. We'd love to hear from you. Connect with the School of Engineering on social media, by email at engineering@cua.edu, or stop by and visit if you're in the area.

I hope you're as proud as I am of the School of Engineering, and on behalf of everyone here, I thank you for your continued support.



John Judge
Dean, School of Engineering

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Breaking New Ground in Rehabilitation Engineering

MOVING THERAPY BEYOND THE CLINIC AND INTO THE PATIENT'S HOME

Faculty and staff members of The Catholic University of America School of Engineering are honored by the award of a $4.6 million, 5-year grant to establish a Rehabilitation Engineering Research Center (RERC-DC). Professor Peter Lum, chair of Biomedical Engineering, will serve as RERC-DC's director.

"This reaffirms Catholic University's reputation as a national leader in rehabilitation engineering," said Lum. "The engineering innovations and knowledge gained will contribute to a paradigm shift away from clinic-based to home- and community-based approaches."

This exciting endeavor is funded by the National Institute on Disability, Independent Living, and Rehabilitation Research of the Department of Health and Human Services, and will focus on patient-centered mobile technologies to assess and treat sensorimotor impairment in individuals with neurologic injury. Various target populations include infants at risk for developmental motor delay, children with cerebral palsy (CP), and adult stroke victims. Each of these conditions results in sensorimotor impairments that profoundly impact quality of life and function, and places significant demands on our health care system.

Rehabilitation treatment and assessments are currently completed in clinics by highly skilled clinicians. But traveling to a clinic to receive one-on-one treatment from a therapist can be a challenge that severely limits access for many patients and may blunt the effectiveness of some interventions. Furthermore, there is growing evidence that clinic-based assessments of movement ability do not directly measure the ultimate goal of rehabilitation, spontaneous use of impaired limbs integrated into activities of daily living. The goal of RERC-DC is to develop home-based technologies for assessments that are more valid and treatments that are less expensive, more convenient, and potentially more effective.

"I'm most excited about technologies that empower patients with access to therapies 24/7 and enable more frequent and valid assessments that will help us better understand the recovery process," said Lum.

He will lead an interdisciplinary team of investigators from four area institutions including Catholic University, MedStar National Rehabilitation Hospital (NRH), Children's National Health System (CNHS), and Johns Hopkins University. The dynamic team includes engineers (Peter Lum, Ph.D.; Sang Wook Lee, Ph.D.; Sahana Kukke, Ph.D.; Lin-Ching Chang, Ph.D.; Kevin Cleary, Ph.D.; and Reza Shadmehr, Ph.D.), physicians (Alexander Dromerick, M.D.; Taeun Chang, M.D.; Olga Morozova, M.D.; and Sally Evans, M.D.), scientists (Manon Schladen, Ph.D., and Barbara Bregman, Ph.D.), and research therapists (Rahsaan Holley, OT, and Kathy Brady, PT).

> "Traveling to a clinic to receive one-on-one treatment from a therapist can be a challenge that severely limits access for many patients..."

The center incorporates six research and development projects with unifying themes of patient-centered methods, patient motivation, sensorimotor feedback, and robust activity monitoring. Project D1 is led by Lum and will develop a biomimetic hand exoskeleton and a gravity compensation shoulder device. In a departure from many current approaches, both exoskeletons will be designed so that individuals with stroke can use them at home during activities of daily living. Project D2 is led by Kevin Cleary and will develop an ankle-based mechanical platform combined with video games for home-based rehab of children with CP. The fun and engaging aspects of this training will encourage the high repetitions needed for effective rehabilitation.

There are no clinically accepted, objective methods of assessing spontaneous use of impaired limbs in the home and community. Sahana Kukke is leading Project R1, which will track sensorimotor development and predict future outcomes in infants at risk for motor delay using home-based video, machine learning, and specially designed

Virtual reality: Sang Wook Lee works with grad student Billy Vermillion

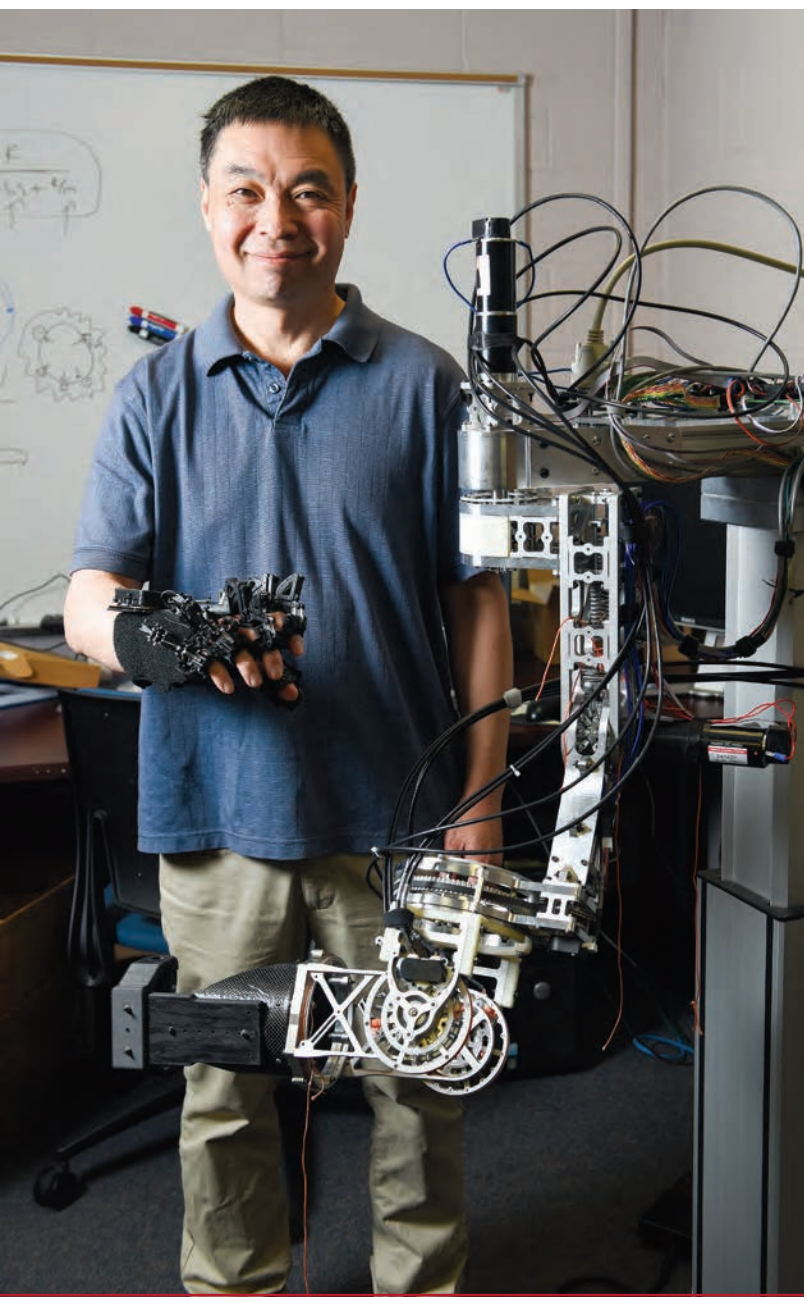
toys that provide novel sensory feedback. Project R2, led by Alexander Dromerick, will study machine learning algorithms and wrist-worn accelerometry for objectively measuring the amount of functional arm use in persons with stroke. Sang Wook Lee will supervise Project R3, using virtual reality and mathematical models to investigate factors such as the energetic cost and reward associated with upper limb movements, and how these affect the choices of persons with stroke to either use an impaired upper extremity or compensate with the opposite limb. Understanding these factors will guide development of future interventions.

Patients often reject rehabilitation technologies. Project D3 is led by Manon Schladen and will explore patient and caregiver perspectives on home-based technologies and develop guidelines and best practices for how to translate these technologies into the home.

These six projects are tightly integrated to maximize the impact of the available funds. The intellectual exchange fostered by RERC-DC between investigators from traditionally disparate disciplines is expected to spark new ideas and spin-off projects. The work is supported by state-of-the-art motion capture, electrophysiology, fabrication and design facilities at Catholic University, NRH, and CNHS. Additionally, the center will make use of the outstanding clinical resources at NRH and CNHS to identify individuals with disabilities who may benefit from these technologies, and can provide invaluable feedback and guidance on the research and development activities. While training graduate students and post-doctoral fellows, the center will train the engineers of tomorrow with a summer internship program for junior- and senior-level undergraduate engineering students. The center will also engage in outreach programs for students at local middle and high schools with the goal of introducing the fields of rehabilitation and rehabilitation engineering.

The new center builds on an existing collaboration between Catholic University Biomedical Engineering and NRH called the Center for Applied Biomechanics and Rehabilitation Research (CABRR). Founded in 2002 by Joseph Hidler and currently directed by Lum, CABRR has supported dozens of projects over the years, including the development of two devices that have been commercialized and are being used in clinics worldwide. The ZeroG (Aretech LLC, Ashburn, Va.) body weight compensation device, developed by Hidler, with research from Lum and Elizabeth Brokaw, led to the ManovoSpring (Hocoma AG, Switzerland). CABRR investigators are currently funded by National

Institutes of Health, National Science Foundation, and the Department of Veterans Affairs to work on projects synergistic with RERC-DC, including the Biomimetic Hand Exotendon Device (BiomHED), Hand Spring Operated Movement Enhancer (HandSOME), and a 5-DOF arm exoskeleton.



Peter Lum

Grad student Rafael Casas models a device

Grad Student Presents Robotics at Event Celebrating Maker Culture

The "maker movement" puts a technological spin on traditional crafts. This cultural thread stitches together a broad spectrum of manufacturers, inventors, hackers, hobbyists, and do-it-yourselfers interested in creating new devices or simply tinkering with products that have already emerged. Through events such as the Capitol Hill Maker Faire®, held in Washington, D.C., maker culture encourages innovation as well as responsiveness to consumer need.

Rafael Casas, a Ph.D. student in Biomedical Engineering, attended the June event and presented his work on rehabilitation robotics. His work involves the use of 3-D printing and laser cutting to create customized exoskeletons for the hand. Used as part of a clinical study in physical therapy, these exoskeletons assist stroke patients to recover their hand function. He took several versions of his exoskeleton to the Maker Faire.

"It was a great opportunity to network," Casas said, "and see the innovations being developed by local universities and organizations as well as others across the country." He made use of the Fabrication Lab at the School of Architecture and Planning in preparing his work for the event.

The Nation of Makers, in collaboration with the Institute of Museum and Library Services and the Congressional Maker Caucus, hosted the interactive event at the Rayburn Congressional office building. Participants joined together to provide hands-on demonstrations of the breadth of making across the United States.

State of the Art

ENGINEERING SCHOOL LAUNCHES CUTTING-EDGE PROGRAMS

Responding to the needs of employers in the Washington, D.C., region and around the world, the School of Engineering has developed several new academic programs, including data science and analytics at the graduate and undergraduate level, as well as professional certificate programs in cybersecurity and privacy, power electronics, and additive manufacturing.

Data science is the structured means by which analysts in a particular field use computer science, statistics, and machine learning to collect, process, analyze, visualize, and interact with data to create useful knowledge. Data science techniques have application in any field where large sets of data can be collected or generated and then analyzed, including all disciplines of engineering, physical and social sciences, and businesses of all types. The U.S. workforce faces a growing talent shortage in the area of data science, and the local region is already experiencing a dearth of appropriately trained employees.

The School of Engineering has created an undergraduate minor, a graduate certificate, and a Master of Science degree in Data Analytics. The programs are housed in the department of Electrical Engineering and Computer Science but are supported by other programs and departments around the University, including Mathematics, Library and Information Science, and Business. The School of Engineering is working closely with partners in industry and government, which will provide access to real-world data sets, internships and employment opportunities for students, and advice on program content. The management and technology consulting firm Booz Allen Hamilton is a lead partner in the effort and has committed $300,000 over three years to help launch the program.

An online graduate certificate in cyber security and privacy, developed in partnership with the School of Engineering and the Metropolitan School of Professional Studies, was also launched in 2018. This is another field seeing rapid growth: the federal government's Bureau of Labor Statistics projects that jobs in information security will grow by 18% from 2014 to 2024.

The graduate certificate in power electronics was developed as a response to demand from the U.S. Navy and Navy contractors (see page 8). Courses developed for the new off-campus program will also be offered on campus to traditional graduate students, who may pursue a certificate alone or as part of study toward a master's degree or doctorate in electrical engineering. For launch in 2019, the School of Engineering has developed a graduate certificate in additive manufacturing. Though 3-D printing has become commonplace, the state of the art has advanced far beyond prototyping with plastic. Creation of parts made from functional materials such as metals and composites now provides an alternative to traditional manufacturing techniques; the technology is now on the cusp of widespread adoption for general manufacturing, with increasing use for fabrication of spare parts, small series production, and

> "... the federal government's Bureau of Labor Statistics projects that jobs in information security will grow by 18% from 2014 to 2024."

tooling. The rapidly advancing technology has enormous potential, as parts can be made in virtually any shape with fewer and faster production steps and greater customization. The range of materials that can be printed is rapidly expanding, and mixing of multiple feedstocks during printing can create materials with completely new properties. The additive manufacturing market is expected to reach $20 billion by 2020 and could expand tenfold in the following decade. The new graduate certificate program will be part of the graduate program in Materials Science and Engineering (M.S.E.), and students can earn the certificate alone or as part of study towards the M.S.E. master's degree.

Courtesy photo

Alumnus Helps Shape New Program

Joe Logue, B.E.E., 1987, is the recipient of the Engineering Distinguished Alumni Award for 2018. He recently retired as executive vice president at Booz Allen Hamilton, where he led the firm's defense and intelligence business. Joe has taught technology management and strategic management at Johns Hopkins University and the University of Maryland. In addition to his B.E.E. from Catholic University, Joe holds an M.S. in Technology Management from the University of Maryland.

Joe has served as a member of the School of Engineering's Board of Visitors, and has been instrumental in establishing a partnership between the school and Booz Allen Hamilton, leading to the launch of the University's new programs in data analytics. In February 2018, School of Engineering leaders and members of the Board of Visitors toured the company's Innovation Center in downtown Washington, D.C., and exchanged ideas with Joe's team on how to create a data analytics program that would meet the region's workforce needs, which are fast outpacing the supply of qualified talent.

The School of Engineering thanks Joe Logue for his leadership and dedication to his alma mater, and congratulates him on his many accomplishments during his career at Booz Allen Hamilton.

Broadening Summer Horizons

HIGH SCHOOL STUDENTS ATTEND THE "ENGINEERING NEW FRONTIERS" CAMP

High school students from around the country explored engineering and on-campus living at Catholic University during the annual "Engineering New Frontiers" camp held in July. Peggy Julian, from the Center for Academic and Career Success, and Greg Behrmann, an associate professor of biomedical engineering, directed the camp with support from faculty, staff, and students, local engineering companies, and government laboratories.

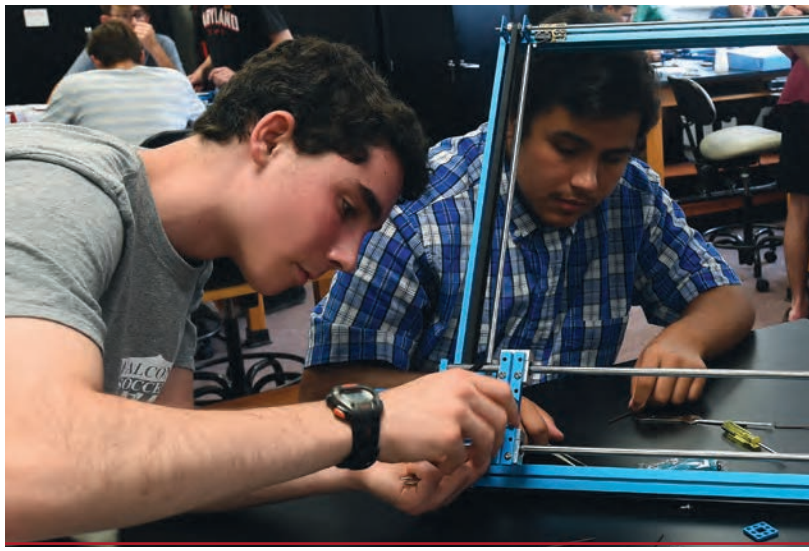
Chris Deegan, CEO and president of Gibbs and Cox Maritime Solutions, delivered an opening address describing the application of scanning technology for the creation of complex models of ship interiors. Afterward, students explored design thinking, prototyping, and iteration by completing two rounds of the well-known Spaghetti Marshmallow Tower Challenge.

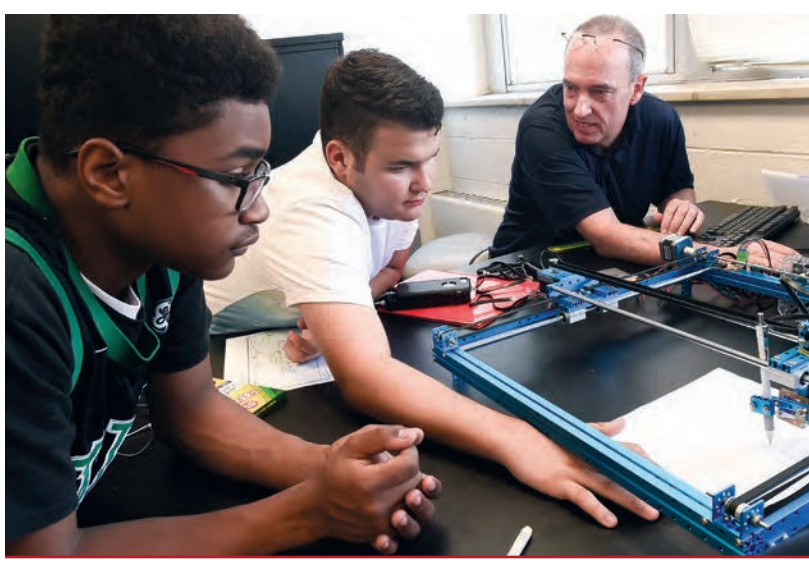
Over the course of a busy week, students discussed the selection of engineering majors and professions, and worked on the mechanical and electrical assembly of complex, computer-controlled drawing robots. They learned to convert universal bitmap files to vector format, allowing the robots to produce detailed drawings of the campers' choosing. Breakout sessions allowed the teens to explore topics such as women in engineering, entrepreneurship, and the college admission process.

Students also traveled off-campus to view engineering in the workplace. They completed an extended tour of the NASA Goddard Space Flight Center and also enjoyed a behind-the-scenes tour at a large-scale construction project hosted by officials from Forrester Construction Company.

Recreational programs included an evening tour of Washington, D.C., monuments, a performance of the musical *Dave* at Arena Stage, and D.C. United soccer at the new Audi Field.

By all accounts, the week was a resounding success, giving students professional and educational insights as well as the opportunity to have fun and make new friends.





Stock photo

Ships Ahoy!

NEW COURSES SUPPORT MILITARY MEMBERS

The School of Engineering is taking new steps to serve members of the military with recently established partnerships between the University, the Naval Sea Systems Command (NAVSEA), and the Huntington-Ingalls Industries–Newport News Shipbuilding company (HII-NNS), which supports the U.S. Navy.

Thanks to these new contracts, the school will offer 20 graduate courses in power electronics and systems engineering management for NAVSEA and HII-NNS employees hoping to earn engineering certificates or graduate degrees.

All classes will be offered online or at the HII-NNS Washington, D.C., offices near Washington Navy Yard. The goal of the program is to allow Naval employees to pursue professional development opportunities that are conveniently located, expertly taught, and affordable.

The school began offering classes for NAVSEA and HII-NNS clients in summer 2018, with a power electronics course taught by Assistant Professor George Nehmetallah in May and June. Three additional classes were held during the fall 2018 semester.

Mel Williams, a retired vice admiral in the U.S. Navy who now serves as the School of Engineering's associate dean for external affairs, said forming the new partnerships is one way the school is fulfilling its strategic mission of establishing unique and timely new programs that serve the region, nation, and world with superior technical competence.

"It is an absolute privilege for me to serve and support the Catholic University School of Engineering, while also supporting the U.S. Navy's graduate education needs for their women and men who serve our nation," Williams said.

The newly cemented partnerships have also resulted in increased opportunities for current engineering students. After the HII-NNS chief engineer visited Catholic University's campus in February, students were placed in internships or hired for full-time positions at the company's Newport News location.

From left, Michael Monaghan, LeQuan Clinton, Emma Flanagan, John Judge, Van Lam, and Vy Bui.

Hacking for a Better World

STUDENT HACKERS COMPETE LOCALLY AND IN ROME

Forty students used data science and engineering skills to devise potential improvements to the lives of the homeless during the University's first hackathon, hosted by the School of Engineering on Jan. 27, 2018, in collaboration with the D.C. Department of Human Services.

Students split into teams for the event, dubbed "Hacking Homelessness." After initial presentations, teams were given just over four hours to work on their projects. Vy Bui, a doctoral student in electrical engineering, worked with her teammates on an app that uses mapping technology similar to that used by Uber, the rideshare service. If manufactured, the app would help social workers locate people in need and determine if they had been approached previously. Bui's team won first place.

"This app would save time and make work easier for social workers," Bui said. "They'll have less traveling and they could help more people."

The hackathon was inspired by one of the 14 "global grand challenges" issued in 2008 by the National Academy of Engineering — in this case, the challenge to restore and improve urban infrastructure. The Grand Challenges Scholars Program prepares students to tackle some of the largest problems of the 21st century. Catholic University's engineering school is one of only a few Catholic engineering programs in the United States to participate in the program.

The event was sponsored by Rocket Software, headed by CEO Andy Youniss, B.S. 1983, which provided Oculus Rift virtual reality headsets to each member of the winning team.

Bui and four other students from Catholic University went on to compete in "VHacks," the first hackathon at the Vatican, which took place in March. She was joined by LeQuan Clinton, a master's student in architecture and planning; Emma Flanagan, a sophomore studying business and marketing; Van Lam, a doctoral student in biomedical engineering; and Michael Monaghan, a senior studying computer science.

At VHacks, the assignment was to conceive a product that would foster interfaith dialogue. The Catholic University team created a web application called Faithstrings, which would allow users to immerse themselves in different faith communities through virtual reality. The design earned second place and a $1,000 prize. The team also won an award for best utilization of SalesForce's Technology Platforms, earning each member a new iPad.

"Our students are always looking for ways that they can apply their education to solve real problems," said John Judge, dean of engineering, who traveled to Rome for the event.

Online Courses

CMGT 505
Decision Analysis

CMGT 522
Cyber Security for Engineering Managers

CMGT 528
Project Delivery Methods and Procurement

CMGT 547
Managerial Engineering Economics

CMGT 570
Project Management

CMGT 572
Organizational Theory and Behavior

CMGT 580
Intro to Systems Engineering Management

EE 568
Intro to Power Electronics

CMGT 510
Information Systems for Managers

CMGT 530
Emergency Management and Business Continuity for Engineering Managers

CMGT 573
Planning and Control of Organizations

CMGT 574
Strategic Management

CMGT 575
Intro to Systems Analysis

EE 566
Intro to Electric Machines and Drives

EE 674
Power System Protection


Ed Pfueller

An Engineering Classroom Outside Pangborn Hall

In recent months, construction work in our vicinity has demonstrated engineering in action. It's a little unsightly at times, maybe a little noisy and inconvenient, but it's going to make life so much better in the long run! Here's what we'll see when the work is done!

Corporate Partners

The School of Engineering at Catholic University works with corporate partners that share our passion for innovation, continued growth, and development. We strive for mutually beneficial partnerships that produce unique value for our mission and for our partners alike. The School of Engineering thanks our corporate partners for their generous support.

LOCKHEED MARTIN
NEW JERSEY RESOURCES
ROCKET SOFTWARE
BOOZ ALLEN HAMILTON
CLARK CONSTRUCTION
WHITING-TURNER
GILBANE

Realizing Full Potential

ENGINEERING STUDENTS, FACULTY, AND STAFF RECEIVE TRAINING IN LEADERSHIP AND SOFT SKILLS

Leadership, effective communication, collaborating in diverse groups, adaptive thinking, teamwork, and professionalism are qualities that employers need in the workplace.

As a pilot effort in August 2018, a broad mix of students, faculty, and staff participated in a three-day workshop addressing leadership and soft skills. The 13 participants included women and men who are domestic and international students, undergraduate and graduate students, faculty, and staff. Mechanical Engineering alumna Carrie Root, M.S. '86, Ph.D. '91, facilitated the training. Root is CEO and founder of Alpha UMi, developer of the 5G Power Skills Certification."

Extensive interactive group sessions covered the competencies employers have identified as lacking in many employees, as well as competencies that will better enable participants to realize their full potential at Catholic University and beyond– one of the goals articulated in the school's strategic plan. Upon completing the training, each participant received a certification and digital badge, which may be included on their LinkedIn page and their resumé. Three of the faculty and staff participants are now certified to facilitate future training.

"It trained me to look at a problem from a leadership perspective and be positive in difficult situations," said Ujjal Bhowmik, an assistant professor in the Electrical Engineering and Computer Science Department who became a certified facilitator.

Engineering Dean John Judge and Associate Dean for External Affairs Mel Williams, Vice Adm. U.S.N. (retired), chose to pilot the program after listening to feedback from alumni and their employers.

Courtesy photo

Robin Winkle, of Alpha UMi, is one of the course facilitators.

Provost Andrew Abela and Ozlem Kilic

Good Work Recognized

SCHOOL OF ENGINEERING PERFORMS WELL ON UNIVERSITY RESEARCH DAY

Several members of the School of Engineering community were singled out for special recognition at University Research Day on April 19, 2018.

Two faculty members were among the recipients of awards presented by Provost Andrew Abela. Ozlem Kilic, associate dean of the School of Engineering, received the Award for Achievement in Research, and George Nehmetallah, assistant professor of electrical engineering and computer science, won the Young Faculty Scholar's Award.

Student researchers were also recognized. Jenna Gietl, a mechanical engineering student, won the Best Undergraduate Poster award for "arChitectUral Acoustics." Biomedical engineering students Colleen Regan and Noor Aamer were both finalists for the award.

James Convoy and Pasham Adwani, electrical engineering and computer science students, together were finalists for Best Undergraduate Oral Presentation. Van Lam, a graduate student in biomedical engineering, was a finalist for Best Graduate Student Oral Presentation, and Christopher Rahimi, also in biomedical engineering, was a finalist for Best Graduate Student Poster.

More Awards for Engineering Faculty, Staff, and Students

The School of Engineering held its annual end-of-the-year luncheon on May 2, 2018. Attended by faculty, students, staff, alumni, and University administrators, the event celebrates the end of a successful academic year. Several awards were presented to students and faculty members. The recipient of the Engineering Staff Excellence Award for 2018 was Renay Serrano, assistant to the chair of the Department of Civil and Environmental Engineering.

MAY 2018 SCHOOL OF ENGINEERING LUNCHEON

Faculty Award Recipients

Charles H. Kaman Award
for Excellence in Research ..... Christopher Raub

Charles H. Kaman Award
for Excellence in Teaching ..... Jason Davison

Burns Junior
Faculty Fellowship ..... Bismark Agbelie and Chanseok Jeong

Student Award Recipients

The H.B. Atabek Award ..... Marisa Piedad Coene

Biomedical Engineering Society Award ..... Wendy Jasmin Reyes

American Society of Civil Engineers
National Capital Section Award ..... Matthew Holtschneider

Dennis McCahill
Award for Service in
Civil Engineering ..... Christopher Martin and Brendan James Schiaffo

Timothy Kao Award for Excellence
in Civil Engineering ..... Matthew Holtschneider

The George McDuffie Award for
Excellence in Electrical Engineering ..... Justin Alexander Cassidy

Renay Serrano received the Engineering Staff Excellence Award

The John N. Welch Award for
Excellence in Computer Science ..... Michael Monaghan

The C.C. Chang Award for Excellence
in Mechanical Engineering ..... Olivia J. Sposato

American Society of Mechanical
Engineers Award ..... Grace Elía Brodeur

Mechanical Engineering
Chair's Service Award ..... Jenna Kathleen Gietl

The Anthony J. Scullen Award ..... Marisa Piedad Coene and Matthew Robert Holtschneider

The Benjamin T. Rome Award ..... Grace Elía Brodeur

Dean's Service Award ..... Morgan Nicole Hrabsky

From left, Charles Nguyen, MaryKate Selgrath, and John Judge

Honoring Leadership – and a Former Dean

NEW AWARD NAMED FOR CHARLES NGUYEN IS ESTABLISHED

A new awards program named for Dean Emeritus Charles Nguyen has been established to honor senior students who show exemplary leadership talent. Under Nguyen's leadership, from 2001 to 2017, the School of Engineering more than quadrupled enrollment, strengthened academic programs, and developed international partnerships with universities in Vietnam, China, Taiwan, Philippines, India, and Brazil.

The first winner of the new Dean Charles Cuong Nguyen Leadership Award, announced at the Engineering Spring Luncheon in May 2018, is MaryKate Selgrath, who recently completed her fourth year in the five-year dual degree program for Civil Engineering and Architecture.

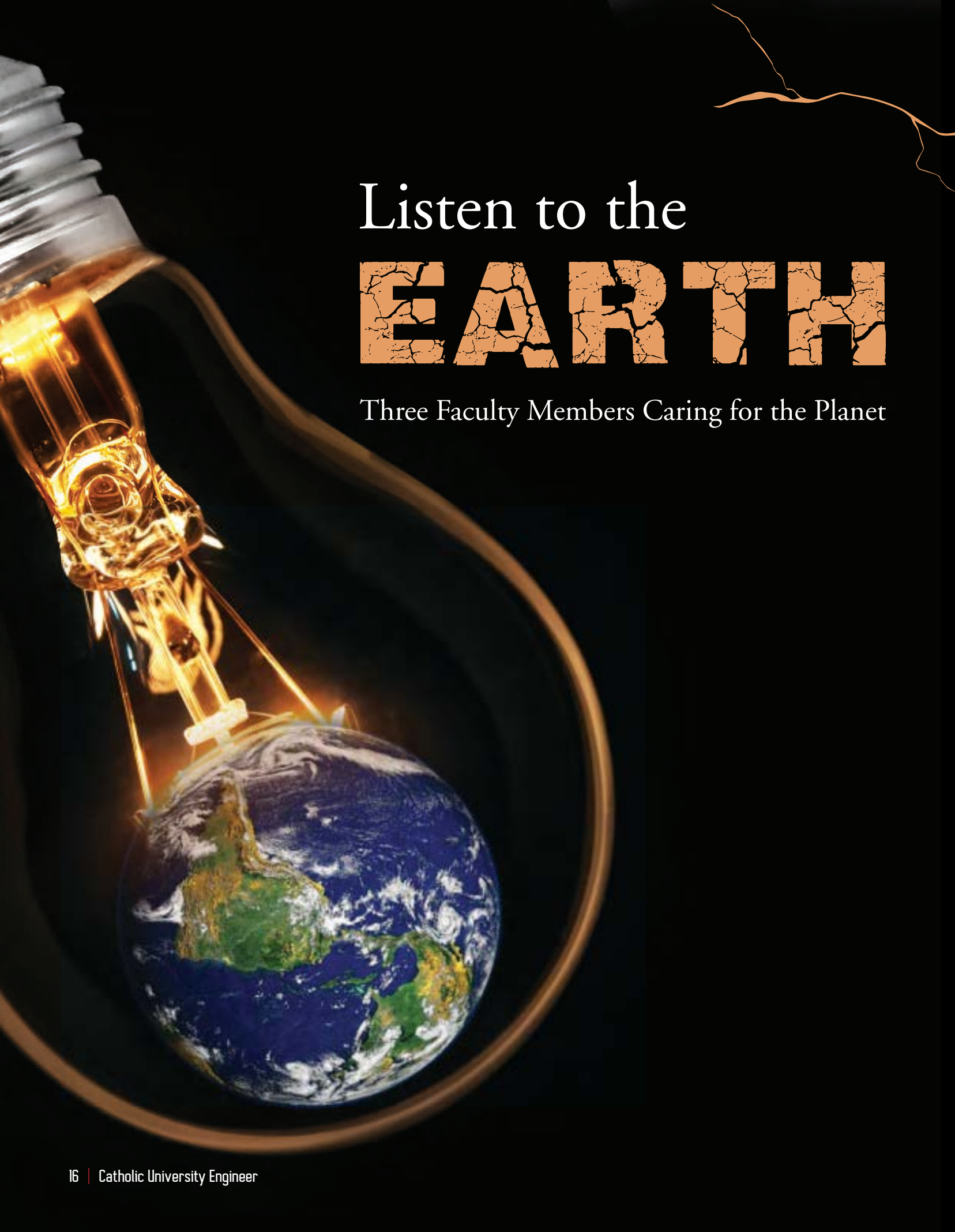
Selgrath served as the president of the University's chapter of the American Society of Civil Engineering (ASCE) and helped plan the ASCE conference, which involved raising $56,000 and hosting 350 students from 14 surrounding schools. She also helped institute a new mentoring board in the civil engineering department and has helped with student recruitment by reaching out to prospective students and participating in recruitment events such as Focus on Engineering and Odyssey Day.

"Dean Nguyen has made such a huge impact on the school, so I'm very honored and thankful to receive this award," said Selgrath. "It was a great surprise. I was very excited and I know everyone in the civil engineering program was excited."

Looking back on her time at Catholic University, Selgrath said she has greatly enjoyed participating in the ASCE and recommends it as a way to meet people in the engineering school and beyond.

"What I found here at Catholic is that this is a very small community and everyone really can get to know each other," she said. "I've made great relationships with other students and the faculty and ASCE is what helped me do that."

The new award was made possible thanks to financial support from engineering alumni Matt, John, Mark, and Elizabeth Burns; Vinny Sica; Carrie Maslen; and Get Moy.



Listen to the EARTH

Three Faculty Members Caring for the Planet

Arash Massoudieh is an associate professor and chair of the Department of Civil and Environmental Engineering, formerly known as the Department of Civil Engineering. Students can focus on one of the following areas: construction management, environmental engineering, structural geotechnical engineering, and transportation engineering. They can also earn a double degree in civil engineering and architecture. In a message on the department's website, Massoudieh wrote, "Our goal is to educate 'whole engineers' who not only know the technical aspects of their field, but can also apply their knowledge … for the betterment of the society."

WHY DID THE NAME OF YOUR DEPARTMENT CHANGE TO INCLUDE ENVIRONMENTAL ENGINEERING?

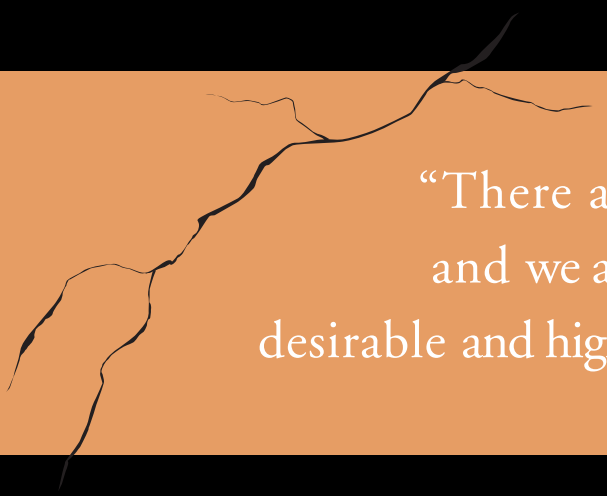
Starting from the 1970s and '80s with the growth of the environmental movement, there has been increased awareness about the impact of environmental stewardship. People realize that we can't really continue the way we've been conducting things, or we're going to face enormous problems. We can use things at the rate we're using them, but that may cause some issues for the next generations. They're not going to have the same resources, and may face a lot of issues such as pollution and resource scarcity. The issue of the environment is not just a fancy concept for tree huggers — it has real economic consequences.

In a lot of countries, they're facing enormous issues with water quality or scarcity, which can in turn affect food production. In different places, such as China, Bangladesh, and India, population growth, rapid industrial development, and lack of attention to environmental issues have caused water quality to be affected. In the United States, in the '50s and '60s, there were problems with air quality in urban centers, and the water quality in a lot of waterways started to look in a critical condition. You had rivers catching fire! So people started to realize this is a serious issue that needs serious attention.

Traditionally, civil engineers were in charge of a lot of things related to environmental engineering, such as providing clean water, collecting wastewater, controlling floods, and collecting storm water. Even though environmental engineering is a very multidisciplinary field, it has been traditionally under civil engineering, so civil engineering departments started to increase their involvement in environmental issues, and started changing their name accordingly.

In the past, we have graduated a large number of master's and Ph.D. students with a focus in environmental engineering. Environmental engineers need a set of skills — some that overlap with civil engineering — but they also need some skills that are not necessarily taught in traditional areas of civil engineering. For example, they need to know about biology, chemistry, ecology, maybe public policy, even geography, economics, and so forth. In the program that we are establishing, we are trying to consider this multidisciplinary aspect of environmental engineering. We got some help from the Chemistry Department and the Biology Department; they're going to teach some of our courses.

Civil engineering is a very classical area of engineering. There's a lot of focus on mechanics. Mechanics plays a very important role in environmental engineering, too. For example, environmental engineers should know about hydraulics. They should know about fluid mechanics. These are the same things that civil engineers should know, because they have been in charge of building dams, designing irrigation canals, dealing with storm water, designing water networks, and so on. But in addition to that, environmental engineers need to know things that are not traditionally taught, or taught very thoroughly, in a typical civil engineering curriculum. This new program in environmental engineering is going to help us tap into a new pool of prospective undergraduate and graduate students. I really hope this new program can increase our enrollment.



> "There already has been some climate change and we are witnessing its effects. So it's of course desirable and highly crucial to control it and mitigate it."

WILL THE FOCUS OF YOUR RESEARCH CHANGE?

My main area is related to water quality, the fate and transport of pollutants in water. If there's a spill in a river, what's going to happen to the pollutants with time? If we can predict that, we can do risk assessment, and we can also come up with engineered solutions to maybe clean up the site or manage the system.

There are a lot of challenges when we talk about natural systems. For example, there is a thing called heterogeneity: When someone designs a structure, the materials we deal with are pretty homogeneous. We know the properties of steel and concrete to a very good degree. When we're talking about groundwater systems or soil, first of all, there are a lot of unknowns, and second, the properties of soil are not uniform, but highly random. If I take a sample at one point, I may see certain properties, but if I move a little bit I may see completely different properties. It's very hard to even know the properties of the materials we deal with in natural systems. Usually finding properties is costly, because you need a large number of samples.

We need tools to be able to predict things, and that's true for a lot of other engineering fields. Computers have been helpful; they provide cost-effective ways to mimic processes in natural systems. My main area is modeling. Using a computer program, I try to simulate the process in a natural system as closely as possible. And that has been a continuous effort. You see in weather forecasts, for example, they're getting better and better and better. When there's a hurricane, they predict when and where it's going to land, and the predictions are improving because they use computer models to do these kinds of simulations.

HOW SHOULD WE RESPOND TO THE CLIMATE CRISIS?

There are two aspects. One aspect is to try to come up with policies or ways to slow down the increase in greenhouse gas emission. The other aspect of it is becoming ready for climate change. There already has been some climate change and we are witnessing its effects. So it's of course desirable and highly crucial to control it and mitigate it. For example, in the area of flood control, we know that climate change will cause more extreme events, so how we can really adapt our infrastructure to be able to handle that?

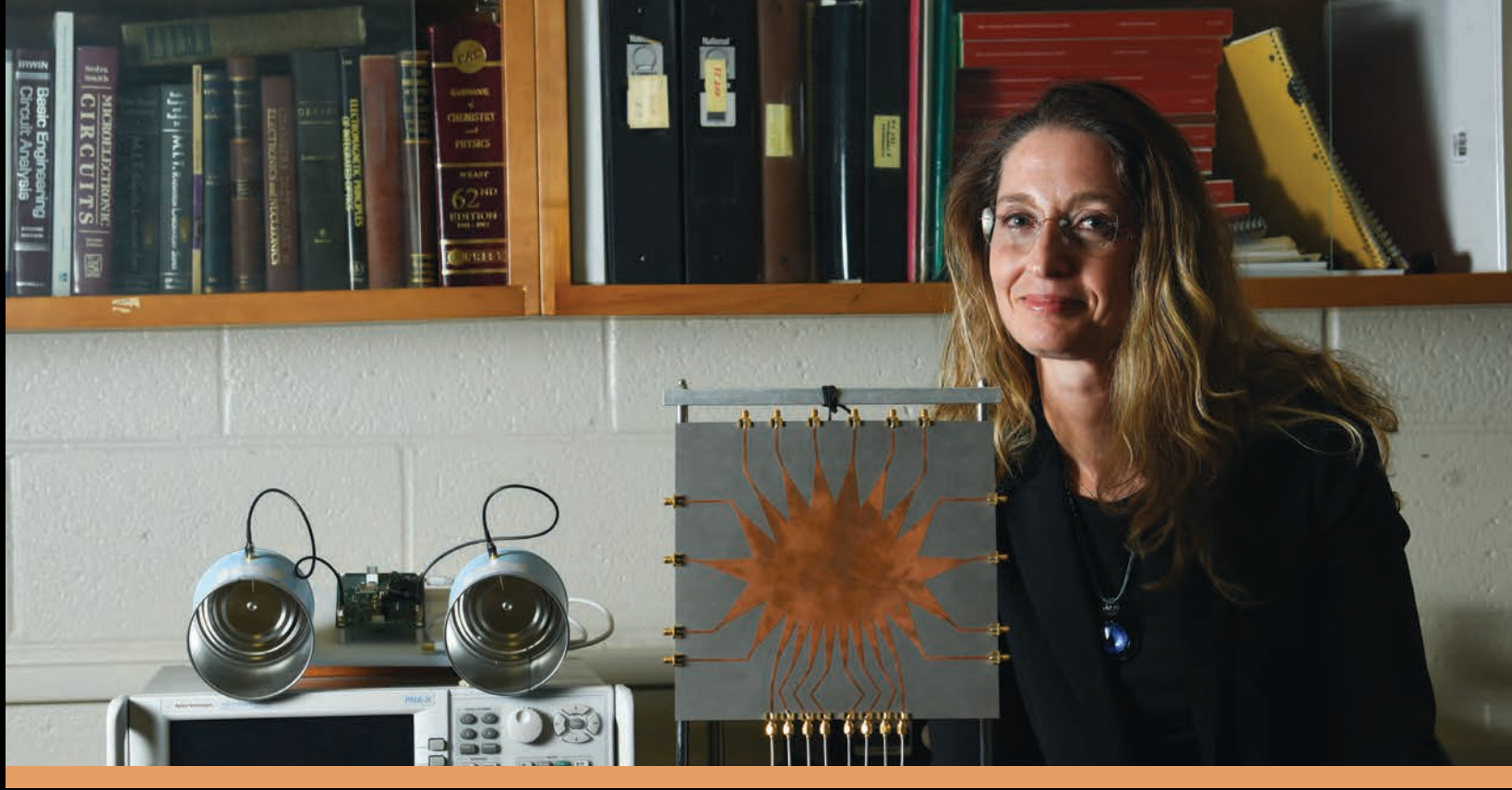
Federal government has a role, but the private sector, state government, and local governments can also have big effects. And in a lot of states, they are doing some really good things.

ARE YOU OPTIMISTIC ABOUT THE FUTURE?

I am very hopeful. I think we have made enormous progress, if you look at the long term. If you think of the air quality in the city of Los Angeles in the 1970s and compare it to now, it's very easy to realize that there has been an enormous amount of progress in the United States. A lot of that is due to regulation, a lot due to people becoming more aware, and a lot due to advancements in technology. I'm still optimistic. Even though politics can have some short-term impact on slowing down the progress, I don't think it can affect the long-term trend.

It's in the interest of business to be more environmentally conscious. Bad air quality can have serious economic impacts and hinder business. There has been resistance from oil companies, but in the long run, I think they will realize that if they do things in a more environmentally responsible way, it's going to help their business. Even if there's no policy to encourage electric cars, just the economy of that means that at some time, electric cars will be more cost-effective than gasoline cars, and this is a trend that will enormously help air quality.

In terms of climate change, things are a little less optimistic. I think there had been good progress in the U.S. in reducing greenhouse gas emissions, but there are other players in the world and a lot of them are where the United States was 20 or 30 years ago. China is now the largest producer of greenhouse gases. There needs to be some sort of global consensus, which unfortunately in the current "climate" is hard to reach.



2 Ozlem Kilic, associate dean of the School of Engineering and professor of electrical engineering and computer science, is the director of the Engineering Center for Care of Earth (ECCE). She organized the international climate change workshop held on campus in November 2017, and is now at work planning a second conference, scheduled for April 16–17, 2019. People can register for the conference at **on-climate.com/2019-conference/registration**.

WHAT CONNECTS ELECTRICAL ENGINEERS TO ENVIRONMENTAL ENGINEERING?

The connection is mainly with monitoring and assessment, whether it's satellites or drones or any flying system. Using microwave technology and radar technology, we can monitor things like agricultural development, forestation, and sea salinity on a global scale. That's where electrical engineers come in. We are the unsung heroes in climate science, monitoring what's happening on a day-to-day basis. While civil and mechanical engineers are hard-core with getting problems addressed locally, electrical engineers tend to be monitoring and assessing on a large scale. In terms of direct-impact technology, electrical engineers are also helping with solar energy and wind turbines.

WHEN DID YOUR INTEREST IN THE ENVIRONMENT FIRST AWAKEN?

Working on my Ph.D. at George Washington University, I monitored forestation. I developed electromagnetic scattering models to understand different structures and characteristics of the vegetation in the signatures we would receive from the satellites. So, for me, it's an old interest — not just technical, of course, but on a personal level, because it affects all of us.

WHAT ARE YOUR GOALS AS DIRECTOR OF ECCE?

Our first initiative was to establish the workshop in November 2017. It was such a success that at the end of the panel, I asked our panelists and speakers, 'Where do we go from here? How can ECCE help with the next step?' They responded, 'Let's continue having this meeting annually so we can all report on our progress!' So, this year we are having a larger-scale meeting, a two-day conference in April. We are partnering with Common Ground Research Networks. It's their Eleventh International Conference on Climate Change.

This summer, I was in Italy at Università Politecnica delle Marche, in Ancona, for a month as a visiting professor, and I met a group of scientists in Venice to have a tour of their coastal resilience initiatives. We are going to reciprocate and host a site tour in Chesapeake Bay to showcase what our initiatives are. This tour will also be part of our conference. We'll start with the site tour, and then we'll have our technical sessions and a panel discussion.

I would like to establish ECCE as an organization that leads on climate science and technology. At The Catholic University of America, and especially with the encouragement of Pope Francis, I believe these kinds of initiatives not only must be taken, but also must be pioneered.

HOW WILL THE UPCOMING CONFERENCE COMPARE TO THE LAST ONE?

It will be on a much bigger scale. Last year, about 20 speakers participated, and the audience varied between 40 to 100 or more throughout the day. This time, we are expecting about 200 participants. We are going to be highly visible.

The theme of the next conference is "coastal resilience." That's why I went to Venice — because they are ahead of the curve, and I know our Eastern Shore has similar problems, so I hope to get involved with the Chesapeake Bay Foundation. I'm happy to report that retired Rear Admiral David Titley has agreed to be the keynote speaker at our workshop. He served as chief oceanographer for the U.S. Navy, and later as chief operating officer of the National Oceanic and Atmospheric Administration (NOAA). He's very well known and respected in the field.

In Italy, I also met with Archbishop Spina of Ancona to discuss ECCE initiatives at Catholic University. The archbishop was very supportive; he would really like us to engage more with the Vatican, and he encouraged us to prepare a letter to Cardinal Peter Turkson. We're working on it, and we are hoping to have the opportunity to meet Pope Francis and receive his blessings on our initiatives.

WHAT OTHER INITIATIVES WILL ECCE UNDERTAKE?

There are a number of Catholic University faculty members already active in the field of the environment and care of Earth, so we would like to provide means for more focused research. I want to put Catholic University on the map on this topic. After *Laudato Si'* we should be leading, not catching up, and I know a number of universities have been doing things ahead of us.

As part of this objective, first, I would like to take ECCE to the next level. In addition to organizing and hosting conferences on climate change, which is now an annual commitment of ECCE leadership, it would be great to establish a center with funding for research. Right now we have only volunteers, so we can only do so much. To have real impact, we need funding, so that's my main objective for the future. Funding will enable us to take on much bigger initiatives. We are actively seeking industry partnerships. We'll be working on proposals for backing by government agencies, such as the National Science Foundation (NSF). We are already talking to some local companies.

Engineering School Hosts Workshop on Climate Change

International experts who participated in a workshop at Catholic University in November 2017 sent a clear message: Climate change is confronting our planet and its inhabitants with enormous challenges, and only by joining together can we expect to resolve them.

"We are all part of the problem; we all have to be part of the solution," said Ezio Mattiace, one of the experts who gathered for the Nov. 16 "Challenges of Climate Change" workshop, sponsored by the School of Engineering and organized by Professor Ozlem Kilic.

Mattiace, a specialist in renewable energy representing the Climate Reality Project, began his presentation by showing a slide of the iconic photograph from space of Earth as the "blue marble." That image, captured in 1972 by the crew of NASA's Apollo 17 spacecraft, has been credited with helping to foster a new environmental awareness.

The workshop, held in the Edward J. Pryzbyla University Center, was the first event marking the engineering school's commitment to establish an Engineering Center for Care of Earth, intended to foster greater understanding of the effects, both positive and negative, that technology has on our planet and on our relationships with one another.

"The School of Engineering has a long history of research and education in areas that relate to the environment," said John Judge, the school's dean, in his opening remarks. "But after Pope Francis published his encyclical *Laudato Si'* in the summer of 2015, it was apparent that we needed a more organized response to the challenge of protecting our common home."

"We are proud of our commitment to environmental stewardship at Catholic University," President John Garvey told workshop attendees in his welcoming remarks, concluding, "Climate change disproportionately affects the poor, which makes addressing it a matter of social justice."

Several speakers pointed out that climate and weather are two different things, as are global warming (cause) and climate change (effect). In the words of Ross Salawitch, a professor in the departments of atmospheric and oceanic science, chemistry, and biochemistry at the University of Maryland, College Park, who spoke on the importance of the Paris Climate Agreement, "climate is

To bring visibility to our initiatives at Catholic University on this issue, I have been actively engaged in a number of professional organizations. Recently, for instance, I was elected by the Climate Reality Project to be a Climate Reality Leader. In August, I went to Los Angeles for official training and to meet Al Gore, and I can provide presentations to audiences on request.

Another thing I would like to see is for our University to be one of the universities that has joined the Climate Leadership Network [**secondnature.org/climate-leadership-network-map**]. It was very nice to see that President Garvey recently signed the Catholic Climate Declaration to declare our commitment to the issue. This is a topic that involves everyone, so I would like to see it elevated to the University level. I would like in the long run to drop the 'e' for engineering and have the center called Center for Care of Earth to involve our entire University.

DO YOU SEE THAT HAPPENING SOON?

This is a big undertaking, especially with no significant funding. But I will be taking the initiative to submit proposals this year and engage in dialogues with industry and government entities. This is too important not to try.

WHY HAS THE RESPONSE TO THE ENVIRONMENTAL CRISIS NATION-WIDE BEEN SO UNEVEN?

I think human psychology tends to want to ignore the big problems. That may be playing into it. We have the technology! It may be expensive, but there are so many places on Earth that are suffering; some islands are on the verge of disappearing, and others have already disappeared. If we confront the problem and support the technology, it can be more affordable. So, my objective is to say that Catholic University takes this to heart, and is keen to bring awareness. Instead of fear, let's just look at the problem with a can-do attitude. It's still not too late.

the average of weather."

"Global warming causes climate change, and climate change causes natural disasters," said Sen Nieh, professor and chair of the University's Department of Mechanical Engineering. Nieh presented data showing that there has been a clear and troubling increase over the past half-century in disasters such as wildfires, hurricanes, tornadoes, and tsunamis, causing massive loss of life and property and increasing the number of climate refugees uprooted from their homes.

Among many other participating speakers were Giovanni Cecconi, founder of the Venice Resilience Lab, who highlighted how the city of Venice is responding to rising sea levels; Compton Tucker, a senior scientist with NASA's Goddard Space Flight Center, who shared his expertise on satellite observations of weather and climate; and Mark Z. Jacobson, professor of civil and environmental engineering at Stanford University, who spoke on the necessity of conversion from our dwindling supply of fossil fuels to renewable energy sources such as wind, water, and solar power.

A recently published article in the journal BioScience, signed by more than 15,000 scientists from 184 countries, warns that not enough is being done to address the climate crisis. Nonetheless, some workshop speakers suggested that there is cause for optimism. Polls show that significant international majorities favor the conversion to renewable energy. Market forces are making alternative energies less expensive. And renewable energy creates jobs. State and city governments across the U.S. are showing leadership in the area of climate change.

"There's a lot to be hopeful about," said Davin Hutchins, an official of Greenpeace and a senior volunteer with the Climate Reality Project. "There are a lot of minds being changed."

Sen Nieh

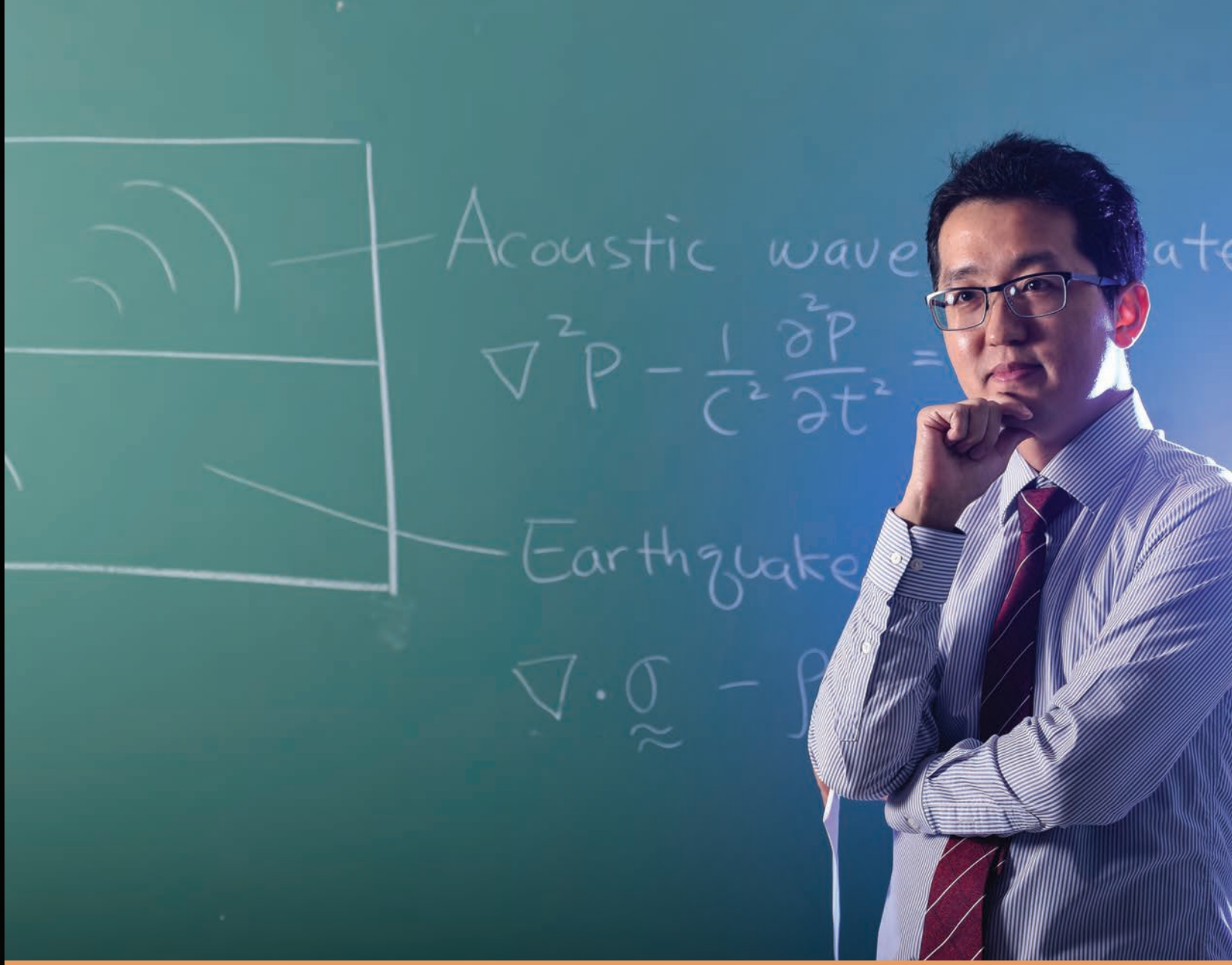
NASA Goddard Space Flight Center Image by Reto Stöckli

ARE YOU OPTIMISTIC?

We have to be. There has already been major climate change. We're going to pay some consequences, for sure. It's a very complex problem, but my worry is that people will just give up and focus on the day-to day. There are things we can do. Whether it has a big impact or not, why should we not do it? It's our ethical responsibility to the next generation and to Mother Earth. Sometimes I see people presenting in support of this cause, and it kind of turns me off when to motivate people they say, 'This [environmental measure] is profitable.' We should do it because it's the right thing to do! If it's profitable, that's good for some business, but I want to go to bed at night and feel good that I've done something right. We all have responsibilities we owe to this Earth. It's not just about profits.

ARE YOU PLEASED BY THE SCHOOL'S NEW ENVIRONMENTAL ENGINEERING PROGRAM?

I am so delighted to see that! We also recently launched a Data Analytics program. Big data and environment and care of Earth are very connected. I'm hoping data science can help us find correlations between issues, better monitor the changes we are facing, and better understand what is causing them. So, the launch of Environmental Engineering in parallel with the data science is very exciting to me.

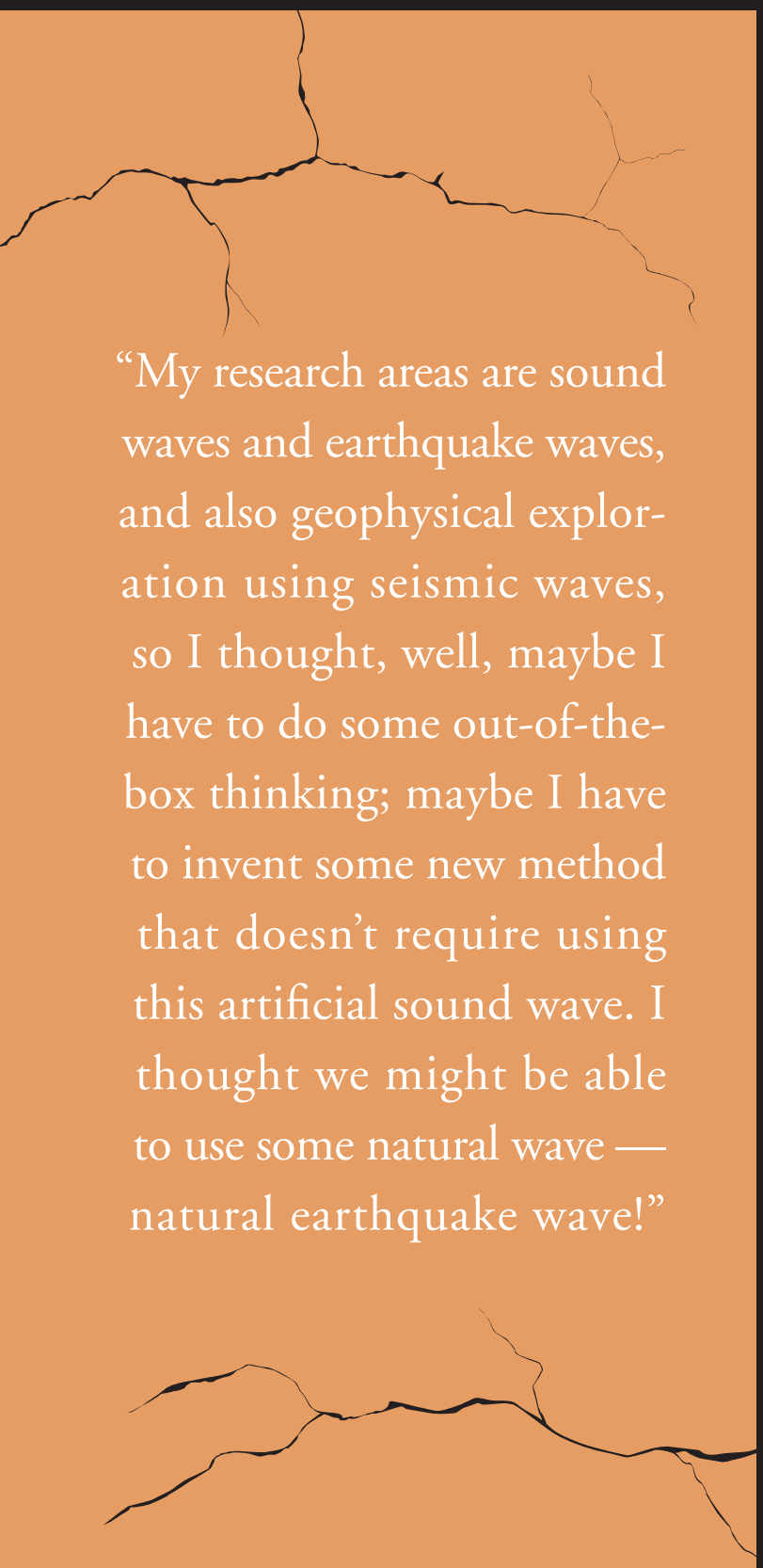


3 Oil companies in search of offshore oil deposits typically conduct seismic surveys by sending loud sound waves from an air gun to the seabed and analyzing the reflected waves. Such explosive noise can be lethally harmful to marine wildlife such as dolphins, porpoises, and whales, which rely on underwater sounds to navigate, find food, and communicate. Assistant Professor Chanseok Jeong, who joined the Department of Civil Engineering in 2013, is investigating a new method of doing such surveys by "listening" to earthquake waves, thereby reducing noise pollution. The U.S. Geological Survey estimates that there are more than 500,000 detectable earthquakes every year, though only a small percentage of them cause any damage.

HOW DID YOU GET INTERESTED IN THIS SUBJECT?

One day in my first or second year at Catholic University, I saw a BBC News article about whales and dolphins stranded on the beach. I kept seeing this kind of article and I was very surprised. I knew that dolphins were dying on the beach, but the frequency of this happening is increasing every year. So, I got interested in this problem and did some research. One of the primary reasons whales and dolphins are stranded is because of noise pollution in the oceans.

One of the causes is sound waves that have been used by oil companies. My research areas are sound waves and earthquake waves, and also geophysical exploration using seismic waves, so I thought,



"My research areas are sound waves and earthquake waves, and also geophysical exploration using seismic waves, so I thought, well, maybe I have to do some out-of-the-box thinking; maybe I have to invent some new method that doesn't require using this artificial sound wave. I thought we might be able to use some natural wave — natural earthquake wave!"

well, maybe I have to do some out-of-the-box thinking; maybe I have to invent some new method that doesn't require using this artificial sound wave. I thought we might be able to use some natural wave — natural earthquake wave! Whales and dolphins already adapted to earthquake waves. They have survived them for more than a million years, so I came up with the idea that maybe using this method, we can find some information about where the oil reservoirs are under the seabed. That is, while waves propagate through the seafloor, they will carry information about underlying geological formations. We will extract such information from the recorded data of earthquakes.

This is a completely new idea. It can save both money and wildlife. It's like a one-stone, two-bird approach. I think the top executives in oil companies are very sensitive to what people think about them. People criticize oil companies for being greedy and not caring about the environment. Recently, activists in Greenpeace started to protest about this kind of noise pollution from oil companies. In a recent court case, the U.S. Navy was banned from using sonar waves in California waters.

DO YOU FORESEE ANY POTENTIAL PROBLEMS WITH USING EARTHQUAKE WAVES AS YOU PROPOSE?

I think I'm on the right path. If successful, my method will reduce anthropogenic noise pollution and all its side effects, so the overall direction of my research is very promising.

WHAT ABOUT AREAS WITHOUT MUCH EARTHQUAKE ACTIVITY, SUCH AS THE FLORIDA COAST?

A lot of earthquakes happen on the West Coast. But on the East coast, like Florida, we are going to record a very mild signal, associated with remote earthquakes from some other area.

ARE THERE OTHER LIKELY USES OF THIS TECHNIQUE, APART FROM OFFSHORE ENERGY COMPANIES DOING SEISMIC SURVEYS?

The latest mission of NASA to Mars is called InSight. [*He reads*] "The InSight's objective is to place a stationery lander equipped with a seismometer and heat transfer probe on the surface of Mars to study the planet's early geological evolution." In this mission, they just sent a new probe, which has a seismometer. On Mars, there are

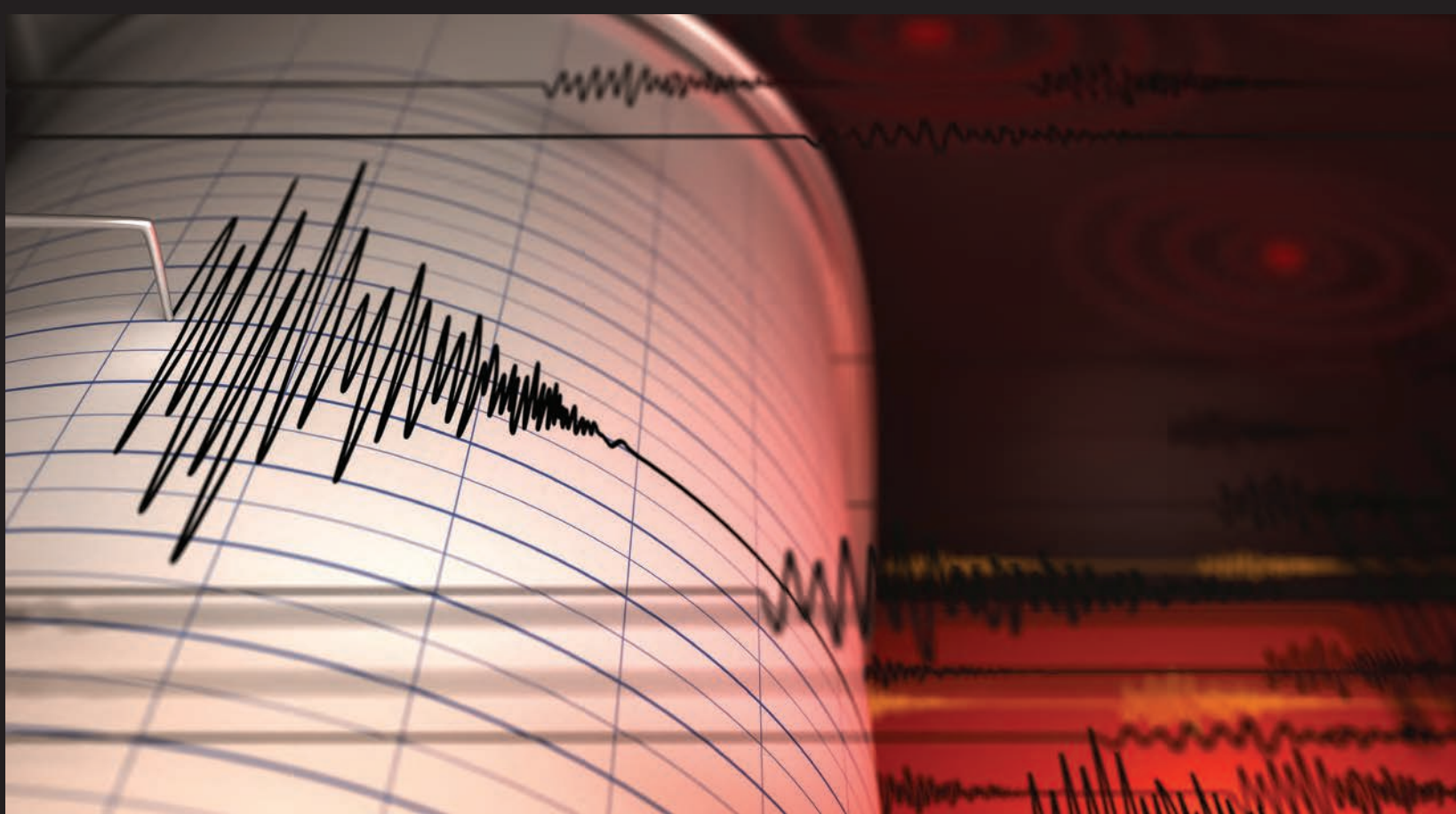
marsquakes, and they can measure this marsquake motion by using this one accelerometer. NASA claims that by using this motion they can characterize what is inside Mars. But the problem is that this one accelerometer can measure the motion only at a single point, so we can't have a lot of information from the marsquake.

My idea is that we can send another probe, and this lander has another sensor. It's not a conventional accelerometer. Instead, it will be high-speed cameras. A faculty member of the mechanical engineering department here, Zhaoyang Wang, has developed a technique using two cameras to measure vibration at more than a thousand points on the surface of a three-dimensional object. In other words, on Mars, using these high-speed cameras, they can measure quake motions in a very wide space and extract a lot of information on what's under the surface more accurately than by using measured seismic motion from a single seismometer.

Thus, I will develop some computational and theoretical method that helps extract information from marsquake motions. The marsquake motion data are just a bunch of numbers. I will develop some method that extracts some geological information about Mars from these random numbers.

In the area of mitigating noise pollution in the oceans, I have several other applications in mind. Traditionally, navies use sonar waves to detect the submarines of other nations or ships on the surface. The sonar wave is reflected from the other submarine and comes back. From this reflected wave, they figured out where the submarine is. When they use this sonar wave, they create this very loud sound, which creates a lot of harmful health effects to marine mammals. My research is on passive sonar methods. That is, we will just listen for any sound from hostile submarines without using any active sonar. A submarine makes a propeller sound or engine sound, and this sound wave can travel to our submarine. By analyzing this, we can pinpoint what it is, where it is, and how it's moving.

Another application involves offshore wind turbines. When we build a wind turbine, we first put a big pile in the seabed, and then we install the turbine. But when we install this metallic pile, we have to hammer it with a metallic hammer. We have to hammer one pile several thousand times to install it, and in the area around these piles, the intensity of the hammering sound is great enough to kill dolphins and whales. It's a very serious problem. So another research topic is how to mitigate this underwater piling noise.



A New Engineering Course Starts with

INNOVATION

Encouraging students to be creative and confident

It isn't often that twin brothers Edward ("Bingo") and Donald ("Buster") LaHaye find themselves in the same classroom at the same time. Earlier in their college careers, they took a business class together, in which Buster, an electrical engineering major, was on the home turf of Bingo, a marketing major.

In the fall semester they were on Buster's turf. On a Thursday night in September, the brothers were in a corner classroom of Pangborn Hall, working together on a team project to help solve the power crisis in Puerto Rico following the mass outages left by Hurricane Maria.

"I never thought I'd be in an engineering class with my brother," said Bingo, who is lending his marketing knowledge to his group's startup. The new School of Engineering course, Social Innovation Startups, is open to seniors and graduate students from all disciplines. According to its syllabus, the only prerequisite is "interest or passion to discover how an idea can become a real company, by working on a project in a team."

The hallmark of the course is its challenge to students to use their innovation and marketing skills to serve others. "As we considered a service that could help others in need, we couldn't help but think about the people of Puerto Rico suffering for so long since the hurricane hit," said Bingo, whose team is one of two groups working on solutions to the Hurricane Maria crisis.

Across the classroom, another group is huddled together working to develop an origami-style, pop-up mobile clinic for medical missions in the Philippines. Other startups include a highly functional, yet affordable lower-limb prosthetic; a smart greenhouse; a wireless beehive monitoring system; and a stroke-rehabilitation protocol.

Chris Danek, B.M.E 1989, who developed the course and is its

co-instructor, pitched the idea for Social Innovation Startups to the School of Engineering more than two years ago. He envisioned an interdisciplinary course in which students would work together to develop a product that serves the common good, and then learn how to launch it into the business world. The course would teach students how to become "design thinkers" — people who aren't afraid to tackle a problem from any angle, and who know how to harness the expertise of their team.

Danek knows about innovation. The engineering alumnus, who has a Ph.D. from Stanford University and an M.B.A. from the Wharton School of Business, is listed as an inventor on 70 U.S. patents. He led the initial clinical development of bronchial thermoplasty, the first approved intervention to treat asthma. He also co-founded AtheroMed, Inc., where he led the development of a clinically and commercially successful treatment for peripheral arterial disease.

To teach the course, Danek is partnering with co-instructor Greg Behrmann, a faculty member in the School of Engineering, who has more than 20 years of experience as an innovator in the medical device industry. Students in the course benefit from the guidance of many others, as well; each team is matched with a mentor from the school's faculty or from the business world. The teams also partner with industry experts who provide practical input and feedback. A steady stream of guest speakers from government agencies, nonprofits, and companies add to the real-world learning experience.

Early in the fall semester, Danek laid out basic tenets of the course for his students: "Have empathy with the people you are trying to serve; conduct interviews; listen to them. To maintain creativity and energy, work in teams. Generate tons of ideas. Make tangible prototypes. Test and refine your solutions." He encourages students to learn from failure. "Even the most successful entrepreneurs rarely get it right the first time. Share your prototype and iterate based on feedback."

In addition to developing technical skills, Danek says the course is designed to give students a set of real-world skills including "leadership, teamwork, communication, and collaboration."

After a pilot course was successfully offered last spring, the course is now spread over two semesters, allowing students adequate time to fully develop, iterate, and test their product or service.

Danek, a Silicon Valley entrepreneur and consultant, says he is at a point in his career where his joy comes from helping others turn innovative ideas into practical solutions. Every Wednesday he takes the "red eye" to Washington, D.C., making himself available to the teams during the day before the Thursday-evening class. Then he's back on a Friday flight to the West Coast.

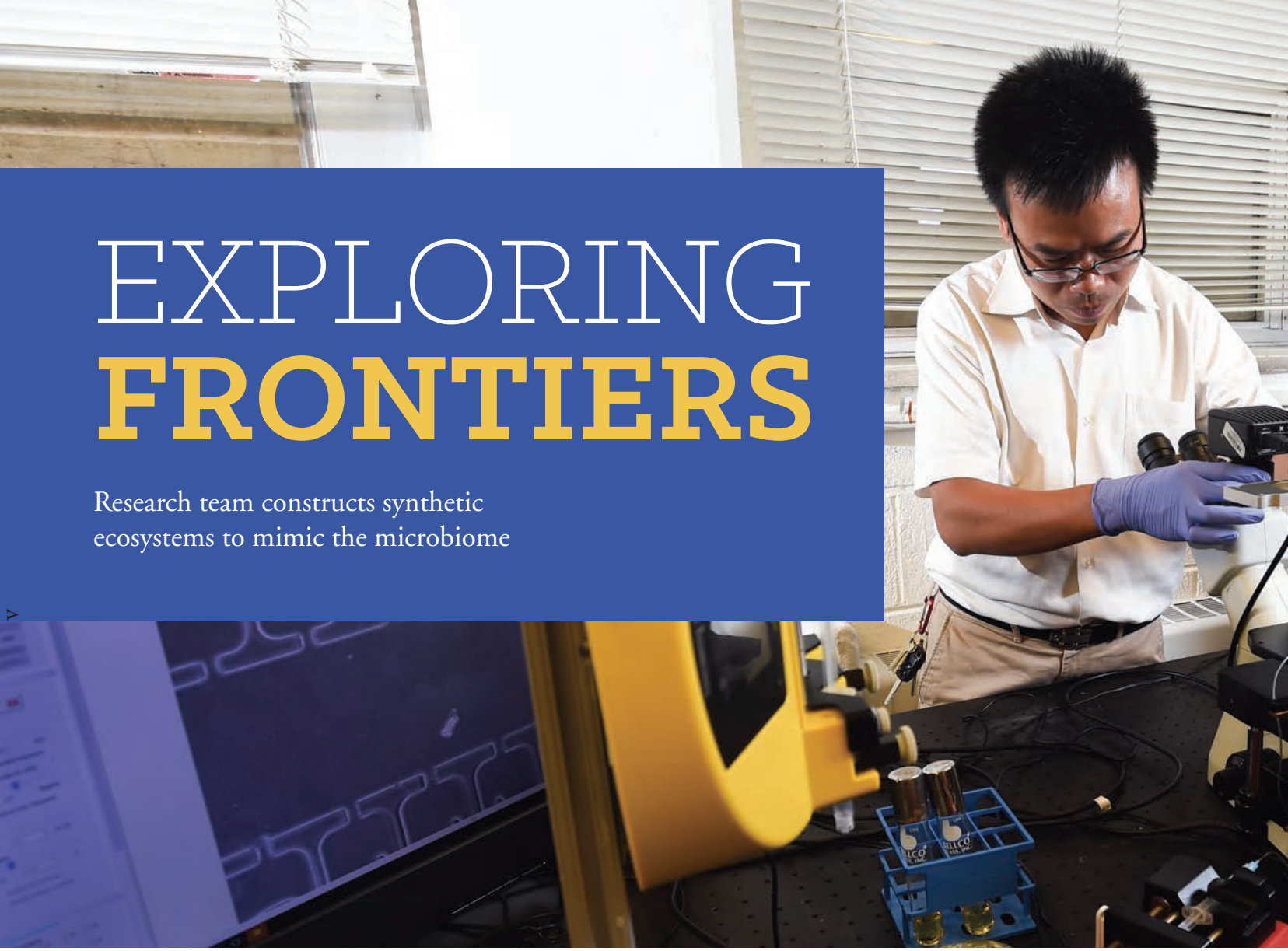
"I've always been grateful to my alma mater," he says. "It provided me with the strong foundation for what I've achieved, and it's important to me to contribute to the school's advancement. I like where the school is headed. The strategic plan laid out by the new dean emphasizes innovation and practical experience in addition to extremely strong academics. The students are energetic and creative, and my interaction with them helps me engage in my own work at a deeper level."

Carrie Maslen, the former vice president of sales operations at Samsung and a 1982 graduate of the school's Mechanical Engineering Program, has served as guest speaker for the course. She loves helping students prepare for work in the modern business world.

"Chris laid out his vision," Maslen says, "and I thought, 'How cool would it be for Catholic University to have this?' And I can tell you, that's business — you have to work with all different groups. If we teach our students to operate in silos, we are not preparing them for the future. When I am working on a project, I am working with legal, I am working with marketing, I am working with product development. That's how you get something done."

The lower-limb prosthetic group is getting input and feedback from professionals at the National Rehabilitation Hospital. "We are approaching this from a technical perspective — ending or lessening joint pain, providing adequate cushioning in each step," says Caroline Miller, a senior biomedical engineering student. "But we are also looking at quality-of-life issues and reimbursement issues. When we met with people at NRH, we learned that insurance reimbursement is a major barrier to people in getting access to high-quality prosthetics. So we are looking at solutions to that as part of our product development."

"Dr. Danek has been through this process so many times," says Patrick Walsh, a senior mechanical engineering student, who is also on the prosthetics team. "He talks a lot about having creative confidence throughout the process. And it really adds to our confidence to have him and the other faculty members and industry mentors helping us out and believing in our projects."



EXPLORING FRONTIERS

Research team constructs synthetic ecosystems to mimic the microbiome

The human body, both on its surface and in its depths, is populated by millions of microorganisms. These organisms, key players both in maintaining health and in triggering illness, form an ecosystem known as the microbiome. An interdisciplinary team of researchers at Catholic University is exploring this microscopic frontier.

Collaborators Xiaolong Luo, an associate professor of mechanical engineering, and John Choy, an assistant professor in biology, have been awarded $462,000 in NIH funding to extend their work. Their aim is to create a biological platform that will enable researchers to learn how bacterial species interact, for good or ill.

"The interactions between the microbes within the microbiome, and how these interactions impact the host, remain largely unknown," said Luo. "This grant can energize us to work more and focus more on this."

Together, Choy and Luo have designed highly flexible microfluidic devices that can provide a livable habitat for multiple species of bacteria and yeast, even if each has different nutritional needs. Their platform gives different species the freedom to interact.

"It's clear that bacteria and other microorganisms inhabiting our body have a profound effect on our health," Choy said. "Our collaboration is to try to develop a very simplified system and then build on it to try to understand how these microorganisms interact, and how the chemicals they produce can affect changes in behavior between those different species that could lead to disease or protect health."

Luo and Choy have been working together for several years. Though their current experiments are aimed at studying mixed cultures of two species of bacteria with a single species of yeast, they hope to build a platform that will allow them to dissect the complex signaling networks that connect many more species, akin to what we find in the human microbiome. In the human gastrointestinal tract, for example, signaling molecules secreted by certain microorganisms help to coordinate more complex tasks such as utilizing nutrient resources or surviving a dose of antibiotics.

"A biological platform of this kind will allow research that is not possible with standard microbiological techniques," Luo said. "Up until now, scientists typically study microorganisms in pure cultures or observe interactions between microbes that share the same nutritional requirements. With the new platform, scientists will be able to study

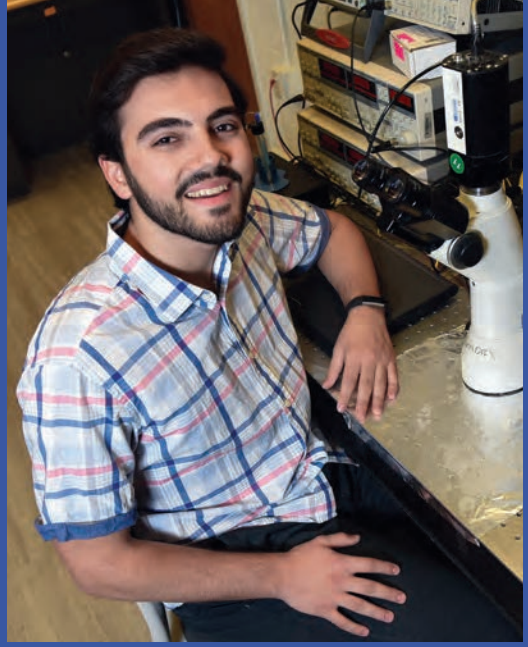
Xiaolong Luo, left, and John Choy

the interactions of more diverse species on a single cell level or as entire populations. Modeling the natural ecosystems in an artificial and controlled environment represents a crucial first step to study the interactions between microorganisms."

The researchers' novel microfluidic platform consists of freestanding biopolymer chitosan membranes, termed "fluitrodes," that are biofabricated in small apertures connecting adjacent microfluidic channels. Like electrodes transmitting electrons, the fluitrodes transmit ions and small molecules from one microchannel to another. The microfluidic platforms, with channels the size of a human hair in diameter, provide 3-D cell culture scaffolding and enable precise control of the interactions between cells.

The interdisciplinary nature of their work, Choy and Luo say, positions their project on frontier terrain between biomedical engineering and biology.

"If you look at science, it's becoming more interdisciplinary," Choy said, "because the new technologies that are being developed are being used to address long-standing biological questions. The convergence that has been happening in the past 10 years has really moved us ahead in our understanding of basic biology and could lead to advances in health care which could make a difference in diagnosing and curing diseases."



Saba Owens

LEARNING BY DOING

STUDENT ENJOYS ADVANCED RESEARCH OPPORTUNITY

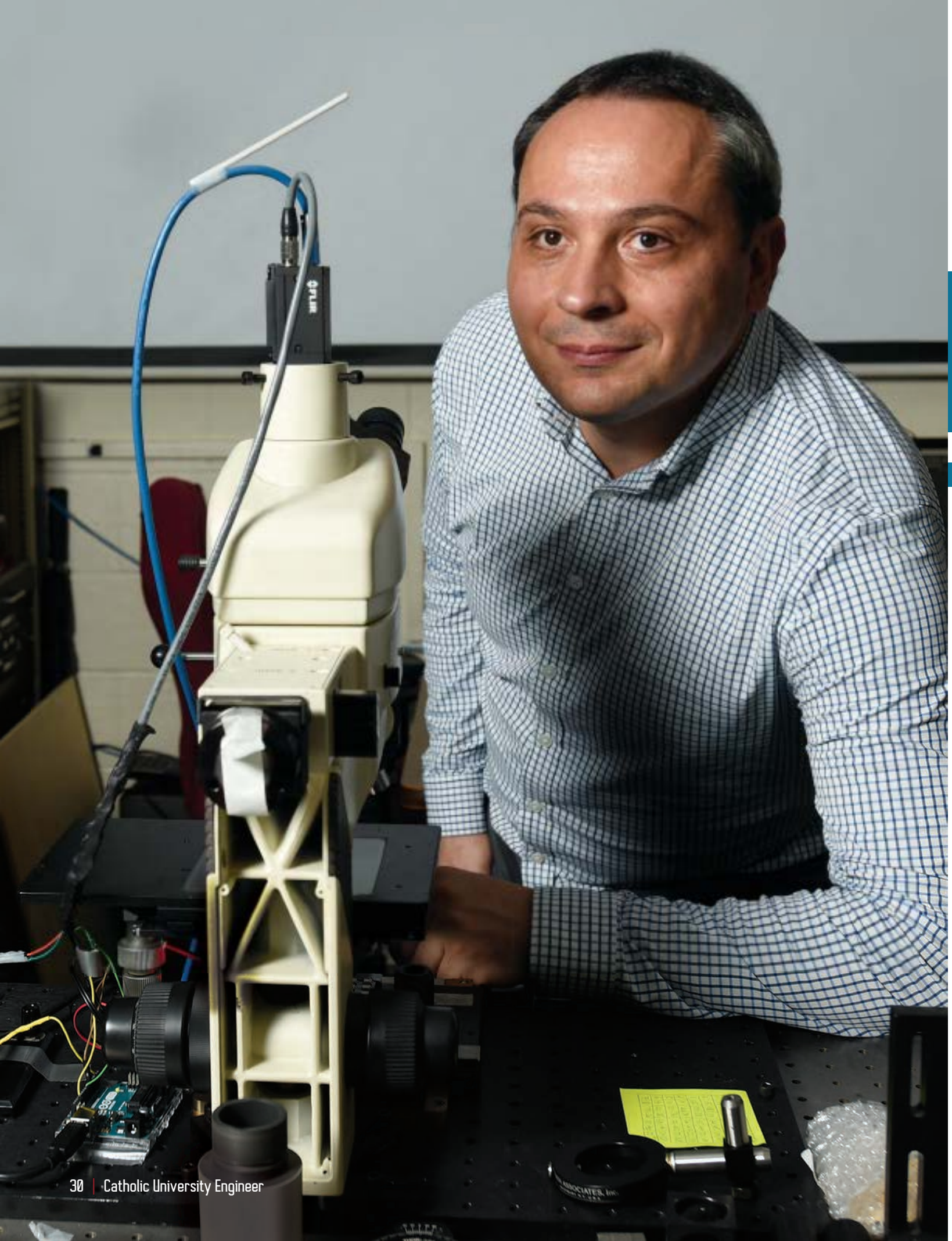
When Saba Owens enrolled in the School of Engineering, he expected to explore as many different aspects of engineering as possible. One thing he didn't expect was that he would be doing high-level research in a laboratory, working alongside graduate students in close contact with their faculty mentor, Xiaolong Luo.

Laboratory research, Owens discovered, is a little like a team sport in that his success often depends on the other players.

"I can reach out to the person next to me and say, Help! Do you understand what's happening?," says Owens, a senior biomedical engineering major. "When I first got to the lab, I honestly had no idea what to do. But I was willing to tackle anything, really. I just wanted to gain that experience."

Owens is working on a team researching techniques to mimic molecular interaction within the human body. Some day, he would like to work on developing prosthetics for children. But whatever the future holds, he feels well prepared. Presenting his findings regularly in the lab has boosted his confidence and helped him master a key workplace skill.

"Once a week all the teams come together," he says, "and I have to present my findings for that week, so it really trained me to be able to speak about my work. That's really a key factor of research — to convey your findings to other people. If you can't do that, how is your work going to be implemented later on in the work force?"



Focused on OPTICS

Engineer Keeps His Eye on New Challenges

As a boy growing up in his native Lebanon, George Nehmetallah, assistant professor of electrical engineering and computer science, enjoyed figuring out how the pieces of nature work together.

"I used to watch all science movies — any science-related documentary or science fiction," he said. "Some people have musicians as idols, and some people have Newton or Einstein. I guess I'm in the second group."

Unsurprisingly, given his interests, Nehmetallah felt drawn to engineering. After earning his bachelor's degree from the Lebanese University School of Engineering, and a master's degree from the American University of Beirut, he moved across the world to pursue his doctorate in electrical engineering at the University of Dayton in Ohio.

Though he had previously studied antennas and electromagnetics, Nehmetallah became interested in optical engineering, a field of study focused on designing instruments utilizing the properties of light. His first project was looking at multidimensional solitons (light pulses that travel without distortion due to propagation). The research inspired him, in part, because it looked like the science fiction films he had grown up watching.

"It was similar to what you would see in *Star Trek*, with a big burst of light," he said. "I became interested in it because it reminded me of these things I had grown up with."

Eventually, Nehmetallah attended a conference on holography, a 3-D imaging technique. The conference inspired him to begin working on imaging research for the U.S. Army, for which he was honored with an Army Achievement Award in 2011. Nehmetallah wrote a book, *Analog and Digital Holography with MATLAB*, and has authored more than 120 peer-reviewed journal publications and conference proceedings.

Since joining Catholic University's engineering faculty in 2013, Nehmetallah has continued his research in 3-D imaging, digital holography, and metamaterials. Collaborating with a biomedical engineer, Assistant Professor Christopher Raub, he is working to capture 3-D images of various kinds of cancer cells. The goal is to understand these cells in a new way in the hopes of developing a cure.

In another project, Nehmetallah and his graduate student, Thanh Nguyen, hope to develop a method of reconstructing video sequences of dynamic live cells captured using a computational microscopy technique called Fourier ptychographic microscopy (FPM). Nehmetallah and Nguyen believe that their new technique will find wide applications for in vitro live-cell imaging.

His additional projects include further work on night vision imaging for the Army, and a sensor for gas detection that can be used on NASA CubeSat missions to detect life on other planets.

Nehmetallah has also been instrumental in the development of a new partnership between the School of Engineering and Newport News Shipbuilding in which engineering faculty share their expertise in power systems and power electronics with employees working in the field. The program is part of a Navy-wide shift toward modernized technology that can better withstand foreign attacks.

Having the opportunity to work on such a wide range of projects is a thrill for Nehmetallah, who still enjoys the challenge of figuring out how the world works. For his efforts, he was recognized with the University's 2018 Young Faculty Scholar's Award.

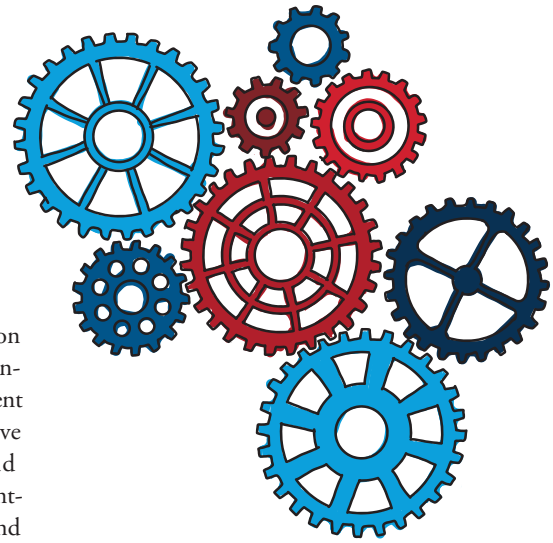
"I don't do engineering for the money," he said. "I do it for the fun — and for trying to have as big an impact on humanity as possible."

Nehmetallah said he loves working with graduate students and helping them to pursue their engineering goals. But most of all, he loves to learn and challenge himself.

"Whenever you learn more, you kind of realize how much you lack in knowledge," he said. "I try to be creative and to solve problems. The motivation is to see what others have done, what failures they have faced, and to try to do a better job."

//EYE ON FACULTY

Engineering Leadership Welcomes New Members



Nader Namazi, professor of electrical engineering and computer science, has been appointed chair of the Electrical Engineering and Computer Science Department, returning to a role he held from 2005 to 2008. Namazi joined the faculty in 1992. He has expertise in signal processing, including image motion detection and estimation, image sequence filtering/restoration, and digital communications and classification. He is a senior member of IEEE, a member of Eta Kappa Nu, and a recipient of the Alpha Delta Gamma Teaching Award.

Ozlem Kilic, professor of electrical engineering and computer science, has been appointed the associate dean of the School of Engineering. Kilic, whose new appointment was effective June 1, will assist Dean Judge with administration and the implementation of new initiatives and programs. Her responsibilities include working with the department chairs, program directors, and administrative staff to coordinate all undergraduate and graduate programs; coordinating the appointment and promotion process for faculty; and meeting with current and prospective students, faculty, staff, and visitors to answer questions, address concerns, and promote the School of Engineering. Kilic joined the faculty in 2005 and previously served as the chair of the Electrical Engineering and Computer Science Department. She received the 2018 Provost's Award for Research Excellence at University Research Day (see page 13) for her work in electromagnetics and antennas.

Arash Massoudieh, associate professor of civil and environmental engineering, was appointed chair of the Civil Engineering department in fall 2017 after serving as acting chair since January 2017. He joined the faculty in 2008 and is an expert in environmental engineering, with a focus on modeling of ecological systems and contaminant transport. Under his leadership, the department has changed its name to Civil and Environmental Engineering (see page 17) and will begin offering new degrees in environmental engineering at both undergraduate and graduate levels.

President John Garvey, left, and Diego Turo

Turo Wins Teaching Award

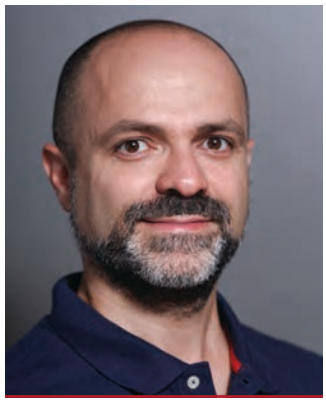
Diego Turo, clinical assistant professor of mechanical engineering, accepted the Advancement in Teaching Award at a faculty luncheon on May 1, 2018. In presenting the award, Provost Andrew Abela said Turo demonstrated a "commitment to improve the department by making fundamental and innovative changes in all the courses he has taught."

"I felt totally overwhelmed when I received the notice from the provost," said Turo. "I couldn't believe it. I knew that my teaching style was well received among all my students, but I was just not expecting to be recognized by the provost himself."

Since joining the faculty in 2014, Turo has taught 12 different courses. He serves as the coordinator of the newly established concentration in aerospace engineering, offered to undergraduate students since 2017.

"The Provost made a great speech about my teaching performance," Turo said after the luncheon. "It was all so wonderful, and I am grateful for it. However, if there is one thing I will cherish forever, it's the memory of the happiness and the pride I saw in the eyes of my students when I gave them the news. That was priceless!"

New Faculty and Staff



Francesco Corvaro

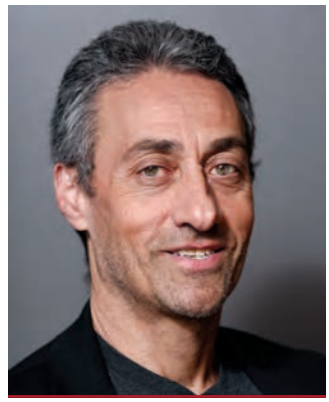
Mechanical engineer Francesco Corvaro joins the faculty this year as a visiting professor in the Department of Civil and Environmental Engineering. He is associate professor in applied physics (thermodynamics, heat and mass transfer, energy systems and renewable energies) at the Marche Polytechnic University in Ancona, Italy. He is an avid soccer fan and devoted skier. Corvaro and his wife, Barbara Marchetti, a lecturer in the Department of Civil and Environmental Engineering, have four children.

"I am very excited for the opportunity to teach at Catholic University," says Corvaro, who earned his Ph.D. in 2005. "Between the Catholic University of America and the Marche Polytechnic University, there have been several exchanges of students and professors. Last summer, three students of the mechanical engineering course came to my university in Italy. Also, in July 2018, three professors from the School of Engineering were at my university as visiting professors."

Theresa Nixon

Theresa Nixon, M.S.M. 2018, joins the School of Engineering as the new assistant to the chair for Electrical Engineering and Computer Science. She was born and raised in San Diego, Calif. When her family relocated to the Los Angeles area, Theresa followed (somewhat) in the footsteps of her grandmother, a prolific dancer, by going into the entertainment business as a writer. She wrote primarily for local music publications. In 1984, she interviewed Paul McCartney; an excerpt of the interview was cited in John Braheny's third edition of *The Craft and Business of Songwriting* (2006).

After working in the television and motion picture industry, she later became a legal assistant for the State Bar of California and the state's Office of the Attorney General. Nixon earned a bachelor's degree in legal studies/business law and public policy at University of Maryland University College, and later a master's degree in leadership and management at The Catholic University of America.



Sergio Picozzi

Sergio Picozzi joined the School of Engineering as a visiting assistant professor in the Materials Science and Engineering Program.

He received his Laurea in Physics (cum laude) from the University of Naples, Italy, with a dissertation on string theory, and his Ph.D. in Physics from Southern Illinois University, with a dissertation on applications of information theory to condensed matter physics.

He returns to Catholic University, where he did research in the Vitreous State Laboratory from 2008 to 2012, after teaching physics and electrical engineering for six years at the University of Maryland. He also taught for many years at Duke University and at The George Washington University.

Picozzi's research interests include nanotechnology, stress and fracture in solids, statistical and nuclear physics, and applications of physics to economics and finance. He is actively involved in the development of a research program in additive manufacturing, and he is preparing a new course on the science underlying this technology.

Christina Thurston

Christina Thurston joined the Department of Mechanical Engineering as the assistant to the chair in October of 2018. Before coming to The Catholic University of America, Christina worked at South Dakota State University in the Department of Housing and Residential Life, as the secretary for off-campus housing and summer camps/conferences. She graduated from Bennett College in Greensboro, N.C., with a B.A. in Mass Communications in 2008. Christina is a proud native of Maryland and a member of Delta Sigma Theta Sorority. She takes pride in providing a warm and welcoming environment for the Mechanical Engineering Department, and looks forward to assisting in its continued success.

Engineering Alumni Have Risen High in the U.S. Navy

Catholic University's Engineering Management Program has a long history of serving the educational needs of the Department of Defense. With classes offered off-campus in Crystal City, Va., near the Pentagon, the program is an attractive option for young officers stationed in Washington, D.C. An arrangement created in the 1980s to accept transfer credit for coursework at the U.S. Navy's Nuclear Power School made a master's degree in Engineering Management a possibility for many naval officers, and the program's alumni have gone on to a variety of prominent positions, many devoting long and distinguished careers to service in the Navy.

Six alumni of the Engineering Management Program have reached the rank of Vice Admiral. Three of these 3-star leaders are currently on active duty: Vice Admiral Frederick J. ("Fritz") Roegge, who currently serves as the President of the National Defense University; Vice Admiral Chas Richard, currently Commander of United States Submarine Forces, who received the 2017 Engineering Distinguished Alumni Award; and Vice Admiral Bill Merz, currently the Deputy Chief of Naval Operations for Warfare Systems in the Pentagon, who was a special guest speaker at the School of Engineering's Alumni Reception during the 2017 Cardinal Weekend.

The other three have retired from active-duty military service: Vice Admiral (retired) William Hilarides, who served as Commander of Naval Sea Systems Command; Vice Admiral (retired) John Bird, who served as Commander of U.S. Seventh Fleet; and Vice Admiral (retired) Mel Williams Jr., who served as Commander of U.S. Second Fleet and after retirement as a Presidential Appointee — the Associate Deputy Secretary of Energy. Williams received the 2012 Engineering Distinguished Alumni Award, and returned to the School of Engineering in 2017 as associate dean for external affairs, directing the school's off-campus programs (including Engineering Management) and strengthening partnerships with a variety of corporations, other universities, and government agencies. The school is fortunate to have Admiral Williams on its leadership team and is proud and honored to have so many alumni who have served our country with such distinction.

Vice Admiral Frederick J. Roegge

Vice Admiral Chas Richard

Courtesy photos

Vice Admiral Bill Merz

Vice Admiral (retired) William Hilarides

Vice Admiral (retired) John Bird

Vice Admiral (retired) Mel Williams Jr.

Alumnus Recognized for Lifetime Achievements

NASA/Goddard/Bill Hrybyk

Edmund Habib, left, accepts an award presented by Chris Scolese, director of NASA's Goddard Space Flight Center, in recognition of his contributions to space communications.

In recognition of his lifetime achievements in space communications at NASA, Edmund J. Habib, B.E.E. '49, received one of two 2018 Engineering Pioneer Awards from the Goddard Space Flight Center.

As one of the agency's first employees in the 1950s, Habib made vital contributions to the development of NASA's first tracking, data processing, and satellite ground control systems. These efforts enabled NASA to bring back valuable information about our planet, the solar system, and the universe.

Later in his career, Habib developed technologies that made possible an unprecedented space communications system consisting of as many as 10 active satellites that make up the Tracking and Data Relay Satellite System. The system allows astronauts and spacecraft to communicate with Earth. The network currently brings 28 terabytes of data to Earth every day from more than 40 NASA missions, allowing the U.S. to lead the world in scientific discovery.

"Through your efforts," wrote NASA officials in a letter congratulating Habib, "the 'dream of yesterday' has become 'the reality of tomorrow.'" Personable and passionate about space communications, Habib eagerly communicates his passion to others. Anyone who sits down with him at a café should be prepared for a physics lesson. Minutes after beginning a conversation, Habib is likely to get busy using napkins and the backs of menus to demonstrate how satellites communicate with one another and with Earth. He can readily describe the Doppler effect on space communications while providing a quick background on the satellite communications system he helped design. He might even surprise the restaurant's server with a brief explanation of his back-of-napkin renderings.

Habib is happy to talk telemetry with alumni who are interested in his work and in past, present, and future communications technologies. He can be reached at ehabibee@msn.com.

Graduate Student Leaves Distinguished Record

Courtesy photo

Jude Anike

In April, graduate student Jude C. Anike successfully defended his Ph.D. dissertation on the piezoresistive response of carbon nanotube (CNT) fibers toward their development into sensors for structural health monitoring, as well as other energy and medicine applications.

Anike has published more than 15 papers, including two book chapters as first author, and has presented his research at the technical conferences of the American Society for Composites (ASC), the Materials Research Society, and the TechConnect World Conference on Innovation and Nano & Emerging Technologies. He has received several awards, including the doctoral scholarship from ASC; the TechConnect student leader recognition; the National Institute of Standards and Technology (NIST) Accolade award; and the Joseph Corasaniti Endowed Scholarship and New Millennium Research Assistantship at Catholic University. He also was recognized for his expert review of manuscripts by international journals such as Carbon and Composites Part A.

Previously, Anike earned a Master of Science degree in Materials Science and Engineering at Catholic University and a bachelor's degree in physics from the Federal University of Technology in Nigeria. While studying at Catholic University, he had an opportunity to work at NIST, where he acquired CNT fiber images from electron microscopes.

As a student and scholar, Anike was a superb role model. He studied hundreds of journal papers, dedicating long hours to run experiments in the lab and — more important — to observe and think about the results before unveiling new phenomena in the response of CNT fibers.

Anike recently moved with his young family to Arizona, after accepting a position as a senior process engineer with Intel.

//OUR STUDENTS

From left, Suker Li, Olivia Sposato, Mary-Kate Bull, John Difrisco, Matt Brady, John Judge

Senior Design Day Celebrates 10 Years

The 10th anniversary of Senior Design Day was observed in May. For a decade, students, faculty, and friends have gathered on the day before final exams begin in the spring to celebrate the accomplishments of graduating seniors in their yearlong capstone design projects.

This year, the large number of seniors required the expansion to three concurrent sessions, as 2 teams from every department presented their work to fellow students, faculty, staff, and visitors who evaluated the designs. A morning of oral presentations was followed by lunch and a poster session, where students displayed their results and in many cases provided demonstrations.

Votes from visiting judges were used to determine a winning team from each department. From among nine biomedical engineering groups, the judges selected "A Nanoparticle Based Method for Detecting Cancer Biomarkers," from team members Marisa Coene, Kebebe Olenja, and Abdullah Alalyani, who were advised by Christopher Raub. The winning civil engineering project was "Dulles International Metro Station and Monorail Loop" by Matthew Holtschneider, Christopher Martin, John O'Donnell, Brendan Schiaffo, and James Walsh, advised by Bismark Agbelie. In the Electrical Engineering and Computer Science department, the winning project was "Virtual Target for Marksmanship Training" with team members Christine Tomasic, Steven Dvornicky, and Phineas Reichert, advised by George Nehmetallah and Nader Namazi. The winning mechanical engineering project was "Low-Speed Subsonic Wind Tunnel" by Matt Brady, Mary-Kate Bull, Jack Difrisco, Suker Li, and Olivia Sposato, advised by Nellore Venkataraman and Diego Turo.

Many thanks to the nearly 30 faculty members and others who mentored students throughout the year, and congratulations to the class of 2018 on their outstanding design projects!

Constructing the University's Future

STUDENT'S INTERNSHIP IS A WAY OF GIVING BACK

Sometimes engineering can take a student far afield to locations in other states or even abroad. And sometimes, as junior Bryan Minarczyk knows, it can allow you to see your own university in a new way.

For much of the last year, Minarczyk, a civil engineering major, has been an intern for Whiting-Turner, the construction company working on an ambitious, multimillion-dollar renovation project located right here on Catholic University's campus. The project is, of course, the renovation of 100-year-old Maloney Hall, the new home of the University's Busch School of Business.

As an intern on the project since last August, Minarczyk has enjoyed what most students and alumni could only dream of: a front-row seat for a new chapter of University history.

"It's really interesting, and as a student, it's great to see the University improving," Minarczyk said. "I'm also a finance minor, so I might even have class in this building at some point."

Working at a construction project is nothing new for Minarczyk, who first served as an intern for Whiting-Turner during the summer after his freshman year. That summer, he worked on a project in Loudoun County, Va., and learned much about quality-control testing, safety walks, and what it's like to work with project superintendents.

"I was on my feet all day for eight hours," he said. "Now, I work on the project side of things, which is a little bit more of the business-administrative side. I work a bit more closely with the project owners here at Catholic, the architects, and the engineers to actually get the work done."

During his sophomore year, Minarczyk worked at the Maloney Hall site between classes about three days a week. This past summer, he continued full-time. He appreciates the opportunity to test his engineering training while still in school. Sometimes, he brings classroom learning to the field; other times, classes reinforce knowledge he already gained at the construction site.

"In some regards, you can immediately put into practice what you learn in the classroom," he said. "I took a surveying class and I had never surveyed a thing in my life. But then I was asked to do some surveying at my internship and I was confident that I knew how to do it."

In the future, Minarczyk hopes to find an internship allowing him to work on the design aspect of construction. After graduation, he wants to work for a company like Whiting-Turner, where numerous Catholic University alumni are already employed.

In the meantime, Minarczyk said he is proud to have a role in a project that will serve his University for years to come.

"People talk about giving back to the school, and it's pretty remarkable to say that something I am working on will be here forever," Minarczyk said. "I think this building is going to have a huge impact on the business school and the University as a whole."

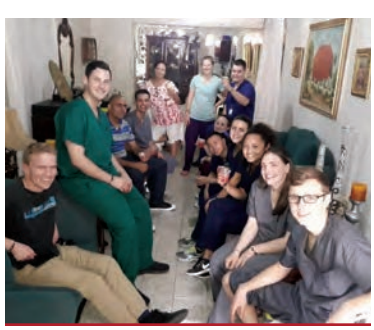
Students Host ASCE Conference

Every spring, Catholic University students compete in the American Society of Civil Engineering (ASCE) Virginias Student Conference. The event includes the concrete canoe and steel bridge competitions, interdisciplinary games, and a formal awards banquet. This year, Catholic University had the honor to host the conference in Washington, D.C., with over 300 students from 14 universities attending. The primary student organizers, MaryKate Selgrath (president of the University's ASCE student chapter), Elizabeth Cossel (conference chair), and Bryan Minarczyk (vice president), raised $60,000 to host the events. Organizing the ASCE conference taught students the importance of teamwork, communication, budgeting, and project management. Additionally, Catholic University's Steel Bridge Team (led by Christopher Martin and Brendan Schiaffo) won first place for stiffness, first place for display, and third place overall.

Courtesy photo

Emergency Care Required

STUDENTS REPAIR HOSPITAL EQUIPMENT IN THE DOMINICAN REPUBLIC



Photos courtesy of Sadie Sabina.

As medical equipment becomes more complex (and often more expensive), providing state-of-the-art medical care in developing countries poses greater challenges.

"A global outlook reveals a pressing need for reliable hospital equipment that lasts longer, breaks down less often, and is easier to maintain and repair," said Christopher Raub, assistant professor of biomedical engineering. "Students and professionals should be aware of this duality to propose better solutions."

According to the website of Engineering World Health (EWH), a non-profit devoted to improving healthcare in the developing world, a startlingly high percentage of critical medical equipment in developing countries — 40% — needs repairs or should be replaced. Too few skilled technicians are available to install, fix, maintain, and calibrate such equipment.

Through a joint program of EWH, the University of Portland, and The Catholic University of America, third-year biomedical engineering student Sadie Sabina recently spent three weeks fixing broken equipment for hospitals in the Dominican Republic. The students salvaged usable parts from broken instruments and repaired everything from photo-therapy lights to nebulizers.

"I worked on a lot of nebulizers," Sabina said. "Doctors would often bring them to us to fix as quickly as possible so that they could be put back into circulation. It was stressed that our fixes didn't need to be permanent; they just needed to happen as quickly as possible."

Sabina was assigned to work with a group of students at El Hospital Infantil Regional Universitario Arturo Grullón, the largest children's hospital in the region. Mothers from Haiti often brought their children there for basic care.

"We were brought to a warehouse on our first day that was filled with broken and unusable equipment," Sabina said. "One of the most shocking things to me was a large CT [computed tomography, used in producing X-ray images of the body] machine that had been dropped off in the warehouse somehow, but the hospital has no way of moving it, fixing it, or removing it from the warehouse."

In addition to their technical work, the students interacted with members of the community through homestays. Students were provided with a crash course in the Spanish language, an interpreter, and a supervisor at the hospital to oversee their repair and salvage work.

"My homestay host, Altagracia, was incredibly kind and welcoming," Sabina said. "She also knew everyone in the neighborhood. She loved to have our entire program group over at her small house and made sure everyone had a good time."

By the end of their stay, the students repaired nearly 80 pieces of medical equipment at two hospitals in Santiago, the second-largest city in the Dominican Republic.

"It was an incredible experience and I wish I could have stayed longer," Sabina said. "I know that I will be going back."

"The students were fabulous people: mature, calm, hardworking, good-natured, skillful," according to Leslie Calman, president of EWH, reflecting on the program at its conclusion. "Really, we couldn't ask for better."

Courtesy photos

Trip to Bolivia Complements Grand Challenges Scholars Program

This past summer, students from Catholic University's School of Engineering joined a mission trip to Bolivia. Led by a staff member from Franciscan Missionary Service in partnership with the Carmen Pampa campus of the Catholic University of Bolivia, the trip gave students an opportunity to lend local Bolivians a hand with community work.

"Our group assisted with tasks such as gardening, pig pen maintenance, and coffee plantation," said Saba Owens (see p.29), a senior biomedical engineering major.

Apart from such physical labor, the students were able to sit in on classes at the Catholic University of Bolivia.

"I attended a course focused on education and disability services," Owens said. "I learned much about Bolivian policies on disability issues, but I was also given the time to present my junior design project to the students. My project focused on wheelchair-bound patient accessibility, which related very well with the course subject matter."

Overall, the trip provided students with an excellent opportunity to consider the different ways in which various challenges are faced in other societies. For example, agronomy students in Bolivia have developed their own methods of crop cultivation by recycling plastic bottles for irrigation purposes.

The mission trip complemented the goals of the Grand Challenges Scholars Program (GCSP) of the National Academy of Engineering. Owens is among the first Catholic University engineering students to participate in the GCSP, which prepares students to work on solving some of the biggest problems facing humanity in the 21st century.

The program is built around five core competencies: entrepreneurship, social consciousness, multidisciplinary cooperation, multicultural understanding, and a research or design project addressing a Grand Challenge theme. The experience Owens had in Bolivia will contribute to his being recognized as one of Catholic University's first Grand Challenge Scholars when he graduates in May 2019.

National Capital Chapter of the Construction Management Association of America (CMAA) Scholarship Winners

Courtesy photos

Jasmine Ohi

Senior, Department of Civil and Environmental Engineering
$1,200 scholarship

Olivia Janney

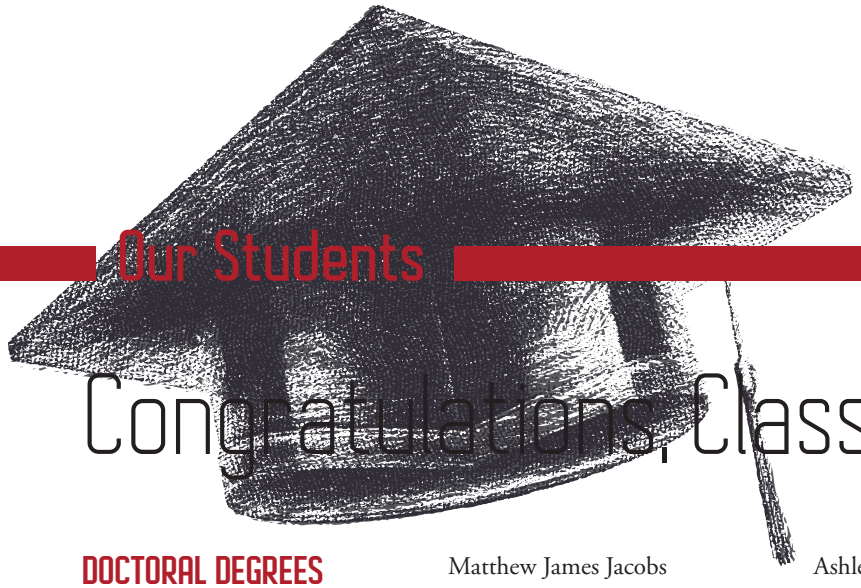
Senior, Department of Civil and Environmental Engineering
$750 scholarship

Willem Brocal

Senior, Department of Civil and Environmental Engineering
$750 scholarship

Mary Valerie Angela Garcia

Senior, Department of Civil and Environmental Engineering
$750 scholarship



Congratulations, Class of 2018!

DOCTORAL DEGREES

Fadi Al-Ayed
Dissertation: *Real-time Adaptive Intrusion Detection to Secure File Transfer Sessions*

Jamal Alikhani
Dissertation: *Uncertainty Analysis and Multi-objective Control Design of Methanol-feed Nitrification-Denitrification Process in the Municipal Wastewater Treatment Plant*

Abdullah Saad M. Alshahrani
Dissertation: *Hybrid PSO Genetic Algorithm Optimization for the Enhancement of WSN's Lifetime*

Awatef Mohammed Alshehri
Dissertation: *Magnetically Actuated Tissue Constructs for Cancer Cell Mechanobiology*

Jude Chinonso Anike
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A Scholarship Encourages Big Plans

She may be on the small side – her height is 5 feet exactly – but Vené Richardson-Powell thinks big. The first-year biomedical engineering student is brimming over with plans, goals, hopes, and dreams.

"I used to want to be a paleontologist," she says, "then I wanted to be an astronaut. I've been all over the place, but everything that I've ever wanted to be has dealt with science."

When Richardson-Powell was 8 years old, her paternal grandparents suffered from serious illnesses. Ever since, she has set her sights on helping people with comparable health problems.

"Watching them go through the things they were going through," she says, "I decided to become the first doctor in my family. I want to get my Ph.D. and be an engineer, so I can either make medicines or study cell tissue growth and development."

At first, the lifelong resident of Silver Spring, Md., resigned herself to being a commuter student, due to constraints on the family budget. When she learned that she had been awarded an Edward M. Nagel Scholarship, her plans changed.

"I had just come home from a workout," she remembers, "and I was really tired and disappointed because that same week, my mom said, 'You have to commute.' And then I got a call saying that I got a scholarship!"

If only a small portion of her plans come to fruition, Richardson-Powell will achieve much. Apart from soaking up knowledge in classes, Richardson-Powell hopes to play on the University's field hockey team. She also plans to join the Spanish club and to join an art club, if her schedule permits. In addition, she will be reopening the campus chapter of the National Society of Black Engineers (NSBE).

"I've contacted the regional NSBE director for this area," she says. "I want to help other people get a foot in the door. It's better to have more heads than one, in science especially."

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