

A MAKERSPACE
IN ACTION

Q&A WITH
UNIVERSITY PRESIDENT

SPRINGWEAR FOR
STROKE VICTIMS

CATHOLIC UNIVERSITY | Engineer

Fall 2023



Two Endowed Chairs

*The School of Engineering
welcomes first endowed
chairs, thanks to a
\$10.5 million gift.*

Jeffrey Herrmann *and* Santiago Solares

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Dean's Welcome



What a year it's been for the School of Engineering! As you'll read in this issue, we're celebrating the largest gift ever to the school, a \$10.5 million pledge by an anonymous benefactor to endow two faculty positions.

This remarkable generosity has allowed us to hire two outstanding faculty members who have already established strong reputations at larger, research-intensive universities, but who are drawn to Catholic University's unique mission. They'll immediately increase our research profile and teaching capacity in two key areas, autonomous systems and nanotechnology, and join us alongside other new faculty who strengthen our expertise in neuroscience and network security.

Our growing faculty and staff supports a growing student body. University President Peter K. Kilpatrick's focus on growth has seen results already: In the School of Engineering we have a 12%

increase in the number of first-year students over last fall and well over twice as many new graduate students enrolling this semester! The University as a whole is growing well, too, with STEM disciplines like engineering and computer science being key drivers of that growth. You can learn more about President Kilpatrick's career as an engineering professor and academic leader, and his vision for Catholic University, in my conversation with him on Page 16.

While we're investing in enrollment growth and strengthening our research impact, we're also listening closely to industry to make sure our graduates will be well-prepared for the workforce. We've engaged with companies to sponsor our student design projects and faculty research, expanded educational programs tailored to local industry partners, and are designing new professional graduate programs to meet market demand. Our alumni are well-placed in a variety of key infrastructure and technology sectors, and provide great inspiration, mentorship, and connections for our students.

We've also expanded our outreach to the next generation. In February we hosted the Greater Washington, D.C., Junior Science and Humanities Symposium, bringing over 50 talented high school students who heard from distinguished speakers and presented their own research. This summer we offered two distinct summer camps: More than 50 students participated in our Engineering New Frontiers and Computational Biosciences programs. And this year we'll be running after-school programs for local high schoolers in our new makerspace. A team of our undergraduate students will guide these hopefully future engineers through projects designed to get them excited about studying STEM disciplines.

Whether you're a graduate of Catholic University who hasn't been back in a while, or a possible future graduate looking to see what we have to offer, we'd love to see you on campus to show you the exciting things going on!

A handwritten signature in black ink that reads "John A. Judge". The signature is fluid and cursive, with a long horizontal stroke at the end.

John Judge
Dean, School of Engineering

//CONTENTS



Two Endowed Chairs



Endless Possibilities with Pangborn's Makerspace



Q&A with University President
Peter K. Kilpatrick



SpringWEAR Brings Hope to
Stroke Victims with Hand Impairments

02//School News

20//Eye on Faculty

22//Alumni

26//Our Students

30//Class of 2023

33//Scholarship
Spotlight

//SCHOOL NEWS

A Look at the Award-winning Senior Design Projects

Seniors pursuing undergraduate degrees in the School of Engineering are required to complete yearlong design projects covering subjects in computer science and mechanical, electrical, biomedical, environmental, and civil engineering.

Twenty-five separate groups began designing, assembling, and testing their prototypes during the fall 2022 semester and in the spring, completed the designs and presented their discoveries at Senior Design Day, held on May 1.

Awards for Best Overall Project and Best Presentation went to biomedical engineering majors Troy Young, B.B.E. 2023, Massimo Tschantret, B.B.E. 2023, Jacob Tribull, B.B.E. 2023, and Ameer Antar, B.B.E. 2023, who designed “A Breakaway Device for a Transfemoral Osseointegrated Prosthetic System.”

The group’s design was for a device that attaches above the artificial knee of a prosthetic leg to preserve the implant bone fixation of transfemoral amputee patients. The reusable device breaks away in response to excessive torsional, compression, traction, and bending loads so patients may return to intense athletic activities with reduced risk of implant failure.

The group developed different models with varied spring strengths to accommodate the uniquely different injuries and safety requirements of each patient.

Three groups received Best Poster awards, including four civil and environmental engineering and architecture double majors who teamed up with the Architect of the Capitol to redesign an underused parking lot, Lot 7, near the Rayburn House Office Building.

“We chose this project because it was a perfect blend of expressive design, and also engineering design solutions,” said Victoria Roscoe, B.S.Arch./B.C.E. 2023.

Other group members were Vincente Johnson, B.S.Arch./B.C.E. 2023, Connor Quinn, B.S.Arch./B.C.E. 2023, and Samantha Scian, B.S.Arch./B.C.E. 2023.

A significant part of the redesign was about storm water management, so the project includes rain gardens and bioswales to alleviate flooding



Engineering students Abdulaziz Altamimi, Gino Martinelli, Ian Clarke, and Bridget Atkinson, left to right, work on their Senior Design Projects.

and water flow issues on the site. The design also includes walking paths intended to have educational signs to inform visitors about the site’s sustainability and maintenance features.

“The reason that our poster was successful was because of our background with architecture,” Roscoe said. “We understood that we need to translate these engineering solutions into something that the general public would also easily be able to understand.”

While perhaps not feasible to implement at this time, Roscoe said the design is meant to inspire the Capitol architects with future projects.

Biomedical engineering majors Elizabeth Staten, B.B.E. 2023, Heather Berberich, B.B.E. 2023, Aubree Narus, B.B.E. 2023, and Chelsea Loh, B.B.E. 2023, received a Best Poster award for their design of a photo biofabrication bioprinter. The device aims to make photo biofabrication cost effective, accurate, flexible in design, and more scalable to enable bioprinting of implantable tissue constructs for tissue reconstruction.

The device uses a 440 nanometer blue light laser to photocrosslink ruthenium sodium persulphate gelatin gels with a programmable XY plotter, 3D printed laser housing, and adjustable legs to vary the height.

Photocrosslinking, which is absorption of light by prepolymer molecules to induce a photo-chemical reaction, leads to the formation of covalent bonds. The photo biofabrication bioprinter can print a snake pattern onto the gels with patterns of cultured cells on photocrosslinked areas.

A Best Poster award also was given to mechanical engineering majors Ian McCaw, B.M.E. 2023, and Molly Glynn, B.M.E. 2023, for their design on posturography for children who use wheelchairs. The device, which is a mat that can be placed under the patient’s hips, has four

“We chose this project because it was a perfect blend of expressive design, and also engineering design solutions.”



Vincente Johnson, Connor Quinn, Victoria Roscoe, and Samantha Scian, left to right, present their redesign of an underused parking lot near the Rayburn House Office Building at Senior Design Day May 1.

sensors set up in a Wheatstone bridge electrical circuit to compile data.

The prototype gives real-time feedback to the user who can then adjust posture to improve mobility and coordination. The device is meant to provide affordable, innovative, and effective treatments for people with cerebral palsy and other mobility-impairing conditions.

Electrical engineering majors Arthur Coy, B.E.E. 2023, and Thomas Nargi, B.E.E. 2023, received an honorable mention for their multipurpose low-cost spectrometer design, a tool that measures how intensely specific wavelengths reflect compared to others.

The design was built with 3D printing and approximately 580 lines of coding that had to be tested and built upon, making up about 60-70% of the project.

The two electrical engineering majors chose the spectrometer project because of its value in testing samples non-destructively. To measure the light wavelengths of an object, the spectrometer only requires the reflection of light from the object's surface.

This device could be applied to matching paint colors or shades of makeup, taking it beyond simple eye-matching inaccuracies. Coy hopes that next year's class of senior engineering students will continue to develop the project.

“It was a good practice in understanding the design process,” Coy said. “This is the first time we've had a full year to work on just a single project. The most valuable thing I took away from it was that the process takes time, and that you have to be careful; there's so much testing that's involved. That experience will help me in the future in understanding that the time it takes to make something is usually longer than you expect.” — C.E.

Research Day 2023 Award Winners from the School of Engineering



BEST UNDERGRADUATE POSTER PRESENTATION

Shoe Sensor Monitoring Diabetic Neuropathy,
by Noah Miller, Biomedical Engineering

Adviser: Nathan Neckel

BEST GRADUATE POSTER PRESENTATION

A Smarter Parking System Mobile Application,
by Mina Grace Larraquel, Computer Science

Adviser: Matthew Jacobs

FINALIST, UNDERGRADUATE ORAL PRESENTATION

Latching Mechanism for Golf Adaptive Device,
by Madison Hughes, Biomedical Engineering
Collaborators: Elizabeth Caufield, Ryan Walczak

Adviser: Gregory Behrmann

BEST PH.D. ORAL PRESENTATION

*HandMATE: Hand Movement
Assisting Therapy Exoskeleton,*
by Matteo Pergami-Peries,
Biomedical Engineering

Adviser: Peter Lum



FINALIST, FACULTY AND PH.D. STUDENTS ORAL PRESENTATION

*Develop High-Capacity FeF3 Thin Film Conversion
Cathode for Next-Generation Li-ion Batteries,*
by Binh Hoang, Mechanical Engineering

Adviser: Chuan-Fu Lin

Graduate Student's Eyes Opened During Award-winning Parkinson's Project



Gerson Escobar, M.S. 2023

When Gerson Escobar, M.S. 2023, thought of potential ideas for participating in University Research Day, he had several favorites.

“I wanted to work on a weather regression model, loan regression model, global food regression model, etc.,” the master’s student in data analytics confided. “But I never had a concrete plan set in place.”

That changed following conversations with his adviser, Professor Lin-Ching Chang, director of the data analytics program, that led him to pursue a classification project.

It proved to be a good decision, as Escobar won the Best Master’s Oral Presentation award in the April 18 campus-wide event for “Parkinson’s Disease Detection Using Traditional Machine Learning Algorithms and Voice Signals.” It was a remarkable result, as Escobar had never heard of the disease before speaking with Chang.

A project of the Parkinson’s Foundation found that 1.2 million people in the U.S. will live with the disease by 2030. The National Institutes of Health states that Parkinson’s disease is the second-most common neurodegenerative disease in the U.S. after Alzheimer’s disease. People with Parkinson’s may experience tremors, slowing of movement, limb stiffness, and balance problems.

“I did extensive research and understood the seriousness and impact of neurodegenerative diseases,” Escobar said. “It shaped the project’s focus to be less about completing a model and more about telling a story through my project. I wanted to demonstrate how the models work, where the research originates, and how we can continue to improve them for Parkinson’s disease (PD) patients.”

The project became more than an academic pursuit for Escobar, who became increasingly aware of the toll Parkinson’s disease takes on lives across the country.

“During my research, I learned the severity of PD and how many people currently live with PD,” he said, “and how the projection of people living with PD will significantly increase in the next few years. . . . I had never heard of PD. The only neurodegenerative disease I heard about was Alzheimer’s. Learning about how practitioners use seismic and traditional tests to detect PD was interesting.”

Chang coordinated weekly progress presentations to assist students while providing feedback. Escobar said the regular check-ins were inspiring and life-changing.

“With the help of the professors and Dr. Chang, I could complete this project or program,” Escobar said. “The assistance and guidance were fantastic, and I’ll forever cherish it.” — M.J.P.



Associate Professor Chris Raub and Clinical Assistant Professor Matthew Jacobs instruct campers in Engineering New Frontiers Summer Institute.



Microscope assembled by summer camp participant.

Glenn W. Bailey Foundation Supports the Engineering New Frontiers Summer Institute

The Engineering New Frontiers Summer Institute received a \$20,000 gift from the Glenn W. Bailey Foundation for support of pre-college programming that encourages exploration of the field of engineering. The funding was applied to the purchase of microscope kits and eyepiece cameras for participants of the Engineering New Frontiers Institute, held July 17-21.

For some of the participants, this was the first time they had access and professional guidance and training on how to operate and use a microscope. Other activities included a coding/cybersecurity bootcamp, computer-aided design and rapid prototyping, laser digital engraving, and an engineering design jam. Participants also had an opportunity for career planning, university application preparation, mock interviews, and entrepreneurship.

Under the supervision of faculty, participants applied the engineering knowledge and principles they learned to create products of their own. This experience was invaluable, not only due to the hands-on experiential learning opportunity, but also because of the exposure to tools commonly used in the industry.

Associate Professor Chris Raub, who led the program, said, “One goal of the institute was to help students understand their options in engineering and prepare for a university engineering degree with knowledge of an end goal in mind. By sending each student home with a microscope, microscope camera, and an entrepreneurship-oriented engineering design textbook, we hope to stimulate self-directed study of the materials on the microscale and encourage students in their enthusiasm for STEM.”

For many of the students, this was the first time they owned this kind of equipment.

The mission of the Glenn W. Bailey Foundation is to support STEM learning initiatives that increase awareness and success in STEM careers in the United States. Formed in 2022, the foundation has a particular focus on providing students and educators with resources and opportunities for STEM-based, hands-on learning that makes a difference for students, regardless of their background. Catholic University’s School of Engineering is grateful to the Glenn W. Bailey Foundation for its generous support, which has made an impact on the institute’s success and participants’ experience.

First Biosciences Camp for High Schoolers Held in July

During a rigorous 10 days in July, nine high school students attended the School of Engineering’s inaugural Computational Biosciences Summer Institute. Taught by Associate Professor and Chair of Biomedical Engineering Chris Raub and Clinical Assistant Professor of Electrical Engineering and Computer Science Matthew Jacobs, the camp was designed for pre-college engineering students and others seeking a comprehensive introduction of fundamental programming concepts. Camp attendees experienced a taste of undergraduate life, staying in the residence halls and taking a university level first-year computer science course with a focus on biomedical applications. Topics included electrocardiogram (ECG) data analysis, Lotka-Volterra system modeling, pandemic infection modeling, medical image analysis, machine learning classification of biometric data, and analysis of wearable biomechanical sensor modeling. The camp is a unique program in that students are able to earn three college credits upon completion. Students also enjoyed use of the Raymond A. DuFour Athletic Center and fields and had the opportunity to attend Mass on campus. Both the Computational Biosciences camp and the Engineering New Frontiers Summer Institute received sponsorship from the National Institute of Building Sciences.



Two Endowed Chairs

Established for the School of Engineering



BY KEVIN RILEY



The first endowed faculty chairs in the engineering school's history have been established with a \$10.5 million gift from an anonymous donor.

University President Peter K. Kilpatrick, a chemical engineer, facilitated the donation, which supports Dean John Judge's goal to attract high caliber and accomplished faculty who are drawn to Catholic University's distinct identity and mission.

"We're absolutely thrilled about this gift and the way it's allowed us to strengthen our faculty," said Dean Judge, "and incredibly grateful to President Kilpatrick and the anonymous donor for supporting the school in this way."

The two new chairs are friends and former colleagues who have reunited at Catholic University.

Jeffrey W. Herrmann, who holds the inaugural St. Abbo of Fleury Endowed Chair in Engineering, and Santiago D. Solares, the first St. Albert the Great Endowed Chair in Engineering, worked together on the faculty of the University of Maryland over a decade ago.

Meeting for breakfast earlier this year, Herrmann told his former colleague that "I've been speaking with the dean at Catholic University's School of Engineering."

"Well that's funny," replied Solares, "because I have too."

The reunited faculty members were drawn to their new positions not only by the reputation and potential offered by Catholic University's School of Engineering, but by the University's mission as a Catholic institution of higher learning. Founded by the U.S. bishops in 1887, the University also is the nation's second oldest research university and is taking steps toward its goal of achieving classification as an R1 research university.

Catholic University Engineer Magazine spoke with each of the new faculty members shortly after their appointments.



Jeffrey Herrmann

St. Abbo of Fleury
Endowed Chair in Engineering

“It’s not just about education, it’s about forming the students, it’s about serving the Church, and making a difference in the world.”

Jeffrey Herrmann:

Driven by Decision Making

A Florida native and Washington Nationals baseball fan, Herrmann said, “The big picture in my research is really in decision making. Over the years that’s been applied in different areas, both human decision making and robot decision making.”

With a bachelor’s degree in applied mathematics from the Georgia Institute of Technology and a doctorate in industrial and systems engineering from the University of Florida, Herrmann headed for a two-year postdoctoral position at the University of Maryland in 1993 and never left. Until coming to Catholic University this summer, he had held joint appointments as a professor in Maryland’s Department of Mechanical Engineering and the Institute for Systems Research. He also was director of graduate programs in reliability engineering.

He has won numerous awards and has authored over 115 journal papers and two textbooks, among other accomplishments.

Herrmann’s research areas include developing novel mathematical models to improve public health preparedness, describing and modeling engineering design decision-making processes, and using risk-based techniques to improve path planning for autonomous systems.

One project, in the early 2000s, involved assisting public health emergency preparedness planners in Montgomery County, Md., with planning medication and vaccine distribution in the event of a bioterrorism attack.

A 2018 sabbatical at Naval Air Station Patuxent River led him into the study of decision making by autonomous systems and metareasoning, a branch of artificial



intelligence that he describes as “reasoning about reasoning.”

Earlier this year, he published the textbook *Metareasoning for Robots: Adapting in Dynamic and Uncertain Environments*.

Decision making, “the essential activity of engineering,” is his favorite subject to teach. He said, “Engineers have to come up with solutions to design problems, and that requires making decisions. ... Most people make decisions in a very ad hoc way, but as engineers, we need to make decisions in a very systematic and rigorous way, so that we’re making the best decisions for our clients or our corporations or whoever.”

He enjoys seeing students master new skills and apply them to achieve their goals, and he recognizes that “an active research program with funding and graduate students” is crucial in the University’s efforts to achieve R1 status. Herrmann hopes to “help the provost and dean recruit faculty ... in whatever way I can.”

He also is looking forward to continuing his research, collaborating with new colleagues at Catholic University and continuing collaborations with colleagues at the University of Maryland and other

Santiago Solares

St. Albert the Great
Endowed Chair in Engineering



organizations, such as the Army Research Lab.

A member of the Society of Catholic Scientists and the Knights of Columbus, Herrmann is at home with Catholic University's mission. "The values and the priorities of the University closely align with my own values and priorities," he said. For Herrmann, it is an opportunity to be part of a community that "has a very good reason for why we do what we do."

"It's not just about education, it's about forming the students, it's about serving the Church, and making a difference in the world," he said.

"We have an important emphasis on preparing students to go out and get jobs. At the same time, we want them to be good engineers. We want them to be integrating their faith and their practice of being an engineer."

Santiago Solares:

Drawn to Nanoscale Mechanics

While he once considered the priesthood, Guatemala-born Santiago Solares found his calling in a different direction, as an engineer whose research has spanned scanning probe microscopies, nanoscale mechanics, multiscale modeling, and viscoelastic materials.

He earned a master's degree in industrial engineering at the University of Miami before moving on to earn both a master's degree and doctoral degree in chemical engineering from the California Institute of Technology.

Solares also spent several years in the corporate world, first at Pepsi-Cola International, where he landed after completing his bachelor's degree in chemical engineering at the Universidad del Valle de Guatemala. He later worked at Mars

Inc., the multinational food and pet services company perhaps best known for its Snickers and M&M's candies.

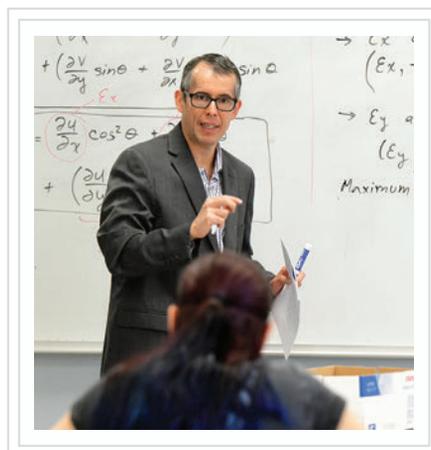
After completing his doctorate, Solares joined the faculty of the University of Maryland in 2006 then moved to the George Washington University in 2014. He has authored or co-authored nearly 70 articles.

He is drawn to nanoscale mechanics, which is the mechanics of very small things.

"These things are very difficult to measure and sometimes their properties are very difficult to define. It's challenging to figure out the right units, and the instrumentation is not always ideal. But we need those measurements in order to build microscale systems," Solares said.

"When you build a bridge, you know the properties of steel and cement, which allow you to design a system that will work safely. My field is understanding how those measurements should be done, what the proper quantities are, and how those systems actually behave."

He is happy to be at Catholic University, having gained experience in industry and secular universities.



"It's extremely important to make that connection between faith and reason. Among other things, it also helps you respect the order found in nature."

“We’re thrilled to have Drs. Herrmann and Solares bringing their decades of teaching experience and cutting-edge research to the school.” –Dean Judge

“I gathered enough experience in industry, in other universities ... such that I could come back and help strengthen Catholic education,” he said. “That is my call now, and that’s why I am here.”

“The deeper you go into things, the more you see God’s hand in it. People say, if you find a watch in the sand, you know there’s a watchmaker. In science, the deeper you go, the more you find and it’s always more and more complex,” he said.

“It’s extremely important to make that connection between faith and reason. Among other things, it also helps you respect the order found in nature,” Solares added.

Encouraging students is important to him. He moved from the corporate world to academia in part because he found engineers often not only had not learned the principles they should have in a university, but had a mindset “that whatever you learned at the university was useless, and then you would go out into the real world and they would teach you everything that really mattered,” Solares said.

From the beginning, he makes sure to tell students not to adopt that mindset. “They really need to learn these things, and it will make their life and everybody’s life a lot easier,” he said.

One of the joys of teaching is “when you see the students that turn around. You have ... students that are very well prepared and self-sufficient; they’ll be fine no matter what. But when you have students who are struggling, but want to do well — they’re trying but it’s just not working out — and one day it just clicks. Sometimes you can even tell the moment when it clicks. And then I hear from these students five to 10 years later, and they say things like, ‘I’m doing this big job and it is going well.’”

Solares is up for the challenge of achieving R1 status: “We can definitely become an R1

university, and the way to do that first of all is doing what we do really, really well.”

He sees this happening through, in part, focusing on students, grant management, and showing results from the grants. He pointed out that Catholic University already has good relationships with companies, and believes with a “focus on the quality of students, we can definitely get research through industrial collaborations, and that of course improves our standing. But I think we need a different strategy from what is traditionally done.”

“I think at the end of the day our reputation is going to depend on what quality of work our people do, and I think we can definitely compete by teaching our students to do really good work,” he said.

What is this engineer’s favorite subject to teach? The answer might be a little surprising: molecular physics.

“When you get down to the atomic level of things, the theories are a little bit different, the mathematics is a little bit different, and the phenomena, so to speak, blow your mind. Molecular systems do things that are unexpected. Matter behaves in ways that we are just not used to seeing because we live in a macroscopic world. Those things attract me ... and I find them challenging.”

Professors Herrmann and Solares are among four new faculty members joining the School of Engineering this fall (see “New Faculty and Staff, Page 20”).

“As enrollment increases, we’re growing the faculty to expand our teaching capacity and increase the impact our research has on the world,” said Dean Judge. “We’re thrilled to have Drs. Herrmann and Solares bringing their decades of teaching experience and cutting-edge research to the school.”

With gratitude to its generous donor, Pangborn Hall welcomes these two esteemed professors who are bound to leave a solid legacy at the School of Engineering. ⚙️





St. Abbo of Fleury

St. Abbo of Fleury was a Benedictine monk born around 945 near Orléans, France. This 10th-century saint was chosen as the namesake of an endowed chair because he was one of the great mathematicians of his day, with well-known works on calculus and the metaphysics of numbers. He is also known for his writings and study of philosophy, canon law, and astronomy that contributed to scholasticism and an understanding of his era. Abbo died in 1004 from a wound received while trying to resolve a dispute as part of his monastic reform in France. The miracles that occurred at his tomb led to his canonization. His feast day is Nov. 13.



St. Albert the Great

St. Albert the Great was a 13th-century German Dominican friar, philosopher, scientist, and bishop. Albert greatly influenced the Church's stance toward Aristotelian philosophy, and was a teacher and mentor of St. Thomas Aquinas. He served as an educator at Paris and Cologne, as Dominican provincial, and as bishop of Regensburg. Albert wrote volumes on a number of topics including natural science, mathematics, and astronomy. He was canonized and recognized as a Doctor of the Church by Pope Pius XI in 1931. He is the patron saint of educators, scientists and philosophers. His feast day is Nov. 15.



Endless Possibilities with **Pangborn's Makerspace**

By Jason Davison

Welcome to the first makerspace at Catholic University!

The workshop is housed on the first floor of Pangborn Hall and serves as a rapid design center for engineering prototypes. The makerspace is funded by a \$750,000 grant from the Office of Naval Research called RAISE (Research and Innovative STEM Education). Last year, we purchased 11 3D printers, a laser cutter, bandsaw, drill press, and assorted hand tools. On top of that, materials and supplies are freely available to all of our students.

The space is run by engineering students who supervise and train visitors entering the space. Students can come to the workshop each day from 3–8 p.m. and build projects ranging from toy models to completing senior-level design projects, working with a broad range of materials including wood, plastics, electronics, and fabrics. The makerspace is a radical change in Catholic University's making culture because it enables students to be in charge of a workshop and dictate the purpose of the space.



Research in the Makerspace

The makerspace is also being used as a research tool for students in the mechanical engineering and electrical engineering programs. Sergio Picozzi and George Nehmetallah, members of the electrical engineering and computer science faculty, are working together to develop wireless power transmission that works underwater. The idea behind it is to power submersible robots with greater efficiency for naval applications. The professors worked with a senior design team and hired three research interns. So far, they have designed antennas with finite element software, built the prototype devices using the 3D printers, and tested them with a vector analyzer, all funded by the RAISE grant.

The mechanical engineering research project is led by Associate Professors Diego Turo and Joseph Vignola focusing on acoustical and vibrational applications. The group is analyzing the properties of additive manufactured parts by testing their integrity under vibrational loads and is currently working with plastic printed parts made in the makerspace to test their methodology and will later conduct similar tests with metal printed parts. The purpose of this work is to create alternative and lower-cost methods for material evaluation when compared to traditional metal analysis.



Building Models

During the spring 2022 semester, the makerspace filled up late at night with dual-degree students in architecture and engineering all working on their individual projects. The students had been tasked to design a building using wood and display their models to the class. Our engineering students were able to jump into the makerspace and use the bandsaw to cut out their designs. Later, the students grabbed sandpaper to finish off their handiwork. The makerspace simplified the process for students and the staff ensured that they did it safely.

The space is a one-stop shop with nearly all of the materials needed to build and finish a class project for the next day. Students can make sure to complete their assigned tasks and not worry about the complications of finding a workspace with the right parts and tools.



Senior Design

The School of Engineering runs its two-semester capstone course for all senior engineering and computer science students each year. The seniors start their designs in the fall semester with calculations, CAD drawings, and numerical models. In the spring, students build and test their engineering designs in the school's labs. This year was the first time that students had open access to a makerspace with rapid manufacturing capabilities.

One group used the 3D printers to develop synthetic leaves for acoustical testing and characterization. Another, working on a steel-bridge project, created a wooden jig with the laser cutter that increased the accuracy of their final construction. A third team created a custom antenna geometry using the 3D printers to precisely lay copper wire.

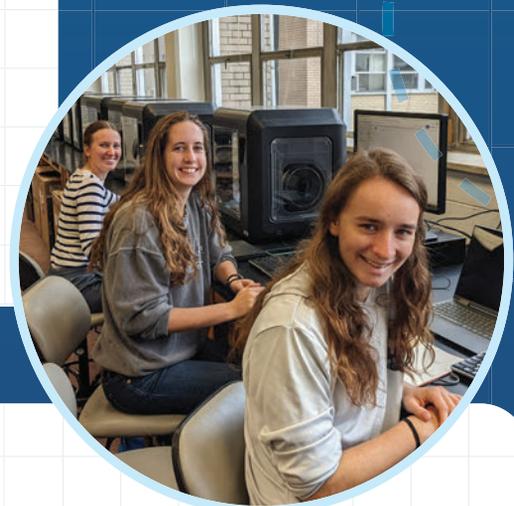
The new capabilities of the makerspace are expanding the output of the students, and allowing them to build their dreams.



First-Year Making

The first-year Introduction to Engineering class was one of the first groups to use the makerspace in the fall 2022 term. Students first learned about the deformation of I-beams in their lecture class and were taught to use a CAD package called OnShape to design a unique miniature beam. They then printed their designs using the makerspace's 3D printers.

Finally, the completed beams were tested in a universal testing machine to find their maximum load capacity. This new course module provides first-year students with a practical opportunity to experience junior- and senior-level tools, while also integrating multiple disciplines (e.g. civil, mechanical, and material science).



Makerspace Staff

The RAISE research grant has a primary objective to increase the diversity, equity, and inclusion in engineering. As part of that goal, the research team used an extremely inclusive hiring practice that focused on students who wanted to contribute to the project. Twenty students were hired as teaching and research assistants, and we are proud to have a diverse cohort. In the first year, the team hired 20 students, including 15 women and eight underrepresented minority students.

This initial group of exceptional teaching-assistant leaders played a crucial role in guiding and inspiring their peers. They were the pioneers in the space and taught students how to use the tools and machinery. Not only did they share their knowledge, but they also created a vibrant and inclusive culture within the room, encouraging creativity and collaboration among all participants. It was evident that they enjoyed their work, constructing their own devices and serving as mentors. The student staff supported over 150 visitors to the makerspace in its first semester of operation! ⚙️



with

University President Peter K. Kilpatrick

from ONE ENGINEER TO ANOTHER



Q DEAN JUDGE: How did your own fascination with engineering begin?

PRESIDENT KILPATRICK: I started my science and engineering career wanting to be a chemist, and I majored in chemistry as an undergraduate. I did this because I really enjoyed working in the chemistry lab, asking scientific questions, and I did a lot of that in high school and in my first few years in college. What I ultimately discovered was that I really enjoyed working with my hands, learning new things, and having some kind of positive impact on society by doing something practical. This eventually led me to move from chemistry to chemical engineering, which I did my senior year in college and then in graduate school.

Q How did your family support that journey?

My mom and dad (and my siblings) always supported me in school and enjoyed celebrating my successes in school. My wife Nancy, who is also a chemist, supported me in every conceivable way. She worked as an organic chemistry teacher while I was in graduate school so we could afford for me to complete my Ph.D.

Q You hold or share 12 patents in chemical engineering. Can you tell us about that work and how it helped define your career?

Engineering is both the art and the science of applied, quantitative problem solving for societal benefit. I love the quote by Theodore von Kármán, the famous engineer, that “scientists study the world as it is, engineers create the world that never has been.”

What this means to me is that engineers work to solve important societal problems, such as creating clean energy for the world, by inventing new methods and devices. I have had the joy and privilege of doing both scientific research (chemistry mostly) and engineering research during my career. The 12 patents have almost all emerged from understanding an important societal problem (such as making an immunoassay more sensitive or creating a food disinfectant), applying the scientific method to a testable hypothesis, and creatively inventing a solution that never existed before. This is all very exciting and rewarding.

Q You’ve also been involved in two startups – what is invigorating about working in entrepreneurship as well?

Startups, particularly successful ones, have an enormously positive impact on our society and help create the prosperity we enjoy in our country in so many ways. Entrepreneurs are like the engineers of the economy. They create businesses and jobs that were not there before. Startups and entrepreneurship are the keys to stimulating and continuing to grow our economy.

We are very blessed to have a very strong entrepreneurship program here at The Catholic University of America in our Busch School of Business called the Center for Principled Entrepreneurship. It would be good for our School of Engineering and our other schools to integrate their creative, entrepreneurial work with the work of the Center for Principled Entrepreneurship.

Q What do you believe is a hallmark of a top engineering program and how is Catholic University delivering on that?

The conventional wisdom is that top engineering programs are those that are research-intensive and generate the products of research, including publications, inventions, startups, and the like. I have become convinced, after 40 years in higher education, that the very best engineering programs are those that are having a very positive impact on society.

When we think about our society, the most important element is of course the flourishing of the human person. So I think we should think about how well our students are flourishing as persons. Are they happy and fulfilled in their work and in their lives? Are they serving our society, including the weakest and most vulnerable in our society?

Of course, to actually have an impact on society as an engineer, you need to be excellent in what you do. We must educate our future engineers with outstanding academic programs delivered by engineering professors who are experts in their field. Our commencement speaker last May was Arthur Brooks. He told the graduates, “To love others through your work means bringing your very best effort every single day. It

Dean John Judge first met President Peter Kilpatrick years ago,

when Dr. Kilpatrick was the McCloskey Dean of the College of Engineering at the University of Notre Dame. As President Kilpatrick completed his first year as Catholic University's 16th president, Dean Judge asked him to share reflections on his own engineering journey and his enthusiasm for the future of Catholic University's School of Engineering.



means being completely, uncompromisingly dedicated to excellence in everything you do.”

Answering yes to these questions and then having the metrics to back all that up are, I believe, some of the hallmarks of a top engineering program. My hope for our School of Engineering is that we can answer “yes” to these questions for all of our students, undergraduate and graduate.

You've talked about stressing innovation at Catholic University. What does that look like for the School of Engineering?

Certainly, innovating in our research to generate inventions and startups, as we discussed earlier, is part of the answer. But we can also innovate in terms of our education, and many great universities are doing this. One distinctive hallmark of a Catholic university is that it seeks to integrate the disciplines, so integrating our engineering disciplines, our business school, our science departments, and our philosophy and theology, and other humanities programs, to create new synergistic programs of study and research is an important way to innovate. It is also the case that the most innovative academic programs are the easiest to recruit great students to, which is a major goal for our University.



What are your own hopes for Catholic University's engineering and computer science programs?

I would like to see our engineering and computer science programs more closely integrated with our other disciplines to create unique, innovative, academic programs. I would also like to see us better integrate our great Catholic intellectual tradition more closely with our programs of study in engineering and computer science. For example, the entire field of artificial intelligence, as well as other important applications of computing, are in great need of great moral and theological thinking to ensure that these rapidly changing technological fields are developed with the benefits of all members of our society in mind, particularly the poorest and most vulnerable.

How can alumni and supporters help shape the future of the school?

We need the engagement of our alumni and our supporters in many ways. Firstly, our alumni and supporters who run technology-based companies or who have roles in major technological companies can help us ensure both our education and our research are up-to-date, innovative, and of the greatest benefit to society. Secondly, our alumni and supporters can serve as mentors and advisers to our students and faculty on a variety of issues. We also benefit greatly from those alumni and donors who are able to help us fund capital and programmatic improvements to our engineering and computer science programs.

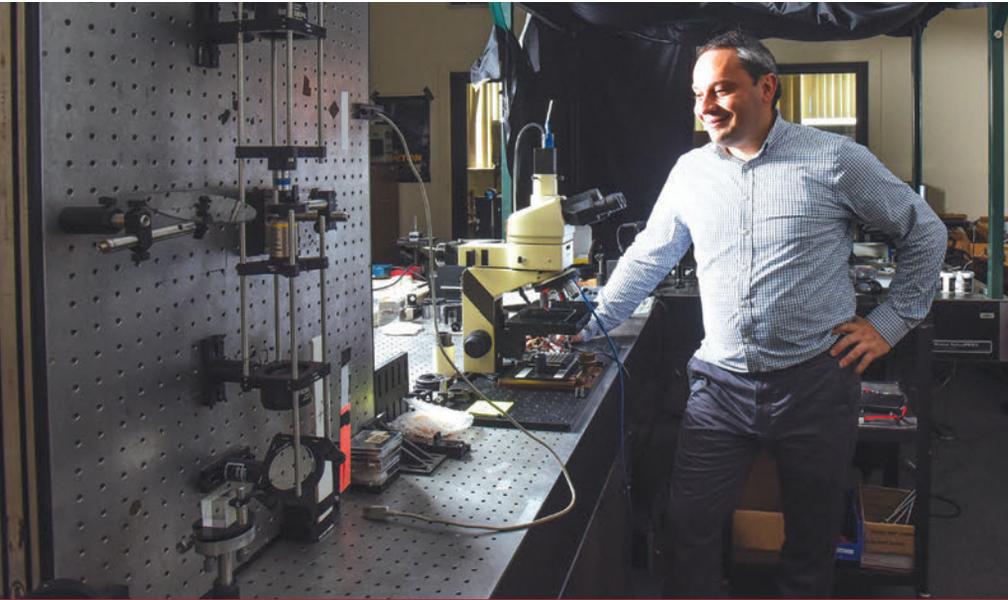
President Kilpatrick with Hanh Hoang, B.B.E. 2023, a current master's student in biomedical engineering.



After transitioning into higher-level administrative roles, how do you remain connected to engineering? Do you still get the itch to teach and conduct research?

I strive to remain connected to engineering and technology by reading what I can about the role of engineering and computer science in higher education, an important issue for comprehensive universities. I also enjoy, when I can, learning new topics in technology by attending lectures. And, yes, I still get the itch to teach and conduct research. My last few journal articles appeared in print just a few years ago, and I am keenly interested in teaching a seminar course in technology and ethics, or something closely related to engineering and society. 

//EYE ON FACULTY



Associate Professor George Nehmetallah

Nehmetallah Presented NASA's Group Achievement Award

The work of George Nehmetallah, associate professor, and the Electrical Engineering and Computer Science Department (EECS) is soaring to new heights.

In March, Nehmetallah and a team of 12 researchers were awarded NASA's Group Achievement Award for their development of a novel non-dispersive infrared gas analyzer (NDIRGA) suitable for future use in outer space. The team was made up of engineers and scientists from around the world, including Dat Tran and Nicolas Gorius, Ph.D. candidates in EECS.

NASA's Group Achievement Award is conferred for outstanding accomplishment through the coordination of many individual efforts that have contributed substantially to NASA's mission.

The team's research began in January 2019 with funding from two NASA grants that aimed to support a future probe mission to the "ice giants" in the outer solar system, Uranus and Neptune.

An NDIRGA monitors water vapor and carbon dioxide gas partial pressures in space-based instruments. An NDIRGA subsystem that uses an NDIRGA currently is in development as part of the Comet Astrobiology Exploration Sample Return (CAESAR) mission at NASA Goddard Space Flight Center.

CAESAR is expected to be part of the NASA New Frontiers 5 mission that will take place as early as 2024 and is designed to support "high-science-return investigations" that contribute to an understanding of the solar system.

CAESAR aims to robotically acquire surface material from the nucleus of a Jupiter-family comet and return the sample to earth for laboratory analysis. The NDIRGA sample containment systems will protect the samples from contamination or alteration that would hinder their scientific lab analysis.

Nguyen Honored at World Automation Congress

The 2022 World Automation Congress (WAC) was dedicated to Charles Nguyen, dean emeritus and professor of electrical engineering and computer science. The event took place Oct. 10–13, 2022, in San Antonio, Texas. WAC is an international non-profit technical meeting dedicated to global dissemination of the latest information in the field.

Nguyen was acknowledged for "extraordinarily outstanding contributions to research in intelligent and robotic systems and achievements in engineering education and leadership."

In addition, Nguyen received a Medal of Honor for his contributions in founding the official journal of WAC, the international journal *Intelligent Automation and Soft Computing*, and serving as its editor-in-chief for 15 years. Nguyen has been elected the next general chair of WAC, and is organizing the 2024 meeting.



Dean Emeritus Charles Nguyen, right.



2023 was the first year Catholic University hosted the Greater Washington, D.C., Regional Junior Science and Humanities Symposium.

Kiriazes Wins \$18,000 Grant to Host Symposium

Rebecca Kiriazes, assistant professor of civil engineering, was awarded a \$18,000 grant from the National Science Teaching Association to host the 60th annual Greater Washington, D.C., Regional Junior Science and Humanities Symposium (JSHS) at Catholic University Feb. 25, 2023.

The regional symposium is part of a national high school STEM competition backed by the Department of Defense that challenges, engages, and publicly recognizes high-achieving students and their original research in science, technology, engineering, and math. Local high school students present their research at regional symposia before continuing at the national level. This was the first year the University was a region host.

Over 50 students from across the Washington metropolitan area submitted posters and presentations that were judged by a panel of experts. Dr. Harvey J. Alter, a medical researcher, virologist, physician,

and Nobel Prize laureate best known for his work that led to the discovery of hepatitis B and C, gave the keynote speech. Students took a tour of campus and were offered \$1,000 scholarships to Catholic University. A \$2,000 first-place academic scholarship was awarded to Lynn Tao for her presentation on early breast cancer risk detection.

The top students advanced to the national symposium April 12–15, in Virginia Beach, Va. Three won awards, including a first-place award, in the national competition.

Around 10 University engineering students assisted with hosting the event, allowing them to interact with and inspire future engineers.

“Hosting JSHS was a great opportunity to establish contacts and engage with students,” Kiriazes said. “Hosting the event further strengthened CUA’s existing relationships with DOD STEM outreach efforts. It was also fun showing off our campus and facilities to some of the top high school students in the D.C. area.”

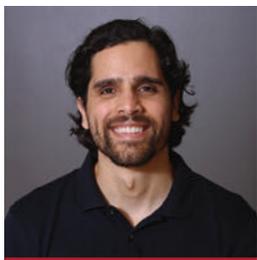


Clockwise: Assistant Professor Jason Davison; water sampling system on the banks of Sligo Creek; and Ph.D. candidate Grace Pooley Deans.

Davison Receives Grant to Research Microplastics

The AnthroHydro Lab at Catholic University, under the direction of Jason Davison, assistant professor of engineering, received a \$50,000 grant from the Chesapeake Bay Trust Foundation in spring 2022 to investigate microplastics in the Anacostia Watershed. The research team, whose work is ongoing, includes undergraduate and graduate students working under Davison’s direction. The researchers are conducting work north of the campus at Sligo Creek, sampling water using a peristaltic pump and stainless steel filters. The team conducts all travel for field work on bicycles, promoting carbon neutral research. Learn more at anthrohydro.com.

New Faculty and Staff



Santiago Correa, Ph.D. 2023, joined the School of Engineering in July 2023 as director of fabrication facilities. He received his master's and doctoral degrees at Catholic University in biomedical engineering with a focus on tissue engineering, bio-optics, and mechanobiology, after earning his B.S. in biology at Florida Atlantic University. With his experience in engineering and design, he hopes to help Catholic University's students gain the skills and insights needed to develop their ideas for real-world applications. Off work, he enjoys hiking and biking around Rock Creek Park and the Shenandoah mountains.



Joseph Flanagan joined the School of Engineering in September 2023 as administrative assistant in the dean's office. He received a bachelor's degree in political science with a minor in Spanish and sociology from the University of Massachusetts, Amherst. As an undergraduate, he worked as an administrative assistant in the Office of the Bursar, assisting students and parents with billing and financing. He also has experience working as a research assistant and a teaching assistant in the UMass Department of Sociology. Flanagan likes to travel, recently completing an 8,000-mile road trip across the country. He also enjoys hiking, mountain biking, skiing, and cooking.



Jeffrey Herrmann, Ph.D., joined the Department of Mechanical Engineering in August 2023 as a professor of mechanical engineering and the St. Abbo of Fleury Endowed Chair in Engineering (see story on Page 6). He previously taught at the University of Maryland for 28 years. Herrmann received his B.S. in applied mathematics from Georgia Institute of Technology, and his Ph.D. in industrial and systems engineering from the University of Florida. He has published over 100 journal papers and 15 book chapters, co-authored an engineering design textbook, edited two handbooks, and authored two textbooks. In his off time, he enjoys playing the card game pinochle with his family.



Kevin Riley joined the School of Engineering in October 2022 as operations coordinator. Riley previously served as a surface warfare officer in the U.S. Navy for eight years. His most recent assignment was as port operations officer-in-charge for Naval Support Activity Washington, and he previously served on the aircraft carrier USS George H. W. Bush and the destroyer USS Pinckney. He received a B.A. in history from Fordham University. A native Washingtonian, he loves playing football and spending time with his family.



Dominick Rizk, Ph.D., joined the Department of Electrical Engineering and Computer Science as an assistant professor in August 2023. He received his B.E. in computer and communication engineering from Notre Dame University-Louaize and his M.S. and Ph.D. in computer engineering from the University of Louisiana at Lafayette. He is the recipient of the Ragin' Leadership Academy Award, the President's Award for Educational Excellence and Outstanding Academic Achievement, and the ULL Dissertation Completion Fellowship. He has also worked as a computer analytics and design professional at iTether Technologies and a telecommunications engineer at OGERO.



Santiago Solares, Ph.D., joined the faculty in the Department of Mechanical Engineering in fall 2023 as professor of mechanical engineering and the St. Albert the Great Endowed Chair in Engineering (see story on Page 6). He was previously a faculty member at the George Washington University and the University of Maryland at College Park, visiting fellow and guest scientist at the National Institute of Standards and Technology, and visiting scientist at the Karlsruhe Institute of Technology. He also worked in industry with Mars Inc., and Pepsi-Cola International. He earned his M.S. and Ph.D. in chemical engineering from the California Institute of Technology, his M.S. in industrial engineering from the University of Miami, and B.S. and Licenciado in chemical engineering from the Universidad del Valle (Guatemala).



Alessandro Vato, Ph.D., joined the faculty in the Biomedical Engineering Department as associate professor in fall 2023. Vato's research focus is developing systems that control artificial devices using brain signals, with the aim to restore lost motor functions for people suffering from stroke, spinal cord injuries, or Parkinson's disease. He obtained his Ph.D. in bioengineering and bioelectronics at the University of Genoa (Italy) and held a postdoctoral fellowship at Northwestern University. He continued his work on brain-computer interfaces at the Italian Institute of Technology and the National Center for Adaptive Technologies (NCN) in Albany, N.Y. With his wife and four children, he enjoys eating pesto and focaccia, typical dishes from Genoa, and wholeheartedly follows his hometown soccer team.

School Leadership Update

Christopher Raub, Ph.D., associate professor of biomedical engineering, was appointed chair of the Biomedical Engineering Department in January 2023. Raub, who joined the faculty in 2014, is an expert in tissue engineering and biomedical optics. His research interests include studying microscale mechanisms of tissue injury, remodeling, and repair; cancer cell metastasis; mucosal tissue behavior; and quantitative polarized light microscopy. He has also recently led the School of Engineering's summer camps for high school students (see story on Page 5).

In Memoriam Timothy Kao, Professor Emeritus

Professor Emeritus Timothy Kao, Ph.D., passed away peacefully in his sleep April 16, 2023, after a long battle with leukemia. He was 85. Kao, an expert in fluid dynamics and environmental science, was a member of the civil engineering faculty for 39 years, and served both as chair of the department and associate dean of the school. He was an outstanding, respected educator and scholar and a friend and mentor to many students and colleagues.

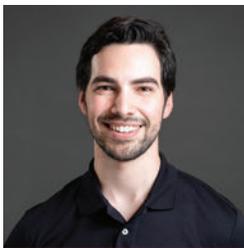


Making Space for Exploration

WITH THEIR BLEEDING EDGE STARTUP, QUANTUM SPACE ALUMNI ARE WORKING TO DEVELOP ESSENTIAL SPACE INFRASTRUCTURE.



Ben Reed,
B.S. 1990



Justin Cassidy,
B.E.E. 2019, M.S. 2019



Kam Ghaffarian,
B.S.E. 1980

Several Catholic University alumni are on a mission to transform the future of space commerce as part of a groundbreaking new startup, Quantum Space. The company was founded in 2022 by Catholic University alumni Kam Ghaffarian, B.S.E. 1980, and Ben Reed, B.S. 1990, along with their partner, former NASA Administrator Steve Jurczyk. The startup's goal is a big one: developing space infrastructure that will allow space missions and satellite teams to operate in deep space more safely, reliably, and affordably.

“As you move out away from Earth, it becomes harder and harder to navigate or control spacecraft,” said Reed, who earned his bachelor’s in chemistry from Catholic University in 1990. “We realized there is a real opportunity to develop spacecraft systems and a cislunar architecture of satellites that would allow humanity to further explore our solar system. We are working on the infrastructure — for communications, transportation, and navigation — that will allow humanity to explore and make use of a new environment.”

Prior to joining Quantum Space as the chief technology officer, Reed was the former division chief of Exploration and In-Space Services at NASA’s Goddard Space Flight Center. He was interested in starting Quantum Space because he wanted to do something bold and transformational with “a big, hairy, audacious goal.” Now, he enjoys developing relationships within the industry and watching trends to determine what future customer needs are going to be.

“My job is to be the top technical authority as well as the top technical navigator mapping out what the architecture looks like, what is possible today and what is going to be possible tomorrow,” he said. “We want to develop products that are future proof and that won’t become stale or stagnant right after release.”

Currently, the company is preparing its first spacecraft, QS-1, which is scheduled to launch in October 2024. Operating in cislunar space (the space between earth and the moon), the craft will carry a space situational awareness payload provided by GEOST as well as hosted payloads from other customers. Following that launch, the company plans to operate an outpost in space. The outpost will have two components — a spacecraft bus that hosts payloads using modular plug and play interfaces and a delivery spacecraft that could bring payloads to the outpost and install them with robotic arms.



A Cardinal Family Tradition

Justin Cassidy, B.E.E. 2019, M.S. 2019, is not the only one in his family who has benefited from a Catholic University education. Both his father and mother are engineers, both having earned degrees in mechanical engineering from Catholic University.

His father, the elder Justin Cassidy, B.S.M.E. 1988, works as a chief engineer at SAIC, providing support to multiple projects at NASA's Goddard Space Flight Center and Johnson Space Flight Center, while his mother, Rosa Cassidy, B.S.M.E. 1988, M.M.E. 1990, works as vice president for commercial excellence for Franklin Energy. Justin's sister Isabelle Cassidy, B.S.Arch. 2021, M.Arch. 2023, M.S.N.Z.D. 2023, earned her bachelor's in architecture and master's degrees in both architecture and net zero design and now works as an architectural designer for a firm in Bethesda, Md.

His aunt Patricia Tunnermann, M.A. 2014, earned a master's in early childhood special education from Catholic University. And Justin's wife, Elizabeth Cassidy (formerly Mendoza), B.A. 2018, graduated with a bachelor's in psychology.

Though he didn't always envision himself following in his parents' footsteps, Justin said he chose Catholic University for its small-school feel inside the city.

"There was just something about CatholicU, where it fit the bill for just about everything I could have wanted," Justin said.

His parents were thankful for both Catholic University's part in their own success and the support for their children.

"It was incredible to see my children grow in their future career paths in the same warm environment that attracted me to CUA and the School of Engineering," Rosa said.

Reed said he is grateful to be part of the space industry because of the ever-growing impact things happening in space have on modern life. He expects the payloads brought to the outpost could be used to improve efforts related to communications, navigation, remote sensing, space domain awareness, and space weather tracking.

"Everything done in space is done for people here on Earth," said Reed. "That excites me to no end."

Looking back on his time at Catholic University, Reed said he is thankful to have met his wife, Elaine, B.A. 1989. He's also grateful that, as a chemistry major, he learned to think rigorously and scientifically, skills that have been useful every day of his career.

"The lessons and the foundations Catholic developed in me is what allowed me to succeed," he said.

Quantum Space co-founder Kam Ghaffarian has a long history with scientific research, having previously started the commercial space station company Axiom Space and lunar lander developer Intuitive Machines. Like Reed, he credits his Catholic University education for playing a "pivotal role" in his journey from a young engineer to a co-founder and CEO.

"Everything done in space is done for people here on Earth."

"As an engineering graduate and a lifelong learner, I deeply value the transformative power of a strong education," he said. "Catholic University equipped me with essential skills and knowledge, laying a solid foundation for success in the ever-changing fields of technology and space exploration. My education fostered my commitment to continuous learning, adaptability, and critical thinking, shaping me into the engineer and leader I am today."

Reed and Ghaffarian are not the only Catholic University alumni at Quantum Space. Justin Cassidy, B.E.E. 2019, M.S. 2019, who earned both his degrees in electrical engineering from Catholic University, started working at Quantum Space last year as a member of the engineering team. He had previously worked alongside Reed when he interned on Reed's team at NASA Goddard.

During his time in the engineering school, Cassidy said he got to experiment and learn about a wide range of subjects, including power systems, circuit designs, and computer networks. That exposure has helped him in the startup, because he is often asked to step in and assist with various aspects of the project.

"The work I'm doing right now never gets boring; there's always a new challenge every day. At a fundamental level, we're trying to do something new and very hard," Cassidy said. "It is so rewarding to know that in a couple of years we're going to be building a really robust network in space which has not been done in the way we're doing it. I'm grateful for the opportunity to challenge myself and to advance the ways humans interact with space." — K.B.

From Start to Finish Recent Alumnus Helps Construct Garvey Hall



Two months after attending his graduation virtually from a folding chair in his backyard, William Pyne, B.M.E. 2020, returned to the University for day one of his first post-graduate job: senior project manager for construction of Catholic University's new dining facility.

Similar to other college graduates during the pandemic, Pyne did not experience a normal graduation ceremony. But unlike many peers who joined the remote workforce during the height of COVID-19, Pyne was on campus with Manhattan Construction Company to begin the new Garvey Hall project in July 2020, from the day the first steel pile went into the ground until the nearly 35,000-square-foot building officially opened Dec. 5, 2022.

As senior project manager, Pyne fielded problems or questions related to the project and was responsible for troubleshooting issues that arose. He reviewed submittals or requests for information that had to do with anything from the kitchen equipment installations to the structural steel to the stone facade.

"There was a lot of overall ingenuity and problem solving that I had to use every single day and the foundation of that really started in my HVAC classes," Pyne said, referencing his favorite classes as an engineering student.

The HVAC classes grounded Pyne's understanding of the refrigeration cycle and the general procedures of the systems that permit buildings to function properly.

"It was really applicable to my everyday job that I do now," he said. "It prepared me to deal with a lot of the equipment that I saw on the job every single day with Garvey Hall."

Garvey Hall was a challenging and unique project because of the materials and methods used. Constructed by hand, the building was "a time capsule, in a way," Pyne said. The stone was 100% hand laid by 30 Washington, D.C., stonemasons who were on the site for two years.

"I was blown away by the techniques of building classic structures that exist elsewhere on campus," Pyne said, pointing out Caldwell Hall, which is the oldest building on campus and was dedicated in 1888. "Those all were built by hand many, many years ago and they really just wanted to keep that theme and that approach to building."

Garvey Hall boasts a state-of-the-art custom kitchen with custom-made pieces of stainless steel, kitchen tables, and countertops. The building's clay tile roof is a unique building application for the Washington metropolitan area, one that is typically found in the southern region of the United States.

"This building is a really expensive project. I was very pleased to see how much of a commitment the University has made to give back to the students here and improve their dining experience," Pyne said. "The University spared no expense to try to make it an immaculate centerpiece on campus for many years to come."

During the project, students from the School of Engineering made multiple site visits to explore the construction and speak with the engineers, including Pyne. It wasn't so long ago that Pyne was in those students' shoes, starting out in the School of Engineering.

“It prepared me to deal with a lot of the equipment that I saw on the job every single day with Garvey Hall.”

Coming from Crofton, Md., Pyne chose Catholic University so he could play varsity baseball while studying engineering. Pyne’s great-great-grandfather, Daniel Pyne, was a boxer and football player for the University in the 1930s and was inducted into the University’s Athletics Hall of Fame in 1992.

“It was definitely a personal connection I felt to the school that drew me to come here too,” said Pyne, who grew up seeing his ancestor’s plaque of induction hanging in his grandparents’ house.

Pyne was captain of the baseball team during his senior year, preparing him for his future leadership roles on a construction crew.

In his sophomore year, Pyne discovered the Manhattan Construction Company at the University career fair, leading to a summer internship during which he worked with the company to renovate residence halls at George Washington University.

“That’s just kind of where I fell in love with the idea of working for a general contractor and being out on the jobsite every single day,” Pyne said. “From there, I really decided that construction was a path that I wanted to follow.”

Now an established project manager, Pyne sits behind the bright blue Manhattan Construction Company sign at the University career fairs twice a year, looking for Catholic University interns to fill the position that kick-started his career.



Above, Manhattan Construction Company in July 2020 on the site of the future Garvey Hall. Below, William Pyne, B.M.E. 2020, was senior project manager for the new dining hall.

There’s a real pipeline from Catholic University to Manhattan Construction Company, he said. “The company is very pleased with the level of talent that comes out of the school and believes that the school really prepares engineering students well for the future.” — C.E.

Alumni Notes



Williams appointed to University Board of Trustees

Vice Admiral (retired) Melvin Williams, Jr., M.S.E. 1984, was appointed in June 2023 to The Catholic University of America Board of Trustees. Williams earned his master’s degree in engineering management from CatholicU while a junior officer in the U.S. Navy, then returned to serve in academic leadership after a distinguished Navy career and a presidential appointment as associate deputy secretary at the U.S. Department of Energy. After holding positions at the George Washington University and the University of California, Davis, he joined Catholic University’s School of Engineering from 2017 to 2022 to oversee the engineering management program, off-campus initiatives, and other programs for professionals. “As a grateful alum and former associate dean in the School of Engineering, it is an absolute privilege for me to continue service in support of The Catholic University of America,” Williams said.



Root inducted into Institute of Electrical and Electronics Engineers Eta Kappa Nu Society

Carolyn Root, M.S. 1986, Ph.D. 1992, was recognized by the Institute of Electrical and Electronics Engineers by being inducted into the honor society Eta Kappa Nu (IEEE-HKN). Root’s invitation recognized her work providing leadership skills training to engineers and engineering students, including a series of professional development workshops offered to Catholic University undergraduate engineering and computer science students as part of the Senior Seminar curriculum.

//OUR STUDENTS

SpringWEAR Brings Hope to Stroke Victims with Hand Impairments

During his doctoral studies in biomedical engineering at Catholic University, doctoral student in biomedical engineering, Rafael Casas, Ph.D. 2022, was part of a research team working on a spring-powered, wearable hand device that improves range of motion for stroke victims, enabling them to open and close their hands and perform simple everyday tasks, like picking up a cup or a ball.

The researchers, under the direction of Professor Peter Lum, would occasionally talk about the possibility of starting a company to manufacture and market the device (known as HandSOMEII), making it widely accessible, and significantly improving the quality of life for stroke victims.

In 2021, Casas decided to take the plunge, becoming the founder and CEO of SpringWEAR, a research and development company based in Baltimore that is developing upper-limb exoskeletons for stroke rehabilitation. Earlier this year the company received its second grant to fund research and development.

“Rafael works exceptionally hard and has always had that desire and drive to have an impact on stroke victims beyond just developing devices in the lab,” said Lum, who was a biomedical engineer with a research

rehabilitation and development center focused on veterans before coming to Catholic University. “For Rafael to take this on and make it his career path is exceptional and unique.”

Stroke is the leading cause of long-term disability worldwide, with 15 million new cases each year globally, including 800,000 in the United States alone. Sixty-two percent of stroke survivors will have impairments of the hand, including the inability to open or close it, as well as increased tightness, which makes it difficult to live independently.

Casas’ goal for SpringWEAR is to make and sell a suite of devices that are affordable, customizable, and designed to help patients with activities of daily living as part of a home rehab program. The company builds on more than 25 years of research by the Center for Applied Biomechanics and Rehabilitation Research — a partnership of Catholic University’s biomedical engineering department and researchers at MedStar National Rehabilitation Hospital in Washington, D.C. near the University campus.

Casas, who also works as a postdoctoral researcher in the biomedical engineering department, took the initiative to do the extensive legwork that’s required to start a company like SpringWEAR, said Lum.

Casas recruited a team of fellow Catholic University researchers

Diane Nicholas, a retired physical therapist from MedStar National Rehabilitation Hospital who is a consultant for SpringWEAR, performs an assessment of a stroke patient.





Biomedical engineering master's student Hanh Hoang, B.B.E. 2023, assesses the patient's range of motion of each finger joint using a cyberglove.



A computer screen shows one assessment of a stroke patient's hand.

“Rafael works exceptionally hard and has always had that desire and drive to have an impact on stroke victims beyond just developing devices in the lab.”

to take a rigorous 20-week course with the IMPACT Center that is sponsored by the National Institute on Disability, Independent Living, and Rehabilitation Research. The course walked them through the process of commercializing research, developing a business plan, and creating product prototypes.

Once SpringWEAR was created, the institute — the federal government's primary disability research organization — awarded the company the first of two \$100,000 Small Business Innovation Research grants. The first grant funded additional research on HandSOMEII (formally known as the Hand Spring Operated Movement Enhancer). The second grant, which was awarded earlier this year, supports the development of a motorized hand exoskeleton for stroke rehabilitation.

Casas noted that “other priorities for SpringWEAR to address” include approval of the devices by the U.S. Food and Drug Administration and

determining reimbursement by insurance companies for patients who want to buy them.

Casas' drive to establish SpringWEAR stemmed, in part, from his concern for the stroke victims he's met while helping to develop HandSOMEII. Working one-on-one with stroke patients referred by the hospital, Casas and his fellow researchers tweak and fine-tune the device to meet the specific needs of individual patients.

The company is named after one of Lum's early devices that was called SpringWEAR — a reference to the springs or other kind of elastic elements that most of them contain. “The name also implies spring as in regrowth and hope for patients,” said Casas.

“This work is really inspiring,” he said. “I tell the patients they've built a fire in me to speed up the process as much as I can, so the devices will be accessible for them to take home as soon as possible.” — K.L.



Sophia Cook, B.A. 2023, and Margaret Bubel, B.M.E. 2023, run the Pi Day course.



Pi Day Run participants pose for a pre-race photo.

School of Engineering Organizes First Pi Day Run

On March 14 — that's 3.14 or Pi Day — the School of Engineering celebrated the number and pun with a 3.14 mile fun run/walk around campus, followed by a buffet of pie back at Pangborn Hall. Though the day was beautifully sunny, an ice-cold wind was blowing. As the 5 p.m. start time approached, students, faculty, and staff crowded into Pangborn's lobby to wait for the last participant — Dean John Judge — to arrive.

After shivering through a group picture, the runners and walkers were off, following a series of chalk arrows marking the route. The first students to conquer the course, Joseph Gabris, a junior studying mechanical engineering, and Rachel Bussanich, a senior architecture major, won the much coveted trophies for fastest male student and fastest female student respectively.

The run's organizer, Emily Bowman, B.M.E. 2023, a senior in mechanical engineering, crossed the finish line next. The prize for fastest staff member went to School of Engineering Administrative Assistant Liz Schack. Diego Turo, associate professor for mechanical engineering, came in first among the faculty. Maria Erquiaga, a junior mechanical engineering major and Tau Beta Pi president-elect, presented the 3D-printed trophies.

Following the awards ceremony, the participants retired to the Scullen Room for well-earned pie and to start planning to make the event bigger and better next year!



Our Students

Hard Hat Ceremony and Senior Design Night

The Civil and Environmental Engineering Department's annual Hard Hat Ceremony and Senior Design Night, held since 2021, is a new tradition that has quickly become a favorite.

More than 200 alumni, students, faculty, University leaders, and industry professionals were on hand in Heritage Hall on Oct. 19, 2022, as Jason Davison, assistant professor of civil and environmental engineering, distributed a hard hat and high-visibility vest to each first-year student. The items first were blessed by Father Aquinas Guilbeau, O.P., University chaplain.

This celebration of new students at the beginning of their journey into the engineering profession, and networking opportunity, opened with remarks from University President Peter K. Kilpatrick, Provost Aaron Dominguez, Engineering Dean John Judge, and Ryan Knox, project executive for Clark Construction.

In addition to the hard hat ceremony, posters of the preliminary work for senior design projects in civil, environmental, and mechanical engineering were on display, giving students the opportunity to discuss the projects they will complete in the spring semester.

Clark Construction Group, LLC, was the presenting sponsor for the evening, with additional sponsorship by Associated Builders and Contractors of Metro Washington, Bozzuto Construction, Consigli Construction Co., and Whiting-Turner Contracting Co.



The School of Engineering's Hard Hat Ceremony has become a favorite tradition.

Catholic University Engineering Students Participate in Lockheed Martin Ethics in Engineering Competition

A team of two students from the School of Engineering represented Catholic University at the annual Ethics in Engineering Competition organized and hosted by the Bethesda, Md.-based Lockheed Martin Corporation in spring 2023. This was the first time that Catholic University participated in the prestigious competition.

Kerene Bomela, in her first year studying electrical engineering, and Johnathan Casey, B.S. 2023, were led by their faculty adviser, Sergio Picozzi, clinical assistant professor of electrical engineering and computer science.

The students competed in a field of 73 two-person teams from universities across the nation plus one team from overseas.

Each team, representing one of two parties in an ethics dispute between two fictional engineering outfits, faced another team in each

round. The fictional ethics case was conceived by Lockheed Martin ethics specialists and released to the participants a few weeks prior to the event.

The Catholic University team won its first round before succumbing by a very narrow margin to a much more experienced team in the second round. Catholic University received excellent feedback from Lockheed Martin staff, and the team reported the experience was of extraordinary value from both human and professional standpoints. Catholic University plans to send a new team into the competition in 2024 so stay tuned.





May 2023 School of Engineering Awards

Student Award Recipients

Dean Charles Cuong Nguyen Leadership Award

Amelia Baldo

The H.B. Atabek Award

Seraphina Culp

The Anthony J. Scullen Award

Margaret Bubel

The Benjamin T. Rome Award

Kelsey Martin, Troy Young

Biomedical Engineering Society Award

Eilis McCormick

American Society of Civil Engineers National Capital Section Award

Nathaniel Lauren Selden

Dennis McCahill Award for Service in Civil Engineering

Mitchell Aaron

Timothy Kao Award for Excellence in Civil Engineering

Vincente Johnson

The George McDuffie Award for Excellence in Electrical Engineering

Isabella Freemont

The John N. Welch Award for Excellence in Computer Science

David Olumilua, Geetanjali Sharma

The C.C. Chang Award for Excellence in Mechanical Engineering

Margaret Bubel, Nicholas Mascolo

American Society of Mechanical Engineers Award

Amelia Baldo, Kelsey Martin

Ruth Hicks Award for Service in Mechanical Engineering

Emily Bowman

Dean's Service Award

Jacob Tribull, Emily Bowman

Grand Challenges Scholars

Emily Moriarty

Elizabeth Staten

Wesley Garnes

Leandro Mendez Zuleta

Faculty and Staff Award Recipients

Burns Junior Faculty Fellowship

Rebecca Kiriazes

Charles H. Kaman Award for Research Excellence

Diego Turo

Charles H. Kaman Award for Teaching Excellence

Jason Davison

Dean's Faculty Service Award

Jandro Abot, Gregory Behrmann

Engineering Staff Excellence Award

Elizabeth Schack

Engineering Part-Time Instructor Award

Walter Steimel, Esq., Colleen Canovas, Esq.

Our Students

Congratulations, Class of 2023!

Doctoral Degrees

Saeed Zayed Al Muharrami

Dissertation: Developing a Water Management Digital Twin Model for the City of Abu Dhabi

Abdulelah Sulaiman Alrebaish

Dissertation: Crystal Structure and Mechanism of Formation of Biological Hydroxyapatite Mesocrystals

Santiago Ocampo Correa

Dissertation: Biofabrication of in vitro Tumor Microenvironments for Mechanistic Studies

Son Dinh

Dissertation: Transmission Control and Optimization in Hybrid Wireless Network

Tu Thi Cam Duong

Dissertation: Synchronization Sliding Mode Control of Closed-Kinematic Chain Robot Manipulators with Time-Delay Estimation

Sharif Helmi Rabeea Khalil

Dissertation: Receiver Localization in M-Mimo Beamforming Networks

Hsin-Hung Kuo

Dissertation: Hand Use and Grasp Sensor (HUGS) System in Monitoring Infant Fine Motor Development

Phan Thai Hien Nguyen

Dissertation: Understanding Underlying Mechanisms of Upper Extremity Functional Impairment Following Stroke

Le Hoang Phu Pham

Dissertation: In vitro Biofilm Model in Calcium Alginate to Probe Antibiotic Susceptibility Assays and Mutual Microbial Interactions

Tannaz Tayyarian

Dissertation: Carbon Nanotube Yarn Monofilament Polymeric Composites: Thermoresistive and Dynamic Piezoresistive Responses

Andrea Vecchiotti

Dissertation: Modeling Atmospheric Sound Propagation in Littoral Environments

Master of Science, Biomedical Engineering

Abdulelah Saeed Ali Bakdam

Kaitlyn Christine Caple

Seraphina A. Culp

Misca Tennille Geter

Abia Sheikh Khan

Tang Thu Ha (Jessica) Ngo

Master of Science, Civil Engineering

Fatmah Ahmad Abbas

Fahd Alajmi

Mohammed Mahdi Alajmi

Ahmad Alfidhli

Saleh Almarri

Yousef Almejaibel

Abdullah Almutairi

Yahya Mohammed H. Alsaab

Yousef Alwazzan

Zebasil Getu Asefa

Yousef Salem

Kimberly Sorto

Master of Science, Computer Science

Leanne N. Aspinwall

John D. Bird IV

Edward Gustave Born

Alexis Jane Sahagun Bumanglag

Glenn Fierek

Kelsey Hecker

Patrick K. Hentz Jr.

Harris Ray Jolly

Jeremy Katzenstein

Mina Grace Larraquel

Rose Miner

Brian Achuna Ofonedu

Melinda Kristie Banton Perez

Jasper Effin Reed

Andrew W. Russell

James Strawa

Master of Science, Data Analytics

Gerson Rafael Escobar

Donald F. Fuaelem

Abdulbasit Abdulrahman M. Hawsawi

Ramesh Mainali

Jaya Prasad Tatineni

Master of Science, Electrical Engineering

Saleh Alharbi

Jonathan Alexander Guandique

Thomas Daniel Melgaard

Mohamad Ali Nacemi

Trieu Nguyen

Bryan Isaac Vogel

Master of Science, Engineering Management

Amer Aldawood

Yazeed Alharbi

Abdulrahman Ali M. Al Mutiq

Saud Asad Alsharif

Sulaiman Ibrahim Sulaiman Alsughayyir

Abdarhman Duaij Y. Al Thuwaini

Madeline Marguerite Groettum

Abdulbasit Abdulrahman M. Hawsawi

Austin Sage Hunt

Skylar William McLean

Elise Marie Parker

Master of Science, Materials Science & Engineering

Matthew Joseph D'Ortona III

Luke Evan LaRosa

Patrick P. Walsh



Master of Science, Mechanical Engineering

Sarah Abdulhussein Allami
Jonathan E. Mattson
Joseph W. Osborne
Sarthak Regmi
Eryk Ross
Jeffrey Antonio Schriefer-Flores

Bachelor of Biomedical Engineering

Ameer Antar
Heather Berberich
Christopher A. Bianchi
Seraphina A. Culp
Molly Katherine Glynn
My Minh Hanh Hoang
Khanda Karim Khan
Chelsea Asia Loh
Eilís Rose McCormick
Alhareth Yousif Mendkar
Noah Miller
Aubree Rose Narus
Tang Thu Ha (Jessica) Ngo
Huynh Yen Nhi Nguyen
Robert W. Novak
May T. Rajtboriraks
Elizabeth Grace Staten
Eric William Szydlowski
Jacob Tyson Tribull
Massimo Tschantret
Troy Alexander Young

Bachelor of Civil Engineering

Mitchell Aaron
Mohammed Mahdi Alajmi
Mubarak Almarri
Omar Almutairi
Dieter Alec Kerat
Megan Elizabeth Kuhns
Riley Scott Meyers

Emily Rita Moriarty
Anh Kiet Ngo
Malachi Jordan Phillips
Nathaniel Lauren Selden

Bachelor of Civil Engineering and Bachelor of Science in Architecture

Vincente Rodriguez Johnson
Connor M. Quinn
Victoria Elena Roscoe
Samantha Zoe Scian

Bachelor of Electrical Engineering

Faisal Alenezi
Rayan AlKefari
Kaitlyn Christine Caple
Johnathan Michael Casey
Arthur Berkley Coy
Isabella Rose Freemont
Arthur Liam Jackson
Foti Koutsouli
Matias Maldonado
Leandro Enrique Méndez Zuleta
Thomas J. Nargi
Jacob Scoblick
Noah Turner

Bachelor of Mechanical Engineering

Abdullatif Najeeb Alforaih
Saeed Almarri
Hisham Saleh Alqasoumi
Abdulaziz Altamimi
Bridget Marie Atkinson
Amelia Jane Baldo
Emily Elizabeth Bowman
Margaret Bubel
Conor Vincent Casey
Ian Harley Albert Clarke
Chase Matthew Dreitlein
Matthew William Gardiner

Leonardo Jose Giron Berrios
Richard Gage Hurlbut
Hamad Hussain
Robert Stake Jett
Stephen Albert Patrick Kish
Elizabeth Rose Lange
Joshua Lara
Daniel Marcello
Kelsey Martin
Gino Joseph Martinelli
Nicholas M. Mascolo
Ian James McCaw
Colin James McDonnell
Megan Metzger
Nicholas Miraglia

Bachelor of Science in Computer Science

Hayley Elizabeth Cora Buba
Gustavo R. Cestero Manzanal
Prithvi Raj Gali
Wesley Garnes II
David Olumilua
Michael William Quinn
Rhea Neha Roxy
Sebastian P. Scheller
Geetanjali Sharma
Blaise Nicholas Trapani

Bachelor of Science, Environmental Engineering

Nathaniel Alexander Perrins



Our Students

Student Profile: Jacob Tribull

JACOB TRIBULL, B.B.E. 2023,
IS THIS YEAR'S RECIPIENT OF THE
ENGINEERING DEAN'S SERVICE AWARD.



The Tribull family, from left to right: Jenna Tribull-Moore, Elizabeth Tribull, Shelby Tribull, Jacob Tribull, and Edward Tribull.

Why did you decide to come to Catholic University?

I knew CatholicU engineering would challenge me and offer opportunities for growth. Here, I would be challenged every day to be the best version of myself.

Why study biomedical engineering?

Biomedical engineering provides a bridge between person, science, and medicine. You have the unique opportunity to combine a person's wants and medical needs, while pushing the boundaries of what is scientifically possible.

Can you talk about your senior design project?

Our device was created to allow patients with osseointegrated prosthetics to return to high impact activities like skiing, running, and mountain biking.

Osseointegration involves implanting a titanium fixture into the bone of an amputated limb. A titanium rod is then inserted into this fixture and sticks out of the skin. A prosthetic limb is connected to this transcutaneous rod, allowing the prosthetic limb to become "a part" of the patient's leg.

If an osseointegrated patient falls, the consequences can be catastrophic and could result in a fracture of the residual limb from the inside out. Our device allows for the prosthetic limb to separate from the rod, saving the patient's residual limb. Currently,

the industry gold standard is not able to meet the needs and desires of the Department of the Defense.

In April, we began a partnership with the Osseointegration Program of the Department of Defense at Walter Reed National Military Medical Center and the Uniformed Services University to further develop and test our device. They have been incredibly helpful and have provided us with tremendous resources. With their help we have had great success with our project, winning Catholic University's Engineering's Senior Design Competition in 2023. We are continuing our partnership to continue testing with the hope of obtaining a patent and human testing. Additionally, a lot of our success can be attributed to our challenger from the QL+ foundation. Our challenger is incredibly inspiring and is always willing to help with our development.

What's one thing you'll miss most about Catholic University?

The location. So close to everything, but secluded enough to feel like its own entity.

What were the best parts of your time in the School of Engineering?

What was your favorite class?

Who was your favorite professor?

Best part of engineering was senior year. Being able to be in control of our project was a really amazing experience. We got to learn everything from designing, to grant applications,

to presenting to decorated colonels and medical professionals. My favorite professor in engineering was Dr. Gregory Behrmann. He pushed me intellectually every day, while supporting and developing me into a medical student.

What will you be moving onto next?

I am currently a 2LT (2nd Lieutenant) in the United States Army's Medical Service Corps, and attending Uniformed Services University (USU) in Bethesda, Md., to obtain my M.D. I'm happy to have life planned out for 20+ years. I'm a planner, but do not have to box myself in. At USU I'm guaranteed a job and a medical residency, but my career field is vast with ample opportunities. I hope to pursue a specialty in the field of rehabilitation medicine.



Associate Professor Chris Raub, Jacob Tribull, B.B.E. 2023, and Dean John Judge.



Scholarships Open Doors

“Thanks to this generous scholarship, my family and I don’t have to worry as much about financing my tuition. By lessening this burden, this scholarship allows me to focus on my schoolwork and not worry about how I will afford to go to school. One thing I hope to do in the future is to pay this kindness forward and assist other struggling students in the way you have done for me.”

Sophia Smith

Biomedical Engineering Major
Expected Graduation: Spring 2026

Impact scholarships like this have spurred a 12% increase from last year in undergraduate enrollment in the School of Engineering, bringing the numbers back to pre-pandemic levels.

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